

Developmental changes in source monitoring
in 3- to 5-year-old children:

Favorable conditions
and
factors relevant to early source monitoring

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dedicated to Mama, Opa and Omi

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Abstract

The ability to differentiate between the sources of our memories is a complex memory performance. In my dissertation, I examine what favorable conditions of early source monitoring performances are and what cognitive, social-cognitive and social factors are relevant to early source monitoring performances.

In my first experiment, I examined whether an action encoding mode in comparison to a verbal encoding mode is a favorable condition for early reality monitoring, internal and external source monitoring performances using a sample of thirty-six 3-, 4- and 5-year-old children. Besides this, I examined whether working memory performances, verbal abilities, false-belief understanding and social variables are meaningfully related to these source monitoring performances. My first experiment showed that the action encoding mode is a favorable condition for 4- and 5-year-olds' external and reality monitoring performances but not for the 3-year-olds' source monitoring performances. My experiment revealed as well that the selected working memory performances, verbal abilities, false-belief understanding and single social abilities were meaningfully related to single source monitoring performances.

In my second experiment, I examined whether the familiarity with the person source is a favorable condition of early reality and external source monitoring performances, when multiple source attributions (reality, internal and external source monitoring sources) in a multiple source attributions condition are possible and whether the internal source monitoring instruction can be optimized for 3-year-old children using a sample of forty-eight younger 3-, older 3-, 4- and 5-year-old children. I also examined whether inhibition performances, verbal abilities, theory of mind abilities and social variables are relevant to the early reality monitoring (familiar; unfamiliar), to the internal and to the external source monitoring performances. My second experiment showed that the familiarity with the person source is a favorable condition for the children in each age group. The experiment also revealed that multiple source attributions are possible at the middle of the third year of life and that the internal source monitoring instruction can be optimized for older but not for younger 3-year-old children. Again single relations were found between the selected verbal abilities, theory of mind abilities and social variables and the included types of source monitoring but no relations were found between the inhibition performances and the examined source monitoring performances.

With these findings, my experiments extend our current knowledge on how young children differentiate between the sources of their memories by showing when source monitoring is first possible, what characteristics are already used, how source monitoring can be improved, and what cognitive, social-cognitive and social variables are relevant to early source monitoring.

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1 General Introduction

One of the most amazing things in early development is how children find their way in their growing number of memories. How is it possible for example that a young child can vividly remember a specific dialog and the grips carried out during building a stone dam together with another child that has only been met once before on a weekend holiday a couple of months ago? Or how is it possible that a child can remember a dialog between their parent and a stranger about a fantastic but unsuccessful attack of three players during a football game without mixing up what was said by whom when later talking about the football game with a friend? In remembering such experiences, it is not only necessary to remember the specific event, its place, its course and the persons that were present, but it is also necessary to somehow remember who said what, who did what and to remember what the intention was. With it, such memories require in addition to the recollection of the *pure facts* about the event, the differentiation between the (person) sources of single elements of the recollected event. Besides this, they also require to remember and report the event correctly corresponding to the person source of that memory. This ability of young children to differentiate between the different person sources of their memories is the subject of my dissertation. I will examine how young children learn to differentiate between the person sources of their memories and with it, how they find the sources in their recollections. Thereby, I focus my examination on children between the third and the sixth year of life because the beginning and the most important developmental changes seem to take place during this time of age (Lindsay, 2002; Roberts, 2000, 2002). I will also focus my examination on the differentiation of person sources because person sources seem to be the first sources and the most important sources of our memories.

Before I outline my specific research questions, I first give a brief introduction into the ability to differentiate between the sources of our memories and what is known about its developmental pathway. After that, I derive my specific research question and outline the experiments I carried out for my dissertation.

The theoretical basis of the ability to differentiate between the sources of our memories is the source monitoring framework. The source monitoring framework was developed by Johnson, Hashtroudi and Lindsay (1993) and is an extension of the reality-monitoring framework proposed by Johnson and Raye (1981). It is a theoretical and empirical well founded and established approach describing and explaining the ability to differentiate between the sources of our memories in a multilayered way (e.g., Tulving & Craik, 2000). Because other theoretical approaches focus on specific aspects of source monitoring performances only (e.g., Fuzzy-trace theory by Brainerd & Reyna, 1990, 2005; for comparisons see Reyna & Lloyd, 1997; Lindsay & Johnson, 2000; Thierry, Spence & Memon, 2000), I opted to use the source monitoring

framework proposed by Johnson, Hashtroudi and Lindsay (1993) as the theoretical framework for my dissertation.

The source monitoring framework is an integrative approach that incorporates the central themes of contemporary memory theories (Johnson & Raye, 2000). The central themes include the constructive and reconstructive nature of memory, the importance of retrieval cues, and the need for memory mechanisms (Johnson & Raye, 2000). The source monitoring framework assumes that memories consist of distributed characteristics, more or less well bound together, that resulted from perceptual processing (e.g., identifying objects, locations, colors) and reflective processing (e.g., imagining a conversation, planning activities; Johnson & Raye, 2000). This means that memories are initially constructed from perceptions, thoughts, beliefs and goals activated at the time of acquisition and they are reconstructed (often differently) in the contexts of different activated information and goals (Bartlett, 1932; Johnson & Raye, 2000). This suggests memories may be activated incompletely with different characteristics activated at different times, conflated with similar memory characteristics from other events, or otherwise changed by additional perceptual or reflective characteristics (Johnson & Raye, 2000). Because of this vagueness about the origin of the mental experience, inferential processes are needed to evaluate the source of an activated memory (Johnson & Raye, 2000). The source monitoring framework suggests that we evaluate activated information and infer from its phenomenal properties and/or its relation to other memories, knowledge and beliefs that it is *veridical* (Johnson et al., 1993; Johnson & Raye, 1981, 2000; Lindsay & Johnson, 1989; Raye, Johnson & Taylor, 1980). Evaluation processes are assumed to vary from relatively automatic (or heuristic) to more deliberate (or reflective, or systematic) complex processes (Johnson et al., 1993; Johnson & Raye, 2000). The parameters of these evaluation or monitoring processes – such as how and what types of information are included – vary as a function of the selected decision criteria like the consequences of errors, social factors, and the like (Johnson et al., 1993; Johnson & Raye, 2000). In this sense, source monitoring performances also provide a way of investigating the characteristics that give memories their episodic character because it is the quality of having a particular source in the personal past that makes a memory autobiographical (Johnson, 2005; Johnson et al., 1993; Lindsay, 2000; Mitchell & Johnson, 2000).

In the source monitoring framework, the term *source* refers to the characteristics that specify the conditions under which a memory is acquired (Johnson, Hashtroudi & Lindsay, 1993; Lindsay, Johnson & Kwon, 1991). These characteristics include the spatial, temporal and social contexts of the event, as well as the media and modalities through which the event was perceived (Johnson et al., 1993). In the source monitoring framework, it is assumed that the source of information typically is not stored as a propositional tag along with the memories, knowledge and beliefs but is rather inferred based on the available information (Johnson et al., 1993; Johnson & Raye, 2000). Either heuristic, or more deliberate, or a mixture of both source

decisions can be used to attribute a source to its memory (Foley & Johnson, 1985; Foley Johnson & Raye, 1983; Johnson, 1991; Johnson et al., 1993; Johnson, Foley, Suengas & Raye, 1988b). Johnson et al. (1993; Johnson & Raye, 2000) assume that we are not always conscious of these source decision processes and that heuristics source decision processes take place constantly without notice and are relatively automatic and effortless. In contrast, the systematic source decision processes require reflective processes that are likely to give rise to a sense of effort (Hasher & Zacks, 1979; Johnson & Raye, 2000) or control (Johnson & Raye, 2000; Posner & Schneider, 1975; Shallice, 1988).

In the source monitoring framework it is assumed that the characteristics of an activated memory are evaluated with respect to the expectations about the distinguishing qualities of the different sources of memories (Johnson et al., 1993; Johnson & Raye, 2000). Depending on the conditions of the time when the source decision takes place and the importance of the accuracy, a specific subset of characteristics of the activated target memory can be selected. Based on this the source can then be attributed (Johnson & Raye, 2000). If accuracy is more important, maybe more specific information, another set of memory characteristics, strategic retrieval and evaluation processes are used (Johnson & Raye, 2000). According to the source monitoring framework, schemas and other prior knowledge (e.g., about a particular person) help to define source typical exemplars in heuristic and systematic source evaluation processes (Johnson & Raye, 2000).

Heuristic source decision processes are often based on phenomenal characteristics (Johnson & Raye, 2000). This assumption is based on empirical findings showing that source monitoring accuracy is influenced by manipulations of qualitative memory characteristics like perceptual details, cognitive operations and semantic information (Durso & Johnson, 1980; Lindsay et al., 1991; Johnson & Raye, 2000; Markham & Haynes, 1993). Besides this, people often offer specific details of a target memory as evidence that it really happened (Johnson & Raye, 2000): “I remember were we were sitting in the room and how the sun was shining on the show case with the old books inside”. Additionally, when people rate the qualitative characteristics of their memories, ratings are typically higher for perceived than for imagined events, and higher for correct than for incorrect events (Henkel, Johnson, and De Leonardis, 1998; Johnson, Foley, Suengas & Raye, 1988; Mather, Henkel & Johnson, 1997; Norman & Schacter, 1997).

While heuristic source decision processes rely on a rather nondeliberative comparison of phenomenal characteristics of an activated target memory to a set of expected characteristics, systematic source decision processes are responsible for a reflective and systematic retrieval of additional information and more deliberate reasoning about the event or target memory (Johnson & Raye, 2000). Examples of such systematic source decision processes can be the reflective generation of retrieval cues (use of previous knowledge to generate retrieval cues to gain additional memory characteristics), the retrieval of supportive memories (retrieving additional memories related to the target memory), noting the consistency or inconsistency of the memory characteristics (in remembering from one time to another, from person to person or the attributes

of a specific memory), and the evaluation of plausibility or likelihood (what is generally known/believed of the target memory) (Johnson et al., 1993; Johnson & Raye, 2000). Both – heuristic and the systematic source decision processes – are assumed to be embedded in an inter-individual social context and a broader cultural context that influence the nature of the events experienced initially (Johnson & Raye, 2000). This embedment is also assumed to affect the interpretations of the events and the criteria used later in making attributions of the source (Johnson & Raye, 2000).

In the source monitoring framework, three main types of source monitoring have been described into which most sources can be categorized (Johnson et al., 1993). The first main type of source monitoring is reality monitoring. This type of source monitoring contains an internal and an external source (Johnson et al., 1993). The internal source always refers to the person making the source attribution. For example, the person making the source attribution may comment on the unusual dress a woman just passing him is wearing to a colleague. The external source is always a source other than the person making the source attribution. For example, the external source could be the colleague replying to the comment of the person making the source attribution about his impression about the unusual dress. However, it is also possible for internal and external sources to only be privately perceivable in terms of covert behaviors (e.g. if the person only thought about the unusual dress).

The second main type of source monitoring is internal source monitoring. In this type of source monitoring, the person carrying out the source attribution is the source of the two (or more) contained internal sources. For example, the person making the source attribution can be the public internal source of an action carried out (e.g., turning of the iron before leaving the house) and also the private internal source of an action just thought of but not actually carried out (e.g., just thought about checking whether the window in the kitchen is closed before leaving the house).

The third main type of source monitoring is external source monitoring. In this type of source monitoring the sources consist of other persons, information sources (e.g., newspaper, television) or other types of information from outside the person carrying out the source attribution. For example, the first external source could be a teacher explaining how volcanoes work and the second external source could be the grand father of the person telling stories about his visit of a volcano in South America.

The assumption that reality monitoring, internal and external source monitoring are distinguishable classes of source monitoring is supported by the findings that poor performances in one type of source monitoring does not necessarily mean poor performance in another or all other types of source monitoring (Durso, Reardon & Jolly, 1985; Durso, Reardon, Shore & Delys, 1991; Harvey, 1985; Hashtroudi, Johnson & Chrosniak, 1989; Johnson et al., 1993). For

example, research on source monitoring has shown that young children have difficulties in internal source monitoring task but do not have difficulties in reality monitoring task (Foley & Johnson, 1985; Foley et al., 1983; Welch-Ross, 1995). However, Johnson et al. (1993) do not assume that different source decision processes are involved in the different source monitoring tasks (Johnson et al., 1993). Rather they assume that the different source monitoring tasks differentially draw on different memory characteristics but the retrieval and the source decision processes are the same in each type of source monitoring.

In the source monitoring framework it is assumed that the different types of sources differ from each other in their specific memory characteristics (Johnson et al., 1993). The main memory characteristics are perceptual (e.g., sound, colours), contextual (e.g., spatial, temporal), semantic, and affective (e.g., valence) in addition to cognitive operations and activities (e.g., thoughts inferences, elaborations, imageries in different modalities, reflective initiations and manipulations of images and thoughts; Johnson & Raye, 1981; Johnson et al., 1993). Sources of actual perceived events typically contain more perceptual, contextual, semantic and affective characteristics compared to sources of imagined events (e.g., Hashtroudi, Johnson & Chrosniak, 1990; Johnson et al., 1988b; Johnson et al., 1993; Roberts, 2000; Schooler, Gerhard & Loftus, 1986; Suengas & Johnson, 1988). On the other hand, sources of imagined events contain more cognitive operations (e.g., more conclusions or elaborations) and less perceptual and contextual characteristics (Johnson et al., 1993). According to the source monitoring framework, source decisions are based on average differences in the (typical) characteristics of the memories from the different sources involved.

Because the source decision depends on the availability of the source specific memory characteristics, it relies on the quality of the information recorded initially (Johnson et al., 1993). As pointed out before, these memory records themselves are the products of the perceptual and reflective processes that took place during the initial experience (Johnson, 1983; Johnson & Multhaup, 1992; Johnson et al., 1993). Features or characteristics that are poorly bound to the characteristics of an event during encoding or not consolidated or stored afterwards will be poor cues for those of other characteristics later (Johnson, 1992; Johnson & Chalfonte, 1994; Johnson & Raye, 2000). Characteristics of events may be poorly bound together for various reasons, including distractions during encoding, time pressure or similarity (Craik & Byrd, 1982; Jacoby, Woloshyn & Kelly, 1989; Johnson & Raye, 2000). Anything that prevents a person from acquiring the information will reduce encoding of the potentially source relevant characteristics (Johnson et al., 1993). For example, divided attention or stress can disrupt the perceptual and reflective encoding processes resulting in less enriched memory traces, which are later need to attribute the source (Jacoby, 1991; Jacoby et al., 1989; Kelley & Lindsay, 1993; Johnson et al., 1993). Source attributions are also more difficult if less source specific features are available or if the source characteristics are more similar (e.g., Ferguson, Hashtroudi & Johnson, 1992;

Johnson, Foley & Leach, 1988a; Johnson & Raye, 2000; Lindsay et al., 1991). Likewise, any factors that reduce the likelihood of an event becoming embedded in other events can reduce the amount of potential source relevant event characteristics (Johnson et al., 1993). Thus, the number of correct source attributions increases with the number of memory characteristics that exclusively belong to a certain source (Lindsay et al., 1991). Because source monitoring depends not only on the quality of the encoded and retrieved memory characteristics but also on the source decision processes, anything limiting these source decision processes during the source attribution can disrupt source monitoring performances (Johnson et al., 1993). This could be time pressure, severe stress, distractions or binding deficits, such as strategic retrieval deficits and deficits in the use of the strategic source decision processes and techniques (Johnson et al., 1993; Johnson & Raye, 2000). However, correct source monitoring attributions should be easy and accurate when the target event is retrieved in rich detail, when its attributes are unique characteristics of its source, and when appropriate source decision strategies are used (Johnson et al., 1993). Research on source monitoring indicates that source monitoring is almost fully developed at the age of 9 years and is fairly stable through most of adulthood with some decline in the elderly years (Johnson et al., 1993; Johnson & Raye, 2000; Mitchell & Johnson, 2000; Lindsay, 2000; Roberts, 2000).

Meanwhile, there are a numerous studies available that attempt to identify the physiological foundations of the source monitoring framework. Based on cognitive neuroscience studies of healthy adults, of older adults and of different groups of patients, two brain regions have been found to be involved in source monitoring processes (Johnson et al., 1993; Mitchell & Johnson, 2000; for an overview see Johnson & Raye, 2000). The first regions are the medial-temporal areas and the second regions are the frontal areas. Lesions in the medial-temporal or diencephalic areas have been found to affect the feature binding processes that are required for the encoding and the consolidation of complex information (e.g., Mitchell & Johnson, 2000; Johnson & Raye, 2000; Moscovitch, 1995; Squire & Knowlton, 1995). Besides this, lesions in the frontal areas have been found to affect self-initiated processes promoting binding (e.g., through maintaining the activation) and that are often critical for retrieval and evaluation processes (e.g., Mitchell & Johnson, 2000; Stuss & Benson, 1986; for an overview see Johnson & Raye, 2000). Lesions in both brain regions can affect source monitoring processes and often lead to lower source monitoring performances (e.g., Johnson et al., 1993; Johnson & Raye, 2000; Johnson, O'Connor & Cantor, 1997; Mitchell & Johnson, 2000). Consistent with these patterns of results, studies including older adults showed that these participants had lower source monitoring performances relating to their performances in neuropsychological tests measuring functions of the medial-temporal and frontal areas (Craik, Morris, Morris & Loewen, 1990; Glisky, Polster & Routhieaux, 1995; Henkel et al., 1998; Mather, Johnson & De Leonardis, 1999; Mitchell & Johnson, 2000; Schacter, Kaszniak, Kihlstrom, and Valdiserri, 1991; Schacter, Koutstaal &

Norman, 1997). For example, frontal area impairment often goes along with deficits in source identification tasks (Mitchell & Johnson, 2000; Schacter, Harbluk & McLachlan, 1984; Shimamura & Squire, 1987; Schimamura, Janowsky & Squire, 1990) and combined with impairments of other areas, like the basal forebrain, can result in profound source confabulations (DeLuca & Cicerone, 1991; Johnson, Hayes, D'Esposito & Raye, 2000; Mitchell & Johnson, 2000).

Besides this, studies using electrophysiological (ERP, Johnson, Kounios & Nolde, 1996; Wilding & Rugg, 1996) and neuroimaging techniques (fMRI, e.g., Nolde, Johnson & D'Esposito, 1998; Nyberg, McIntosh, Cabeza, Habib, Houle & Tulving, 1996; Zorrilla, Aquirre, Zarahan, Cannon & D'Esposito, 1996) examining the cortical activities of healthy adults engaging in source monitoring tasks revealed activations in the right and in the left prefrontal cortex indicating that these regions are involved in the source decision processes (Johnson & Raye, 2000; Mitchell & Johnson, 2000). Neuroimaging studies using episodic memory tasks suggest that the right prefrontal cortex is involved in relatively simple episodic memory performances and the left prefrontal cortex is involved in more complex episodic memory performances (Mitchell & Johnson, 2000; Nolde, Johnson, & Raye, 1998). Johnson and Raye (2000) and Mitchell and Johnson (2000) concluded from these findings that heuristic source decision processes could be supported by activity in the right prefrontal cortex and systematic source decision processes could be supported by activity in the left (or left and right) prefrontal cortex (see also Johnson & Raye, 1998; Nolde et al., 1998). Nevertheless, Mitchell and Johnson (2000) emphasize that the processes involved in heuristic and systematic source monitoring processes need to be further examined and specified because it is still unknown exactly how they are involved in these source monitoring processes.

Taken together, based on neuropsychological studies, cognitive aging studies, and studies using imaging techniques, it therefore seems that the medial-temporal areas and the frontal areas are central for source monitoring performances.

Because the source is not provided by a memory trace but is a result of a complex decision making process Johnson et al. (1993) assume that source monitoring develops with age. However, according to the source monitoring framework, source monitoring is not a single skill that a child acquires completely at a specific age (Lindsay et al., 1991; Lindsay, 2000; Johnson et al., 1993). Because source monitoring involves inferences about a number of different aspects of remembered events (e.g., remembering who, where, how, when) and requires a multitude of mental activities (e.g., perceptual and reflective analyses, integration, retrieval), developmental changes in source monitoring are said to take place gradually and are situation specific (Lindsay et al., 1991; Lindsay, 2000). Based on these complex demands, it can also be assumed that the development of source monitoring in children is related to individual differences along a number of dimensions (Lindsay, 2000; Lorschach & Ewing, 1995; Quas, Qin, Schaaf & Goddman, 1997;

Welch-Ross, Diecidue & Miller, 1997; Roberts, 2000). The available research on children's source monitoring already supports both assumptions (for an overview see Roberts, 2000). For example, children as young as 4 years of age can perform as well as adults at identifying the source of their memories in single situations, whereas in other situations children at the age of 8 years can perform poorer as adults (Foley, Aman, & Gutch, 1987; Foley & Johnson, 1985; Johnson & Raye, 1983; Lindsay et al., 1991; Roberts & Blades, 1998; Sussman, 2001). Foley and Johnson (1985) found for example that six year old children were as good as adults in attributing reality and external source monitoring sources correctly to their memories whereas the 6-year-old children could not attribute internal source monitoring sources as good as adults correctly to their memories. Based on such findings, Foley, Santini, and Sopasakis (1989) proposed that younger children particularly have difficulties in differentiating expressed thoughts or actions from those that were only imagined (see also Lindsay, 2000; Lindsay et al., 1991; Johnson et al., 1993; Sussman, 2001; Welch-Ross, 1995). One explanation for this difficulty is that children first need to acquire a firm conceptual understanding of imaginary mental representations before they are able to attribute such sources correctly to their memories (e.g., Perner, 2000; Welch-Ross, 1995). Such an understanding is acquired at the age of 4 years (e.g., Wooley & Phelps, 1994; Wooley & Wellman, 1993) which is the age where internal source attributions begin (e.g., Welch-Ross, 1995).

However, Johnson et al. (1993; Lindsay et al., 1991) assume that these specific difficulties with internal sources may indicate a more general difficulty that young children seem to have in coping with the similarity. The similarity in the source relevant memory characteristics can exist in the perceptual properties, in the functional properties, in the semantic content and/or in the cognitive operations (Day, Howie & Markham, 1998; Foley, Harris & Herrman, 1994; Johnson et al., 1993; Lindsay, 2000; Lindsay et al., 1991; Roberts 2000). Lindsay et al. (1991) found for example that across a variety of source monitoring tasks, the age differences are higher when the sources were more similar. The main reason for the difficulty of similar sources seems to be that not enough distinctive source specific memory characteristics are available that allow a clear attribution of the source to its memory. When the sources become more similar on one dimension, other potential source relevant memory characteristics may become more important and might be the only critical memory characteristics that allow a correct source attribution (Johnson et al., 1993). Younger children may have particular difficulties using multiple cues for their source attributions (Ferguson et al., 1992; Johnson et al., 1993) and/or to switch to other critical source characteristics of other modalities and thus fail to attribute the highly similar sources correctly to their memories (c.f., Lindsay et al., 1991). Lindsay et al. (1991) speculate that the following three factors can affect the ease with which the source of a memory is identified and that these factors can make sources highly similar to one another. The first factor is the amount and nature of the source relevant information accessible for the event; the second factor is the amount and nature of knowledge available about the characteristics properties of the

source or sources included; and the third factor is the extent to which the attributes of the target memory are uniquely specific to memories from its source (Lindsay et al., 1991). Lindsay et al. (1991) assume that these factors might be clarified by analogies to ongoing perception. For example, perceptual errors are relatively likely when stimuli are unfamiliar, when targets and distractors are similar, and when the decision criteria are lax or inappropriate (Lindsay et al., 1991). Source monitoring errors are relatively likely when memories are vague or incomplete, when the source is unfamiliar, when the source characteristics properties of the sources are very similar or when the source attributions are made quickly rather than more deliberately (Lindsay et al., 1991).

Besides this, other factors may lead to the gradual developmental change in young children's source monitoring performances. Lindsay (2000) assumes that children's ongoing experience may differ from adults' experiences in ways that affect some source monitoring performances but not other source monitoring performances. Young children for example might be better than adults at imagining themselves performing actions (Lindsay, 2000). With this, their memories on performed and imagined actions might have become more similar and are therefore harder to discriminate. This makes it more difficult to attribute them correctly to memories (Lindsay, 2000). According to Lindsay (2000), another reason might be that the kinds of memories coming quickly and easily to mind at test differ for children and adults. Adults may encode, consolidate and remember more source relevant characteristics, are more likely to gain access to the critical source relevant memory characteristics, and thus can attribute more sources correctly to their memories (Lindsay et al., 1991; Lindsay, 2000). Age related changes in source monitoring could also be based on deficiencies in young children's use of heuristic and/or systematic source decision processes (Johnson et al., 1993; Lindsay, 2000). It is possible that young children only have a small number of (nondeliberate) automatic or heuristic source monitoring processes available. They may still not know, fail to use, or use these more deliberate heuristic or strategic retrieval and source decision strategies less efficiently (Ackerman 1985; Lindsay, 2000; Johnson et al., 1993). If the source tasks are more demanding (e.g., due to higher similarity of the source relevant memory characteristics), then more deliberate heuristic or strategic source decision processes may become necessary but the younger children do not have these processes available yet and thus may not attribute the sources correctly to their memories (Johnson et al., 1993; Lindsay, 2000).

Another possible explanation is that the poorer source monitoring performances in younger children may be due to the immature development of the frontal areas that seems to play a central role in executive control of intentional retrieval and in (source) memory judgements (Cycowicz, Friedman, Snodgrass & Duff, 2001, 2003; Giedd, Blumenthal, Giedd et al., 1999; Leichtman, Morse, Dixon & Spiegel, 2000; Newcombe, Drummey, Fox, Lie & Ottinger-Alberts, 2000; Ruffman, Rustin, Garnham & Parkin, 2001; Schacter, Kagan & Leichtman, 1995; Schneider, Il'yasov, Hennig & Martin, 2004; Sowell, Delis, Stiles & Jernigan, 2001, van Petten,

2004). The frontal lobes show a long developmental course and the myelination and synaptic density do not appear to be complete until late adolescence or early adulthood (Chugani, Phelps & Mazziotta, 1987; Huttenlocher, 1990; Sowell, Thompson, Holmes, Jernigan & Togan, 1999; Yakovlev & Lecours, 1967). Studies of the EEG coherence or synchrony over the frontal regions indicate that changes extend into adulthood (Epstein, 1986; Thatcher, 1992; Thatcher, Walker & Giudice, 1987; Schacter et al., 1995). It is therefore possible that single source monitoring processes are not available because of such a late maturation. However, brain regions like the medial temporal lobes that seem to be involved in item memory mature earlier (e.g., Bauer, 2007, 2009; Nelson, 1995, 1997) and could allow other specific source monitoring to be performed at an earlier age.

Based on each of the previous presented origins of age differences in source monitoring different reasons and consequences for the beginning and the improvement of early source monitoring performances can be derived. If it is possible to create favourable encoding, consolidation/storage and retrieval conditions for young children then it might be possible to find out when source monitoring performances are first possible and how early source monitoring performances can be improved. In my dissertation I take up this research question and conduct two cross-sectional experiments to examine what favourable conditions of early source monitoring performances are and whether they allow and improve source monitoring performances of 3-, 4- and 5-year-old children. In both experiments, I focus on favourable encoding, consolidation and retrieval conditions. In the first experiment, I examine whether an action encoding mode is a more favourable condition of early source monitoring performance than a verbal encoding mode. In the second experiment, I examine whether the familiarity with the person source is another favourable encoding, consolidation and retrieval condition that allows children to attribute more familiar person sources correctly to their memories at an earlier age than unfamiliar person sources. In the second experiment, I also examine the age at which young children are able to attribute multiple sources in a simultaneous source attribution condition correctly to their memories and whether the internal source monitoring instruction can be optimized for 3-year old children. Each of the four conditions will help identify and specify favourable conditions of early source monitoring performances. These conditions will also give an indicator of when young children are first able to carry out source monitoring performances. Both experiments will also reveal insights into the question whether young children already have (all) information processing processes available to carry out source monitoring performances or whether young children cannot carry out source monitoring performances successfully because of their lower knowledge and experiences available during the source monitoring processes. Based on the reason, different consequences follow for the improvement of early source monitoring and for the borders of the beginning of early source monitoring. However, it could also be possible that both reasons are responsible for the lower source monitoring performances

in young children. If this is the case then it needs to be examined to what *extent* both reasons are responsible for the lower source monitoring performances.

In the two experiments of my dissertation, I only measure behavioural data. The first reason for this is that at present not much is known about the conditions of early source monitoring, the spectrum of early source monitoring performances and their developmental course way. They need to be identified and specified first before other types of data such as psychophysiological, neuropsychological data or data from brain imagining techniques can be assessed and interpreted meaningfully. The second reason is that there are a range of measurement challenges when assessing ongoing brain activities in young children because body movements that directly affect the quality of the assessed data cannot be controlled easily in younger children. For these reasons, I use behavioural data as the bases of analysis in both of my empirical studies.

Besides the examination of favourable conditions of early source monitoring, I also try to identify and specify factors relevant for early source monitoring performances. It can be assumed that the central cognitive, the social-cognitive, and the social changes taking place during the early childhood may allow, and/or support, and/or moderate the early source monitoring performances in meaningful ways (Roberts, 2002; Thierry, Spence & Memon, 2001; Welch-Ross, 2000). This might be particularly the case for executive functions, for working memory performances, for verbal abilities, for theory of mind abilities and for social variables marking favourable source relevant conditions. Because at present, the relations between these five groups of factors and source monitoring have not been examined much in source monitoring studies it is necessary to systematically examine the relevance of each factor for early source monitoring performances (Thierry et al., 2001; Welch-Ross et al., 1997; Welch-Ross, 2000). I therefore systematically examine whether and how these four groups of factors are related to the different source monitoring performances assessed in both experiments and how they may support and/or moderate the source monitoring performances of the 3-, 4-, and 5-year-old children. These analyses will give important insights into the factors relevant to early source monitoring and with it help understand how source monitoring is carried out and when developmental changes take place.

Now I present the two experiments of my dissertation in detail. In each experiment, I first present the theoretical and the empirical foundation of the addressed research questions and derive the hypotheses that are to be tested in the experiments. After that, I describe the method of each experiment. Following that, I present the results of each experiment and then discuss each research question in a discussion section. I end each experiment by summarizing the conclusions that can be drawn from the experiment. I close my dissertation with a general discussion in which I embed my research questions into the broader theoretical context and point out the arising practical implications.

2 Experiment 1

In my first experiment, I now examine whether the encoding mode is a favourable condition of early source monitoring performances and whether working memory performances, verbal abilities, false-belief understanding and social abilities are factors relevant to early source monitoring performances.

I describe experiment 1 in five sections. In the first section, I describe and discuss the theoretical and empirical foundation of my research questions (2.1). In the second section, I present the method of experiment 1 (2.2) and then describe in the results of experiment 1 (2.3). In the fourth section, I discuss in detail the empirical findings and theoretical meanings of the research questions of experiment 1 and point out the tasks of following research (2.4). In the fifth section, I then present the conclusion that can be drawn from experiment 1 (2.5).

2.1 Theoretical and empirical foundation

In this section, I present and discuss the theoretical and empirical foundation of experiment 1. I divided the section into two sub sections. In the first sub section, I discuss whether an action encoding mode can be a favourable encoding conditions of early source monitoring (2.1.1) and in the second sub section, I discuss whether working memory performances, verbal abilities, the false-belief understanding and social variables are relevant for early source monitoring performances (2.1.2).

2.1.1 Encoding conditions of early source monitoring

The ability to differentiate between the sources of our memories comprises the successful retrieval of the source specific memory characteristics (Johnson et al., 1993). The successful retrieval of the source specific memory characteristics itself requires the successful encoding of these source specific memory characteristics because only what has been encoded can later be retrieved (Johnson & Raye, 2000; Roberts 2000). It is possible that younger children encode a lower number of source specific memory characteristics and therefore have difficulties to attribute the sources correctly to their memories. If they can encode more source specific memory characteristics, then they might be able to attribute more sources correctly to their memories. In experiment 1, I take up this consideration and examine whether young children attribute more sources correctly to their memories in an encoding condition in which more source specific memory characteristics are available.

What can be a favourable encoding condition in which young children encode more source specific (memory) characteristics?

A promising favourable encoding condition for young children is an action encoding condition or an action encoding mode respectively. The first reason for the possible suitability of an action encoding mode could be that young children are already highly familiar with simple actions and can carry these out very well. This should allow them to retrieve the correct action execution and to carry out the simple actions by themselves in an optimal way. They may also know where difficulties in simple action executions come up and what possible differences between simple actions exist. Besides this, young children are highly familiar with watching how other people carry out simple actions. They should therefore have a broad knowledge about how different simple actions can be carried out. This may allow the children to observe how other people carry out the actions in an optimal and familiar way. Additionally, the children might be able to detect the person specific characteristics of the action executions and use them as additional cues in their source attributions.

Besides this, if actions are carried out then many perceptual characteristics and various cognitive characteristics about the action planning, the action execution and the action evaluation are generated and can be encoded (e.g., Engelkamp, 1998; Foley & Ratner, 2001; Nilsson, 2000; Welch-Ross, 1995). This is the case for actions carried out by one self as well as for actions carried out by others (Foley & Ratner, 2001; Engelkamp & Zimmer, 1998). Because young children mainly use perceptual memory characteristics for their source attributions (Welch-Ross, 1995), an action encoding mode could be suitable particularly for children younger than four years of age because it provides them with that type of memory characteristics they mainly use. This may allow them to encode more source specific memory characteristics and to attribute sources correctly to their memories and also to improve on this performance. The action encoding mode could be suitable for older children as well because it provides them with various cognitive characteristics or cognitive operations. This is particularly the case during the action planning and the action evaluation (Foley & Ratner, 2001). Because children at four years of age use cognitive characteristics or cognitive operations in their source attributions (Welch-Ross, 1995), the action encoding mode could also improve older children's source monitoring performances because it provides them with additional source specific cognitive operations that should ease correct source attributions. Thus, an action encoding mode could be a suitable encoding condition for children between the third and the sixth year of life in which early source monitoring performances could be made possible and improved upon (c.f., Foley & Ratner, 2001; Foley et al., 1983; Johnson, Raye, Hasher & Chromiak, 1979).

In order to assess whether more source specific memory characteristics are encoded and more sources are attributed correctly to the children's memories in an action encoding mode, it is necessary to use a second encoding mode which does not contain the assumed enhancing source

specific memory characteristics. Such an encoding condition serves as a type of control condition and is used to estimate the assumed advantage of the action encoding mode. However, to draw reliable conclusions about the assumed advantage it is necessary that the second encoding mode differs only in the source specific memory characteristics from the action encoding mode and that ideally all or at least most other differences are controlled. One encoding mode that meets these requirements for the most part is a verbal encoding mode. In a verbal encoding mode, no memory characteristics about performed or observed actions are contained. Besides this, in a verbal encoding mode the source specific memory characteristics are limited to the semantic characteristics of the verbal phrases, words or sentences used, to the instruction, to the production and/or to the perception of the verbal statements, and to the characteristics of the (individual) presentation of the verbal statements (e.g., specific sound of the voice of the person producing the verbal statement, affective involvement). However, if the characteristics of the instruction (e.g., by using the same person that present the actions and the statements verbally) and of the individual presentation of the verbal statements are controlled (e.g., by using a within-subject factor) then the only characteristics to be encoded are the semantic characteristics of the verbal statements and depending on the type of source, its production and/or perception. Therefore, I selected a verbal encoding mode as the control encoding mode to examine the possible advantage of an action encoding mode.

In experiment 1, I will examine the possible advantage of an action encoding mode not only in one type of source monitoring but in reality monitoring, in internal source monitoring and in external source monitoring performances. This allows the examination of whether the advantage exists equally in the three main types of source monitoring and allows the study of a broader spectrum of early source monitoring performances.

Because different types of sources can be contained in the three main types of source monitoring (for a review see Roberts, 2000), I will first lay down what types of sources I select for my examination. For the reality monitoring condition, I select a public internal (subject-performing/repeating) and a public external real-person source (experimenter-performing/repeating). For the internal source monitoring condition, I select a public internal source (subject-performing/repeating) and a private internal real-person source (subject-imagining) and for the external source monitoring condition, I select two public external real-person sources (experimenter-performing/repeating).

Now I describe the potential memory characteristics of the selected sources in the action and in the verbal encoding mode. After that, I discuss how the characteristics can improve source monitoring performances.

In an *action encoding mode*, a single action or a combination of simple actions is carried out by a person. Depending on the person performing the action, a specific distribution of memory

characteristics is generated. In the following, I specify what distributions of memory characteristics are generated for the public internal (subject-performing), the public external (experimenter-performing) and the private internal person sources (subject-imagining).

If the action is instructed verbally and pictorially (as it is the case in experiment 1) then auditory characteristics and visual characteristics are generated for each action verbal-semantic characteristics about the action phrase. This is the case for each type of action performance.

If the action is carried out by the child itself (*subject-performing*), then the action phrase needs to be understood correctly first. If the action is already known, then the stored knowledge about that action can be used to carry it out. If the action is unknown, then the action needs to be planned before it is carried out. During the action planning, the (pre-existing) knowledge about similar actions or how they can be altered for the respective action might be used and can be retrieved from the memory. Based on that, the action should be planned correctly and then can be carried out. During action understanding, action retrieval and/or action planning cognitive operations about the action are generated (e.g., via the supplementary motor cortex; Engelkamp & Zimmer, 2006; Foley, Dorso, Wilder & Friedman, 1991; Foley & Ratner, 2001; Hornstein & Mulligan, 2004; Johnson & Raye, 1981; Murachver, Pipe, Gorden, Owens, & Fivush, 1996). For a whole action execution, usually various single action segments are carried out and need to be combined. This can vary in the level of consciousness awareness. All of these single section segments generate various motor or haptic characteristics that are processed in various brain areas (e.g., via the cerebellum, motor cortex (primary motor cortex, supplementary motor cortex, premotor cortex) as well as in areas processing and integrating visual information; Engelkamp & Zimmer, 2006). The motor or haptic characteristics can be encoded as single segments, as a larger segment combination or as a whole action and can enrich the memory trace (Engelkamp, 2001; Engelkamp & Zimmer, 2006; Foley, Bouffard, Raag & DiSanto-Rose, 1991; Johnson & Raye, 1981; Murachver et al., 1996). If the action is controlled visually then visual characteristics can be generated as well during the action execution (Hornstein & Mulligan, 2004; Johnson & Raye, 1981; Murachver et al., 1996). After the action is carried out, it can be evaluated. Such an evaluation can generate additional cognitive operations (Foley & Ratner, 2001; Foley, Harris & Hermann, 1994; Johnson & Raye, 1981, 2000). Besides this, individual characteristics of the person carrying out the action can accompany the action execution and its planning and evaluation. This can also generate cognitive operations, motor and affective characteristics (e.g., typical movements, states of mind like joy, dislike, insecurity, speed of execution).

For actions performed by another person (*experimenter-performing*), a different distribution of the cognitive operations, motor, visual, and affective characteristics is generated. The verbal action phrase can be understood correctly but does not necessarily have to be. Because the action does not have to be carried out, the correct action does not have to be searched, retrieved and/or planned, but it *can* be done. Thus, cognitive operations (including semantic characteristics) and

affective characteristics about the action understanding and the action planning can possibly be generated (Day et al., 1998) but they do not have to be. Because the action is not carried out by oneself, no motor or haptic characteristics about the real action execution are generated. Instead of this, many visual characteristics of the action execution are generated during the observation as long as no statements or sounds are made (Hornstein & Mulligan, 2004; Johnson et al., 1993; Johnson & Raye, 1981, 2000). During and after the observation, the action can also be evaluated in relation to oneself and generate additional cognitive and affective characteristics (Foley & Ratner, 2001; Foley, Santini & Sopasakis, 1989; Murchver et al., 1996). For the experimenter-performed actions, the individual characteristics of the experimenter carrying out the action and individual characteristics of the own can accompany the action execution and planning, observation, and the evaluation. This can also generate different cognitive, visual and affective characteristics (e.g., typical movements, states of mind like joy, dislike, insecurity, speed of execution).

Likewise, if the action phrase is only imagined (*self-imagining*), a specific distribution of cognitive operations and affective characteristics are generated. After the action phrase is presented verbally and has not merely been imagined as being performed, it needs to be repeated mentally only (as it is the case in experiment 1). However, the action phrase must not be understood correctly, it must be only possible to repeat mentally the action phrase. While thinking about the action phrase, mainly cognitive operations about the verbal-semantic characteristics and about the mental activity “thinking” should be generated (Day et al., 1998; Johnson & Raye, 1981, 2000). Besides this, affective characteristics may accompany the mental activity “thinking” and thus can be generated as well (e.g., states of mind like joy, dislike).

Each of these generated characteristics in the action encoding mode can be encoded and can be a source specific memory characteristic if they inform about the person source of the action. For subject-performed actions, various motor characteristics, visual characteristics and cognitive characteristics regarding the action planning, the action execution and the action evaluation are available that can be encoded and can increase the number of source specific memory characteristics. For experimenter-performed actions, various visual characteristics and some cognitive characteristics regarding the action planning and the action monitoring are available that can be encoded and can increase the number of source specific memory characteristics. For imagined actions cognitive characteristics, cognitive operations and affective characteristics can be encoded.

Now I describe the specific characteristics of the single sources in the **verbal encoding mode**. In a verbal encoding mode, a person repeats simple verbal phrases. Depending on the person repeating the verbal phrase, a specific distribution of memory characteristics is generated. In the following, I specify what distributions of memory characteristics are generated for the public internal (subject-repeating), the public external (experimenter-repeating) and the private internal person sources (subject-imagining).

If the verbal phrase is instructed verbally and pictorially (as it is the case in experiment 1) then for each verbal phrase verbal-semantic characteristics, auditory characteristics and visual characteristics are generated.

If the verbal phrase is repeated by the child itself (*subject-repeating*), then cognitive characteristics and operations (e.g., semantic characteristics, repetition of the verbal phrase, thoughts about it), motor characteristics and auditory characteristics through the verbal production of the phrase are generated. After the repetition of the verbal phrase, the repetition might be evaluated by the own person and thus cognitive operations can be generated. Besides this, individual characteristics of the person repeating the verbal phrase can accompany the repetition as well. This can also generate cognitive, motor and affective characteristics (e.g., states of mind like joy, dislike, insecurity, speed or loudness of the repetition). However, the verbal phrase does not have to be understood correctly, the child must only be able to repeat it.

If the experimenter repeats the verbal phrase (*experimenter-repeating*), then cognitive characteristics (e.g., semantic characteristics) and auditory characteristics through the repetition of the verbal phrase are generated. After the repetition of the verbal phrase, the repetition might be evaluated by the own person and thus lead to additional cognitive characteristics. Besides this, individual characteristics of the person repeating the verbal phrase can accompany the repetition. This can generate cognitive and affective characteristics (e.g., states of mind like joy, dislike, insecurity, speed or loudness of the repetition). Again, it is not necessary for the verbal phrase to be understood correctly.

If the verbal phrase should merely be imagined or thought about (*subject-imagining*), then a specific distribution of cognitive operations and affective characteristics is generated that can be encoded. After the verbal phrase has been presented verbally, it needs to be repeated mentally (as it is the case in experiment 1). The phrase does not have to be understood correctly, it must only be repeated mentally. The process of thinking about the verbal phrase, mainly involves cognitive operations about the semantic characteristics should generate the mental activity “thinking” (Johnson & Raye, 1981). Besides this, affective characteristics may accompany the mental activity “thinking” and can also be generated (e.g., states of mind like joy, dislike).

Each of these generated characteristics in the verbal encoding mode can be encoded and can be a source specific memory characteristic if they inform about the person source of the verbal statement. For subject-repeated verbal phrases, various auditory characteristics, motor characteristics, cognitive characteristics and cognitive operation are generated that can be encoded. For experimenter-repeated verbal phrases, various auditory characteristics, cognitive characteristics and cognitive operations are available that can be encoded. For subject-imagined verbal phrases cognitive characteristics, cognitive operations and affective characteristics are generated and can be encoded.

Based on the differences in specific characteristics contained in the action and in the verbal encoding mode, it can be concluded that more perceptual source specific characteristics are available in the action encoding mode. Because young children mainly use perceptual characteristics in their source attributions (Welch-Ross, 1995), they should profit from this additional encoded perceptual source specific memory characteristics and should use them in their source attributions. This is assumed particularly for these perceptual characteristics because young children are already highly familiar with the perceptual characteristics of performed and observed actions. Besides this, the action encoding mode also involves cognitive operations and characteristics about the action planning and the action evaluation. Because children at four years of age use cognitive operations in their source attributions (Welch-Ross, 1995), they should also profit from these additional source specific memory characteristics. Based on the higher number of available source specific memory characteristics in the action encoding mode the children should encode and retrieve more source specific memory characteristics and with it should attribute more sources correctly to their memories. This is likewise the case for subject-performed and for experimenter-performed actions in the three main types of source monitoring because in these sources the additional perceptual and cognitive characteristics about the actions are available.

Because the motor, visual and cognitive characteristics about the action planning, the action execution and the action evaluation are not available in the verbal encoding mode, the number of encoded source specific memory characteristics should not be enhanced in such a manner and should not lead to more correct source attributions in the verbal encoding mode.

Theoretical and empirical support for the advantage of actions for memory performances also comes from research on action memory. Research on action memory consistently shows that simple actions are recalled and recognized better when they are performed by oneself than when they are heard or read only (e.g., Bäckman, 1985; Cohen, 1981; Engelkamp, 1998; Engelkamp & Zimmer, 1994, 1995; Helstrup, 1987; Nilsson, 2000). The advantage of self-performed action phrases, relative to heard or read action phrases in verbal tasks has been called the subject-performed task effect or the enactment effect (Engelkamp & Zimmer, 1994). The subject-performed task effect is very robust and is found in various testing conditions involving actual objects or substitutes (e.g. gestures; e.g., Engelkamp & Zimmer, 1994, 2006), in recall, cued-recall and in recognition (e.g., Cohen, 1989; Engelkamp, 1998; Engelkamp & Zimmer, 1994; Nilsson, 2000) and in conditions in which participants have their eyes open or closed during enactment, receiving visual feedback or not (e.g., Engelkamp, Zimmer & Biegelmann, 1993; Hornstein & Mulligan, 2004). Several studies also found an advantage for subject-performed actions relative to actions carried out by other persons (in so called experimenter-performed tasks; Dick, Kean & Sands, 1989; Engelkamp, 1997; Engelkamp & Zimmer, 1983, 1997; Hornstein & Mulligan, 2001, 2004; Zimmer & Engelkamp, 1984) but other studies found no

differences between subject-performed actions and experimenter-performed actions (Cohen, 1981, 1983, Cohen, Peterson & Martini-Atkinson, 1987). In research on action memory, the multi-modal nature of enacted events is seen as the central reason for the enactment effect (Mulligan & Hornstein, 2003). According to Bäckman and colleagues (e.g., Bäckman & Nilsson, 1985; Bäckman, Nilsson & Kormi-Nouri, 1993) actions are better retained because of a combination of verbal-semantic (or conceptual), perceptual, and motor output systems that are activated during enactment. In contrast, Engelkamp and Zimmer focus mainly on the motor component (1985, 1994; 1997; Engelkamp, 1998, 2001). According to their approach, motor characteristics, separate from visual-sensory characteristics, are assumed to be responsible for the enactment effect (Engelkamp & Zimmer, 1997, 2006). This research approach has engendered debates about the nature of the enactment effect that are still going on (Bäckman, Nilsson & Chalom, 1986; Engelkamp & Zimmer, 2006; Kormi-Nouri & Nilsson, 2001). Without going deeper into these debates or discussing other explanations, motor characteristics seems to enhance memory performances about enacted events although it is still not clear whether motor characteristics are solely responsible for the enactment effect or a combination of verbal-semantic, perceptual and/or motor output systems.

Research on action memory also indicates that actions performed by others can also enhance memory performances (Engelkamp, 2001; Engelkamp & Zimmer, 2006; Hornstein & Mulligan, 2004; Mulligan & Hornstein, 2001). In research on action memory, other-performed tasks or experimenter-performed tasks are often characterized as falling on a continuum between self-performed tasks and verbal tasks (Bäckman et al., 1993; Engelkamp, 1998; Mulligan & Hornstein, 2001). Experimenter-performed tasks are similar to verbal tasks because no overt motor action is carried out but they resemble subject-performed tasks in that the verbal instruction is accompanied by perceptual and particularly visual information (Hornstein & Mulligan, 2004; Mulligan & Hornstein, 2001). Research on action memory indicates that particularly visual information is critical for experimenter-performed tasks and enhances memory performances (e.g., Engelkamp et al., 1993; Engelkamp, 1998, 2001; Hornstein & Mulligan, 2004; Mulligan & Hornstein, 2003). In contrast, research shows that visual information is not critical to the subject-performed task effect (Engelkamp, 2001). According to the motor encoding view of the subject-performed effect (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006), the motor information is the critical type of information in the memory trace for subject-performed actions. Based on that, it can be concluded that the (encoding) processes differ between subject-performed tasks and experimenter-performed tasks and that the role of visual and motor encoding seems to be the critical factor (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006) along with a combination of verbal-semantic, perceptual and/or motor information (Bäckman & Nilsson, 1985; Bäckman et al., 1993; Hornstein & Mulligan, 2004). Research on action memory also shows a subject-performed task effect over imagined action phrases (Ecker & Engelkamp, 1995; Engelkamp, 1986, 2001; Perrig & Hofer, 1989) although

research indicates that imagining of (overtly) subject-performed actions share process components (e.g. they are prone to confuse if the tasks are more difficult; e.g., Ecker & Engelkamp, 1995; Engelkamp, 2001; Goff & Roediger, 1998). Besides this, research on action memory indicate that enactment enhances item-specific information (i.e. characteristics of the distinctiveness of each item; Hunt & Einstein, 1981), but does not enhance item-relational information (i.e. characteristics of the relationships among the items or elements; Hunt & Einstein, 1981) like memory characteristics, context, or source (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Helstrup, 1989; Hornstein & Mulligan, 2004; Knopf, 1991; Nilsson & Cohen, 1988; Ratner & Hill, 1991; Zimmer & Engelkamp, 1985).

Research on action memory indicates that action memory improves with age (Foellinger, Trabasso, 1977; Foley & Johnson, 1985; Johnson, Perlmutter & Trabasso, 1979; Price & Goodman, 1990; Ratner & Hill, 1991; Ratner, Smith & Dion, 1986). Acting facilitates memory performances less in younger children than in older children (Ratner & Hill, 1991; Salz & Dixon, 1982) suggesting that action memory may contain strategic components (Foley & Ratner, 2001; Cohen, 1981) and those differences seem to exist in the processes between younger children, older children and adults (Cohen, 1981; Foley & Johnson, 1985; Ratner & Hill, 1991; Saltz & Dixon, 1982). Research on action memory in children suggests that younger children benefit more from watching someone else perform the actions than from carrying out the actions themselves (Engelkamp & Zimmer, 1985; Foley & Johnson, 1985; Ratner & Hill, 1991; Wolff & Levin, 1972). For example, Wolff and Levin (1972) found that 5-year-old children tended to recall actions better if the experimenter rather than the child performed the actions. The authors assumed that younger children could be less able to enact meaningful interactions between objects and thus their recall improves more when they are watching an expert person carrying out the actions (Ratner & Hill, 1991; Wolff & Levin, 1972). However, watching another person perform an action did not always help younger children (Ratner & Hill, 1991). In other studies, no differences between subject-performed actions and experimenter-performed actions were found in children (Cohen, 1983; Cohen & Bean, 1983; Ratner & Hill, 1991) and sometimes younger children show better recall of their own actions than those of others or merely imagined actions (Anderson, 1984; Baker-Ward, Hess, & Flanagan, 1990; Gordon, Jens, Shaddock & Watson, 1991; Parker, 1995; Roberts & Blades, 1995; Sussman, 2001; Welch-Ross, 1995). Unfortunately, it is presently not clear what may cause these divergent findings.

Research on action memory in children shows that prospective processes like action planning and action anticipation also influence memory performances (Foley & Ratner, 2001). In relation to action planning, research shows that young children better recalled self-planned actions than other-planned action (Bender & Levin, 1976; Foley & Ratner, 2001). In relation to action anticipation, research shows that preschoolers consistently falsely claimed they contributed actions that the experimenter actually contributed, but they rarely claimed that the children contributed to themselves (Foley, Ratner & Passalacqua, 1993; Foley & Ratner, 1998a, 1998b;

Ratner et al., 2000). Foley and Ratner (2001) assumes that as children observe another person initiate actions, they may imagine themselves doing, thinking, or feeling as the other person acts, thinks and feels. Later on, children may mistakenly claim that they themselves carried out the actions because they become confused between the representation of the actual action and the imagined action (Foley & Ratner, 2001). However, this is the case if a common goal exists in the action tasks. In noncollaborative contexts in which children have no opportunity to observe the experimenter, errors are low and children are no more likely to say that they carried out the experimenters actions than they are to say that the experimenter carried out their actions (Foley & Ratner, 2001). Thus, research on action memory clearly indicates the advantage of actions for memory performances.

Based on the previous reported empirical findings about action memory it can be assumed that performed actions increase the number of source specific memory characteristics and lead to a higher number of correct source attributions. For the number of source specific memory characteristics it should be irrelevant whether the actions increase mainly item-specific information or item-relational information as far as they give information on the source of the memory. The same should be true for the other types of memory characteristics. As long as the motor, the perceptual and the conceptual characteristics give information on the source of the memory, they should support source monitoring performances and increase the number of correct source attributions (Johnson et al., 1993). Nevertheless, the reported differences between the subject-performed, the experimenter-performed and the imagined action phrases can lead to differences in the correct source attributions in the single types of sources. Based on the type of available information some memory characteristics might be used better than others (motor vs. verbal semantic characteristics) and some memory characteristics might be used later than others (visual vs. verbal semantic characteristics). Are there any empirical findings available, which show that actions enhance source monitoring performances?

Currently, there are only a few studies available, which examine the advantage of actions for source monitoring performances. The first study I present is an ERP study conducted by Senkfor, van Petten and Kutas (2002). In this study, adults generated and performed typical actions for some objects and watched an experimenter perform typical actions for other objects. The study revealed that source monitoring performance was better in the performed than in the observation condition indicating that the enactment effect exists in source monitoring performances. However, the study has two meaningful limitations (Hornstein & Mulligan, 2004). First, the memory test contained no new items in the recognition part and therefore item memory performances are not clear and cannot be used to evaluate the source monitoring performances. Second, the performance condition contained a generation component that was not contained in the observation condition. In the performance condition, the adults generated the action before performing it, whereas in the observation condition the actions were not generated. This goes

along with two problems. First, the performed items were not fully under experimental control and thereby raise the possibility of item selection effects (Hornstein & Mulligan, 2004) and second, it is not clear whether the superior source monitoring performance in the performance condition could have been due to generation rather than enactment (Hornstein & Mulligan, 2004; Marsh, Edelman & Bower, 2001). Despite these limitations, the study of Senkfor et al. (2002) indicates that actions can enhance adult's source monitoring performances and that source monitoring performances seem to be better for subject-performed actions than for experimenter-performed actions.

The second study, I present is a study reported by Cohen and Faulkner (1989). In their experiment, actions described the movement of objects around a grid (e.g., "put the spoon next to the toothbrush", "put the stamp on the book"). The adult participants performed some of these actions and watched the experimenter perform other actions. The test was a source recognition test in which new items were recombinations of old objects and actions (e.g., "put the toothbrush on the book"). The study revealed superior item memory and approximately equivalent source monitoring performances for the performed and for the observed actions. However, the study also has two meaningful limitations (Hornstein & Mulligan, 2004). The first limitation is that no direct statistical comparisons of the performed and the observed actions were made. Second, the fact that the new items were recombination's of old objects and actions may have placed more demands on the old recognition test and with it may have influenced the source monitoring performances (Hornstein & Mulligan, 2004). Exactly the same results were found in a study reported by Conway and Dewhurst (1995) using the same materials as Cohen and Faulkner (1989). However, they did not directly compare the performances in the performed with the performance in the observed condition. Taken together, the studies by Cohen and Faulkner (1989), and Conway and Dewhurst (1995) indicate that in some conditions actions do not enhance source monitoring performances. Because the source monitoring performances in the performed and in the observed conditions were not directly compared with each other, it is not possible to draw conclusions about the possible differences between the two different action conditions.

The third study that gives information on the questions of whether actions enhance source monitoring performances is a study reported by Hornstein and Mulligan (2004). The adult participants performed some actions and watched an experimenter performing other actions. The experimenter read each action aloud and then carried them out. In addition, they examined the effects of visual feedback in an eyes-open (standard), in a mirror and in an eyes-closed condition. The memory test was given two days later. The study showed better item memory for the subject-performed actions than for the experimenter-performed actions. The subject-performed effect was visible across the varying levels of visual feedback, a result consistent with the motor encoding view of the subject-performed effect (Engelkamp, 1998, 2001; Hornstein & Mulligan, 2004). In contrast to the enhancing effect on item memory, Hornstein and Mulligan (2004) found

no enhancement of source monitoring performances in the eyes-open and the eyes-closed condition but worse source monitoring performances in the mirror condition. The impairment of source monitoring in the mirror condition is consistent to other source monitoring findings and show that with an increasing number of similarity source monitoring performances decreases (e.g., Johnson et al., 1993; Lindsay et al., 1991). Differences between the subject-performed and the experimenter-performed actions were not found in the eyes-open and in the eyes-closed conditions but a lower number of correct source attributions in the subject-performed actions than in the experimenter-performed actions in the mirror condition. Thus, like the study by Cohen and Faulkner (1989) and the study by Conway and Dewhurst (1995) this study by Hornstein and Mulligan (2004) indicates that actions consistently enhance item memory but do not enhance source monitoring in adults. The limitations of the single studies (e.g., recombinations in item recognition) as well as the two-day delay used by Hornstein and Mulligan (2004) could be reasons for the absent advantage of actions for source monitoring. However, the pattern of results conforms to other empirical findings within the source monitoring research, which indicates dissociation between item memory and source memory (see Johnson et al., 1993 for a review). Although such dissociation exists, actions can enhance source monitoring performances as long as they increase the number of source specific memory characteristics. The previously presented theoretical considerations about how actions can enhance memory performance and source monitoring (e.g., Engelkamp, 1998; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001; Johnson & Raye, 1981) and the empirical findings reported by Senkfor et al. (2002) indicate that this can and should be the case.

Other empirical findings directly examining the question of whether actions enhance source monitoring performances in general and/or in relation to subject-performed, to experimenter-performed and/or to imagined actions are not available at present for adults or for children. The same is true for direct comparisons of subject-performed tasks, of experimenter-performed tasks, of imagined-tasks and of verbal tasks that inform about the possible advantage of an action encoding mode in comparison to a verbal encoding mode. Nevertheless, in research on source monitoring there are some studies available in which action phrases and verbal phrases were used as items. These studies can give a first insight into the question of when the different sources can be attributed correctly to memories in an action encoding mode. This also gives a first insight into the possible advantage of an action encoding mode. Besides this, the studies indicate possible differences between subject-performed actions, experimenter-performed actions and imagined actions. Because children below six years of age are the focus of interest in my first experiment, I present only studies in which children below 6 years of age were included. The first empirical study, I present is a study conducted by Price and Ford (2006). They examined in forty 3- to 6-year-old children source attributions for subject-performed and for experimenter-performed actions in a reality monitoring condition. They examined source monitoring performances after a one-day and after a three-day delay. The study showed that the

source attribution rates were highly accurate and above chance level after the one-day delay and also after the three-day delay. Differences between the subject-performed and the experimenter-performed actions were not found at either time of delay. Thus, the study shows that correct source attributions in a reality monitoring condition are possible in 3- to 6-year-old children. Besides this, no differences were found between subject-performed actions and experimenter-performed actions.

Besides subject-performed and experimenter performed actions, imagined actions were examined in a study conducted by Sussman (2001). Ninety-six 4-, 8-, and 12-year-olds and adults engaged in interactions (subject, experimenter) and were asked to imagine other interactions (subject, experimenter). After a short delay of five minutes, test and distractor items were presented and half of the participants of each age group were required to make source attributions. After a one-week delay, source attributions were examined in all participants. Results¹ showed that the 4-year-old children attributed the performed actions but not the imagined actions correctly to their memories immediately and after the one-week delay. The 4-year-olds attributed more subject-performed actions correctly to their memories than experimenter-performed actions. Besides this, the 4-year-olds attributed more performed actions correctly to their memories than imagined actions (subject-, experimenter-performed and imagined actions were not compared separately). Thus, the study by Sussman (2001) shows that correct source attributions for subject-performed and experimenter-performed actions are possible at four years of age but the children had difficulties to attribute the imagined sources correctly to their memories. Besides this, the 4-year-olds attributed subject-performed actions better than experimenter-performed actions and better than imagined actions correctly to their memories.

Source monitoring performances for subject-performed actions (using real objects), for (subject-) pretended actions and for (subject-) imagined actions were examined by Welch-Ross (1995) in thirty-six 3-, 4- and 5- year-old children. After a short delay, children were asked to identify the different sources in a 3-alternative, forced-choice procedure (Experiment 1). Results indicate significant improvements in discriminating subject-performed actions from imagined actions and in discriminating subject-performed actions from pretended actions between the third and the fourth year of life. However, the 4- and 5-year-olds still confused the pretended and imagined sources. These results were replicated in ninety 3- and 4- year-olds using a simpler 2-alternative forced choice procedure (Experiment 2). The findings showed that correct source attributions of subject-performed actions are possible at the age of 3 years and of imagined and pretended sources at the age of 4 years. Subject-performed actions were attributed better compared to imagined or pretended actions.

¹ Results are reported only for the younger children because in this treatise preschoolers are in the focus of interest.

Lindsay et al. (1991) exclusively measured external source monitoring performance in preschoolers. In their first experiment, they presented forty-eight 4-year-old children as well as adults a tape-recorded list of words. Half of the words were presented by a speaker at the subject's left side and the other half by a speaker at the subject's right. One-half of the subject listened to a similar female voice, whereas the other half heard a male and a female voice. Immediately after the presentation source attributions were tested. Source discrimination was significantly better than chance in both age groups in the different-voices condition, but not for children in the similar-voices condition. Lindsay et al. (1991) also found comparable results in their second experiment where similar or dissimilar storytellers presented circus acts. Both experiments showed that words and circus acts were discriminated equally by 4-year-old children and adults if they were dissimilar but age differences did exist if words and acts were similar.

Taken together, the reviewed research findings showed that subject-performed actions can be attributed correctly to their memory by the age of three years (Price & Ford, 2006; Welch-Ross, 1995). Experimenter-performed actions and imagined/pretended actions can be attributed correctly to the children's memories at the age of four years (Lindsay et al., 1991; Sussman, 2001). Besides this, children below six years of age attribute subject-performed actions better to their memories than experimenter-performed actions (Sussman, 2001) and than imagined/pretended actions (Sussman, 2001; Welch-Ross, 1995). However, in the study reported by Price and Ford (2006) no differences were found between the subject-performed and the experimenter performed actions.

Based on the presented research on action memory and on source monitoring it can be concluded that actions enhance memory performances by increasing the number of the available memory characteristics (e.g., Bäckman, 1985; Cohen, 1981; Engelkamp, 1998; Engelkamp & Zimmer, 1994, 1995; Helstrup, 1987; Nilsson, 2000). This can clearly be concluded for subject-performed actions, for experimenter-performed actions, and under some conditions also for imagined actions (e.g., Bäckman, 1985; Cohen, 1981, 1989; Engelkamp, 1998, 2001; Engelkamp & Zimmer, 1994, 1995; Helstrup, 1987; Mulligan & Hornstein, 2003; Nilsson, 2000). Based on the presented research it can be concluded that actions also increase the number of the source specific memory characteristics. The additional available motor, visual, cognitive and individual presentation characteristics for performed actions should increase the number of encoded and retrieved source specific memory characteristics and should lead to a higher number of correct source attributions in the action encoding mode. Because in the verbal encoding mode these additional motor, perceptual and cognitive characteristics are not available, the correct source attributions should be lower in this encoding mode.

In experiment 1, I therefore expect that the 3-, the 4- and the 5-year-old children attribute more sources correctly to their memories in the action encoding mode than in the verbal encoding

mode. I expect that this is the case in the reality monitoring, the external and the internal source monitoring condition. In the reality monitoring condition, I expect that the additional available motor characteristics, visual characteristics and cognitive operations of the performed and watched actions increase the number of the encoded source specific memory characteristics in the action encoding mode and lead to a higher number of correct source attributions. In the external source monitoring condition, I expect that the additional available visual characteristics and the cognitive operations of the watched actions increase the source specific memory characteristics in the action encoding mode and lead to a higher number of correct source attributions. In the internal source monitoring condition, I expect that the additional motor characteristics and the cognitive operations of the performed and imagined actions increase the source specific memory characteristics in the action encoding mode and lead to a higher number of correct source attributions. Because children younger than four years of age mainly use perceptual characteristics in their source attributions (Welch-Ross, 1995), I assume that the 3-year-old children profit mainly from the additional source specific motor and visual memory characteristics. Because children at four years of age use cognitive operations and perceptual characteristics in their source attributions (Welch-Ross, 1995), I assume that the 4- and 5-year-old children profit from the perceptual characteristics and from the cognitive operations. In experiment 1, I hypothesize that a higher number of correct source attributions will be found in the action encoding mode (1) across the two sources of each of the three types of source monitoring and (2) in each single source in the three types of source monitoring.

Besides this, the additional source specific memory characteristics in the action encoding mode should allow the children to attribute sources of the actions correctly above chance level to their memories earlier than in the verbal encoding mode. This can be assumed for each of the three selected types of source monitoring because in each type of source monitoring more source specific memory characteristics are available in the action encoding mode compared to the verbal encoding mode. Based on the available empirical findings about source monitoring, it can be expected that reality monitoring performances are above chance level in the action encoding mode at the age of three years (Price & Ford, 2006; Welch-Ross, 1995). Because children at three years of age already use perceptual characteristics in their source attributions (Welch-Ross, 1995), they should be able to encode and use the additional motor and visual characteristics of the subject-performed and the experimenter-performed actions for their source attributions and thus attribute more sources in the action encoding mode correctly to their memory than in the verbal encoding mode. The same can be expected for the external source monitoring condition. The additional visual characteristics for the experimenter-performed actions should allow the children to attribute more external source monitoring sources correctly to their memories in the action encoding mode than in the verbal encoding mode and thus lead to earlier correct source attributions above chance level. Based on the available research findings it can be expected that

this is the case at least for children at four years of age (Sussman, 2001; Lindsay et al., 1991). In relation to internal source monitoring, it can be assumed that the additional motor and cognitive characteristics of the subject-performed and the imagined actions lead to a higher number of correct source attributions in the action encoding mode than in the verbal encoding mode and lead to earlier internal source monitoring performances above chance level. Because for the subject-imagined actions cognitive operations and a more comprehensive conceptual understanding about imagined mental activities is necessary to distinguish between the two internal sources (Woolley & Phelps, 1994; Woolley & Wellman, 1993; Welch-Ross, 1995), it is expected that internal source monitoring performances are not above chance level before the age of four years (as it is shown by Sussman, 2001; Welch-Ross, 1995). In sum, I expect that source monitoring performances in the action encoding mode are correctly above chance level earlier than in the verbal encoding mode. I expect that reality monitoring performance in the action encoding mode is correctly above chance level at the age of three years and that external and internal source monitoring performances in the action encoding mode are correctly above chance level at the age of four years.

Research on action memory and on source monitoring indicates as well that subject-performed actions are often better remembered/attributed than experimenter-performed actions (Dick et al., 1989; Engelkamp, 1997; Engelkamp & Zimmer, 1983, 1997; Hornstein & Mulligan, 2001, 2004; Senkfor et al., 2002; Sussman, 2001; Welch-Ross, 1995; Zimmer & Engelkamp, 1984). In subject-performed actions contain various motor characteristics and cognitive operations about the action planning, the action monitoring and the action evaluation (e.g., Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001). In experimenter-performed actions contain no motor characteristics but do include visual and cognitive characteristics (e.g., Engelkamp, 1998, 2001; Mulligan & Hornstein, 2001; Hornstein & Mulligan, 2004). The additional motor characteristics and cognitive operations of the subject-performed actions can lead to a higher number of source specific memory characteristics and with it lead to a higher number of correct source attributions. Because no motor information is available in experimenter-performed actions, it can be assumed that less source specific memory characteristics are encoded leading to a lower number of correct source attributions. In experiment 1, I therefore expect that more sources of subject-performed actions be attributed correctly to their memories than for experimenter-performed actions. I expect that this is the case for the 3-, the 4- and the 5-year-old children because they can already use the additional source specific motor memory characteristics.

Research on action memory and on source monitoring also indicates that subject-performed actions are often better remembered/attributed than imagined action phrases (Ecker & Engelkamp, 1995; Engelkamp, 1986, 2001; Foley & Ratner, 2001; Perrig & Hofer, 1989; Sussman, 2001; Welch-Ross, 1995). The reason for the advantage of subject-performed actions

again lies in the available motor information that generates perceptual characteristics and cognitive operations (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001). In comparison, this motor information is not available for imagined action phrases although some motor information can be generated if the action performance is imagined (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006). Because subject-performed actions contain motor characteristics and cognitive operations regarding the action planning, the action execution and the action evaluation it can additionally be assumed that more memory characteristics are available for subject-performed actions than for imagined actions. Thus, I expect that more sources of subject-performed actions are attributed correctly to the children's memories than for imagined actions. I expect that this is the case for the 3-year-old, the 4-year-old and the 5-year-old children because the children can already use the additional motor information.

2.1.2 Identifying factors relevant to early source monitoring

In research on children's source monitoring, there still is only limited knowledge on the relevance of central cognitive and social-cognitive performances for source monitoring (Kovacs & Newcombe, 2006; Lindsay, 2002; Roberts, 2002; Welch-Ross, 2000). My second aim in experiment 1 is therefore to identify factors relevant to early source monitoring performances. For this, I selected four groups of factors that seem to be relevant to source monitoring²: Working memory, verbal abilities, false-belief understanding and social variables. In the following four subsections, I derive and discuss the possible relations between source monitoring and each group of factors in detail. I start with the relation between working memory and source monitoring (2.1.2.1). After that, I discuss the relation between verbal abilities and source monitoring (2.1.2.2) and the relation between false-belief understanding and source monitoring (2.1.2.3). In the fourth section, I analyse the relation between selected social variables and source monitoring (2.1.2.4).

2.1.2.1 The relation between working memory and source monitoring

Working memory seems to be central for source monitoring performances because working memory performances may allow the child to build up and to work with the different kinds of memories. It may allow the child to encode, to store and to retrieve short-term and long-term memories and it thereby making it possible for the child to integrate the stored information from different sources into complex representations and draw conclusions about these representations. In this section, I analyse the available theoretical assumptions and empirical findings to get an

² In this treatise, the prediction of source monitoring by the four groups of factors was not reported because of the limited space available.

answer to the question of whether and how working memory is relevant to source monitoring. I begin by pointing out the theoretical relation between both abilities, then present the available empirical findings and derive the hypotheses to be tested in experiment 1.

The most comprehensive working memory model is the multi-component working memory model developed by Baddeley and Hitch (1974). Although other memory models have been developed (e.g., Cowan, 1999, 2001, 2005; Cowan & Alloway, 2009; see also Atkinson & Shiffrin, 1968; Craik & Lockard, 1972), the focus of interest in this section lies on the multi-component working memory model (Baddeley, 2000, 2007; Baddeley & Hitch, 1974). The reason for this is that the working memory model comprises detailed components that allow a more specific and accurate description of the various processes carried out during short-term memory activities.

Baddeley and Hitch (1974) have developed the multi-component working memory model. A few years ago, Baddeley (2000, 2007) has reformulated the working memory model by adding the component “episodic buffer” to the original model. The model consists of a central executive (Baddeley, 2000, 2007; Baddeley & Hitch, 1974) that is linked to the three subsystems visuospatial sketchpad, phonological loop and episodic buffer (Baddeley, 2000, 2007). The multi-component working memory model is presented in Figure 1.

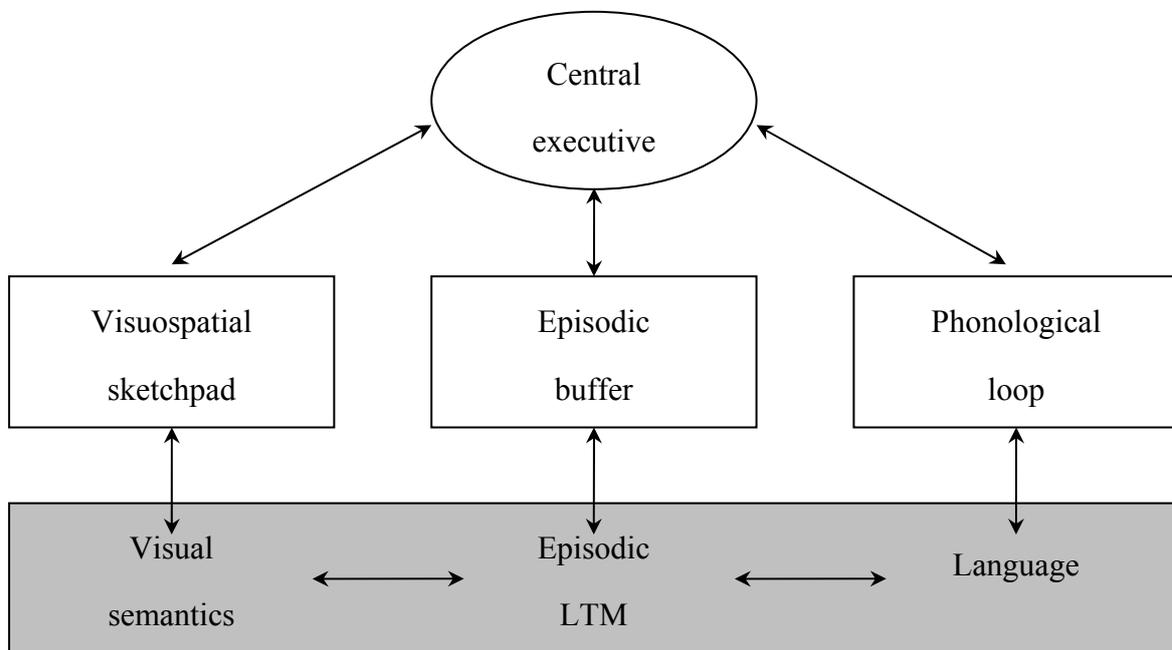


Figure 1 The multi-component working memory model proposed by Baddeley (2000, p. 421). Unshaded areas represent capacities unchanged by learning (“fluid”, e.g., attention, temporary storage) and shaded areas represent capacities changed by learning (“crystallized”, accumulating long-term knowledge, LTM = Long-term memory).

The *central executive* is a flexible system, responsible for controlling and regulating various cognitive processes like temporary retrieval of long-term memory (e.g., Baddeley, 1998), shifting between retrieval strategies and/or different tasks (Baddeley, 1996), selective attention and inhibition (Baddeley, Emslie, Kolodny & Duncan, 1998a), and coordinating of multiple tasks (e.g., Baddeley, Della Sala, Gray, Papagno & Spinnler, 1997).

According to Baddeley (2000; 2007), the central executive implicitly functions as a homunculus, a little man who makes the (important) decisions as to how the *slave* systems of the central executive should be used. The *slave* systems are temporal stores and (a) manipulation platform(s) for the information of specific domains. In the recent years, Baddeley and his colleagues concentrated on the attentional characteristics of the central executive using the supervisory attentional subsystem model developed by Norman and Shallice (1986). As potential subprocesses, the capacity of focusing attention (Baddeley et al., 1998a; Robbins et al., 1996), the capacity of dividing attention (Baddeley, 1996, 2007; Logie, Della Sala, Wynn & Baddeley, 2000; Perry & Hodges, 1999) and the capacity of switching attention (Baddeley, 2002; Baddeley, Chincotta & Adlam, in press) were examined systematically. Because systematic research on the central executive has just started in the last years, it is presently not fully known how the central executive exactly controls the attentional subprocesses and how the central executive controls and influences its single subsystems.

As mentioned above, the central executive is linked to three subsystems (Baddeley, 2000). The first subsystem of the central executive is the *phonological loop*. The phonological loop is a verbal storage system, composed of a short-term phonological store and a subvocal rehearsal process that can be used to restore decaying representations within the store (Baddeley, 1986). It has been suggested that the phonological loop is central for the acquisition of vocabulary, particularly in early childhood (Adams & Gathercole, 1995, 1996; Baddeley, Gathercole & Papagno, 1998b; Gathercole, Hitch, Service & Martin, 1997; Gathercole, Willis, Emslie, & Baddeley, 1992).

The second subsystem of the central executive is the *visuospatial sketchpad*. Baddeley (1986, 2002, 2007) assumes that the visuospatial sketchpad is a subsystem providing a way of integration of visuospatial information from multiple sources like visual, tactile and kinesthetic, as well as from episodic and semantic long-term memory. The sketchpad forms an interface between visual and spatial information and allows a range of channels of information to be bound together (Baddeley, 2002). Empirical evidence indicates that the visual and the spatial components are two separate components (e.g., Baddeley, 2007; Della Sala & Logie, 2002).

The third component in the working memory model is the *episodic buffer*. In the revision of the multi-component working memory model (Baddeley, 2000, 2007) the episodic buffer was separated from the central executive. Baddeley (2000, 2007) assumes that the episodic buffer is a limited-capacity temporary storage system that integrates information from different sources. He suggests that the central executive controls the episodic buffer and is able to retrieve information

from the store in the form of conscious awareness, to reflect on and, if necessary, to manipulate and to modify the retrieved information. According to Baddeley (2000), the buffer is episodic in the sense that it holds episodes whereby information is integrated across space and maybe extended across time. The component is a buffer because it serves as an interface between ranges of systems, each involving a different set of codes. It is assumed that the episodic buffer uses multidimensional codes to integrate the different sets of codes into unitary episodic representations. The assumption is that the buffer is limited in its capacity because of the computational demand of providing simultaneous access to a wide range of different codes (Baddeley, 2000, 2007; Hummel, 1999). The central executive has access to the episodic buffer through the medium of conscious awareness (Baddeley, 2000, 2007). The central executive can also influence the content of what is stored by adding a source of information, whether perceptual, from other components of working memory (the visuospatial sketchpad, the phonological loop) or from long-term memory. According to Baddeley (2000), the episodic buffer provides not only a mechanism for modelling, but also for creating new cognitive representations.

Evidence for the distinction of the episodic buffer from the other components was reported in a study conducted by Alloway et al. (2004). The authors found in a sample of more than 600 4- to 6-year-old children that the episodic buffer is distinct from both the central executive and the phonological loop. Although Alloway et al. (2004) found the distinction in the path analysis; the episodic buffer was highly associated to the phonological loop and to the central executive. Based on the role of the central executive and the access it has to the episodic buffer and the phonological loop, such a relation between the components has to be found if the proposed relations of the multi-component working memory model are correct.

Based on their findings, Alloway et al. (2004) concluded that the modular structure of the multi-component working memory model proposed by Baddeley (2000) seems to be in place in 4- to 6-year-old children.

In the working memory model, each single subsystem of the central executive might be relevant to source monitoring. Because of limitation of space, the analysis of the relation between source monitoring and the subsystems of the central executive is limited in experiment 1 to the subsystem phonological loop and episodic buffer.

The first possible relevant component to source monitoring I take up is the phonological loop. As pointed out before, the phonological loop is a verbal storage system consisting of a short-term phonological store and a subvocal rehearsal process (Baddeley, 1986, 2007). This component could support the retrieval of the source specific verbal memory characteristics and may ease the availability of verbal memory characteristics. Because of its focal point on short-term storage, the influence might be larger in verbal source monitoring tasks in which source attributions are

tested immediately. The phonological loop may also facilitate the retrieval of internal source characteristics. This could be especially the case for characteristics of private internal sources (e.g., thought-sources, pretend-sources), because such internal sources often contain various verbal characteristics and cognitive operations that are more or less verbally based.

The second possible relevant component to source monitoring I take up is the episodic buffer. As stated above, Baddeley assumes (2000) that the episodic buffer is a limited-capacity temporary storage system that integrates information from different sources (e.g., short-term, long-term memories). Baddeley (2000, 2007) assumes that the episodic buffer is controlled by the central executive that is able to retrieve information from the store, to reflect on, to manipulate and to modify the retrieved information. The episodic buffer serves as an interface between ranges of systems involving a different set of codes (Baddeley, 2000). It uses multidimensional codes to integrate the different codes into unitary episodic representations that may go along with consciousness experience (Baddeley, 2000, 2007). The functions of the episodic buffer could be central for source monitoring processes because source monitoring depends on feature binding or information integration during encoding and remembering (Henkel, Johnson & De Leonardis, 1998; Mather, Johnson & De Leonardis, 1999). In source monitoring, it is first, necessary to retrieve a specific memory or event and the related context characteristics of that specific memory or event. Based on the available memory and source specific context characteristics, the source then has (typically) to be attributed to its original memory with more or less certainty (Johnson et al., 1993). The function(s) of the episodic buffer (may) allow the retrieval and integration of the various memory characteristics from ranges of systems into episodic representation and serve as the platform for the source decision processes. Next to other integrative processes, source attributions might be *one* integration process in the episodic buffer in which the source is attributed nondeliberately or deliberately to its origin. If a representation is attributed to the own person (internal source), the representation may go along with a consciousness experience. However, the consciousness experience is not limited to internal sources and can be found in external sources as well. The episodic buffer could be *the* central working memory component that allows the retrieval and integration of source specific memory characteristics and allows carrying out the source decision processes.

Although the previously described relations between working memory and source monitoring can be derived on a theoretical level, the meaning of the central executive, the episodic buffer and/or the phonological loop for source monitoring has not been studied much empirically yet. However, a few attempts have been made recently.

The first empirical study examining the relation between source monitoring and working memory was carried out by Ruffman, Rustin, Garnham and Parkin (2001). They presented sixty-one 6-, 8- and 10-year-old children a videotape (5 min. long) and an audiotape (3 min. long) about a dog named Mick. Some information about the story was repeated in these two external

sources (videotape vs. audiotape) and some were presented only in one source. Immediately after presenting both tapes in succession, children were asked various questions on what happened in addition to source questions. In the chosen working memory task, Ruffman et al. (2001) showed their participants rows of three digits and asked them to read aloud each digit. The rows were presented separately in succession (e.g., 8 1 4, 5 3 9) and consisted of three digits per row. The child was asked to remember the last digit of each row and to remember each of the last digit in the order they were presented (e.g., 4, 9). The most difficult item contained five rows. The authors expected a link between working memory and source monitoring because of the common need for consciously mediated, working memory-dependent strategic processing and the insight into the context, which are required in both tasks. The chosen working memory task can be classified as a complex working memory task that can be assigned to the central executive (Alloway et al., 2004; Pickering & Gathercole, 2001). However, Ruffman et al. (2001) did not assign their working memory task to the components of the multi-component working memory model proposed by Baddeley (2000). Results of the study showed that working memory performance was positively related to the hit rates of the questions on what happened, to the video only and to the tape only source questions after vocabulary and age were partialled out. Thus, the selected working memory task accounted for the unique variance in the video only and tape only source questions. Despite the slightly divergent intention in explaining the link between working memory and source monitoring in this experiment, the study conducted by Ruffman et al. (2001) indicates that the assessed working memory performance seems to play a more general role in assisting memory and in source monitoring.

Sussman (2001) conducted the second empirical study examining the relation between source monitoring and working memory. As already described, she presented ninety-six 4-, 8-, and 12-year-old children various categories of action. Participants engaged in some interactions (self-performed, other-performed) and were required to imagine others (self-doing-imagined, other-doing imagined). After action presentation, short-term memory skills were assessed by the subtest number recall of the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983). Half of the participants of each group were required to discriminate sources after a short delay of 5 minutes. After a one-week delay, source discrimination was measured in all participants. The study showed that none of the different source monitoring scores were related to the short-term memory performances in the number recall task. Therefore, the number of recall performances as one measurement of the phonological loop (Pickering & Gathercole, 2001; Alloway et al., 2004) was not meaningfully related to various reality monitoring sources in the source tasks of Sussman (2001). This result leads to the conclusion that the phonological loop assessed by number recall does not seem to be relevant for immediate and delayed source discriminations of actions. The missing correlational patterns could be explained by the fact that the phonological loop is a verbal short-term store and actions may contain less verbal

information. Beside this, in the delayed source test, verbal short-term storage could be of less importance for source discriminations of actions.

Price and Ford (2006) conducted the third study examining the relation between source monitoring and working memory. They presented motor activities to forty normally developing 3- to 6-year-old children in a reality monitoring task (self-performed vs. other-performed) and tested source discrimination after a one-day and after a three-day delay. Additionally, they tested working memory by a digit forward task. As pointed out before, digit recall can be seen as a measurement of the phonological loop (Pickering & Gathercole, 2001; Alloway et al., 2004). The results of the relational analysis revealed that working memory was positively related to source monitoring across both sources as well as to both single sources after the one-day delay. After the three-day delay, no significant correlations were found between working memory and reality monitoring. In contrast to the findings made by Sussman (2001), the study by Price & Ford (2006) leads to the conclusion that the phonological loop is positively related to reality monitoring performance after a one-day delay but not after a three-day delay. This result stands partly in contradiction to the assumption that the phonological loop is essentially important for verbal short-term information. One explanation for this finding could be that the phonological loop may contain additional abilities (like the verbal based retrieval) which might be responsible for this relational pattern after one-day delay. It may also indicate that the relation could be moderated by another factor (e.g., central executive functions). The high associations between the phonological loop, episodic buffer and the central executive support such an assumption as it was found in the already cited study by Alloway et al. (2004).

Thus, based on the available empirical findings it can be concluded that single working memory performances are related to source monitoring performances in children (Price & Ford, 2006; Ruffman et al., 2001).

In reference to source monitoring, the episodic buffer might be the temporary storage space for retrieved source specific memory characteristics from different sources and be the platform for the decision processes. Performances in tasks measuring episodic buffer functions concerning retrieving and integrating information from different sources and/or drawing conclusions about (the origin of) the retrieved and integrated episodic representations are assumed to be related to source monitoring performance because similar processes might be carried out in both types of tasks. Unfortunately, empirical findings about the possible relation between the episodic buffer and source monitoring that help specifying the possible relations are not available. In experiment 1, I will examine episodic buffer functions using a memory-for-sentences task. According to Baddeley (2000; Baddeley & Wilson, 2002) and Alloway et al. (2004), a recall (or memory) of spoken sentences is an appropriate task to examine episodic buffer functions because it involves a retrieval and an integration of information from the phonological loop (verbatim recall of individual words and their order) as well as the language processing system (semantic and

syntactical analysis). Nevertheless, using a memory-for-sentences-task to measure episodic buffer capacities, conclusions are ultimately limited to episodic buffer functions concerning the retrieval and integration of information from different sources (i.e., phonological loop and the language processing system). Thus, no conclusion can be drawn about episodic buffer functions on the retrieved representations such as where, when and how the information was encoded. Although both episodic buffer functions are of central interest for source monitoring processes, I measure episodic buffer functions only by a memory-for-sentence-task in this experiment. The selection for using only this task is justified by the fact that it is currently not yet clear whether episodic buffer tasks are a reliable and valid method of measuring both episodic buffer functions in children between 3- and 6-years- of age.

As pointed out in the multi-component working memory model, the phonological loop is a verbal storage system, composed of a short-term phonological store and a subvocal rehearsal process that can be used to restore decaying representations within the storage system (Baddeley & Hitch, 1974; Baddeley, 1986; Baddeley, 2000, 2007). In relation to source monitoring, the phonological loop can support encoding and retrieval of source specific memory characteristics and ease the availability of verbal memory characteristics in source monitoring performances. Tasks measuring phonological loop functions concerning the capacity and working method of the short-term phonological store and/or the subvocal rehearsal processes are assumed to be related to source monitoring because both processes seem to be carried out in these tasks. In experiment 1, I will examine phonological loop functions by a phonological-working-memory-task for nonwords. According to Alloway et al. (2004, see also Gathercole & Baddeley, 1996; Gathercole, Willis, Baddeley & Emslie, 1994), nonwords repetition is an appropriate task to assess phonological loop functions because it involves a short-term storage of new, single speech sounds that need to be encoded, stored and actively recalled as a whole (non)word under the exclusion of the use of the vocabulary store. Nevertheless, by using nonwords repetition as the only indicator to test the phonological loop, the conclusions about the phonological loop are limited to the structural processing of the short-term storage of not previously listened to speech sounds excluding the use of the available vocabulary. Although two empirical studies examined the relation between single phonological loop performances and single types of source monitoring exist (Price & Ford, 2006; Sussman, 2001), empirical findings about the relation between the phonological loop performance phonological-working-memory-performances-for-nonwords and the three main types of source monitoring are not available to help specify the possible relations.

Based on the assumption that source monitoring and episodic buffer performances contain the retrieval and the integration of information from different systems, I expect a positive relation between source monitoring and the episodic buffer performance memory-for-sentences. I expect the relations to be independent of the type of source monitoring because the retrieval and the

integration of information from different systems is contained equally in the reality monitoring, the internal and the external source monitoring condition (c.f., Johnson et al., 1993). I also expect that the relations are independent of the action and the verbal encoding mode because both encoding modes contain the retrieval and the integration of information (Johnson et al., 1993). In addition, I expect that these relations exist independently of the age of the children because I assume that the episodic buffer performance supports source monitoring equally at all ages.

Based on the assumption that the phonological loop can support the encoding and retrieval of source specific memory characteristics and ease the availability of (verbal) short-term memory characteristics I expect a positive relation between source monitoring and the phonological loop performance phonological-working-memory-performance for nonwords because children with better phonological loop performances should be better able to attribute sources correctly to their memories. The positive relations are expected to be independent of the type of source monitoring because the phonological loop processes are assumed to support source monitoring equally in all types of sources (c.f., Johnson et al., 1993). Differences between the action and the verbal encoding mode are not expected because the basic phonological loop processes should support source monitoring independently of the encoding characteristics. Additionally, the selected phonological-working-memory-performance for nonwords examines phonological loop performances by excluding the use of stored vocabulary and thus does not favour an encoding mode containing more verbal characteristics. I also expect that the relations exist independently of the age of the children because I assume that the phonological loop performance supports source monitoring equally at all ages.

2.1.2.2 The relation between verbal abilities and source monitoring

Besides working memory, verbal abilities might be a second group of performances relevant to early source monitoring. Verbal abilities as the indicator of the complexity of the verbal representation system may enhance source monitoring because the broader and deeper the verbal representation system is, the more source specific verbal memory characteristics might be used during source monitoring processes. In the following section, I take up this question and analyse how verbal abilities might be related to early source monitoring. I start by discussing the theoretical and empirical relations between both performances and then derive the hypotheses to be tested in experiment 1.

At this point in time, the possible relation between verbal abilities or the verbal representation system and source monitoring is not yet systematically described or theoretically derived. Only a few source monitoring studies included verbal abilities and tried to specify their possible relations to source monitoring. Despite this lack of theoretical and empirical embedment, the

relation between the verbal representation system and source monitoring can be specified and derived based on research on memory and its development.

Research on memory development indicates that the verbal representation system is important for memory performances (e.g., Bauer, 2002, 2007; Baddeley, 2007; Fivush, 2002b; Grimm, 2001; Hayne & Simcock, 2009). The verbal representation system seems to be a critical tool for organizing the past in a coherent framework that can be verbally communicated to other people (Fivush, 2002b). It can support memory processing during encoding, storage and retrieval and with it enhance memory performances in various important ways (e.g., Bauer, 2002, 2007; Baddeley, 2007; Grimm, 2001; Hayne & Simcock, 2009). Several studies clearly indicate that children with better verbal abilities often show better memory performances (for an overview see Bauer, 2007; Weinert, 2006; Hayne & Simcock, 2009). However, the relation between memory and the verbal representation system is not a unidirectional one because memory itself influences the verbal representation system (e.g., Baddeley, 2007; Bauer, 2002, 2007; Gathercole et al., 2004; Grimm, 2003; Weinert, 2006). Such an enhancement of memory performances might also be true for the complex memory performance “source monitoring”. The verbal representation system can support source monitoring during encoding, storing and retrieving of the source specific memory characteristics and during the source decisions processes. The broader and deeper the available verbal representation system is, the more source specific verbal memory characteristics might be used for source monitoring. Likewise, progresses in the verbal representation system should enhance source monitoring because a more complex available verbal representation system should allow the use of increasingly more flexible source specific verbal (memory) characteristics. The enhancing effect of the verbal representation system might be higher the more verbal characteristics are contained in a source monitoring condition. The verbal representation system may also allow and support the use of verbal based searching strategies and verbal based nondeliberate and deliberate source decision strategies (i.e., Johnson et al., 1993). Likewise, the use of verbal based searching strategies can enhance the retrieval of the source specific (critical) memory characteristics and support the source decision processes because more distinctive source specific memory characteristics are available. This could lead to an increase in the number of correct source attributions.

Based on these considerations, it can be assumed that both – the retrieval and the strategy benefit of a flexible and efficient available verbal representation system – can enhance source monitoring performances. This enhancement should be independent of the types of sources because all types of sources contain the retrieval and the decision about the source specific memory characteristics (Johnson et al., 1993). Nevertheless, it is necessary to consider that verbal characteristics of a memory or representation are (only) *one* source specific component (Johnson et al., 1993). On principle, memory characteristics from other modalities are source specific components as well and vary depending on the event or the specific source task conditions (Johnson et al., 1993). Thus, the supportive effect of the verbal representation system

should vary regarding the extent of verbal information involved in the event or in the source task. Nonetheless, the effect of a more flexible and efficient available verbal representation system should be highest in verbal events or verbal source tasks because of their high number of verbal characteristics contained.

Based on these considerations, the verbal representation system may support internal source monitoring performances in particular. This could be the case because in the internal imagined source a high number of verbal characteristics should be contained. The reason for that is that the mental activity “thinking” is carried mainly out verbally or at least is verbally based (Johnson et al., 1993). Besides this, the imagined internal sources are mainly based on cognitive operations that are also carried out verbally (Johnson et al., 1993). Thus, the verbal representation system seems to be very important for internal source monitoring sources. A more efficient and flexible available verbal representation system could support internal source monitoring performances by enhancing the encoding, storage and retrieval of the internal source specific verbal characteristics of the cognitive operations and of the mental activity “thinking”. Through the imagined internal source, internal source monitoring should always contain verbal characteristics and therefore could always be related to the verbal representation system. The relation could be stronger as more additional verbal characteristics are contained in the source task (like in a verbal encoding mode). In comparison to other types of source monitoring (e.g., public reality monitoring, external source monitoring), the relation to the verbal representation system might be higher because of the additional verbal characteristics of the imagined internal source. This would mean, that the possible relations between the verbal representation system and the other types of source monitoring which do not contain imagined sources depend more on the source task characteristics and vary stronger corresponding to the amount of verbal information contained.

In the analyses of the relation between the verbal representation system and source monitoring it might be helpful to differentiate between verbal abilities representing the passive available verbal representation system and verbal abilities representing the active available verbal representation system. Verbal abilities representing the passive available verbal representations system or verbal comprehension performances respectively comprise performances in that only a comprehension of verbal stimuli is required (Grimm, 2001). This is the case for example in word comprehension, sentence comprehension, story comprehension and grammatical rule understanding (Grimm, 2001). In contrast, verbal abilities representing the active available verbal representations system or verbal production performances respectively comprise performances, which contain the active production of verbal expressions (Grimm, 2001). This is the case for example in the active vocabulary level, sentence and story production and morphological rule using (Grimm, 2001). It is possible that the relations between the verbal representations system and source monitoring are observable earlier in verbal comprehension performances than in verbal production performances because the information processing

demands are lower in verbal comprehension performances than in verbal production performances (c.f., Hayne & Simcock, 2009). This may make the relations between the verbal representation system and source monitoring observable earlier particularly in younger children that are more vulnerable to higher information processing demands³. However, from a theoretical point of view both – verbal comprehension and verbal production performances – should be related to source monitoring because both types of verbal abilities should support the encoding, storage and retrieval of the source specific verbal memory characteristics.

At this point in time, only a few studies have examined the relation between verbal abilities and source monitoring. In two of these studies, the relations to verbal comprehension performances have been examined and in the third study the relation to verbal production performances have been examined.

In the first study, the relations between the speech comprehension performance receptive (hearing) vocabulary and the three main types of source monitoring were examined. Hala, Rasmussen and Henderson (2005) used thirteen normally developing 6-year-old children and thirteen autistic children as participants. In each source task (reality, internal and external source monitoring) these children were presented words from two real-life sources. Immediately after presentation, the children were asked to make an old/new-recognition and source attributions. The receptive vocabulary level was examined by the Peabody Picture Vocabulary Test (Dunn & Dunn, 1997). The Peabody Picture Vocabulary Test is a measurement for an individual's receptive (hearing) vocabulary for Standard American English in that the child is asked to point to the picture that fits best to the presented word or phrase (Dunn & Dunn, 1997). The study showed that the verbal comprehension performance receptive vocabulary was not related to source monitoring in the normally developing children. This was the case for all three types of source monitoring. However, it has to be considered that the correlational analyses are based on 13 children only and it is possible that the relations are not stable enough to show the expected relations.

Besides this, Price and Ford (2006) examined the relation between reality monitoring and the verbal comprehension performance receptive vocabulary level in forty normally developing 3- to 6-year-old children. They presented the children action phrases, which were then carried out by the children and an experimenter. After a one-day and after a three-day delay the children were asked to make old/new-recognitions and source attributions. The receptive vocabulary level was examined by the British Picture Vocabulary Scale (Dunn, Dunn, Whetton & Pintille, 1982). The British Picture Vocabulary Scale is a measurement of the receptive vocabulary for Standard

³ However, in experiment 1 I will not directly test whether verbal production performances are related earlier to source monitoring or how large the differences between these two groups of verbal abilities might be. Both questions cannot be tested meaningful in the experimental design in experiment 1 and need to be addressed in experimental designs created for such research questions.

English where the child is asked to point to the picture that best matches the presented word or phrase (Dunn et al., 1982). The study showed that the verbal comprehension performance receptive vocabulary was not related to reality monitoring performances after the one-day delay nor after the three-day delay. This was true in the clustered high familiar sources across the reality monitoring and external source monitoring conditions and in the single high familiar source in the external source monitoring condition. However, the absent relations could be due to the fact that action phrases were used which only contain a low number of verbal characteristics. It is possible that the relations will be apparent in source monitoring performances, which contain more verbal characteristics.

To my knowledge, further studies examining the relation between verbal comprehension performances and source monitoring in 3- to 6-year-old children are not available. Nevertheless, the two available studies indicate that the verbal comprehension performance receptive vocabulary is not related to reality monitoring, to internal and to external source monitoring performances in 3- to 6-year-old children. However, both studies might have not been able to show the expected relations due to their low sample size (Hala et al., 2005) and the use of action phrases (Price and Ford, 2006).

The only study examining the relation between verbal production performances and source monitoring is conducted by Drummey and Newcombe (2002). They presented one-hundred-sixty-seven 4-, 6- and 8-year old children ten facts about different topics (e.g., “What animal cannot make any sounds? A giraffe cannot make any sounds.” Drummey & Newcombe, 2002, p. 505). An experimenter and a puppet presented the facts and were used as two external sources. After a one-week-delay, children were asked about the facts and if they answered the fact question correctly, they were asked where the information was learned. Drummey and Newcombe (2002) examined the verbal fluency by a category generation task in which the child is asked to name as many terms as possible in a respective category in a given time (categories: Animals, fruits and vegetables). They found no relations between the speech production performance verbal fluency and their external source monitoring task in 4- and 6-year-old children. However, they found a positive relation between verbal fluency and the source memory performances of 8-year-olds. It has to be considered that verbal fluency is one possible verbal production performance that informs about the breadth and depth of the active available category knowledge and their time-restricted retrieval. It might be the case that the theoretically expected relations are found in children younger than 6 years of age in other verbal production performances that may represent other aspects of the breath and the depth of the active available verbal representation system.

In experiment 1, I will examine verbal comprehension and verbal production performances separately to examine whether and how both groups of verbal abilities are related to the three main types of source monitoring. I will examine verbal comprehension performances by a

sentence comprehension task. Sentence comprehension comprises the comprehension of the grammatical simple clauses, of temporal clauses, of causal clauses of relative clauses and the semantic of the contained vocabulary (Grimm, 2001). It is therefore a broad verbal comprehension performance (Grimm, 2001) and in comparison to the receptive vocabulary level, a broader verbal and more complex verbal comprehension performance. Sentence comprehension is thereby a representative indicator of the passive available verbal representation system. I will examine verbal production performances by an active vocabulary task and by a morphological rule-using task. The active vocabulary level is a central component of verbal production performances because it gives information on the represented semantic concepts (nouns, verbs etc.) that can be named actively (Dunn et al., 1982; Kiese-Himmel, 2005; Kiese & Kozielski, 1979; Weinert, 2006). The morphological rule-using task comprises the level of correct plural using in words (Grimm, 2001) and is a more specific indicator of the active available verbal representation system that focuses on specific grammatical rule using. Both verbal production tasks are therefore representative indicators of the active available verbal representation system.

Based on the previous presented theoretical considerations and empirical findings, it can be assumed that a broader and deeper passive available verbal representation system can support source monitoring through a better encoding, storage and retrieval of source specific verbal characteristics (e.g., Bauer, 2007; Grimm, 2001; Hayne & Simcock, 2009; Weinert, 2006). My expectation held in experiment 1 is therefore that the verbal comprehension performance “sentence comprehension” is positively related to source monitoring. Because verbal characteristics are contained in each source task and in the verbal and in the action encoding mode (through the verbally presented phrases), I expect that sentence comprehension is related to reality monitoring, to internal and to external source monitoring in the verbal and in the action encoding mode. However, I expect a very strong relation between sentence comprehension and internal source monitoring because the verbally based cognitive operations involve the most source specific verbal memory characteristics and are therefore contained in the internal source monitoring sources (e.g., Johnson et al., 1993). This is expected to be the case in the verbal and in the action encoding mode. The relations between sentence comprehension and source monitoring are also expected to be independent of the age of the children because the verbal representation system should support source monitoring equally in each age group.

Besides this, I expect that the verbal production performances “active vocabulary level” and “morphological rule using” are positively related to source monitoring because the broader and deeper the active available verbal representation system is, the more verbal characteristics should be encoded, stored, retrieved and used in the source decision processes. Because verbal characteristics are contained in each source task and in the verbal and in the action encoding mode (through the verbally presented phrases), it is also expected that both verbal production

performances are related to reality monitoring, to internal and to external source monitoring in both encoding modes. A very strong relation between the two verbal production performances and internal source monitoring is expected because the verbally based cognitive operations involve the most source specific verbal memory characteristics (e.g., Johnson et al., 1993). This should lead to a very strong relation independent of the encoding mode. The relations between the selected verbal production performances and source monitoring are expected to be independent of the age of the children because the verbal representation system should support source monitoring equally in each age group.

2.1.2.3 The relation between false-belief understanding and source monitoring

Theory of mind abilities seem to play an important role in early source monitoring and might be necessary for qualitative developmental progresses in children between 3 and 6 years of age (e.g., Naito, 2003; Perner & Ruffman, 1995; Price & Ford, 2006, 2007; Ruffman et al., 2001; Welch-Ross, 2000). In this section, I take up this assumption and analyse whether and why relations exist between source monitoring and the central theory-of-mind ability false-belief understanding. I start the section by discussing the theoretical relations between both performances and then present the available empirical findings. At the end of the section, I derive the hypotheses to be tested in experiment 1.

The ability to attribute mental states to oneself and to others is a cornerstone in cognitive development (e.g. Flavell & Miller, 1998; Wellman, 2002; Perner, 1991). The understanding of mental states are subsumed under the concept *theory of mind* and describe everyday or folk psychology in that the construal of persons as psychological beings, actors and selves are the focus of interest (e.g., Astington, 1993; Flavell & Miller, 1998; Perner, 1991; Wellman, 1990). The term *theory of mind* emphasizes that folk psychology involves seeing oneself and other persons in terms of mental states – like desires, emotions, beliefs, intentions, and other inner experiences that result in action (Wellman, Cross & Watson, 2001). Mental-state understanding requires a realisation that mental states may reflect reality and may be manifested in overt behaviour, but are internal and mental, and thus distinct from real events, or behaviours (Wellman et al., 2001). The understanding that a person has a *false-belief* provides evidence for appreciating such a distinction between the mind and the world (e.g., Dennett, 1979, Perner, 1991, Wellman, 2002; Wimmer and Perner, 1983).

Wimmer and Perner (1983) developed the meanwhile classic false-belief task. In this false-belief task, a decision about two conflicting mental representations has to be made. In the classical false belief-task, children are confronted with a short story about a boy named Maxi. Maxi puts his chocolate into a cupboard. Shortly after, his mother takes the chocolate from the cupboard and puts it into a drawer while Maxi is not there. Then Maxi returns and the child is asked where

Maxi will look for his chocolate. If Maxi's perspective and belief is not considered (that *he* put his chocolate into the cupboard), then it is predicted that the child will provide the wrong answer (that he will search in the drawer) and lead to a false-belief about Maxi's searching behaviour. In contrast, the correct answer provides evidence that the child know that Maxi's action depends on his beliefs rather than the real situation, because belief and reality diverge. At the age of 3½- to 4-years, children start to consider false-beliefs of others and solve such false-belief tasks (e.g., Perner, 1991; Wellman et al., 2001; Wimmer and Perner, 1983). While 4- and 5-year old children usually pass the false-belief task, younger children typically do not pass the task. Nevertheless, various studies indicate that in some tasks, 3-year-old children are able to answer the false-belief question correctly (e.g., Chandler, Fritz & Hala, 1989; Lewis et al., 1994; Sodian, 1994). False-belief tasks reveal a fundamental developmental progress in false-belief understanding between the third and the fourth year of life (for a review see Sodian & Thoermer, 2006; Wellman, 2002; Wellman et al. 2001). Research has shown that the false-belief question can be answered correctly if the questions asked are about mental states directly or about behaviour (e.g., what someone thinks vs. where the character will look), when the target person is a real person (child, adult), a story character, a videotaped character, a puppet or when tasks focus on the child's own belief (for an overview see Wellman et al., 2001).

Mental-state understanding may play a central role for source monitoring because in source monitoring performances the understanding that mental states may reflect reality and may be manifest in overt behaviour, but are internal and mental and thus distinct from real events or behaviours (Wellman et al., 2001), seems to be necessary. One attempt to describe the possible relation between mental-state understanding and source monitoring is the "Mental states reasoning model of suggestibility and memory source monitoring" developed by Welch-Ross (2000). However, the focus of the mental state reasoning model lies on the question of how reasoning about mental states of *knowledge* affects *suggestibility* (Roberts, 2002; Welch-Ross, 2000) and thus does not directly describe the possible relations between mental state understanding and source monitoring. The model contains the three components (a) understanding of information access and knowing, (b) the ability to reason about conflicting and counterfactual information, and (c) awareness of knowledge origins. It is assumed that all components lead to a decrease in suggestibility (Welch-Ross, 2000). Unfortunately, a more detailed description of the relation between mental state understanding and source monitoring (i.e., source monitoring performances as described in the source monitoring framework of Johnson et al., 1993) is not presented. Welch-Ross (2000) refers to the lack of research on the relation between source monitoring and mental state understanding and justifies it with a narrow description of the relation between both variables. Thus, the "mental states reasoning model of suggestibility and memory source monitoring" does not specify the possible relations between

mental state understanding and source monitoring in detail and cannot be used to derive hypotheses about possible relations.

Another approach that might be able to describe the relation between mental state understanding and source monitoring is the origin of knowledge approach – a research approach within the theory of mind research. The origin or source of knowledge approach examines the question of how different sources of information lead to different knowledge and mental states (e.g., Flavell, Miller & Miller, 1986; Gopnik & Graf, 1988; O’Neill & Gopnik, 1991; Sodian & Wimmer, 1987; Wimmer, Hogrefe & Perner, 1988). In research about the origin of knowledge, it is assumed that false-beliefs may result from false or insufficient information (e.g., Sodian & Thoermer, 2006). It is further assumed, that the comprehension of a false-belief may imply an understanding of the dependence of information access, knowledge and correct actions (Sodian & Thoermer, 2006). This assumption is based on the empirical findings that children of four years of age and older understand how different sources of information (visually, verbally, through the sense of touch) lead to different knowledge and mental states (Flavell et al., 1986; Gopnik & Graf, 1988; O’Neill, Astington & Flavell, 1992; O’Neill & Chong, 2001; O’Neill & Gopnik, 1991; Sodian & Wimmer, 1987; Wimmer, Hogrefe & Perner, 1988; Wimmer, Hogrefe & Sodian, 1988). If the understanding of how different sources of information lead to different knowledge and mental states is important in false-belief tasks, then it can be assumed that a decision about the source of information access (or knowledge respectively) might be carried out in false-belief tasks. If such a decision is carried out in false-belief tasks then performances in origin of knowledge tasks should be related to false-belief tasks because decisions about the origin of information (or knowledge as well) are need to be made in these tasks.

In spite of their conceptual similarity, the approaches “source monitoring” and “source of knowledge” have rarely been compared or connected (Drummey & Newcombe, 2002; Leichtman et al., 2000; Perner, 2000; Naito, 2003; Robinson, 2000). This is somewhat surprising because the source monitoring framework is not restricted to memories but also comprises of the source of beliefs and knowledge (Johnson et al., 1993; Lindsay et al., 1991).

Recently, some researchers have categorized origin of knowledge tasks as source monitoring tasks (Drummey & Newcombe, 2002; Leichtman et al., 2000; Lindsay et al., 1991; Naito, 2003; Robinson, 2000). Such a categorization is thoroughly justified on the level of source monitoring processes because they should be identical across all (source) tasks (Johnson et al., 1993; Lindsay et al., 1991). However, such a categorization would mean that the proposed relation between false-belief tasks and origin of knowledge tasks might be true for all source monitoring tasks. Thus, it can be assumed that false-belief understanding is meaningfully related to source monitoring, because in both types of tasks attributions about the source of information (knowledge or memories) are carried out. If this assumption is correct, then both performances should be meaningfully related to each other. This would mean that false-belief understanding

should be related to all types of source monitoring because source decision processes are carried out in all types of source monitoring independent of the types of sources (Johnson et al., 1993).

Besides this, a specific relation between false-belief understanding and internal source monitoring could also exist, because both performances seem to contain a mental state understanding about the distinction between the mind and the world⁴. In source monitoring, a mental state understanding between the mind and the world seems to be required in source attributions about imagined mental representations or internal sources respectively (Welch-Ross, 1995). Imagined mental representations seem to require (1) an understanding that imaginations are distinct from reality-based mental representations and (2) that imaginations do not reflect the way the world really is and/or that imaginations do not filter into the physical world (Welch-Ross, 1995). A similar understanding seems to be required in false-belief understanding. False-belief understanding seems to require the comprehension that persons have different beliefs about the world and that beliefs of one person are distinct from beliefs of another person (e.g., Wellman, 2002; Perner, 1991; Perner & Ruffman, 1995; Wimmer & Perner, 1983). In addition, false-belief tasks seem to require an understanding that beliefs do not reflect the way the world really is or that beliefs do not filter into the physical world (Wellman, 2002; Wellman et al., 2001). Thus, it can be assumed that the common ground between false-belief understanding and internal source monitoring is such a mental state understanding about the distinction between the mind and the world. If this assumption is correct, then both performances should be meaningfully related to each other. This would mean as well that false-belief understanding is only related to internal source monitoring because reality monitoring and external source monitoring tasks typically do not contain imagined sources. A relation should only exist to these types of tasks if private (imagined) internal and/or external sources are involved.

Currently, there are two empirical studies available that examine the relation between false-belief understanding and single source monitoring performances.

The first empirical study comes from Evans and Roberts (2005). In the study, a video with a knowledgeable interviewer was presented to fifty 3- to 5-year-old children. Following the video, the children were interviewed by a knowledgeable interviewer and by a naïve interviewer. After a 5- to 7-day-delay, children answered 24 yes/no recognition questions (12 misleading, 12 non-misleading) and then were asked about the source of each recognition question (video, knowledgeable interviewer or naïve interviewer). Afterwards, children's false-belief understanding (among other theory of mind skills) was assessed by a mistaken-contents task and

⁴ Such a specific relation must not automatically exclude the validity of the first explanation. It is rather a kind of extension of the first explanation by considering an additional aspect.

a mistaken-identity task. Results of the study showed that performance on the false-belief tasks were not related to source monitoring accuracy. The authors concluded that other aspects of theory of mind abilities could be more strongly tied to source monitoring than the selected theory of mind tasks. The reported study therefore does not show a meaningful relation between false-belief understanding and the used (external) source monitoring task. Nevertheless, it is possible that the relation was covered by the chosen source task, the included misleading questions and/or the length of the delay because these factors can affect source attribution.

The second study examining the relation between false-belief understanding and source monitoring comes from Kovacs and Newcombe (2006). Their focus of interest in a series of studies was whether focusing on speakers might lead to better source memory in children. They presented This was true in the clustered high familiar sources across the reality monitoring and external source monitoring conditions and also in the single high familiar source in the external source monitoring condition. an audiotape of two dissimilar speakers (male and female speaker) to eighty 4- and 5-year-old children. Two dolls were used to make it easier for the children to identify the sources. Kovacs and Newcombe (2006) used three separate lists of five statements (5 each for source 1, source 2 and new items as distractors), each expressing opinions on topics relevant for children (e.g., dislikes and likes of activities). After a two-minute-delay, a memory test about the statements and their sources was given. Kovacs and Newcombe (2006) also used a false-content task to assess children's false-belief understanding (false-contents "smarties" task by Perner, Leekman & Wimmer, 1987). Results of the correlational analysis showed that source discrimination was not correlated to the false-belief task. This same result was found when the one-focus groups and the other-focus groups were analysed separately. Thus, the study showed that false-belief understanding examined by the false-contents task was not related to the used (external) source monitoring task. Further studies examining the relation between false-belief understanding and reality monitoring, internal or external source monitoring are not available to my knowledge.

Both studies indicate that false-belief understanding is not related to external source monitoring performances and with it indicate that the assumption about relations to all types of source monitoring might not be correct. However, it has to be kept in mind that the two external source tasks contained specific types of information and procedures (e.g., misleading questions, time delay, focusing on speakers) that may have influenced the relations found in the two studies.

Before hypotheses about the relation between false-belief understanding and source monitoring can be derived, it is necessary to briefly discuss possible moderator variables. As pointed out in the previous sections, it can be assumed that source monitoring is related to working memory performances and to verbal abilities. Because false-belief understanding is related to verbal abilities as well as to working memory performances (e.g., Astington & Jenkins, 1995, 1999; Carlson & Moses, 2001; Carlson, Moses & Hix, 1998; Davis & Pratt, 1995; de Villiers, 2000; de

Villiers & Pyers, 2002; Fodor, 1992; Frye, Zelazo & Palfai, 1995; Gordon & Olson, 1998; Hughes & Dunn, 1997; Jenkins & Astington, 1996; Karmiloff-Smith, 1992; Lockl et al., 2004; Olson, 1993; Perner, 1991; Ruffman, Slade, Rowlandson, Rumsey & Garnham, 2003; Shatz, 1994) there is a risk that the relation between source monitoring and false-belief understanding is influenced by both of these variables. Thus, the influence of the possible moderator variables working memory and verbal abilities needs to be tested and controlled for if the relation between false-belief understanding and source monitoring is to be examined in a reliable and valid way.

My focus in experiment 1 is to only examine the relation between false-belief understanding and internal source monitoring. The first reason for this is that on a theoretical level false-belief understanding should be mainly related to source monitoring performances involving imagined sources. In the source tasks of experiment 1, this is only the case in the internal source monitoring task. The second reason for this is that the two available studies indicate that false-belief understanding might be not related to all types of source monitoring (or external source monitoring respectively). For these reasons, I only examine the relation between false-belief understanding and internal source monitoring in this dissertation.

Based on the assumption that false-belief understanding and internal source monitoring performances involving imagined internal sources require a mental state understanding reflecting the distinction between the mind and the world (Welch-Ross, 1995), I expect a positive relation between false-belief understanding and internal source monitoring. This relation is expected to be found across both sources of the internal source monitoring task and in the single sources of the internal source-monitoring task (said-source; thought-source) because in both single sources a mental source seems to be distinguished from a reality source, requiring a mental state understanding. I expect that these relations are positive because children who have a false-belief understanding thereby indicating the understood distinction between the mind and the world are expected to show a higher number of correct internal source attributions as internal source attributions require such an understanding. The action and the verbal encoding modes should reveal these relations because the distinction between the mind and the world is contained in both internal source monitoring tasks and is independent of the characteristics of the encoding mode.

In experiment 1, I expect that the relations between false-belief understanding and internal source monitoring exist independently of verbal abilities and of working memory performances because the relation is expected to be based on the mental state understanding about the distinction between the mind and the world. Thus, I expect that all relations between false-belief understanding and internal source monitoring remain significant if the verbal ability “active vocabulary level” and the working memory performance “phonological working memory performance” are controlled statistically. The verbal ability “active vocabulary level” and the working memory performance “phonological working memory performance” were selected

because they are the most important single indicators of the verbal abilities and working memory performances examined in experiment 1.

The relations are not tested separately in the three age groups because of the small sample sizes in this study.

2.1.2.4 The relation between social factors and source monitoring

As a fourth group of factors, single social variables might be of particular interest for early source monitoring. Changes in the social environment of the child may stimulate the development of source monitoring in a certain way (e.g., Phillips, Mc Cartney & Sussman, 2006). They may provide the child with more opportunities for social interactions to other children and adults and with it enhance learning within the social or collaborative contexts (e.g., Nelson, 1993; Phillips et al., 2006; Rogoff, 1998; Roazzi & Bryant, 1998; Rubin, Bukowski & Parker, 1998; Vandell, Nenide, van Winkle, 2006; Tomasello 2008; Tomasello, Kruger & Ratner, 1993). In this section, I explore the possible relations between source monitoring and different social variables within and outside the family context. I start the section by discussing the theoretical relations and then present the available empirical findings. At the end of the section, I derive the hypotheses to be tested in experiment 1.

There is an enormous number of social variables in various contexts available. These many social variables can be ordered in certain ways. In this dissertation, I organized the social variables into variables *outside the family* and *within the family context*. I selected this arrangement because both classes of social variables seem to be highly relevant for early source monitoring. Besides this, in both classes, changes in the social environment and in the interaction take place between 3 and 5 years of age that seem to be important for source monitoring. However, it has to be considered that the variables of both classes can influence each other and in combination influence the development of source monitoring as well. Therefore, the separation of the two classes of social variables is only clear to a certain extent.

Social variables have not been related systematically to source monitoring. Thus, it is not possible to rely on systematic theoretical derivations or empirical findings about the relation between social variables and source monitoring.

Changes in the social environment of the child can stimulate the development of source monitoring in a certain way (e.g., Perner & Ruffman, 1995; Phillips et al., 2006; Rubin et al., 1998; Vandell et al., 2006). It is possible that such changes might be necessary for developments in source monitoring. A similar assumption has been proposed for the onset of independent locomotion for deferred imitation performances in infants (e.g., Newcombe & Crawley, 2007;

Gross & Hayne, 2004). Gross and Hayne (2004) showed that the crawling status affects the degree to which infants can remember target actions in new contexts. 9-month-old crawlers showed higher memory performances compared to noncrawlers (chronological age controlled) in a deferred imitation when objects and context were changed. This indicates that crawling infants deal with changing contexts leading to the observed effect (Newcombe & Crawley, 2007).

One such a change in the social environment of the child *outside the family* might be the entry in the kindergarten/nursery school or a crèche. In kindergarten⁵, the child now has regular contact to peers, younger children, older children and adults outside the family and outside the circle of friends of their parents. Every person as well as the child itself can be the source of different statements, actions, events, beliefs, emotions and knowledge. Memories of all these different statements, action and so on can be generated and maybe retrieved after shorter or longer times. For these representations it may become more and more important to specify their source because the child might be asked about them by various persons. Parents, relatives or other adults who want to hear about the child's day, and the kindergarten teacher(s) can all be persons asking questions as well as the child itself if it talks about its experiences or memories to other children in the kindergarten group or to children outside the kindergarten. In addition, in some situations it might be important to know the correct source of actions, statements or intentions. In a quarrel or brawl between children in the kindergarten for example, the situation needs to be evaluated and solved.

It can therefore be assumed that the number of the contacts a child has to peers, younger and older children may lead to source attributions particularly for types of source monitoring in which external sources are involved (reality monitoring and external source monitoring). The same assumption might be true for the duration a child has been attended a kindergarten and/or a crèche. With increasing length of time and number of contacts, the child may get more experiences with different external sources and therefore may make source attributions and discriminations more often, which in turn enhance its source monitoring performance gradually.

Besides the kindergarten, a child may also visit additional courses for children regularly per week. This might include courses such as gymnastics, swimming, dancing, singing, learning to play musical instruments and so on. Like the kindergarten, these activities are carried out in groups of children of different age groups, which give the opportunity for more social interactions and may be possible source attributions. Thus, children visiting a number of such courses may attribute and discriminate sources better to their memories. However, not the numbers of hours or courses or the duration per se are meaningful. Rather, the quality of interactions carried out during the hours is important. Yet, the number of hours or courses or duration can give a first insight in the possible relation between the variables.

⁵ The designation kindergarten is used in the following for care taking institutions for children between 3 and 6 years of age although differences in the designation in different countries exist (e.g., USA, GER, AUS).

Besides social variables outside the family, social variables *within the family* might be just as important for source monitoring. The number of hours the child spends with the mother per day, the number of hours the child spends with the father per day and the hours the child spends with another (familiar) person per week seem to be of particular interest. Again, not the numbers of hours per se are meaningful. Rather, it is the quality of interactions carried out during the hours. Again though, the number of hours can give a first insight in the possible relation between variables within the family and source monitoring.

As it is known from research about autobiographical memory development, younger children start to take over the structure of narratives from their parents, particularly from the person who spends the most time with the child (e.g., Bauer, 2007; Fivush, 2002b, 2009; Fivush & Hamond, 1990; Nelson, 1993, 1996). Parents obviously serve as meaningful models for the child's memory development and probably also for the memory performance "source monitoring". For example, parents attribute sources to their own memories, emotions or beliefs and help their child attribute sources to their own memories. They may encourage the child to consider sources of memories or beliefs and correct/explain incorrect source attributions to their child during various interactions. Such interactions with the parents can enhance children's understanding and use of external source attributions in a meaningful way. An important yet currently unanswered question is, whether children conclude source monitoring by themselves or whether they take over the structure on how to make source attributions from their parents or other models in their (closer) social environment. It can be assumed that mothers and fathers are important for the child's development of memory and also for the development of source monitoring.

The mother and the father may also play an important role for the understanding of internal source attributions. The child may increasingly learn (from the mother/father) that public and private internal sources of the child (and mother/father) exist and that they can be discriminated from each other. The mother/father may provide the child with adequate information and interpretations through her parenting/narrative style and thus enhance the child's understanding for different internal sources. This assumption is (partly) analogue to findings of the importance of parenting style and shared activities for children's memory performance and children's social-cognitive development (e.g., Bauer, 2007; Fivush, 2002a, 2009; Ratner, Foley & Gimpert, 2002; Rogoff, 1998; Ruffman, Perner, Naito, Parkin & Clements, 1998; Tomasello, 2008; Tomasello et al., 1993; Wellman, 2002).

Besides the mother and the father, another person in the closer family can serve as a meaningful model as well and can enhance source monitoring performances in the same way with frequent contact to the child (e.g., grandparents, partner in life, other close family members). The same might be true for siblings. Like parents, siblings are external sources in the closer family and can enhance external source monitoring performances because more external source discriminations of memories, knowledge, emotions and beliefs are carried out. Nevertheless, the

beneficial effect of siblings can vary regarding the position the child has in the row of its siblings because the beneficial effects could be different for older and younger siblings.

To my knowledge, empirical studies examining the relation between source monitoring and the social variables are not available. Nevertheless, based on the previously described considerations, the following hypotheses can be derived.

Based on the presented conclusions, I expect in experiment 1 that the external source tasks reality monitoring and external source monitoring are positively related to the number of hours the child spends with the mother per day, the number of hours the child spends with the father per day, the number of hours the child spends with another person per week, the weekly contacts of the child to peers, the weekly contacts of the child to younger children and the weekly contacts of the child to older children. This expectation is based on the assumption that the higher the number of hours and with it the interactions to external person sources is (i.e., mother, father, another person within the family; peers, younger and older children outside the family), the more external source attributions may have been learned and made. I expect this because the child should have more practice in handling and discriminating external sources from each other. I expect the relations to be found in the verbal and in the action encoding modes because the relations should not vary with an action or a verbal encoding mode. It is also favourable to explore whether the relations exist independently of the age of the children.

Besides this, I expect that internal source monitoring is positively related to the hours the child spends with the mother per day and the hours the child spends with the father per day. The explanation behind this is that the more time the mother and the father spends with the child, the more explanations and practice about how to handle public and private internal sources can be received and made. I expect the relations to be found in the verbal and in the action encoding modes because the relations should not vary with an action or a verbal encoding mode. It will also be investigated whether the relations exist independent of the age of the children.

In addition, in post-hoc analyses I will explore whether the remaining social variables number of siblings, the position the child has in the row of siblings, the duration a crèche/nursery school/kindergarten has been attended and the number of courses the child visits regularly are also meaningfully related to reality monitoring, internal and external source monitoring in the action and in the verbal encoding mode.

2.2 Method

Now I describe the method of experiment 1. I start by describing the sample of experiment 1 (2.2.1) and then go on with the experimental design (2.2.2). After that, I describe the materials and the procedure of experiment 1 (2.2.3).

2.2.1 Sample

Thirty-six children were recruited from local nursery schools, kindergartens, pedestrians and institutions offering activities for preschoolers in Kiel, Germany. Of the participants there were twelve 3-year-old ($M = 45$, range 43 to 47 months, 10 girls, 2 boys), twelve 4-year-old ($M = 55$, range 48 to 59 months, 6 girls, 6 boys) and twelve 5-year-old children ($M = 68$, range 63 to 72 months, 6 girls, 6 boys). All participants were normally developed children from German middle class families. They were all native German-speaking children. Education levels of mothers (O-level: 7; Abitur/Fachabitur: 18; Bachelor/Master: 11) and of fathers (O-level: 9; Abitur/Fachabitur: 13; Bachelor/Master: 11; Others: 3) were high and comparably distributed across the age groups. Occupation status differed between mothers (full-time: 6; part-time: 13; non: 17) and fathers (full-time: 26; part-time: 5; non: 5) but were comparably distributed across the age groups. Nine additional children were tested but excluded from the final sample because of failure to complete the tasks (five 3-year-old children and two 4-year-old children), due to delayed development (one 5-year-old child) and due to technical error (one 5-year-old child). The parent and the child received 15 € for their participation.

2.2.2 Design

The design was a 2 (encoding mode: Action vs. verbal) x 3 (type of source monitoring: Reality vs. internal vs. external source monitoring) x 3 (age group: 3- vs. 4- vs. 5-year old children) mixed-model design with the within-subject factors “encoding mode” and “type of source monitoring” and the between-subject factor “age group”. The design is presented in Table 1.

Table 1 Experimental design of experiment 1



		Factor A					
		„Encoding mode“					
		Action			Verbal		
		Factor B					
		„Type of source monitoring“			„Type of source monitoring“		
		Reality	Internal	External	Reality	Internal	External
Factor C „Age“	3;0–3;11	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}
	$\bar{y}_{coc, soc}$	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}
	4;0–4;11	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}
$\bar{y}_{coc, soc}$	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	
5;0–5;11	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	\bar{y}_{rec}	
$\bar{y}_{coc, soc}$	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	\bar{y}_{sar}	

Depend variables: \bar{y}_{rec} = Recognition (old, new)

\bar{y}_{sar} = Source attribution rates (source a, source b)

\bar{y}_{coc} = Cognitive variables (working memory, verbal abilities, false-belief)

\bar{y}_{soc} = Social variables (within the family, outside the family)

2.2.3 Material and Procedure

In the following subsections, the materials and procedure of experiment 1 are described. The first subsection portrays the material and the procedure of the single tasks and the second subsection explains the chronological procedure of experiment 1.

Material and procedures of the single tasks

All test sessions of the children were recorded completely onto a digital dictating machine (Olympus Digital Voice Recorder, VN-480PC). Before coding, the written protocols of each task were checked with the use of the audio protocols and completed/corrected if necessary.

Source tasks. Source monitoring performances were measured after a short delay in a reality monitoring, an internal source monitoring and in an external source monitoring condition in an action and in a verbal encoding mode. The single source conditions are independent source tasks and do not have a common goal. For the six source conditions, a total number of 100 verbal phrases were used. The verbal phrases were based on words taken from the MacArthur Communicative Inventories (Fenson, Dale, Reznik, Bates Tal & Pethick, 1994) and consisted of two to four words each (e.g., reading a book, drinking the milk). All words belong to the vocabulary of 2;6-year-old-children and were age appropriate and highly familiar to 3-, 4-, and 5-year-old-children. A total of sixteen items, eight test items (4 items per source) and eight distractor items, was presented per source task. Additionally, four items were used as training items whereby the same four training items were employed in all source tasks. The items were sorted randomly to the six source tasks and randomly sorted as test or distractor items. The presentation order during encoding and retrieval was similar for all children. During retrieval, the test items per source task were presented in a mixed order together with the distractor items to control item-relational cues through the item order. The 100 verbal phrases were presented audio-visually by a male voice (by using a CD-Player) and by picture cards (15.3 x 21.6 cm) in which the phrases were illustrated by cartoon-like clip-arts (circa 6 x 8 cm).

The order of the source tasks per encoding mode was (1) reality monitoring task and then either the (2/3) internal source monitoring task or (3/2) the external source monitoring task. In the reality monitoring tasks, the internal source was the child and the external source was a female experimenter. Both sources expressed the phrases according to the encoding mode either by performing the actions (action encoding mode) or by repeating the verbal phrases (verbal encoding mode). In the internal source tasks, the internal sources were the child expressing the phrases (outperforming the actions or repeating the verbal phrases) or the child thinking about the presented phrases. The external sources were two female experimenters expressing the phrases (outperforming the actions or repeating the verbal phrases) whereby the experimenter of the reality monitoring task was always experimenter 1 in this source task. The turn of the person *sources* in the reality and external source monitoring tasks were instructed by using a red and a blue plastic tin (Ø 4.6 cm). In the internal source tasks, the male voice instructed the turn of the internal sources (i.e., “say” or “think”).

At the beginning of the *reality monitoring tasks*, the experimenter told the child that they will play a game called “Red says/does or blue says/does” together. The materials of the source task

were placed on the table in a way that the turned source cards were in front of the child. Then the experimenter said, “A man from a CD says “turn around the next card” and after we did this he either says to us “you with the red tin say/do....” or “you with the blue tin say/do....”. If he says “you with the red tin,” then it is your turn because you have the red tin in front of you. If he says “you with the blue tin,” then it is my turn because I have the blue tin in front of me. Then you or I have to repeat/perform what the man said. Let us try the game to make sure we understand it correctly.” After these initial instructions, the training phase started and the game was explained a second time during practice using the same words. After hearing the instruction from the CD, “Turn around the next card” the child or experimenter turned around the card and listened to the male’s voice saying whose turn it is and what to repeat or perform. The first turn was on the experimenter. The experimenter repeated/performed the first phrase and said; “now I repeated/performed what the man said because he said “you with the blue tin say/do” and I have the blue tin”. If the child repeated/performed the phrase than the experimenter said “It is not your turn because you have the red tin. Only the person with the right color of the tin has to repeat/perform what the man said”. The additional three training cards were presented and feedback was given in a similar way. If the last two training trials were correct then the encoding phase started. Otherwise, the training trial was repeated. In the encoding phase, the verbal phrases were encoded as previously described without giving feedback anymore. If the child falsely/did not repeat/perform the phrases during encoding the experimenter reminds the child by saying, “Hey, it’s your turn”. The phrases were presented five sec after the turn-taking-instructions. Eight sec after presenting the phrases the instruction of the next item began. After the encoding phase, the children were involved in a two-minute conversation to attract their attention away from the source task and to avoid recency effects of the test items. Afterwards, each child was told that the experimenter would like to know how good it remembers the previously seen and heard phrases. Then the experimenter said, “Now we will look at different cards. The man tells us again what is on each card. Some of the cards are old cards, which were contained in our “Red says/does and Blue says/does”-game but some cards are new cards, which we have not seen and heard before in our game. After each card, the child was asked whether the card is “old” or “new”.” If the child recognized an item as old, the source question “Who said/did the things on the card?” was asked. If the child did not answer the source question, the child was asked, “Was it [Name of person 1] or was it [Name of person 2]?” The response alternatives in old/new recognition and source recall were counterbalanced within subjects to control response bias. Each source task took eight to 12 minutes.

Figure 2 illustrates the reality monitoring source tasks in the verbal encoding mode and in the action encoding mode.



Figure 2 Illustration of the reality monitoring tasks in the verbal (on the left) and in the action encoding mode (on the right) with a four-year-old girl

In the *external source monitoring tasks*, the child was told that they would now play the game “Red says/does or Blue says/does”. The experimenter said that in this game the second female experimenter has the red tin and has to repeat/perform what the man says. The child was asked to make sure that both experimenters do right thing and were asked to turn around the cards for both experimenters. The training and encoding procedure was similar to the reality monitoring task except the source specific instruction for the second experimenter. After encoding, the child was actively involved in a 2-minute conversation. Then the old/new recognition and source recall of the two external sources took place asking the child whether the items have been presented before. Again, both response alternatives in old/new recognition and source recall were counterbalanced within subjects. Each external source task took eight to 12 minutes.

In the *internal source monitoring tasks*, children were told that they would now play a game called “Saying/Doing or thinking”. The experimenter told the child that “If someone is thinking something in his head, it is just done in the head and nobody can hear it. If someone is thinking, it is not said aloud but done silently in the head so that no one else can hear it.” The experimenter laid her index finger on the mouth and said “shhht, very quietly” emphasizing that thinking is made silently in the head. The male voice instructed the turn of the internal sources by telling “say/do or think it in your head....” The internal source “thinking” was served if the child looked on the card and did not repeat what was seen on the card aloud and did not perform the phrase during encoding⁶. The training and encoding procedure was similar to the reality monitoring task except for the source specific instruction for the “thought”-source. After encoding, the child was actively involved in a 2-minute conversation before old/new recognition and source recall of the two internal sources took place to see if items were recognized as old. Both response alternatives in old/new recognition and source recall were counterbalanced within subjects. Each internal

⁶ Such a behavioral control did not guarantee that the child really think the phrase in their head. This may lead to lower characteristics of these internal source compared to such sources under real carrying out “thinking” conditions. Nevertheless, the selected operational definition is at least not fully controllable even in adults.

source task took eight to 12 minutes. The total time of presentation of the source task items was comparable in each of the three source task conditions and in the action and the verbal encoding mode (*action* encoding mode: RM 2:33 Min., ISM 2:33 Min., ESM 2:43 Min.; *verbal* encoding mode: RM 2:35 Min., ISM: 2:37 Min., ESM 2:43 Min.).

For each of the six source tasks, correct old/new recognition and source attribution were coded with one point. Incorrect answers were coded with zero points. The number of correct answers were added up to correct recognition and source attribution totals and to correct single recognition and source attribution totals (e.g., for the child-source in reality monitoring). Additionally, for each source task, the number of incorrect answers were counted and added to false totals.

Working memory. Episodic buffer functions were measured by a memory-for-sentences task and phonological loop functions by a phonological-working-memory-task for nonwords. Both tasks examine episodic buffer performances and phonological loop performances (Alloway et al., 2004; Baddeley, 2000; Baddeley & Wilson, 2002; Gathercole & Baddeley, 1996; Gathercole et al., 1994) and were taken from the Language Developmental Test for 3- to 5-year-old children (Grimm, 2001). Besides this, the subtest concerning memory span for words was carried out as a control variable. The three subtests of the Language Development Test were used corresponding to the rules of the Language Development Test.

The subtest *phonological working memory for nonwords* examined the ability to represent new, not previously heard speech sounds in the phonological loop. A total number of 12 nonwords with 2 to 4 syllables were used in 3-year-olds and additional 6 nonwords with 5 syllables in 4- and 5-year-olds. The child was asked to repeat several funny words like “nebatsubst” or “ipazeumerink”. The reliability (split-half) of the subtest varied between $\alpha = .62$ and $.81$.

In the subtest *memory for sentences* (4- and 5-year-olds only), the use of acquired grammatical rules for the reproduction of sentences was examined. The child was asked to pronounce meaningful (6) or syntactical-morphological correct yet meaningless (9) sentences with six to 10 words (“The duck is sitting beside the car”, “The quadrangular Indian pours the happy cake into the sack”). Based on the presented sentences, the child was required to understand the sentences and to represent their basic elements. The child was instructed to repeat the sentences immediately after the experimenter finished presenting them. Split-half reliability for the subtest varied between $\alpha = .88$ and $.89$.

The control subtest *memory span for words*⁷ (3-, 4- and 5-year-olds) measured the ability to store and retrieve highly familiar words in a certain sequence (e.g., ship-ball-child-tower). The

⁷ In experiment 1, this subtest was contained as a control variable only. The results are not presented in this treatise but available by the author.

memory span is defined by the maximum number of words repeated correctly (sequences between two to six words). Immediately after presentation, the child was asked to repeat the sequence. Reliability was not calculated for this subtest.

The answers of each subtest of the Language Development Test were coded according to the rules of the test manual. Correct answers were added up to a subtest total. With the exception of the subtest memory-span-for-words, the subtest totals were transformed into T-values. For the entire Language Development Test objectivity (realization, evaluation, interpretation) and validity (construct and criterion validity) were sufficient. The use of a divergent subtest order of the Language Development Test is possible but may affect the comparisons with the norm samples (Grimm, 2001). In this study, the subtest order was not altered but children's performances were measured on two separate days with one-week delay. The subtests took eight to 12 minutes.

Verbal abilities. Verbal abilities were measured by three subtests of the Language Development Test for 3- to 5-year-old Children (Grimm, 2001) and by the Active Vocabulary Test for 3- to 6-year-old Children (Kiese & Kozielski, 1979). The single (sub)tests were carried out corresponding to the rules of the Tests.

Speech comprehension was measured by the subtest *sentence comprehension*. In this subtest, comprehension of grammatical simple clauses, temporal clauses, causal clauses and relative clauses were tested. In a picture selection part (9 cards with two or four pictures), the child was asked to point to the picture that belongs to the presented clause (e.g., "The pencil is in the cup."⁸). The additional pictures contained similar clauses (e.g., "The pencil is [under/beside/on] the cup"). In the manipulation part, sentence comprehension was tested by outperforming the actions of 10 test clauses with different objects (e.g., "Give me the box after you put a button inside"). Split-half reliability varied across age groups between $\alpha = .71$ and $.82$.

Speech production was tested by the subtests encoding of semantic relations and morphological rule using of the Language Development Test and by the Active Vocabulary Test for 3- to 6-year-old Children (Kiese & Kozielski, 1979). In the subtest *encoding of semantic relations*⁹ (in 3-year-olds only), the child's ability to encode and verbally express space-relational contents of 11 pictures was examined (e.g., a picture of a horse standing on a table). The child was shown the test cards and asked to describe what is on the card. The split-half reliability of the subtest was sufficient ($\alpha = .86$). The subtest *morphological rule using* examines the level of plural usage in 10 words (e.g., one picture – four pictures) and 8 nonwords (e.g., one tapsel – three tapseln). The complete plural types that can be discriminated in German language were tested (ending -e,

⁸ The given samples of the subtests of the Language Development Test were translated into English except the nonwords.

⁹

-non with umlaut, -n, -er, -s). Test items were presented on cards with one object on the left side and many objects on the right side. The child was told how one object is called and asked how many objects are called. Split-half reliability varied between $\alpha = .78$ and $.85$.

The answers of each subtest of the Language Development Test were coded according to the rules of the test manual. Correct answers were added up to a subtest total. The subtest totals were transformed into T-values. For the entire Language Development Test objectivity (realization, evaluation, interpretation) and validity (construct and criterion validity) were sufficient. The use of a divergent subtest order of the Language Development Test is possible but may affect the comparisons with the norm samples (Grimm, 2001). In this study, the subtest order was not altered but children's performances were measured on two separate days with one-week delay. The complete subtests took 12 to 18 minutes.

The Active Vocabulary Test for 3- to 6-year-old Children (Kiese & Kozielski, 1979¹⁰) also measures speech production. The test contains a picture-naming task, which examines the active vocabulary level of German content words. In the picture-naming task, children were asked to name 82 black/white drawings of a representative number of German nouns (64), verbs (17) and 1 adjective. For the Active Vocabulary Test objectivity (realization, evaluation, interpretation), reliability (split-half, $\alpha = .94$) and validity (convergent, contents validity) were sufficient. The answers were coded according to the rules of the test manual. Correct answers were added up to test totals and transformed into percent ranks. The complete test took 10 to 12 minutes.

False-belief understanding. Children's false-belief understanding was measured by two false-belief tasks that varied in the used story (Bello's-bone; Mausi's-chocolate). The tasks based on the classical false-belief tasks developed by Wimmer and Perner (1983; Lang & Perner, 2002) and contained an unexpected transfer. False-belief tasks of this sort are reliable and valid tasks to measure false-belief understanding (Wimmer & Perner, 1983; Wellman, 2001). For Bello's-bone task a folding book of a farm (4 scope rooms; Cousins, 2001) and for Mausi's-chocolate task a folding book of a house (3 scope rooms; Cousins, 1998) was used. In Bello's-bone task Playmobile® figures were used (dog, kennel, master, bone, sunflowers (a sheep stable was a part of the book)) and in Mausi's-chocolate task cardboard characters of the folding book and a small piece of chocolate were used (a cupboard and refrigerator were part of the book). Both false-belief tasks involved a story character (Bello the dog, Mausi the mouse) placing an object (bone, chocolate) in one location (kennel, cupboard), leaving (going for a walk, going to play), and another character (Bello's master, Mausi's mother) moving the object to another location (sheep stable, refrigerator) while the first character was not present. Four control questions were asked in each task to ensure that the child followed the story (after the first character left: (1) "Where is

¹⁰ At the time of data collection for experiment 1, the revised version of the AWST was not published.

the [bone/chocolate]?”; after placing the object into the second location: (2) “Do you remember where [Bello/Mausi] put [his/her] [bone/chocolate]?”, (3) “Where is the [bone/chocolate] now?”, (4) “Did [Bello/Mausi] see that the [bone/chocolate] was moved to another other location?”). After the first character returned, the child was asked the belief question ((5)“Where will [Bello/Mausi] look for [his/her] [bone/chocolate]?”) and two memory control questions ((6) “Where is the [bone/chocolate] really?”, (7) “Where did [Bello/Mausi] put [his/her] [bone/chocolate] at the beginning?”). Questions 1, 2 and 7 were coded as memory questions, question 3 and 6 as reality questions, question 4 as a location question and question 5 as the false-belief question. Correct answers were counted with one point and incorrect answers counted with zero points. Numbers of correct answers were added up to a memory total, reality total, location total and false-belief total. Each false-belief task took three to five minutes.

The following Figure 3 illustrates the false-belief task “Bello’s bone” and the sentence comprehension task of the Language Developmental Test.



Figure 3 Illustration of the false-belief task “Bello's bone” (on the left) and the manipulation part of the sentence comprehension task (on the right)

Social variables and behavior control. The *social variables* were examined in the exploration by asking the parent. The social variables were divided into variables within the family and outside the family. The selected social variables *within the family* were birth dates of siblings, the position the child has in the row of siblings, number of hours the child spends with the mother per day, number of hours the child spends with the father per day, and number of hours the child spends with another person per week. The selected social variables *outside the family* were the weekly contacts of the child with peers outside the family (within and outside the kindergarten), the weekly contacts of the child with younger children outside the family (within and outside the kindergarten), the weekly contacts of the child with older children outside the family (within and outside the kindergarten), number and type of courses the child visits regularly, and the duration of how long a crèche or nursery school has been attended.

Besides this, the following *socioeconomic variables*¹¹ were examined in the exploration of the parent: Educational status of mother, educational status of father, occupation of mother, occupation of father, occupation group of mother, and occupation group of father. In addition, the parent was asked about the child's birth, language(s) spoken at home, current medical treatment, and their impression about the fitness of the child during the test sessions.

Behavior control. The experimenter evaluated the behavior of the children (i.e., attention, interaction and emotional states) in each test session and across both test sessions. A dichotomy respond format was used (“given”, “not-given”).

Procedure of experiment 1

Children's performances in the previously described tasks were measured on two separate test sessions using a one-week-delay. The complete procedure per test session lasted on average 45 to 60 minutes. Children were tested either at home or in a child appropriate laboratory room at the University¹². Two female experimenters tested each child individually.

The procedure of experiment 1 began with a short introduction into the study and its course. All tasks of the study were introduced as games. After the short introduction, the child's attention was drawn enthusiastically to the game. Then the task was explained to the child and the training/testing phase began. After the task was over, the child was asked to help tidy up the game and to lay the materials aside. Then the experimenter got the materials of the next game.

The tasks were presented at a low child appropriate table. The child sat on the long side of the table. The first experimenter sat on the left short side of the table. The second experimenter and the parent sat aside to the table. The second experimenter moved closer to the table in the external source monitoring tasks and in the tasks, she carried out with the child. During the games, the parent was asked to not give the right answers to the child or correct the child during the tasks. If the child was too shy or did not want to play alone with one of the experimenter, the parent was asked to sit with the child during the game.

The order of the games at the two test sessions was identical for all children with the exception of the encoding mode and the internal and external source monitoring task. At test session 1, children got either the verbal or the action encoding mode. At test session 2, children got always the other encoding mode. The type of encoding mode per test session was counterbalanced across all children to control position effects.

¹¹ The selected socioeconomic variables were assessed as control variables only. They are not described or discussed in this treatise.

¹² Participants tested at home or at university are distributed equally over the independent variables. They did not differ in their performance. The decision to test children in either place was based on parent's estimations and on their specific claims (e.g., siblings, time available etc.).

At the beginning of each test session, the child was told that a break could be made whenever the child wants to. If the experimenter or the parent had the feeling that the child needs a break (if the child was tired, exhausted, distracted, fooling around or bored), a break was made.

At **test session 1**, the first game was the reality monitoring task. After that, either the internal or the external source monitoring task was played. In the following the false-belief task “Bello’s bone” and after that the remaining internal or external source monitoring task was played. After that the encoding-of-semantic-relations task, the sentence-comprehension task, the memory-span-for-words¹³ task and the morphological-rule-using task was played. After all games of test session 1 were played, the child was told that all games of the day were over and the child was asked whether it want to play new games next week with the experimenters. Afterwards the experimenters expressed their thanks and the child and the parent were said goodbye.

At test session 1, experimenter 1 played the source tasks¹⁴ and the false-belief task with the child. Experimenter 2 played the encoding-of-semantic-relations task, the sentence-comprehension task, the memory-span task and the morphological-rule-using task with the child. The change of the experimenter was made to maintain the attention of the experimenter at an optimal level. The experimenter who was not playing with the child recorded the answers of the child in the task protocols.

At **test session 2**, the first game was the reality monitoring task. After that, either the internal or the external source monitoring task was played. In the following, the false-belief task “Mausi’s chocolate” and the remaining internal or external source monitoring task was played. After that, the phonological-working-memory-for-nonwords task, the memory-for-sentences task and the active-vocabulary-level task was played. After playing all tasks, the child was told that all games of the day were over and the parent was asked to answer the exploration questions. During the exploration, the child was asked to play with experimenter 2 one or two of the games of the test sessions again. After the exploration, the parent and the child received 15 € for their participation and the experimenters expressed their thanks and said goodbye to the child and the parent.

At test session 2, experimenter 1 played the source tasks¹⁵ and the false-belief task with the child. Experimenter 2 played the phonological-working-memory-for-nonwords task, the memory-for-sentences task and the active-vocabulary-level task with the child. The experimenter who was not playing with the child recorded the answers of the child in the task records.

¹³ As pointed out before, this subtest was contained as a control variable only. The results are not presented in this treatise.

¹⁴ The external source monitoring task together with experimenter 2.

¹⁵ The external source monitoring task together with experimenter 2.

2.3 Results

In this section, I present the results of experiment 1 in two sub sections. In the first sub section, I analyse whether the encoding mode is a favourable condition of early source monitoring (2.3.1) and in the second sub section, I analyse whether the four selected factors are relevant to early source monitoring (2.3.2).

The statistical analyses were carried out with the Statistical Program for Social Science 15.0 for Windows. For all statistical analyses a .05 level of confidence was used. Deviations of this level were specified in single cases. In the correlational analyses, one asterisk indicates a .05 level of confidence ($* = p < .05$) and two asterisks indicate a .01 level of confidence ($** = p < .01$).

2.3.1 Encoding conditions of early source monitoring

In this section, I analyse whether the action encoding mode is a favourable condition for early source monitoring. I start the statistical analyses with preliminary analyses in which I test old recognition performances and possible other group differences that can influence the following analyses. After that, I analyse whether the action encoding mode is a favourable condition for early source monitoring.

In the preliminary analyses, I test whether differences in old recognition performances exist that need to be considered in the analyses and conclusions about source monitoring performances. For this analysis, I examine first whether sex differences exist in the correct old recognition performances (total of items recognized correctly as old across the two sources and in the single sources per source task). Using a .20 level of confidence, the 2 x 2 x 3 x 3 Mixed-model analysis of variance (sex vs. encoding mode vs. type of source monitoring vs. age group) revealed no sex differences in correct old recognition performances. Thus, data were collapsed across sex groups for the following statistical analyses.

The means of correct old recognition performance across the two sources per source task of the 3-, 4- and 5-year-old children are presented in Figure 4.

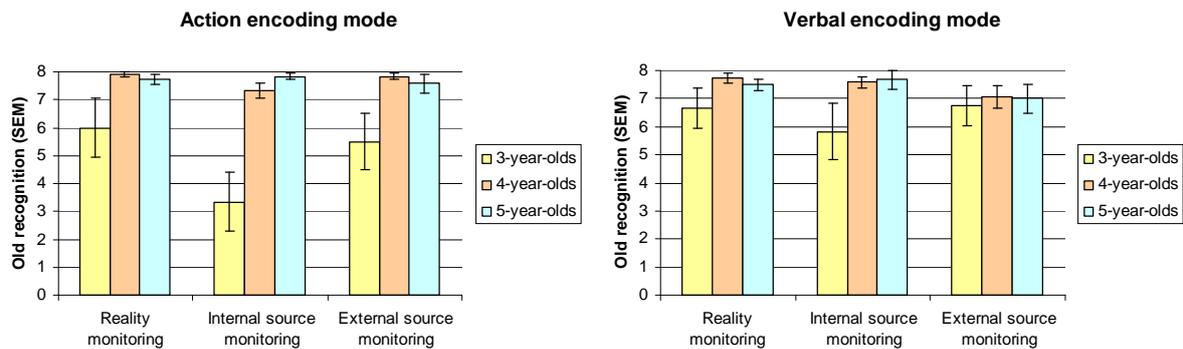


Figure 4 Old recognition performance (across both sources per source task, Maximum= 8 items) in the three main types of source monitoring in 3-, 4-, and 5-year-old children per encoding mode (SEM= Standard error of measurement)

Differences in the correct old recognition performances (totals of items recognized correctly as old across the two sources and in the single sources per source task) between the three age groups were tested by Analyses of variance separately for the two encoding modes and for the three types of source monitoring (age group: 3;0-3;11 vs. 4;0-4;11 vs. 5;0-5;11). The analysis revealed in the old recognition performances across the two sources per source task significant age differences in old recognition in the internal source monitoring task, $F(2,33) = 14.96$, $p = .001$, and in the external source monitoring task, $F(2,33) = 4.23$, $p = .023$, in the action encoding mode. In contrast, no age differences were found in the reality monitoring task in the action encoding mode and in all source tasks in the verbal encoding mode.

With regards to the action encoding mode, post-hoc analysis with a Bonferroni α -adjustment revealed higher old recognition performances in 4- and 5- year-old children compared to 3-year-old children with respect to the internal source monitoring task. The same pattern between 4-year-olds and 3-year-olds was found in the external source monitoring task. Besides this, the post-hoc analyses revealed higher old recognition rates in the 4-year-olds compared to 3-year-olds in the verbal encoding mode of the internal source monitoring task. The same age differences in old recognition performance were found in the single sources of each source task. These results revealed specific age differences in old recognition performances in the action encoding mode between 3-year-old and 4- and 5-year old children in the internal source monitoring task and between 3-year-old and 4-year-old children in the external source monitoring task. Besides this, differences in old recognition performances exist between 3-year-old and 4-year-old children in the external source monitoring task in the verbal encoding mode.

For each type of source monitoring a Discrimination Proportion Score (DPS) was calculated by dividing the total of correct source attributions per source task (across the two sources) by the total of items correctly recognized as old per source task (across the two sources). DPS were calculated in a similar way for each of the single sources per source task.

Sex differences were not expected in the correct DPS across the two sources per source task and in the single sources per source task. Using a .20 level of confidence, a 2 x 4 x 4 Mixed-model analysis of variance (sex x type of source monitoring x age group) showed no sex differences in the correct DPS across the two sources per source task and in the single sources per source task. Thus, data were collapsed and analyzed across sex groups for the following statistical analyses.

Besides this, in the preliminary analyses it was tested whether differences exist in the old recognition performances and in the DPS (across the two sources per source task and in the single sources per source task) between children tested at home and children tested at the University lab. Using a .20 level of confidence, the 2 x 4 x 4 Mixed-model analysis of variance (test location x type of source monitoring x age group) showed no test location differences in the old recognition rates and in the correct DPS across the two sources per source task and in the single sources per source task.

In experiment 1, it was expected that the 3- to 5-year-old children attribute more sources correctly to their memories in the action encoding mode than in the verbal encoding mode. This is expected to be the case across both sources in the reality monitoring, the internal and the external source monitoring tasks (DPS correct across the two sources per source task). The higher source attributions rates in the action encoding mode are expected to exist in the 3-year-old, the 4-year-old and the 5-year-old children. The means of the correct source attributions (DPS, across the two sources per source task) in the three types of source monitoring in the action and in the verbal encoding mode are presented per age group in Figure 5.

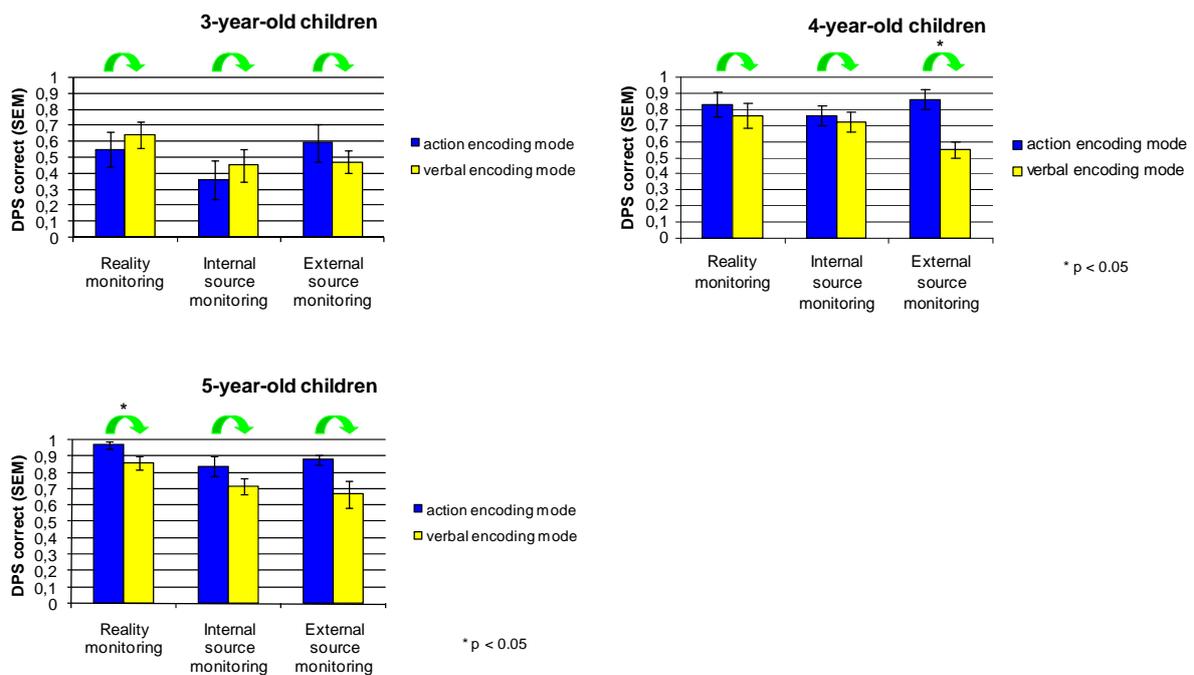


Figure 5 Means of correct source attributions (DPS= Discrimination Proportion Score, across the two sources per source task) in the three types of source monitoring in the action and in the verbal encoding mode per age group (SEM= Standard error of measurement; = expected direction of the advantage)

The differences between the correct source attributions in the action and in the verbal encoding mode per source task in the three age groups (DPS correct across the two sources per source task) were tested by single Analyses of variance for repeated measurement (encoding mode: action vs. verbal). In relation to the 3-year-old children, the analyses showed that the correct source attributions of the 3-year-olds were not significantly higher in the action than in the verbal encoding mode. This was the case in the reality monitoring, in the internal and in the external source task. In relation to the 4-year-old children, the analyses showed that the correct source attributions of the 4-year-olds were significantly higher in the action than in the verbal encoding mode in the external source monitoring task, $F_{4;0-4;11 \text{ ESM}}(1, 11) = 11.93, p = .005$. This was not the case in the reality monitoring and in the internal source monitoring task. In relation to the 5-year-old children, the analyses showed that the correct source attributions of the 5-year-olds were significantly higher in the action than in the verbal encoding mode in the reality monitoring, $F_{5;0-5;11 \text{ RM}}(1, 11) = 5.97, p = .033$. In the external source monitoring task, only a tendency for higher source attributions in the action than in the verbal encoding mode was found, $F_{5;0-5;11 \text{ ESM}}(1, 11) = 4.74, p = .052$, and in the internal source monitoring task no differences were found.

From there, contrary to the hypotheses the 3-year-old children did not attribute more reality monitoring, internal and external source monitoring sources in the action encoding mode

correctly to their memories than in the verbal encoding mode. Conforming to the hypotheses, the 4-year-old children attributed more external source monitoring sources in the action encoding mode correctly to their memories than in the verbal encoding mode but this was not the case for the reality monitoring and internal source monitoring performances. Conforming to the hypotheses, the 5-year-old children attributed in the reality monitoring task more sources in the action encoding mode correctly to their memories than in the verbal encoding mode. In contrast to the hypotheses, this was not the case in the internal source monitoring task and only a tendency for the difference was found in the external source monitoring task.

In experiment 1, it was also expected that the 3- to 5-year-old children attribute in the single sources per source task more sources in the action encoding mode correctly to their memories than in the verbal encoding mode. This was expected to be the case in all single sources in the reality monitoring, the internal and the external source monitoring tasks (DPS correct in the single sources per source task). The higher source attributions rates in the action encoding mode were expected to exist in the 3-year-old, the 4-year-old and the 5-year-old children. The means of the correct source attributions (DPS correct) of the three age groups in the three types of source monitoring in the action and in the verbal encoding mode are presented in Table 2.

Table 2 Means of correct source attributions (DPS= Discrimination Proportion Score) and standard errors of measurement (in parenthesis) per age group in the single sources of the three types of source monitoring in the action and in the verbal encoding mode

	Reality		Internal		External	
	child ¹⁶	exp. 1	performed/ repeated	imagined	exp. 1	exp. 2
<u>3-year-olds</u>						
action	.52 (.14)	.58 (.13)	.33 (.12)	.40 (.14)	.54 (.13)	.65 (.13)
verbal	.60 (.12)	.68 (.11)	.34 (.10)	.56 (.13)	.44 (.09)	.50 (.10)
<u>4-year-olds</u>						
action	.81 (.11)	.88 (.07)	.83 (.10)	.72 (.10)	.79 (.09)	.95 (.03)
verbal	.60 (.11)	.90 (.06)	.73 (.09)	.72 (.10)	.46 (.09)	.63 (.12)
<u>5-year-olds</u>						
Action	.96 (.03)	.98 (.02)	.77 (.09)	.90 (.06)	.88 (.06)	.83 (.08)
verbal	.83 (.06)	.91 (.04)	.75 (.06)	.69 (.07)	.62 (.11)	.58 (.12)

¹⁶ or subject respectively

The differences between the correct source attributions in the action and in the verbal encoding mode of the single sources per source task in the three age groups (DPS correct of the single sources per source task) were tested by single Analyses of variance for repeated measurement (encoding mode: action vs. verbal). In relation to the 3-year-old children, the analyses showed that the correct source attributions of the 3-year-olds were not significantly higher in the action than in the verbal encoding mode. This was the case in all single sources in the reality monitoring, in the internal and in the external source tasks. In relation to the 4-year-old children, the analyses showed that the correct source attributions of the 4-year-olds were significantly higher in the action than in the verbal encoding mode in the experimenter-1-source, $F_{4;0-4;11} ESM_{exp1}(1, 11) = 19.30, p = .001$, and in the experimenter-2-source, $F_{4;0-4;11} ESM_{exp2}(1, 11) = 6.19, p = .030$, in the external source monitoring task. This was not the case for the single sources in the reality monitoring and in the internal source monitoring tasks. In relation to the 5-year-old children, the analyses showed that the correct source attributions of the 5-year-olds were significantly higher in the action than in the verbal encoding mode in the imagined-source in the internal source monitoring tasks, $F_{5;0-5;11} ISM_{thought}(1, 11) = 5.19, p = .044$, and from a tendency in the in the child-source in the reality monitoring task, $F_{5;0-5;11} RM_{child}(1, 11) = 3.90, p = .074$, and in the experimenter-1-source, $F_{5;0-5;11} ESM_{exp1}(1, 11) = 4.09, p = .068$ and the experimenter-2-source, $F_{5;0-5;11} ESM_{exp2}(1, 11) = 4.09, p = .068$ in the external source monitoring task. In the experimenter-1-source in the reality monitoring task and the performed/said-source in the internal source monitoring task no differences were found.

Thus, contrary to the hypotheses the 3-year-old children did not attribute the single sources of the reality monitoring, the internal and the external source monitoring tasks more often correctly to their memories in the action encoding mode compared to the verbal encoding mode.

Conforming to the hypotheses, the 4-year-old children attributed the experimenter-1- and the experimenter-2-source in the external source monitoring tasks more often correctly to their memories in the action encoding mode compared to the verbal encoding mode. This was not the case for the single sources in the reality monitoring and in the internal source monitoring tasks.

Conforming to the hypotheses, the 5-year-old children attributed the imagined-source in the internal source monitoring tasks, more often correctly to their memories in the action encoding mode than in the verbal encoding mode. However, only a tendency for higher source attributions in the action than in the verbal encoding mode was found in the child-source in the reality monitoring task and in the experimenter-1 and experimenter-2-source in the external source monitoring task. In contrast to the hypotheses, this was not the case for the experimenter-1-source in the reality monitoring tasks and the performed/said-source in the internal source monitoring tasks.

In experiment 1, it was also expected that the sources in the action encoding mode are attributed correctly above chance level at an earlier point in time than in the verbal encoding mode. This

was expected to be true for the reality monitoring for the internal and for the external source monitoring performances (DPS correct across the two sources per source task). The means of the correct source attributions in the three types of source monitoring in the action and in the verbal encoding mode are presented per age group in Figure 6.

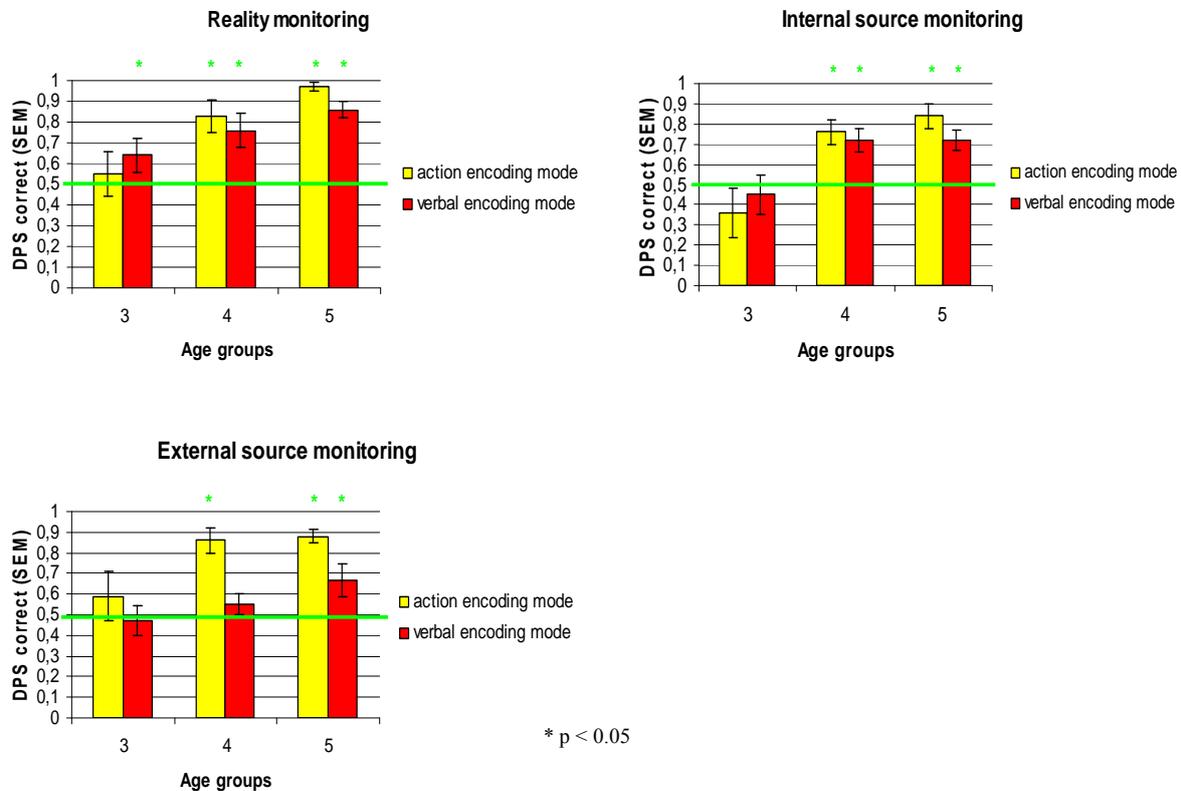


Figure 6 Means of correct source attributions (DPS= Discrimination Proportion Score, across the two sources per source task) in the three types of source monitoring in the action and in the verbal encoding mode per age group (— chance level, SEM= Standard error of measurement)

Because in each source condition, participants chose between two sources, for each source task the expected chance value is 50 %. One-sample *t* tests (fixed test value .50) were used to test each age group for whether the source attribution rates (DPS correct across both sources per source task) in the reality monitoring, the internal and the external source monitoring tasks in the action and in the verbal encoding mode were significantly above chance level. It was then examined in what age groups the source monitoring performances were first significantly above chance level and thus determined at what age the source monitoring performances are first above chance level. In relation to the 3-year-old children, the one-sample *t* tests showed that the source attributions in the reality monitoring task in the verbal encoding mode were significantly above chance level, $t_{3;0-3;11}(11) = 1.88$, $p = .043$ (one-tailed). The source attributions in the remaining types of source monitoring and encoding modes were not significantly above chance level. In relation to the 4-year-old children, the one-sample *t* tests showed that in the action encoding

mode the reality monitoring, $t_{4;0-4;11}(11) = 4.07$, $p = .001$ (one-tailed), the internal source monitoring, $t_{4;0-4;11}(11) = 4.21$, $p = .001$ (one-tailed), and the external source monitoring performances, $t_{4;0-4;11}(11) = 7.75$, $p = .001$ (one-tailed), and in the verbal encoding mode the reality monitoring, $t_{4;0-4;11}(11) = 3.39$, $p = .003$ (one-tailed), and the internal source monitoring performances, $t_{4;0-4;11}(11) = 3.72$, $p = .001$ (one-tailed), were significantly above chance level. This was not the case for the external source monitoring performances in the verbal encoding mode. In relation to the 5-year-old children, the one-sample t tests showed that in the action encoding mode the reality monitoring, $t_{5;0-5;11}(11) = 20.90$, $p = .001$ (one-tailed), the internal source monitoring, $t_{5;0-5;11}(11) = 5.68$, $p = .001$ (one-tailed), and the external source monitoring performances, $t_{5;0-5;11}(11) = 12.19$, $p = .001$ (one-tailed), and in the verbal encoding mode the reality monitoring, $t_{5;0-5;11}(11) = 9.64$, $p = .001$ (one-tailed), the internal source monitoring, $t_{5;0-5;11}(11) = 4.71$, $p = .001$ (one-tailed), and the external source monitoring performances, $t_{5;0-5;11}(11) = 2.19$, $p = .025$ (one-tailed), were significantly above chance level. This pattern of source monitoring performances above chance level shows that reality monitoring performances are first above chance level in the verbal encoding mode in 3-year-old children and external source monitoring performances are first above chance level in the action encoding mode in 4-year-old children.

Thus, conforming to the hypotheses the external source monitoring performances were first above chance level in the action encoding mode at the age of 4 years. In contrast to the hypotheses, the reality monitoring performances were first above chance level in the verbal encoding mode at the age of 3 years. Likewise, in contrast to the hypotheses the internal source monitoring performances were not first but equally above chance level at the age of 4 years.

Besides this, in experiment 1 it was expected that the 3-, 4- and 5-year-old children attribute in the reality monitoring task in the action encoding mode more sources of the subject-performed actions (child-source) correctly to their memories than the sources of the experimenter-performed actions (experimenter-1-source). In experiment 1, it was also expected that in the internal source monitoring task in the action encoding mode the children attribute more sources of the subject-performed actions (performed-source) correctly to their memories than the sources of the imagined action phrases (imagined-source). The higher source attributions rates were expected to exist in the 3-year-old, in the 4-year-old and in the 5-year-old children. The means of the correct source attributions (DPS, in the single sources) of the 3-, 4- and 5-year-old children in the reality monitoring and in the internal source monitoring task are presented in Figure 7.

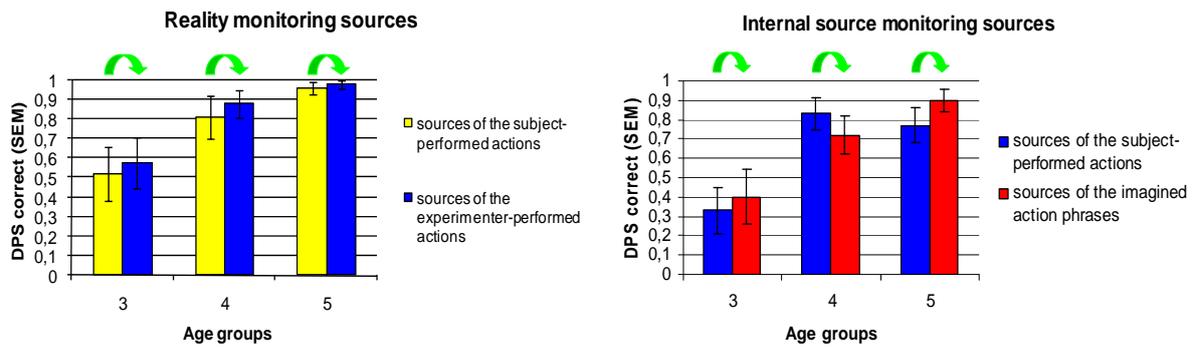


Figure 7 Means of correct source attributions (DPS= Discrimination Proportion Score) of the 3-, 4- and 5-year-old children in the single sources of the reality monitoring and in the internal source monitoring task in the action encoding mode (SEM= Standard error of measurement; = expected direction of the advantage)

The differences between the correct source attributions in the single sources in the reality monitoring and in the internal source monitoring task in the three age groups (DPS correct of the single sources per source task) were tested by single analyses of variance for repeated measurement (source: child vs. experimenter (RM); said vs. thought (ISM)). For reality monitoring sources, the analyses showed that the correct source attribution rates for the sources of the subject-performed actions were not significantly higher than the correct source attribution rates of the sources of the experimenter-performed actions. This was the case for the 3-year-old, the 4-year-old and the 5-year-old children. For internal source monitoring sources, the analyses showed that the correct source attribution rates for the sources of the subject-performed actions were not significantly higher than the correct source attribution rates of the sources of the imagined action phrases. This was likewise the case for the 3-year-old, the 4-year-old and the 5-year-old children.

Thus, contrary to the hypotheses the 3-, 4- and 5-year old children did not attribute more sources of the subject-performed actions (child-source) correctly to their memories than the sources of the experimenter-performed actions (experimenter-1-source) in the reality monitoring task. Likewise, contrary to the hypotheses the 3-, 4- and 5-year old children did not attribute more sources of the subject-performed actions (performed-source) correctly to their memories than the sources of the imagined action phrases (imagined-source) in the internal source monitoring task.

2.3.2 Identifying factors relevant to early source monitoring

In this sub section of the results, I present the relational analyses of source monitoring and the four groups of factors relevant to source monitoring. I start with the relational analyses of working memory and source monitoring (2.3.2.1). After that, I present the results of the

relational analyses of the verbal abilities and source monitoring (2.3.2.2) and the relational analyses of false-belief understanding and source monitoring (2.3.2.3). Finally, I present the relational analyses of the social variables and source monitoring (2.3.2.4).

The following correlation analyses include single, independent pairs of variables and therefore do not require an α -correction (Bortz, 1998).

2.3.2.1 Working memory and source monitoring

The score of each working memory component was tested first to identify extreme values. In the boxplots, no extreme values were found in the two working memory performances.

In addition, the means of each working memory component were compared with the test norms to check if they are comparable to the norm groups of normal developing native German speaking children. The mean T-scores across all age groups in each working memory variable were within one standard deviation around the mean of the test norms of the Language Developmental Test. The same results were found in each single age group.

Besides this, sex differences in the working memory performances were tested by Mann-Whitney-Tests using a confidence level of .20. The Mann-Whitney-Tests revealed no significant sex differences. Therefore, data were analyzed across sex groups.

Pearson product-moment correlation analyses (one-tailed) were used to test the relations between reality, internal and external source monitoring in the action and in the verbal encoding mode (total of correct source attributions) and the episodic buffer performance memory-for-sentences (sum score, 4- and 5-year-old children only). After that, it was examined whether the correlations remained significant if age was controlled in partial correlation analyses (controlled for age in month, one-tailed).

In experiment 1, it was expected that the episodic buffer performance memory-for-sentences is positively related to the reality monitoring, internal and external source monitoring performances in the action and in the verbal encoding mode. The results of the Pearson product-moment correlation analyses showed that the memory-for-sentence performance (4- and 5-year-olds only) was positively related to reality monitoring (.548**) and to external source monitoring (.470*) in the action encoding mode. Both relations remained significant if age was controlled in the partial correlation analyses (RM: .476*; ESM: .435*). The other types of source monitoring in the action and in the verbal encoding mode were not related to memory-for-sentence performance.

Thus, conforming to the hypotheses, higher episodic buffer performances examined by memory-for-sentences go along with a higher number of correct reality monitoring and external source attributions in the action encoding mode. Both relations were independent of the age of the children. In contrast to the hypotheses, the episodic buffer performance memory-for sentences

was not positively related to internal source monitoring in the action encoding mode and to reality, internal and external source monitoring in the verbal encoding mode.

Pearson product-moment correlation analyses (one-tailed) were also used to test the relations between reality, internal and external source monitoring in the action and in the verbal encoding mode (total of correct source attributions) and the phonological loop performance phonological-working-memory-for-nonwords (sum score). After that, it was examined whether the correlations remained significant if age was controlled in partial correlation analyses (controlled for age in month, one-tailed).

In experiment 1, it was expected that the phonological loop performance phonological-working-memory-for-nonwords is positively related to the reality monitoring, internal and external source monitoring performances in the action and in the verbal encoding mode. The results of the Pearson product-moment correlation analyses showed that the phonological-working-memory-for-nonwords performances were positively related to reality monitoring (.287*) and to internal source monitoring (.558**) in the action encoding mode. The partial correlation analyses showed that only the relation between phonological-working-memory-for-nonwords and internal source monitoring remains significant if age is controlled (.329*). The other types of source monitoring in the action and in the verbal encoding mode were not related to phonological-working-memory-for-nonwords performance.

Thus, conforming to the hypotheses, higher phonological loop performances examined by phonological-working-memory-for-nonwords go along with a higher number of correct reality monitoring and internal source attributions in the action encoding mode. However, only the relation to internal source monitoring was independent of the age of the children. In contrast to the hypotheses, the phonological loop performance phonological-working-memory-for-nonwords was not positively related to internal source monitoring in the action encoding mode and to reality, internal and external source monitoring in the verbal encoding mode.

2.3.2.2 Verbal abilities and source monitoring

The scores of the verbal comprehension and the verbal production performances were checked first for extreme values. The boxplot of the sentence-comprehension task showed one extreme value of a 5-year-old child (case 11). The test protocol of that case did not contain remarkable comments explaining the extreme value. A comparison of the extreme value with the test norms showed that the value of the case still lies within one standard deviation. Therefore, despite its extreme value the case remained in the sample. The boxplots showed no other extreme values in the verbal comprehension and the verbal production performances in each of the three age groups.

Besides this, the scores of each verbal comprehension and verbal production performance was compared with the test norms to check if they are comparable to the norm groups of normal developing German speaking children. The T-scores of the sentence-comprehension and the morphological-rule-using performances were within one standard deviation around the mean of the test norms for each child. The percent rank of the active vocabulary performances for each child was at 50 % or above.

In addition, it was tested whether sex differences exist in the verbal comprehension and the verbal production performance scores. The Mann-Whitney-Tests revealed significant sex differences in the sentence-comprehension performances ($p = .16$) at the confidence level of .20. The Mann-Whitney-Tests revealed no sex differences at the confidence level of .20 in the verbal production performances. Thus, the partial correlation analyses controlled sex in the sentence comprehension task and the data were analyzed across sex groups in the morphological rule using and in the active vocabulary tasks.

Partial correlation analyses (controlled for sex, one-tailed) were applied as well to test the relations between the verbal production performance sentence comprehension (sum scores) and reality, internal and external source monitoring in the action and in the verbal encoding mode (total of correct source attributions). After that, it was examined whether the correlations remained significant if age was controlled in partial correlation analyses (controlled for sex, controlled for age in month, one-tailed).

In experiment 1, it was expected that sentence comprehension is positively related to reality monitoring, to internal and to external source monitoring in the action and in the verbal encoding mode. Besides this, it was expected that the relations exist independent of age. The results of the partial correlation analyses showed that sentence comprehension was positively related to internal source monitoring in the action encoding mode (.343*). The relation remained significant if age was also controlled in the partial correlation analyses (.345*). The other types of source monitoring were not meaningfully related to sentence comprehension either in the action encoding mode or in the verbal encoding mode.

Thus, conforming to the hypotheses sentence comprehension was positively related to internal source monitoring in the action encoding mode and the relation is independent of the age of the children. In contrast to the hypotheses, the verbal comprehension performance sentence comprehension was not related to reality and to external source monitoring in the action encoding mode and to reality, to internal and to external source monitoring in the verbal encoding mode.

Pearson product-moment correlation analyses (one-tailed) were again used to test the relations between reality, internal and external source monitoring in the action and in the verbal encoding

mode (total of correct source attributions) and the verbal production performances morphological rule using (sum scores) and active vocabulary level (sum score). After that, it was examined whether the relations remained significant if age was controlled in partial correlation analyses (controlled for age in month, one-tailed).

In experiment 1, it was expected that the active vocabulary level and morphological rule using are positively related to reality monitoring, to internal and to external source monitoring in the action and in the verbal encoding mode. Besides this, it was expected that the relations are independent of age. Regarding the active vocabulary level, the Pearson product-moment correlation analyses showed that the active vocabulary level was positively related to reality monitoring (.501**), to internal source monitoring (.602**) and to external source monitoring (.545**) in the action encoding mode and to internal source monitoring in the verbal encoding mode (.507**). The partial correlation analyses showed that the relations between the active vocabulary level and internal source monitoring (.396*) and external source monitoring (.338*) in the action encoding mode and internal source monitoring in the verbal encoding mode (.350*) remained significant if age was controlled. The reality monitoring and the external source monitoring performances in the verbal encoding mode were not related to the active vocabulary level. Regarding morphological rule using, the Pearson product-moment correlation analyses showed that morphological rule using was positively related to reality monitoring (.323*), to internal source monitoring (.547**) and to external source monitoring (.351*) in the action encoding mode and to internal source monitoring in the verbal encoding mode (.387**). The partial correlation analyses showed that all relations disappeared if age was controlled. The reality monitoring and the external source monitoring performances in the verbal encoding mode were not related to morphological rule using.

Thus, conforming to the hypotheses morphological rule using and the active vocabulary level were both positively related to reality monitoring, internal and external source monitoring in the action encoding mode and to internal source monitoring in the verbal encoding mode. In the case of morphological rule using, each relation depended on the age of the children. In the case of the active vocabulary level, only the relation to reality monitoring depended on age – the remaining relations were independent of the age of the children. In contrast to the hypotheses, morphological rule using and the active vocabulary level was not related to reality monitoring and to external source monitoring in the verbal encoding mode.

2.3.2.3 False-belief understanding and source monitoring

Possible sex differences were tested first in the false-belief question scores of the two false-belief tasks Bello's bone and Mausi's chocolate. The Mann-Whitney-Tests revealed no sex differences on the confidence level of .20. Thus, data was analyzed across sex groups.

Differences between the false-belief task Bello's bone and Mausi's chocolate were tested by *t* tests for depend samples using a confidence level of .20. The analysis showed no differences between the false-belief question scores of both false-belief tasks. In addition, the partial correlations (controlled for age) showed that both false-belief questions were positively related to each other (.645**). These results correspond to the reliabilities of several false-belief performances reported by Mayes, Klin, Terycak, Cicchetti and Cohen (1996). Therefore, one *false-belief score* was calculated by summing up the answers of both false-belief questions.

Pearson product-moment correlation analyses (one-tailed) were applied to test the relations between false-belief understanding (false-belief score) and internal source monitoring performances (total of correct source attributions across both sources; total of correct source attributions in the said/performed- and in the thought-source).

In experiment 1, a positive relation was expected between false-belief understanding and internal source monitoring. This relation was expected to be found across both sources of the internal source-monitoring task and in the single sources of the internal source-monitoring task (said-source; thought-source). The relations were expected to be found in the action and in the verbal encoding mode. The correlational analyses showed that false-belief understanding was positively related to internal source monitoring across both sources in the action encoding mode (.460**) and in the verbal encoding mode (.426**). Besides this, false-belief understanding was positively related to the performed-source (.450**) and to the thought-source (.370*) in the action encoding mode and to the said-source in the verbal encoding mode (.426*). False-belief understanding was not related to the thought-source in the verbal encoding mode.

Conforming to the hypotheses false-belief understanding goes along with a higher number of correct internal source attributions. This is true across both sources of the internal source-monitoring task in the action and in the verbal encoding mode. This is also true in the performed- and in the thought-source of the internal source monitoring task in the action encoding mode and in the said-source in the verbal encoding mode. In contrast to the hypotheses, false-belief understanding was not related to the thought-source of the internal source-monitoring task in the verbal encoding mode.

Partial correlation analyses were applied to test whether the relations between false-belief understanding and internal source monitoring are independent of the verbal ability "active vocabulary level" (controlled for active vocabulary level, one-tailed) and of the working memory performance "phonological working memory performance" (controlled for phonological working memory performance, one-tailed).

In experiment 1 it was expected that the relations between false-belief understanding and internal source monitoring remain significant if the verbal ability "active vocabulary level" and the

working memory performance “phonological working memory performance” are controlled statistically.

The partial correlation analyses showed that if the verbal ability “active vocabulary level” was controlled then all positive relations between false-belief understanding and internal source monitoring disappeared. This was the case across both sources and in the single sources in the action and in the verbal encoding mode. The partial correlation analyses showed that if the working memory performance “phonological working memory performance” was controlled then the relations between false belief understanding and internal source monitoring across both sources (.370*) and in the said-source (.288*) remained significant. Besides this, the partial correlation analyses revealed that false-belief understanding was also meaningfully related to the thought-source in the verbal encoding mode (.300*) if working memory performance was controlled. In the case of the action encoding mode, all relations between false-belief understanding and internal source monitoring across both sources and the single sources disappeared.

Contrary to the hypotheses, all relations between false-belief understanding and internal source monitoring were not independent of the verbal ability “active vocabulary level”. Conforming to the hypotheses, the relations between false-belief understanding and internal source monitoring performances in the verbal encoding mode were independent of the working memory performance “phonological working memory performance”. Contrary to the expectations, not all relations between false-belief understanding and internal source monitoring were independent of the working memory performance “phonological working memory performance”.

Based on the previous partial correlation analyses, it was tested in post-hoc analyses whether the relations between false-belief understanding and internal source monitoring remain significant if only 4- and 5-year old children were included in the partial correlation analyses (controlled for active vocabulary level, one-tailed, α -corrected). The analyses were limited to the verbal ability “active vocabulary level”. The results showed that the relations between false-belief understanding and internal source monitoring across both sources (.405*) and in the single said-source (.457*) in the verbal encoding mode remained significant if the active vocabulary level was controlled. In contrast, the relations between false-belief understanding and the thought-source of the internal source monitoring task in the verbal encoding mode and all relations in the action encoding mode disappeared.

2.3.2.4 Social factors and source monitoring

Mann-Whitney-Tests were used to test sex differences in the social variables with a confidence level of .20. The results showed sex differences in the number of hours the child spends with mother per day ($p < .01$) and in the number of hours the child spends with father per day ($p <$

.17). Other sex differences were not found. Therefore, sex differences were controlled for these social variables by partial correlation analyses.

Pearson product-moment correlation analyses (one-tailed) were used to test the relations between reality and external source monitoring in the action and in the verbal encoding mode (total of correct source attributions) and the weekly contacts of the child to peers, weekly contacts of the child to younger children, weekly contacts of the child to older children and the number of hours the child spends with another person per week (Sum scores of each variable). Partial correlation analyses were used (controlled for sex, one-tailed) to test the relations between reality and external source monitoring and the number of hours the child spends with the mother per day and the number of hours the child spends with the father per day (Sum scores of each variable). After that, it was examined whether the correlations remained significant if age was controlled in partial correlation analyses (controlled for age in month, one-tailed).

In experiment 1, it was expected that the selected social variables are positively related to the external source tasks reality monitoring and external source monitoring. The relations were expected to be found in the action and in the verbal encoding mode. The results of the correlation analyses showed that the weekly contacts of the child to younger children was positively related to reality monitoring in the verbal encoding mode (.319*) but the correlation disappeared if age is controlled in the partial correlation analyses. Besides this the number of hours the father spends with the child per day was positively related to reality monitoring (.314*) and to external source monitoring (.291*) in the action encoding mode. Both correlations remain significant if age is controlled in the partial correlation analyses (RM: .341*; ESM: .299*). The remaining social variables were not related to reality or external source monitoring either in the action or in the verbal encoding mode.

Thus, conforming to the hypotheses, the weekly contacts of the child to younger children (verbal encoding mode) and the number of hours the father spends with the child per day (action encoding mode) were positively related to reality monitoring. Besides this, the number of hours the father spends with the child per day was positively related to external source monitoring in the action encoding mode. However, only the relations of the number of hours the father spends with the child were independent of age. Contrary to the hypotheses, the remaining social variables were not related to reality or external source monitoring in the action or in the verbal encoding mode.

Partial correlation analyses were used (controlled for sex, one-tailed) to test the relations between internal source monitoring and the number of hours the child spends with the mother per day and the number of hours the child spends with the father per day (Sum scores of each

variable). After that, it was examined whether the correlations remained significant if age was controlled in partial correlation analyses (controlled for sex and age in month, one-tailed).

In experiment 1, it was expected that internal source monitoring is positively related to the hours the child spends with the mother per day and the hours the child spends with the father per day. The relations were expected to be found in the action and in the verbal encoding mode. The results of the partial correlation analyses showed that the number of hours the father spends with the child per day was positively related to internal source monitoring (.283*) in the verbal encoding mode. The correlation remained significant if age was controlled in the partial correlation analyses (.290*). The positive relation between the number of hours the father spends with the father per day and internal source monitoring in the action encoding mode was just above the significance level (.282; $p=.051$). When age was controlled in the partial correlation analyses, the relation is significant (.312*). The number of hours the mother spends with the child per day was not related to internal source monitoring in either encoding mode.

Thus, conforming to the hypotheses, the number of hours the father spends with the child per day was positively related to internal source monitoring in the verbal encoding mode. This relation was independent of age. The number of hours the father spends with the child per day was positively related to internal source monitoring in the action encoding mode if age was controlled additionally. Contrary to the hypotheses, the number of hours the mother spends with the child per day was not related to internal source monitoring in neither encoding mode.

Pearson product-moment correlation analyses (one-tailed) were used to test the relations between reality, internal and external source monitoring in the action and in the verbal encoding mode (total of correct source attributions) and the number of siblings, the position the child has in the row of siblings, the duration a crèche/nursery school/kindergarten has been attended and the number of courses the child visits regularly (Sum scores of each variable). After that, with the exception of the variable duration a crèche/nursery school/kindergarten has been attended it was examined whether the correlations remained significant if age was controlled in partial correlation analyses (controlled for age in month, one-tailed). For the variable a crèche/nursery school/kindergarten has been attended, it is not sensible to control age because with increasing age the duration always increases.

In experiment 1, no a-priori hypotheses about the relations were formulated for these groups of social variables. The results of the correlation analyses showed that the number of siblings was negatively related to internal source monitoring in the action encoding mode (-.308*) and in the verbal encoding mode (-.283*). Only the relation in the action encoding mode remained significant if age was controlled in partial correlation analyses (-.284*). Besides this, the position the child has in the row of siblings was negatively related to reality monitoring in the verbal (-.331*) and to internal source monitoring in the action encoding mode (-.472**). Both

correlations remained significant if age was controlled in the partial correlation analyses (RM: $-.287^*$, ISM: $-.455^{**}$). The duration a crèche/nursery school/kindergarten has been attended was positively related to reality monitoring in the verbal encoding mode ($.290^*$), and to internal source monitoring in the action ($.430^{**}$) and in the verbal encoding mode ($.293^*$). The number of courses the child visits regularly was positively related to internal source monitoring in the action encoding mode ($.372^*$). The correlation disappeared if age is controlled in the partial correlation analyses. The remaining social variables were not related to reality or external source monitoring in the action or in the verbal encoding mode.

These results show that specific negative and positive relations were found in the post-hoc analyses between the number of siblings, the position the child has in the row of siblings, duration a crèche/nursery school/kindergarten has been attended, and the number of courses the child visits regularly and reality monitoring and internal source monitoring in the action and in the verbal encoding mode. Some single relations were independent of age while some single relations depended on age. None of the selected social variables were related to external source monitoring.

2.4 Discussion

Now I discuss in details of the empirical findings of experiment 1. The discussion is also divided into two sub sections. In the first sub section, I discuss whether an action encoding mode is a favourable condition of early source monitoring performances (2.4.1) and in the second sub section, I discuss whether the four selected factors are relevant to early source monitoring performance (2.4.2).

2.4.1 Encoding conditions of early source monitoring

In studying favourable conditions of early source monitoring, a very promising favourable condition of early source monitoring performances is an action encoding mode. In an action encoding mode many additional source specific characteristics about the action performance are generated. These additional characteristics can improve the encoding and the retrieval of the source specific memory characteristics and with it lead to more correct source attributions. The additional source specific memory characteristics in an action encoding mode may allow for an earlier point of time correct attribution of sources to the children's memories than in a verbal encoding mode in which these additional source specific memory characteristics are not available.

In experiment 1, I took up both research questions and examined whether the additional memory characteristics in an action encoding mode actions improve early source monitoring performance and allow the children to attribute the sources earlier correctly to their memories than in a verbal encoding mode. I start with the question of whether the additional available memory characteristics in the action encoding mode improve 3-, 4- and 5-year olds' source monitoring performances in comparison to the selected verbal encoding mode. After that, I turn to the question of whether the additional memory characteristics of actions allow the 3- to 5-year-old children to attribute the reality monitoring, the internal and the external source monitoring sources in the action encoding mode correctly above chance level to their memories earlier than in the verbal encoding mode. Then I discuss the questions of whether the 3-, 4- and 5-year-old children better attribute the sources of subject-performed actions correctly to their memories than the sources of experimenter-performed actions and than the sources of subject-imagined actions.

In experiment 1, I expected that the action encoding mode is a favourable condition of early source monitoring performance and improves the correct source attribution rates of the 3-, 4- and 5-year-old children. This expectation was based on the assumption that the additional available motor, visual, cognitive and individual presentation characteristics of performed actions (e.g., Bäckman, 1985; Cohen, 1981, 1989; Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001; Hornstein & Mulligan, 2004; Johnson et al., 1993; Nilsson, 2000; Price &

Ford, 2006; Senkfor et al., 2002; Sussman, 2001; Welch-Ross, 1995) increase the number of encoded and retrieved source specific memory characteristics and with it lead to a higher number of correct source attributions (Foley & Ratner, 2001; Senkfor et al., 2002). Because in the verbal encoding mode these additional motor, visual, cognitive and individual presentation characteristics about performed actions were not available, I expected that the correct source attributions were lower than in the action encoding mode. I expected that the advantage of the action encoding mode exists equally in the reality monitoring, in the internal and in the external source monitoring condition because the additional source specific memory characteristics of the performed actions are contained in each type of source monitoring. I expected that the higher number of correct source attributions in the action encoding mode exist across the two sources of each type of source monitoring and exist in each of the single sources of the three types of source monitoring. The advantage of the action encoding mode were also expected to exist in the 3-, the 4-, and the 5-year-old children because all children should be able to use (at least) the additional perceptual characteristics and the cognitive operations about the performed actions for their source attributions.

Experiment 1 showed that in the action encoding mode more external source monitoring sources in the 4-year-old children and more reality monitoring sources in the 5-year-old children were attributed correctly to their memories than in the verbal encoding mode. This was the case across both sources per source task condition in the 4- and 5-year-old children and this was the case in the two experimenter-performed sources in the external source monitoring condition in the 4-year-old children. Besides this, the advantage of the action encoding mode was also found in the source of the imagined action phrases in the internal source monitoring condition in the 5-year-old children. This pattern of results shows that actions can improve the complex memory performance “source monitoring” (Johnson et al., 1993; Foley & Ratner, 2001; Senkfor et al., 2002). This is already the case in children younger than six years of age. The motor, visual, cognitive and individual presentation characteristics of the performed and observed actions obviously allow 4- and 5-year-old children to encode and to retrieve more source specific memory characteristics and to attribute more sources correctly to their memories. In contrast, in the verbal encoding these additional source specific memory characteristics were not available and the same children attributed a lower number of sources correctly to their memories under directly comparable experimental conditions. This clearly indicates that the additional available characteristics about the performed and observed actions can significantly improve source monitoring performances in young children (e.g., Foley & Ratner, 2001; Hornstein & Mulligan, 2004; Johnson et al., 1993; Price & Ford, 2006; Senkfor et al., 2002; Sussman, 2001; Welch-Ross, 1995).

However, experiment 1 also showed that the advantage of action performance in the action encoding mode did not exist equally in the three main types of source monitoring and equally in the 3-, 4- and 5-year-old children. Experiment 1 revealed that the advantage of the action

encoding mode was limited to the 4-year-old children in the external source monitoring condition and to the 5-year-old children in the reality monitoring condition and to a single source in the internal source monitoring condition. The advantage was not found at all in the 3-year-old children, in the 4-year-old children in the reality monitoring and in the internal source monitoring condition and in the 5-year-old children in one source in the internal and the external source monitoring condition. Therefore, a general advantage of an action encoding mode for the three main types of source monitoring in 3-, 4- and 5-year-old children did not exist in experiment 1.

How can this specific advantage of actions for the single source monitoring performances be explained? With regard to the age differences, I discuss the results and the possible explanations separately for each of the three age groups.

One explanation for the missing advantage of the action encoding mode in the 3-year-old children could be that they may have had difficulties to retrieve the additional source specific memory characteristics. The younger children might have not been able to retrieve the additional memory characteristics by themselves. They may have needed external support or external retrieval cues to retrieve the additional available source specific memory characteristics. In experiment 1, no external retrieval cues have been available and the 3-year-olds may have therefore not retrieved enough or any of the additional available memory characteristics. The absent advantage of the action encoding mode in all three types of source monitoring underpins the assumption that the 3-year-old children may have a general retrieval difficulty in experiment 1. Such a general retrieval difficulty in children younger than four years of age has been reported repeatedly in research on memory development. Particularly younger children report a low number of memories and in comparison to older children report a lower number of memories in free recall conditions (e.g., Bauer, 2002, 2007; Bauer & Wewerka, 1997; Bjorklund et al., 2009; Bauer, Wenner, Dropik, Wewerka, 2000; Ceci & Howe, 1979; Hayne, 2007; Myers, Clifton & Clarkson, 1987; Nelson & Ross, 1980; Peterson & Rideout, 1998). Research on memory development also supports the assumption that particularly younger children need external retrieval cues to recall their memories (at all) and to recall more details of their memories (e.g., Bauer, 2002, 2007; Bjorklund et al., 2009; Ceci & Howe, 1979; Fivush, 2009; Hayne, 2007; Myers et al., 1987; Nelson & Ross, 1980; Peterson & Rideout, 1998; Ratner & Hill, 1991). If such external retrieval cues are not available then memory performances of young children are low. In experiment 1, the assumption that the younger children may have difficulties to retrieve their memories is supported by the low old recognition rates of the 3-year-old children. The old recognition rates of the 3-year-olds were lower in all three types of source monitoring and in the case of the internal and the external source monitoring condition significantly lower than the old recognition rates of the 4- and 5-year-old children. However, it has to be considered that the old recognition rates are just a broad indicator of the successful retrieval and do not inform about

what is remembered exactly and how detailed the memory is. It is therefore not possible to specify in post-hoc whether the children had difficulties to retrieve their memories on the source task items in general or whether the children had difficulties to retrieve the additional source specific memory characteristics available in the action encoding mode. Nevertheless, the findings of experiment 1 indicate that the 3-year-old children may have had difficulties in retrieving the additional source specific memories and therefore may not attributed more sources in the action encoding mode correctly to their memories than in the verbal encoding mode as was expected.

However, it might be possible that the 3-year-old children may already fail to encode the additional source specific memory characteristics in the action encoding mode. Then they would also not have been able to retrieve the additional memory characteristics and use them in their source attributions. Unfortunately, in experiment 1 the successful encoding could not be measured explicitly. Thus, it cannot be excluded in experiment 1 that the 3-year-old children may have failed to encode the additional source specific memory characteristics from the start and thus did not attribute more sources correctly to their memories in the action encoding mode.

The absent advantage of the action encoding mode in the 3-year-old children may also show that the additional source specific memory characteristics may require a more deliberate or strategic use or processing of these characteristics (Foley & Johnson, 1985; Foley & Ratner, 2001; Lindsay et al., 1991; Ratner & Hill, 1991). The 3-year-old children may still not have such deliberate or strategic knowledge available and/or may be not able to use the strategic processes as effectively as older children and adults do (Ratner & Hill, 1991). Therefore, they might be not able to use the additional source specific memory characteristics in an action encoding mode and attribute more sources correctly to their memories. However, at present, it is not known what deliberate and strategically processes are necessary for the additional source specific memory characteristics in an action encoding mode and how they support correct source attributions. This needs to be examined in following research. Nevertheless, the source monitoring framework clearly contains the assumption that deliberate and more strategic source decision processes improves source monitoring performances (Johnson et al., 1993; Johnson, 2000).

Taken together, the absent advantage of the action encoding mode in the reality monitoring, the internal source monitoring and the external source monitoring performances in experiment 1 could result from encoding difficulties, from retrieval difficulties and/or from strategic processing difficulties in the 3-year-old children. The task of following research is therefore to identify where the difficulties exactly result from and how they can be avoided.

In relation to the 4-year-old children, experiment 1 clearly revealed the advantage of the action encoding mode in the external source monitoring condition. The additional available action related characteristics allowed the 4-year-old children to encode and to retrieve more source

specific memory characteristics and with it to attribute more sources correctly to their memories. The advantage of the action encoding mode in the external source monitoring condition seems to clearly result from the additional available visual characteristics about the observed actions. These are the only characteristics in which the action encoding mode and the verbal encoding mode differ from each other. Although in both encoding modes cognitive operations can be generated while watching other persons perform or repeat action/verbal phrases, the visual information has been identified as responsible for the experimenter-performed-task effect (Engelkamp, 2001; Engelkamp & Zimmer, 2006; Hornstein & Mulligan, 2004; Mulligan & Hornstein, 2001, 2003). The advantage of visual information for information processing and memory performances has been shown repeatedly in research which indicates a strong and overall advantage of visual information for information processing and memory performances (Colavita, 1982; Engelkamp, 2001; Lewkowicz, 1994; Markham et al., 1999; Marschark & Hunt, 1989; Paivio, 1971; Posner, Nissen & Klein, 1976). The higher number of correct source attributions of actions performed by others also conforms to research on action memory. Research on action memory in children has shown that younger children often benefit more from watching someone else perform the actions than from carrying out the actions by themselves (Engelkamp & Zimmer, 1985; Foley & Johnson, 1985; Ratner & Hill, 1991; Wolff & Levin, 1972). Wolff and Levin (1972) found that 5-year-old children tended to recall actions better if the experimenter rather than the child performed the actions. The authors assumed that younger children could be less able to enact meaningful interactions between objects and thus their recall improves more when they are watching an expert person carry out the actions (Ratner & Hill, 1991; Wolff & Levin, 1972). However, watching another person perform an action does not always help younger children and improve their memory performance (Ratner & Hill, 1991). In other studies, no advantage of experimenter-performed actions were found in children (Cohen, 1983; Cohen & Bean, 1983; Ratner & Hill, 1991) and sometimes younger children show better recall of their own actions than those of others or than imagined actions (Baker-Ward et al., 1990; Parker, 1995; Sussman, 2001; Welch-Ross, 1995). However, the research about the origin of the experimenter-performed effect and experiment 1 indicate that the advantage of the experimenter-performed actions results from the available visual information and the effective use of this type information (Engelkamp, 2001; Engelkamp & Zimmer, 2006; Hornstein & Mulligan, 2004; Mulligan & Hornstein, 2001, 2003). Children as well as adults process visual information easier and with it better memorize events and sources containing a high amount of visual information. Nevertheless, in experiment 1 it was not examined whether children enact less effective meaningful interactions (between objects) than adults do. This needs to be addressed in following research to answer the question of why young children sometimes had better attribute experimenter-performed sources correctly to their memories.

However, experiment 1 revealed as well that the 4-year-old children did not attribute more sources correctly to their memories in the reality monitoring and the internal source monitoring

condition in the action encoding mode. One reason for this finding could be that the additional motor characteristics and cognitive operations in the action encoding mode must be used more deliberately or strategically to improve source monitoring performances above the level of the verbal encoding mode. Experiment 1 indicates that this seems to not be the case. The 4-year-old children may not use the motor and the cognitive operations deliberately or strategically yet and therefore may not attribute more sources correctly in the action encoding mode. This way they might not be able to profit from the additional available source specific memory characteristics in the action encoding mode. Evidence for young children's difficulties using memory characteristics strategically or using memory strategies comes from research on memory development. Research on memory development has repeatedly shown that children younger than 6 years of age often use no systematic memory strategies and still have a rudimentary understanding about memory strategies and use them only sparsely or not effectively (Bauer, 2007; Bjorklund et al., 2009; Schneider & Bjorklund, 1998; Schneider & Lockl, 2006). At the age of 6 years, metamemory competences and memory strategies come up and are used deliberately (Bjorklund et al., 2009; Schneider & Bjorklund, 1998; Schneider & Lockl, 2006). Thus, the 4-year-old children might still not be able to use the additional motor characteristics and cognitive operations deliberately or strategically and therefore did not attribute more sources correctly in the action encoding mode than in the verbal encoding mode both in the reality monitoring and in the internal source monitoring condition.

Another alternative explanation for the absent advantage could be that the 4-year-olds may not sufficiently encode or retrieve the additional memory characteristics in the action encoding mode. The analyses of the old recognition performance of the 4-year-old children revealed that the 4-year-old children recognized almost all items in the action encoding mode. This was the case in each of the three types of source monitoring. The old recognition rates of the 4-year-olds were comparable to those of the 5-year-olds and indicate that the 4-year-old children encoded and retrieved at least some characteristics of the performed actions of the different source task conditions. Because in experiment 1 only old recognition performance was measured, further conclusions about the quality of their memories cannot be drawn. It is therefore also not possible to examine in post hoc analyses whether the 4-year-old children encode or retrieve the additional available source specific memory characteristics successfully. This needs to be considered and examined in following research.

In relation to the 5-year-old children, experiment 2 showed the advantage of the action encoding mode in the reality monitoring condition across both sources and in the imagined-source in the internal source monitoring condition. The additional available action related characteristics obviously allow the 5-year-old children to encode and to retrieve more source specific memory characteristics and to attribute more reality monitoring sources in the action encoding mode correctly to their memories than in the verbal encoding mode. This advantage shows that the 5-

year-old children already can use the additional available motor characteristics and cognitive operations about the self-performed and experimenter-performed actions and attribute more reality monitoring sources correctly to their memories than in a verbal encoding mode. The 5-year-old children seem to have the alleged deliberate and strategic competences available to use these additional memory characteristics for their reality source attributions. The additional motor characteristics and the generated cognitive operations about the action planning, action execution and action evaluation provided the 5-year-olds with a high number of source specific memory characteristics that allow them to discriminate better and to attribute more of the reality monitoring sources correctly to their memories. The analyses of the single sources in experiment 1 revealed only a tendency that in the subject-performed source more sources were attributed correctly in the action encoding mode than in the verbal encoding mode. Although this differences were significant on the ten percent level only, this finding indicates that the motor and the cognitive characteristics about the subject-performed actions seem to be central for the advantage of the action encoding mode in the reality monitoring condition. Although the additional visual and cognitive characteristics of the experimenter-performed actions are favourable as well, the subject-performed action characteristics seem to be critical for the advantage of the action encoding mode in the reality monitoring condition. In following research it might be possible to examine why this is the case and how exactly the 5-year-old children profit from the additional available source specific memory characteristics in the reality monitoring condition. In following research, it might be also possible to test whether the motor characteristics, the cognitive operations, or both characteristics together cause the advantage and how and why a deliberate or strategic use of these memory characteristics is necessary.

In relation to the external source monitoring condition, experiment 1 revealed that the 5-year-old children only showed a tendency to attribute more sources correctly to their memories in the action encoding mode than in the verbal encoding mode. This was the case across both sources and this was the case in the two single external sources. The advantage of the action encoding mode in the internal source monitoring condition is therefore not as clear as in the reality monitoring condition in the 5-year-old children. This pattern of result indicate that at least some of the 5-year-old children obviously used the additional available visual characteristics of the observed actions and could therefore attribute more sources in the action encoding mode correctly to their memories than in the verbal encoding mode. However, the tendency shows as well that this is not the case in the majority of the 5-year-old children. One possible explanation for this pattern of result could be that the 5-year-old children may have focused on other characteristics than on the perceptual memory characteristics and therefore may attributed not more sources in the action encoding mode than in the verbal encoding mode. The 5-year old children may focused more on the cognitive characteristics and their own or the others mental activities that could have accompanied the action execution. Because only a small number of these characteristics are available for the observed experimenter-performed actions, the external

sources might have been not better attributed in the action encoding mode correctly to their memories than in the verbal encoding mode. Thus, the advantage of the action encoding modes may have not been found because the 5-year-old children may not used the “most effective” source specific memory characteristics in their source attributions but may used “not so effective” source specific memory characteristics.

A first indirect indication for this conclusion comes from a study reported by Kraus and Koehnken (2007) in which 5-year-old children seem to focus more on cognitive operations and mental activities and gave mainly mental activity explanations to a source explanation question “How did you know the source?”. This explanation was given independent of the type of source task and independent of the type of source monitoring (Kraus & Koehnken, 2007). In contrast, 4-year-old children mainly give procedure- and/or perceptual-related explanation to such a source explanation question indicating that they may focus more on these characteristics (Kraus & Koehnken, 2007). In the case of the external source condition, this focus may have lead to the expected advantage of the action encoding mode in the 4-year-old children because they may focus mainly on the perceptual characteristics that contained in the action encoding mode the most effective source specific memory characteristics. However, this is a plausible but a still indirect explanation for the absent advantage of the action encoding mode in the external source monitoring condition in experiment 1. Based on the assessed depend variables in experiment 1 it is not possible to underpin this explanation empirically. This need to be examined in a follow-up study before it can be concluded more reliable that the absent advantage of the action encoding mode in the external source monitoring condition in the 5-year-old children resulted from their focus on cognitive operations and mental activities as the source specific memory characteristics. Such a follow-up examination can also shed further light to the question when young children start to use more deliberate source decision strategies and what type of source decision strategies they use.

In relation to the internal source monitoring condition, experiment 1 revealed that the 5-year-old children only showed a tendency to attribute more sources correctly to their memories in the action encoding mode than in the verbal encoding mode. The advantage of the action encoding mode in the internal source monitoring condition is therefore likewise not as clear as in the reality monitoring condition in the 5-year-old children. The analyses of the single sources of experiment 1 indicate that the less clear advantage seems to lie in the subject-performed actions. Experiment 1 showed that the subject-performed actions were not significantly better attributed in the action encoding mode than in the verbal encoding mode. In contrast, the subject-imagined action phrases were significantly better attributed in the action than in the verbal encoding mode. However, because the 5-year-old children can already use the additional motor and cognitive source specific memory characteristics effectively as shown in the reality monitoring condition, the difficulty in the internal source monitoring condition may lie in the discrimination of the specific cognitive characteristics of the subject-performed source characteristics and/or in the

effective use of the motor source characteristics. Either they may not retrieve enough source specific cognitive and/or motor characteristics or they may need to use other efficient source decision strategies to discriminate and to attribute the sources better to their memories. However, the old-recognition performances showed that the 5-year-olds' recognition performances in the subject-performed and subject-repeated action phrases were equally high and reached almost the maximum. Although old-recognition performance is just a broad indicator of the retrieved memory, it indicates that the difficulties of the 5-year-olds may not result (mainly) from differences in the retrieved memory characteristics. Nevertheless, this assumption needs to be tested before it can reliably be excluded. Thus, the 5-year-olds' difficulty may rather lie in the strategy use. They may still not have other strategies available to use the additional cognitive and motor characteristics effectively in internal source monitoring performances, which would allow them to attribute both internal sources better in the action encoding mode to their memories than in the verbal encoding mode. As pointed out before, children younger as 6 years of age only have a rudimentary understanding of memory strategies available to them and the main developmental changes takes place after the 6 year of life (Bauer, 2007; Bjorklund et al., 2009; Schneider & Lockl, 2006; Schneider & Bjorklund, 1998). To use the additional available source specific memory characteristics for the subject performed actions in the internal source monitoring condition the children may need another (nondeliberate or deliberate) strategy (or strategies respectively). This strategy is obviously not available in most of the 5-year-old children; otherwise, they would have been able to discriminate and to attribute more subject-performed sources correctly to their memories. However, in experiment 1 it can not be examined where the difficulties of the 5-year-old children lie and what strategy is available to them to attribute more subject-performed sources in the internal source monitoring condition correctly to their memories. This requires a systematic analysis of the retrieved memory characteristics and the source decision processes. Because only old-recognition performance were examined and the information about source decision processes was not examined in experiment 1 it is not possible to draw further conclusions about the origin of the 5-year-olds difficulties. To shed light in this difficulty it is necessary to examine both aspects systematically in following research. One research strategy for this research question could be that the children are asked how they attributed the sources to their memories and what characteristics they may use. This way it might be possible to identify the nondeliberate and deliberate strategies the children may already use and need to be used to attribute more sources about subject-performed actions in an internal source monitoring condition correctly to their memories than in a verbal encoding mode. This may also give insights in the development of memory strategies and when and how they are used nondeliberately or deliberately.

Besides the previous two hypotheses, I expected in experiment 1 that the additional available source specific memory characteristics in the action encoding mode allow the children to

attribute the reality monitoring, the internal and the external source monitoring sources correctly to their memories earlier than in the verbal encoding mode. Again, these hypotheses base on the assumption that the additional available motor, visual, cognitive and individual presentation characteristics of performed actions (e.g., Bäckman, 1985; Cohen, 1981, 1989; Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001; Hornstein & Mulligan, 2004; Johnson et al., 1993; Nilsson, 2000; Price & Ford, 2006; Senkfor et al., 2002; Sussman, 2001; Welch-Ross, 1995) should increase the number of encoded and retrieved source specific memory characteristics (Foley & Ratner, 2001; Senkfor et al., 2002) and with it lead to earlier correct source attribution rates above chance level in the action encoding mode. Because in the verbal encoding mode these additional motor, visual, cognitive and individual presentation characteristics about performed actions were not available, I expected that the correct source attributions were lower than in the action encoding mode and are attributed correctly above chance level only at a later age.

Experiment 1 revealed that the 4-year-old children attributed the external source monitoring sources correctly above chance level to their memories in the action encoding mode. In contrast source monitoring performance in the external source monitoring condition was not significantly above chance level in the verbal encoding mode at the age of four years. This was the case first at the age of five years. Thus, conforming to the hypotheses the 4-year-old children attributed the external source monitoring sources in the action encoding mode correctly above chance level to their memories earlier than in the verbal encoding mode. The additional available visual characteristics and cognitive operations about the observed actions (e.g., Engelkamp, 1998, 2001; Engelkamp et al., 1993; Hornstein & Mulligan, 2004; Mulligan & Hornstein, 2003) seem to allow the 4-year-old children to attribute the external sources correctly to their memories earlier than in the verbal encoding mode in that these additional source specific memory characteristics are not available. However, in relation to the reality monitoring and the internal source monitoring condition experiment 1 showed that both source monitoring performances were not attributed earlier in the action encoding mode correctly above chance level to the children's memories than in the verbal encoding mode. For the reality monitoring condition, even the reverse was true in experiment 1. The 3-year-old children did attribute the reality monitoring sources in the verbal encoding mode earlier correctly above chance level to their memories but not the reality monitoring sources in the action encoding mode. As pointed out in the previous section, the absent advantage of the action encoding mode in the 3-year-old children may result from the difficulties to encode, to retrieve and/or to use the additional available motor, visual and cognitive characteristics of the two reality monitoring sources effectively in their source attributions. The use of the additional source specific memory characteristics in the reality monitoring condition seems to require the use of strategies during retrieval and/or during the source decision processes. Like the 4-year-old children, the 3-year-old children may not have these memory (decision) strategies available yet and thus cannot use the additional available

source specific memory characteristics in the action encoding mode. With it, the 3-year-olds did not attribute the reality monitoring sources earlier correctly above chance level to their memories although they are still able to attribute in specific source task conditions reality monitoring sources of subject-performed actions correctly above chance level to their memories (Welch-Ross, 1995). The finding that the 3-year-old children attributed the reality monitoring sources correctly above chance level in the verbal encoding mode indicate another explanation. It might be possible that the 3-year-olds may not be able to retrieve and use the additional source specific memory characteristics because of the slight change in the retrieval mode in the action encoding mode which may have prevented the successful retrieval of the additional memory characteristics. In the action encoding mode, the actions were encoded visually and verbally through the item presentation and motorically by the use of cognitive operations through the action being performed. In contrast, the retrieval took place only visually and verbally. Retrieval cues of the action being performed were not available. These missing retrieval cues may be the cause for the younger children not being able to retrieve (at all) the additional motor and cognitive characteristics and to attribute more sources in the action encoding mode correctly to their memories. This difficulty in the change of the retrieval mode has been reported first by Tulving and Thomsen (1973) and was described as the encoding specificity hypotheses (Tulving & Thomsen, 1973). The encoding specificity hypothesis proposes that with increasing similarity between retrieval and encoding, the probability of retrieval increases (Tulving & Thomsen, 1973). Conforming to the encoding specificity hypotheses, research on memory development has shown that children younger than 4- years of age are particularly vulnerable for changes between the encoding and the retrieval mode (Bauer, 2002, 2007; Hayne 2007; Myers, Perris & Speaker, 1994; Peterson & Rideout, 1998; Simcock & Hayne, 2002). This reason for that seems to be that young children need (more) external retrieval cues to get access and to retrieve their memories and are still not able to compensate the missing external retrieval cues otherwise (e.g., Bauer, 2002, 2007; Bjorklund et al., 2009; Fivush & Hamond, 1990; Hayne, 2007; Ratner & Hill, 1991). Research on action memory has shown as well that memory performance is better if the subject-performed actions are retrieved by actually performing the actions indicating the advantage of the identical encoding-retrieval mode as proposed by the encoding specificity hypothesis (Engelkamp & Zimmer, 2006). Thus, it is possible in experiment 1 that the 3-year-old children could not attribute more reality monitoring sources and attribute them earlier correctly to their memories in the action encoding mode because they may fail to successfully retrieve the additional source specific memory characteristics in the slightly different retrieval mode. In the verbal encoding mode, a change between the encoding and the retrieval mode did not take place in experiment 1. Conforming to the encoding specificity hypothesis (Tulving & Thomsen, 1973) the 3-year-old children were able to attribute the reality monitoring sources correctly (above chance level) to their memories in this condition as it could be expected from their available conceptual understanding about the reality monitoring sources (i.e. the realisation that a statement/action of oneself is distinct from statements/actions of another person; e.g.,

Eckensberger & Plath, 2006; Gergely, 2002; Meltzoff & Brooks, 2001; Meltzoff & Moore, 1997; Perner & Ruffman, 1995; Povinelli, 1995, 2001; Premack, 1990; Tomasello, 1999; Wellman, 2002) and from the available research findings (e.g., Welch-Ross, 1995; Roberts & Blades, 1995). In relation to the hypothesis of experiment 1, it can be concluded that the reality monitoring sources in the action encoding mode were not attributed earlier correctly above chance level to the children's memories. In contrast, the reverse effect was found indicating that the change of the retrieval mode in the action encoding mode may prevent to reveal the advantage of the additional source specific memory characteristics for earlier source monitoring performances.

In relation to the internal source monitoring performance, experiment 1 also revealed that the internal source monitoring sources in the action encoding mode were not attributed earlier correctly to the children's memories than in the verbal encoding mode. The 3-year-old children did not attribute the internal source monitoring sources in both encoding modes correctly to their memories and thus did not attribute the internal source monitoring sources in the action encoding mode earlier to their memories. The reason for this pattern of results again may lie in the 3-year-olds' difficulties to retrieve and to use the additional source specific memory characteristics in the internal source monitoring condition. Another alternative explanation might be that the 3-year-olds still do not have a more comprehensive mental state understanding about real and imagined sources available (Welch-Ross, 1995) and thus could not attribute the two internal source monitoring performances correctly above chance level to their memories. The source attribution rates below chance level in both encoding modes seem to indicate that the low internal source monitoring performances result from a more fundamental processing problem like the missing conceptual understanding about the distinction between the mind and the world (Estes, Wellman & Wooley, 1989; Flavell, Flavell & Green, 1983; Wellman & Estes, 1986; Woolley & Phelps, 1994; Woolley & Wellman, 1990, 1993; Welch-Ross, 1995). Such an understanding is available at the latest at 4 years of age (Wellman & Estes, 1986; Woolley & Phelps, 1994; Woolley & Wellman, 1993; Welch-Ross, 1995). Conforming to this, the 4-year-old children in experiment 1 attributed the internal source monitoring sources correctly above chance level to their memories, as also the case in other studies (Sussman, 2001; Welch-Ross, 1995). However, in experiment 1 the 4-year-old children attributed the internal source monitoring sources in both encoding modes correctly to their memories. Therefore, the hypothesis that the internal source monitoring sources in the action encoding mode are attributed earlier than in the verbal encoding mode could not be confirmed because at the age of 4 years, internal source monitoring performances are above chance level equally in the action and in the verbal encoding mode. Thus, experiment 1 revealed that the additional source specific memory characteristics did not lead to earlier internal source monitoring performances above chance level in the action encoding mode.

Besides this, I examined in experiment 1 whether differences exist between source attributions of subject-performed actions and source attributions of experimenter-performed actions. Research on action memory and on source monitoring indicate that subject-performed actions and their source are often better remembered/attributed than experimenter-performed actions and their source (Cohen, 1981; Dick et al., 1989; Engelkamp, 1997, 1998; Engelkamp & Zimmer, 1983, 1997; Hornstein & Mulligan, 2001, 2004; Nilsson, 2000; Senkfor et al., 2002; Sussman, 2001; Welch-Ross, 1995; Zimmer & Engelkamp, 1984). In subject-performed actions, various motor characteristics and cognitive operations about the action planning, the action monitoring and the action evaluation are contained (e.g., Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001). In experimenter-performed actions, no motor characteristics but visual and cognitive characteristics are contained (e.g., Engelkamp, 1998, 2001; Mulligan & Hornstein, 2001; Hornstein & Mulligan, 2004). The motor characteristics and cognitive operations of the subject-performed actions should enrich memory more than the visual characteristics and cognitive operations of the experimenter-performed actions and lead to a higher number of correct source attributions. I therefore expected in experiment 1 that in the action encoding mode in the reality monitoring condition more sources of subject-performed actions are attributed correctly to the children's memories than for experimenter-performed actions. I expect that this was the case in the 3-, the 4- and the 5-year-old children because they should already use the additional source specific motor memory characteristics in the subject-performed task.

Experiment 1 revealed that the 3-, 4- and 5-year old children did not attribute the sources of the subject-performed actions more often correctly to their memories than the sources of the experimenter-performed actions. The additional motor characteristics and cognitive operations of the subject-performed actions obviously did not lead to a higher number of correct source attributions. One explanation for the absent difference between the subject- and the experimenter-performed source attributions could be the dominance of the visual information in the experimenter-performed actions. The children may have used the visual source specific memory characteristics in such an effective way that they could attribute a high number of sources of the experimenter-performed actions correctly to their memories. The advantage of the visual characteristics might have been so strong that they reached the number of the correct source attributions of the subject-performed actions. The effective use of the visual information is also supported by the high number of correct source attributions in the external source monitoring condition in experiment 1. Another explanation could be that the 3- and the 4-year-old children could not use the additional available motor and cognitive characteristics and therefore did not attribute more sources of the subject-performed actions correctly to their memories. As pointed out before, the additional motor and cognitive characteristics may require the deliberate use or memory strategies to lead to a higher number of correct source attributions. In the case of the 3-year-old children, they might still have difficulties to retrieve the additional source specific memory characteristics if their retrieval was affected by the slight change of the

retrieval mode. Thus, they might not have been able to profit from the additional available source specific memory characteristics of the subject-performed actions. In contrast, the 5-year-old children were able to use the additional source specific memory characteristics of the subject-performed and the experimenter-performed actions in such an effective way that they attributed almost all sources in the reality monitoring condition correctly to their memories. This high source monitoring performance indicates ceiling effects in this age group and in this source task condition that prevented to show the advantage of the subject-performed actions. It is therefore necessary to examine the expected advantage of the subject-perform actions in a source task condition in which ceiling effects exist. In such a source task conditions the advantage should be visible in that age group. Although these findings stand in contrast to the hypothesis of experiment 1, in the study of Price and Ford (2006) there were also no differences in the correct source attributions of subject-performed and experimenter-performed actions found. However, the absent advantage in this study can be also explained by the previous presented considerations. Price and Ford (2006) examined source monitoring performances across 3- to 6-year-old children and therefore the advantage might not have been visible because of the lower performances of the younger children (i.e., the 3- and 4-year-olds) that might be not able to use the additional memory characteristics. Nevertheless, the absent advantage of the subject-performed actions also stands in contrast to the findings reported by Sussman (2001) and by Welch-Ross (1995). Both authors found higher source attributions in subject-performed actions than in experimenter-performed actions in 4-year-old children (Sussman, 2001) and in 4- and 5-year-old children (Welch-Ross, 1995). One explanation of the divergent finding could be that in both studies, real objects were used and the actions were presented in a more interactive manner. This might be necessary for these age groups and would indicate that under this source task conditions 4-year-old children already show the advantage. Nevertheless, it could be possible that memory strategies were necessary but for the included type of information in both studies, the suitable memory strategies of the 4-year-old children might have been available and could be used. Although this might be a plausible explanation of the divergent finding of experiment 1, this conclusion needs to be tested empirically in following research. Such an analysis might also reveal whether memory strategies might be necessary for source attributions of subject-performed actions at all, and if so which ones. In sum, experiment 1 revealed that no more sources of the subject-performed actions were attributed correctly to the children's memories than of the experimenter-performed actions in the reality monitoring condition in the action encoding mode.

In experiment 1, I also examined whether differences exist between source attributions of subject-performed actions and source attributions of imagined action phrases. Research on action memory and on source monitoring indicate that subject-performed actions are often better remembered/attributed than imagined action phrases (Ecker & Engelkamp, 1995; Engelkamp,

1986, 2001; Gordon et al., 1991; Foley & Ratner, 2001; Parker, 1995; Perrig & Hofer, 1989; Sussman, 2001; Welch-Ross, 1995). The reason for the advantage of subject-performed actions again lies in the self-performed action execution that generates various perceptual characteristics and cognitive operations (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001). In comparison, this motor information is not available for imagined action phrases although some motor information can be generated if the action performance is imagined (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006). Because in subject-performed actions motor characteristics and cognitive operations regarding the action planning, the action execution and the action evaluation are contained in addition, I expected in experiment 1 that more memory characteristics are available for subject-performed actions than for imagined actions and thus more sources of subject-performed actions are attributed correctly to the children's memories. I expected that this is likewise the case for the 3-year-old, the 4-year-old and the 5-year-old children because all children should already use the additional memory characteristics of the subject-performed actions.

Experiment 1 showed that the 3-, 4- and 5-year old children did not attribute more sources of the subject-performed actions than the sources of the imagined action phrases correctly to their memories. The additional motor characteristics and cognitive operations of the subject-performed actions did not lead to a higher number of correct source attributions. One explanation for the absent difference between the subject- and the imagined source attributions could also be that the 3- and 4-year-old children were still not able to use the additional available motor and cognitive characteristics because they seem to require memory strategies to lead to a higher number of correct source attributions. Therefore, the 3- and the 4-year-old children may not attribute more sources of the subject-performed actions than the sources of the imagined action phrases correctly to their memories. Beyond this, the 3-year-old children might have difficulties to retrieve and to use the additional source specific memory characteristics at all if their retrieval was affected additionally by the slight change of the retrieval mode in experiment 1. Although the 5-year-old children are able to use the additional available source specific memory characteristics of the subject-performed as shown in the previous analyses they obviously could not attribute more sources of the subject-performed sources correctly to their memories. One explanation for this finding could be that the 5-year-old children had difficulties to discriminate the sources of the performed actions from the imagined actions and thus could not attribute more sources of the performed actions correctly to their memories. It might also be possible that the effective use of the additional subject-performed actions require another memory strategy in order for the children to attribute and to discriminate them better from the imagined action phrases. A strategy like that might not be available yet for the 5-year-old children and therefore they could not attribute more subject-performed sources correctly to their memories. Regarding the imagined action phrase, there is might also be another potential problem for the 5-year-old children (perhaps also for the younger children). If the children in the imagined condition not

only repeated the action phrase but imagined the action execution, then additional cognitive characteristics might have been produced for the imagined action phrase. These additional cognitive operations might be more similar to the cognitive operations of the subject-performed actions and therefore make the source attributions and discriminations more difficult. Based on the higher similarity of the two sources, the advantage of the subject-performed actions may disappear or cannot be found anymore. The higher similarity in the source specific memory characteristics and the imagination of the action executions can influence source monitoring and memory performances (Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Johnson et al., 1993; Lindsay et al., 1991; Lindsay, 2002; Ratner et al., 2000) and may have prevented to display the expected advantage of the subject-performed actions in comparison to the imagined action phrases in the internal source monitoring condition in the action mode of experiment 1.

However, in post hoc analyses of experiment 1 it is not possible to specify what the reason for the absent advantage of the source attributions in the subject-performed actions is. It is therefore necessary to examine the possible alternative explanations in following research.

Nevertheless, the absent advantage of the subject-performed actions in comparison to the imagined action phrases again stands in contrast to the findings reported by Sussman (2001) and by Welch-Ross (1995). Both authors found higher source attributions in the subject-performed actions than in imagined action phrases in 4-year-old children (Sussman, 2001) and in 4- and 5-year-old children (Welch-Ross, 1995). The explanation of the divergent findings could be that in both studies, real objects were used and the actions were presented in a more interactive manner. This might have made the source attributions and discrimination easier and lead to the expected differences between the subject-performed and the imagined source attributions. Nevertheless, it could be possible that memory strategies were necessary as well but for the included type of information in both studies, the suitable memory strategies of the 4-year-old children were already available and could have been used. Although these are plausible explanations of the divergent finding of experiment 1, these assumptions need to be tested empirically in following research. Such an analysis might also be possible to reveal whether at all and what exact memory strategies might be necessary for such source attributions. To sum the findings about this hypothesis up, experiment 1 revealed no higher source attributions rates in the subject-performed actions than in the imagined action phrases in the internal source monitoring condition in the action encoding mode.

In my opinion, the task of following research is to further examine the advantage of an action encoding mode in comparison to other encoding modes. In this connection, it is also meaningful to identify what memory characteristics exactly cause the advantage of the action encoding mode and to answer the question of why children at different times of development cannot use the additional available source specific memory characteristics for their source attributions. A very important task of following research is also to identify what strategic processes or memory

strategies are necessary for the better source attributions in the different types of source monitoring. This will give important insights to the question of how children below six years of age carry out the source decision processes and what nondeliberate or deliberate source decision strategies they can use.

Besides this, an important task of following research is to further identify source task conditions in which source monitoring performances can be improved and can be carried out successfully in the first place. These examinations will extend our theoretical and empirical knowledge about the beginning, the processes, the strategies and the role of favourable source task conditions for early source monitoring performances enormously and with it make it possible to specify the developmental course of source monitoring in children.

2.4.2 Identifying factors relevant to early source monitoring

In this second part of the discussion, I discuss the question of whether and how the selected cognitive, social-cognitive and social variables are relevant to early source monitoring performances. I start the section by discussing the relation between working memory and source monitoring (2.4.2.1). After that, I discuss the relation between verbal abilities and source monitoring (2.4.2.2) and then discuss the relation between false-belief understanding and source monitoring (2.4.2.3). Finally, I discuss the relation between the selected social variables and source monitoring (2.4.2.4).

2.4.2.1 The relation between source monitoring and working memory

From a theoretical point of view, working memory performances seem to be important for source monitoring because they allow the child to retrieve and integrate short- and long-term memories from different modalities (Baddeley, 1986, 2007; Baddeley & Hitch, 1974) and to draw conclusions about the retrieved and integrated representations (Baddeley, 2000, 2007). Using the multi-component working memory model (Baddeley 2000, 2007; Baddeley & Hitch, 1974) as the theoretical framework of working memory, the central executive components episodic buffer and phonological loop seem to be of particular interest for source monitoring.

The episodic buffer is a limited-capacity temporary storage system in which information from a range of systems can be retrieved and integrated (Baddeley, 2000, 2007, Hummel, 1999). The buffer is episodic in the sense that it holds episodes while information is integrated across space and maybe extended across time (Baddeley, 2000). The component is a buffer because it serves as an interface between ranges of systems (Baddeley, 2000). In relation to source monitoring, the episodic buffer allows retrieving and integrating information from different systems into episodic representations and seems to serve as the platform for source decision processes. Tasks measuring episodic buffer functions concerning the retrieval and integration of information from

different systems and/or drawing conclusions about (the origin of) the episodic representations can be expected to be related to source monitoring performance because similar processes should be involved in both types of tasks. In experiment 1, I expected that the episodic buffer performance memory-for-sentences is positively related to source monitoring because in both types of tasks the retrieval and the integration of information from different systems are contained. The relation was expected to be independent of the type of source monitoring because the retrieval and the integration of information from different systems is contained equally in the reality monitoring, the internal and the external source monitoring condition (c.f., Johnson et al., 1993). The relation was also expected to be independent of the action and the verbal encoding mode because in both encoding modes the retrieval and an integration of information is contained (Johnson et al., 1993). It was also expected that the relation exists independent of the age of the children because it is assumed that the episodic buffer performance supports source monitoring equally at all ages.

Conforming to the hypotheses, experiment 1 revealed that the episodic buffer performance memory-for-sentences was positively related to reality monitoring and to external source monitoring performances in the action encoding mode. Both relations were independent of the age of the 4- and 5-year-old children. In contrast to the hypotheses, the episodic buffer performance memory-for-sentences was not related to internal source monitoring in the action encoding mode and to reality, internal and external source monitoring in the verbal encoding mode. This result is surprising because it was assumed that the retrieval and the integration of information from different systems is contained, relevant in each of the main types of source monitoring task, and relevant independent of the action and verbal encoding characteristics. Experiment 1 indicates that this does not seem to be the case, at least not for all main types of source monitoring and independent of an action and a verbal encoding mode. However, why do only 4- and 5-year-old children with better memories for sentences involving a retrieval and an integration of information from the phonological loop (verbatim recall of individual words and their order) and the language processing system (semantic and syntactical analysis) attribute more reality monitoring and external source monitoring sources in an action encoding mode correctly to their memories?

One explanation could be that these children can better use the additional retrieved and integrated verbal source specific memory characteristics of the verbal *action* phrases in their source decision processes, and thus are able to attribute more reality and external source monitoring sources correctly to their memories. It seems to be the case that besides the memory characteristics concerning the observed or the own action execution, verbal memory characteristics are relevant and helpful for the correct reality and external source attributions. The additional verbal characteristics might already be used (nondeliberately or deliberately) by children who have better memory for sentences or episodic buffer performances involving the retrieval and the integration of information from the phonological loop (verbatim recall of

individual words and their order) and the language processing system (semantic and syntactical analysis) respectively and thus improve source monitoring performances. The found relations of experiment 1 could be a first indication for that. Besides this, the use of the additional source specific verbal memory characteristics could be a first nondeliberate or deliberate source decision strategy of children with better memory for sentence performances or verbal based episodic buffer performances and go along with more correct source attributions. However, it is not possible to conclude this directly from the correlational analyses of experiment 1 and other empirical findings are not available at present. This assumption needs to be tested in causal experimental designs in following research.

Experiment 1 also showed that the finding that children with better memories for sentences attribute more sources correctly to their memories is limited to source tasks containing external sources. Although in the reality monitoring task, an internal child source is contained, the findings seem to be limited to the external sources. Otherwise a relation between memory-for-sentences and internal source monitoring should exist – or at least a tendency for that relation. This was not the case in experiment 1 neither below the chosen level of significance nor from the level above marking a tendency (i.e., $p = .10$). This was also not the case in the verbal encoding mode (other reasons for the absent relation will be discussed later). Based on these patterns of relations, it can be concluded that children with better memory-for-sentence performances only attribute more external sources correctly to their memories. The additional verbal memory characteristics might be important particularly in this type of source because in comparison to self-performed actions a lower number of memory characteristics concerning the observed outperformed actions are available (e.g., Johnson et al., 1993; Lindsay et al., 1991). The additional verbal memory characteristics might make it possible to attribute or to discriminate more external sources correctly to their memories. Children who can use these additional verbal memory characteristics may have an advantage and may attribute external sources better to their memories. The memory characteristics concerning the observed outperformed actions might not be sufficient for the sources to be attributed correctly to their memories. Because this distribution of source specific memory characteristics is unique for reality and external source monitoring and for the action encoding mode, the other source monitoring performances may therefore not show these relations.

In the case of the verbal encoding mode, the relations between memory-for-sentences and source monitoring might have not been found because the use of verbal characteristics in addition to other types of characteristics is not given. This is the case because in a verbal encoding mode the main source specific memory characteristics for all sources are verbal characteristics. With the found patterns of results, experiment 1 indicates that the reasons for the relations between memory-for-sentences and reality and external source monitoring in the action encoding mode seems to lie in the use of *additional* verbal source specific memory characteristics besides other source specific characteristics. The working memory component “episodic buffer” seems to

allow this performance and lead to better source monitoring performances. The task of following research is now to replicate this finding and to examine the possible enhancing effect of the episodic buffer in causal experimental designs. It is also very interesting to examine whether this finding also exists if other types of memory characteristics are involved.

Besides this, it is necessary for follow-up research to examine whether the relations also exist at an earlier age. However, this requires a memory-for-sentences task that examines this performance in children younger than 4-years of age in a reliable and valid way. This was not possible in the used memory-for-sentences task in experiment 1 because this task was only applicable for 4- and 5-year-old children. It is therefore necessary to find or develop a task applicable for younger children before the relations between the episodic buffer performance memory for sentences and source monitoring can be examined.

However, the use of a memory-for-sentences task to measure episodic buffer functions means that only episodic buffer functions concerning the retrieval and integration of information from the phonological loop (verbatim recall of individual words and their order) and the language processing system (semantic and syntactical analysis) are examined (Alloway et al., 2004; Baddeley, 2000). Besides this the retrieved information is mainly based on verbal characteristics and allows no conclusions about other types of information (e.g., pictorial, spatial; autobiographic memories, event memories). Thus, episodic buffer abilities concerning retrieval and integration of information from other systems and episodic buffer functions concerning drawing conclusions about the retrieved and integrated representations are not examined. The analyses of experiment 1 therefore only give insights into one episodic buffer function concerning specific types of information systems and memory characteristics. Thus, the relations between source monitoring and the other episodic buffer functions, sources and memory characteristics need to be tested in following research.

The same is true for the central executive and its influence on the episodic buffer. According to Baddeley (2000, 2007) the central executive has access to the episodic buffer by the medium of conscious awareness and can influence the content of the episodic buffer by adding a source of information from various other sources (e.g., phonological loop, visuospatial sketchpad, long-term memory). The central executive not only provides a mechanism for modelling but also a mechanism for creating new representations (Baddeley, 2000) that is of particular interest for source monitoring (e.g., conscious awareness, influence). First empirical studies revealed such a relation between central executive processes and source monitoring (e.g., Ruffman et al., 2001) and underpin the need for systematic following research.

In experiment 1, I examined as well the relation between the working memory component phonological loop and source monitoring. The phonological loop is a verbal storage system, composed of a short-term phonological space for storing information and a subvocal rehearsal

process that can be used to restore decaying representations within the storage system (Baddeley & Hitch, 1974; Baddeley, 1986; Baddeley, 2000, 2007). In relation to source monitoring, the phonological loop may support the encoding and retrieval of source specific memory characteristics and ease the availability of verbal memory characteristics in source monitoring processes. Tasks measuring phonological loop functions concerning the capacity and working method of the short-term phonological storage space and/or the subvocal rehearsal processes are expected to be related to source monitoring performance because the same processes seem to be contained in phonological loop tasks and in source monitoring tasks. Because in experiment 1, the focus of interest lies on the basic processes of the phonological loop, a phonological-working-memory-task for nonwords was used to examine phonological loop functions involving a short-term storage of new, single speech sounds that need to be encoded, stored and actively recalled as a whole with the exclusion of the use of the stored vocabulary. In experiment 1, I expected that a positive relation between the phonological loop and source monitoring exists because the phonological loop as a short-term storage system should support the encoding, storage and retrieval of source specific memory characteristics and ease the availability of (verbal) memory characteristics in source monitoring processes. The positive relation was expected to be independent of the type of source monitoring because the phonological loop processes are assumed to support source monitoring equally in all three types of sources (c.f., Johnson et al., 1993). Differences between the action and the verbal encoding mode were not expected because the basic phonological loop processes should support source monitoring independent of the encoding characteristics. The selected phonological-working-memory-performance for nonwords examines phonological loop performances with the exclusion of the use of the stored vocabulary store and thus does not favour an encoding mode containing more verbal characteristics. It was also expected that the relation exists independent of the age of the children because it is assumed that the phonological loop performance supports source monitoring equally at all ages.

Experiment 1 revealed that, conforming to the hypotheses the phonological loop performance phonological-working-memory-for-nonwords was meaningfully related to reality monitoring and to internal source monitoring performances in the action encoding mode. The relation to reality monitoring depended on age and the relation to internal source monitoring was independent of the age of the children. In contrast to the expectations, the phonological loop performance was not related to external source monitoring performances in the action encoding mode and to reality, internal and external source monitoring performances in the verbal encoding mode. This result is surprising because it was assumed that the phonological loop supports the encoding, storage and retrieval of source specific memory characteristics and eases the availability of (verbal) memory characteristics equally in all sources independent of an action or a verbal encoding mode. Experiment 1 indicates that this is not the case, at least not for the main types of source monitoring and not independent of an action and a verbal encoding mode. In contrast,

experiment 1 showed only specific relations between the phonological loop performance and source monitoring performances in the action encoding mode in which internal sources were contained. Besides this, only the relation to internal source monitoring is independent of the age of the children.

Why do 3-, 4- and 5-year-old children, who can repeat nonwords that require a short-term storage of new, single speech sounds which in turn need to be encoded, stored and actively recalled as a whole (non)word without the use of the stored vocabulary only attribute more reality monitoring and internal source monitoring sources in an action encoding mode correctly to their memories?

One explanation for the specific relation to internal source monitoring could be that the encoding, storage and retrieval of (non)words as a whole is important for imagined internal source attributions and their discrimination from performed internal sources. This could be the case because the source specific memory characteristics are mainly verbal characteristics or cognitive operations. Children who can better encode, store and retrieve (non)words as a whole might have better access to their stored vocabulary and can better encode, store and retrieve words as a whole and therefore have more source specific memory characteristics available for the source decision. This might lead them to be better able to attribute and to discriminate more internal sources correctly to their memories. However, this advantage is obviously limited to the action encoding mode. Otherwise, the same relation should be found in the verbal encoding mode. One explanation for that finding could be that in the action encoding mode it is easier for the children to process and use the verbal memory characteristics in their source decisions because they are more distinct. Children who can better encode, store and retrieve (non)words as a whole might find it easier to retrieve words by themselves and may use more verbal memory characteristics in their source decisions. It might therefore be easier for these children to decide whether the verbal characteristics belong to the imagined source or do not belong to the performed source respectively. Because in the verbal encoding mode, the main characteristics for all sources are verbal characteristics, the children may not additionally use (non)deliberately or deliberately) their good phonological loop performances thereby improving their available verbal source specific memory characteristics. However, based on the correlation analyses it is not possible to conclude what the reasons for the specific relation between the phonological loop performance phonological-working-memory-performance-for nonwords and internal source monitoring is. The proposed explanation needs to be examined in causal experimental designs. Unfortunately, there are currently no empirical findings available, which examine the relation or the reasons for the found relation between both performances. The task of following research is therefore first to replicate the relation and then to examine what reasons lead to this relation.

Besides this, experiment 1 showed that the phonological loop performance nonwords-repetition was related to reality monitoring in the action encoding mode. The reason for this relation also seems to be the internal source in the reality monitoring condition because no relations were

found concerning source tasks containing external sources. It seems that children who can better encode, store and retrieve (non)words as a whole may can better encode, store and retrieve the source specific verbal memory characteristics and the memory characteristics about the performed sources. This enables them to attribute more reality monitoring sources correctly to their memories. These additional source specific memory characteristics may help the children to better attribute and/or discriminate the performed internal sources from the performed external sources in the reality monitoring condition and thus lead to a higher number of correct source attributions. The effective use of these verbal memory characteristics seems to be limited to reality monitoring and to the action encoding mode. Nevertheless, experiment 1 revealed that this advantage depends on age. Based on the small sample sizes in each age group in experiment 1, it was not possible to specify in what age groups the relation between the phonological loop performance phonological-working-memory-for-nonwords and reality monitoring exists. Unfortunately, empirical findings about that help explain and/or specify this relation are not available. The task of following research is therefore to examine in what age groups the relation exists and what the reasons for this relation are. It might be the case that 4- and 5-year-old children use the additional verbal memory characteristics as well. This would indicate that children at this age start to use such memory characteristics systematically and with it improve (nondeliberately or deliberately) their source monitoring performances.

Taken together, experiment 1 clearly showed that the phonological loop function phonological-working-memory-performance-for nonwords is a relevant working memory performance for internal source monitoring and for reality monitoring in an action encoding mode. It is also possible that other phonological loop functions are positively related to internal source monitoring performances or to the other two main types of source monitoring. This might be the case for phonological loop functions involving the available vocabulary. Empirical evidence for such a relation comes from the study by Price & Ford (2006). They found that the phonological loop function assessed by a digit forward task was positively related to reality monitoring performance across both sources after a one-day delay in 3- to 6-year-old children. The same correlation was found between phonological loop performance and single source attributions of the reality monitoring sources. The study conducted by Price and Ford (2006) underpins the assumption that specific phonological loop functions are related to source monitoring. However, in the study reported by Sussman (2001), a relation between the phonological loop (assessed by concerning number recall) and a reality monitoring and an internal source monitoring task was not found in children at 4-years of age. This convergent finding can be partly explained. One explanation might be that in children at age 4, such a relation could not be found because source monitoring is not as stable at that age as it is in older children. A second explanation might be that in the study conducted by Price and Ford (2006) source task specific performance may have produced the relation between the phonological loop task and reality monitoring which was not included in the study reported by Sussman (2001). Nevertheless, both alternative explanations

are reasonable and need to be tested empirically. Unfortunately, at present no other studies are available that inform about the relation between source monitoring and a digit recall task or another phonological loop task. Thus, the explanations are still provisional and systematic follow-up research is needed.

For following research it is necessary to first replicate the findings of experiment 1 because the relations between source monitoring and the selected episodic buffer and phonological loop performances have only been examined in experiment 1. Secondly, the task of following research is to examine the nature of these specific relations and to determine the single processes carried out in these performances. Third, the task of future research is to examine the relevance of the other episodic-buffer and phonological-loop performances for source monitoring as well as to examine the role of the central executive and the visuo-spatial sketchpad for source monitoring. On principal, working memory performances are central for source monitoring performances and help explain how source monitoring performances are carried out. I think it is important for future research to go beyond correlational analyses and to test the meaning of the single working memory performances in causal experimental designs. Based on such experimental designs, it will be possible to determine and specify the role of each working memory component and their single functions for source monitoring performances.

2.4.2.2 The relation between verbal abilities and source monitoring

The verbal representation system seems to be very important for source monitoring and its development. Performances and developmental progresses in the verbal representation system can enhance source monitoring performances because the broader and deeper the verbal representation system is the more source specific memory characteristics can be used in source attributions. In the following section, I discuss in detail whether and how verbal performances representing the passive and the active available verbal representation system are relevant to early source monitoring.

The verbal representation system is important for memory performances (e.g., Bauer, 2002, 2007; Baddeley, 2007; Fivush, 2002b; Hayne & Simcock, 2009). It can support memory processing during encoding, storage and retrieval and with it enhance memory performances in various important ways (e.g., Bauer, 2002, 2007; Baddeley, 2007; Fivush, 2002b; Grimm, 2001; Hayne & Simcock, 2009; Weinert, 2006). In experiment 1, I assumed that this is also the case for the complex memory performance “source monitoring” and that this is already the case for verbal abilities representing the passive available verbal representation system. Thus, I expected that the verbal comprehension performance “sentence comprehension” is positively related to source monitoring. Because verbal characteristics are contained in each source task condition in

experiment 1 and in the verbal and in the action encoding mode (through the verbally presented phrases), I expected that sentence comprehension is related to reality monitoring, to internal and to external source monitoring in the verbal and in the action encoding mode. A very strong relation between sentence comprehension and internal source monitoring was expected because of the involvement of the mainly verbally carried out mental activity “thinking” which contains the most source specific verbal memory characteristics in internal source monitoring sources (e.g., Johnson et al., 1993). This is expected to be the case in the verbal and in the action encoding mode. The relations between sentence comprehension and source monitoring were also expected to be independent of the age of the children because the verbal representation system should support source monitoring equally in each age group.

Experiment 1 revealed that the verbal comprehension performance “sentence comprehension” was positively related to internal source monitoring in the action encoding mode. This relation was independent of the ages 3- to 5-years old. Therefore, experiment 1 clearly showed that young children with better sentence comprehension performances attribute more internal source monitoring sources correctly to their memories. A broader and deeper passive available verbal representation system obviously supports the use of verbal memory characteristics in source monitoring and leads to higher source attribution rates in the internal source monitoring condition. It also seems to be the case that the verbal representation system supports internal source monitoring performances in particular. This assumption is made because in the internal imagined sources a high number of verbal characteristics are contained through the mainly verbally carried out mental activity “thinking” (Johnson et al., 1993). Experiment 1 underpins this assumption clearly through its strong relation to internal source monitoring.

Nevertheless, experiment 1 showed that the expected strong relation between sentence comprehension and internal source monitoring was not found in the verbal encoding mode. This result is surprising because the number of the verbal characteristics should still be higher in the verbal encoding mode than in the action encoding mode and thus should result in a stronger relation. Experiment 1 revealed that this is not the case. Although the low number of sample size needs to be considered, this relational finding is conforming to the finding reported by Hala et al. (2005). These authors also found no relation between their verbal comprehension task “receptive (hearing) vocabulary” and internal source monitoring in a verbal encoding condition. This finding indicates that the absent relation is clearly independent of the specific source task conditions of experiment 1. What are possible explanations for this absent relation? One possible explanation for the absent relation could be that the passive available verbal representation system might not have been sufficient to support the internal source attributions in the verbal encoding mode. It might be the case that too many verbal characteristics are contained in the verbal encoding mode, which makes the two internal sources more similar and harder to discriminate from each other (i.e., Lindsay et al., 1991; Johnson et al., 1993). It is possible that in a case like this (nondeliberate or deliberate) retrieval strategies or source decision strategies are

necessary to discriminate the two internal sources from each other and to attribute them correctly to memories. Thus, the passive available verbal representation system might not have been sufficient to support internal source monitoring in the verbal encoding mode as expected and therefore did not lead to a relation between both performances. This could be a plausible explanation for the absent relation in the verbal encoding mode. Nevertheless, this explanation needs to be tested empirically before it is clear whether this explanation is correct or not. The results of experiment 1 also revealed that the enhancing effect of the passive available verbal representation system might have a boundary. This boundary may have been reached in the verbal encoding mode in experiment 1 and in the verbal source task in the study reported by Hala et al. (2005). The task of following research is now to examine whether such a boundary really exists and if so why this is the case. It is also important to examine whether other verbal comprehension performances are likewise related or are not related to internal source monitoring.

Besides this, experiment 1 revealed that the verbal production performance “sentence comprehension” was not related to reality monitoring and to external source monitoring in the action and in the verbal encoding mode. This result was likewise surprising and stands in contrast to the expectations that the broader and deeper the passive available verbal representation system is, the higher the numbers of correct source attributions in the reality monitoring and the external source monitoring condition are. Experiment 1 shows that this is not the case in the verbal nor in the action encoding mode. Nevertheless, the findings of experiment 1 are also conforming to the empirical findings reported by Hala et al. (2005) and by Price and Ford (2006). In both studies, no relations were found between the verbal comprehension performance “receptive (hearing) vocabulary” and reality monitoring (Hala et al., 2005; Price & Ford, 2006) and external source monitoring (Hala et al., 2005). This clear pattern of results indicates that verbal abilities representing the passive available verbal representation system (receptive vocabulary and sentence comprehension) are not relevant to reality monitoring and to external source monitoring in 3- to 6-year-old children. This seems to be the case independent of the specific source task conditions (e.g., time delay, number of types of source monitoring included) and independent of verbal encoding modes (Hala et al., 2005; Experiment 1) and action encoding modes (Price & Ford, 2006; Experiment 1). Although it has to be considered that in the cited studies a low number of sample sizes (Hala et al., 2005), a broad, undifferentiated age range (Price & Ford, 2006; Experiment 1) and an action encoding mode containing a lower number of verbal characteristics (Price & Ford, 2006; Experiment 1) were used, the pattern of results uniformly supports the conclusion that the passive available verbal representation system is not relevant to reality monitoring and to external source monitoring performances.

Nevertheless, in following research it is necessary to examine whether the same findings exist in more narrow age groups with a smaller range. It is possible that the passive available verbal

representation system is related to reality monitoring and to external source monitoring in single age groups (e.g., in 4-year-olds only) but have not been visible in the three cited studies because of the small sample sizes and broad age groups. If relations were found in single age groups then this would show that verbal comprehension performances are still relevant to reality and external source monitoring performances. However, if no relations were found in the single age groups then this would further support the conclusion that the passive available verbal representation system is not related to reality monitoring and to external source monitoring. Besides this, it is also necessary to examine in future research whether other verbal abilities indicating the passive available verbal representation system are related to reality monitoring and to external source monitoring. Although sentence comprehension and the receptive (hearing) vocabulary are representative and appropriate indicators of the passive verbal representation system, it is still possible that (single) other verbal comprehension performances are relevant for both types of source monitoring.

In experiment 1, I also examined whether and how the active available verbal representations system is relevant to early source monitoring. Based on the assumption that a broader and deeper active available verbal representation system can support source monitoring through a better encoding, storage and retrieval of the source specific verbal characteristics it was expected that the verbal production performances “active vocabulary level” and “morphological rule using” were positively related to source monitoring. Because verbal characteristics are contained in each source task in experiment 1 and in the verbal and in the action encoding mode (through the verbally presented phrases), I expected that the active vocabulary level and morphological rule using was related to reality monitoring, to internal and to external source monitoring in the verbal and in the action encoding mode. Likewise a very strong relation was expected between internal source monitoring and the active vocabulary level and morphological rule using because of the involvement of the mainly verbally carried out mental activity “thinking” which contains the most source specific verbal memory characteristics in the internal source monitoring sources (e.g., Johnson et al., 1993). This was equally expected for the verbal and the action encoding mode. In addition, the relations between source monitoring and the active vocabulary level and morphological rule using were expected to be independent of the age of the children because the active available verbal representation system should support source monitoring equally in each age group.

Experiment 1 showed that the verbal production performance “active vocabulary level” was positively related to reality monitoring, to internal source monitoring and to external source monitoring in the action encoding mode and to internal source monitoring in the verbal encoding mode. Thus, conforming to the hypotheses, experiment 1 revealed that children with a broader and deeper active available verbal representation system attributed more reality monitoring, internal and external source monitoring sources correctly to their memories. This was the case

independent of the encoding mode in internal source monitoring and in the action encoding mode in reality monitoring and external source monitoring. The results concerning the verbal production performance “morphological rule using” showed exactly the same patterns of relations. Thus, conforming to the hypotheses children who are better at actively using the morphological (plural) rules in German language attributed more reality monitoring, internal and external source monitoring sources in the action encoding mode and more internal source monitoring sources in the verbal encoding mode correctly to their memories. The uniform pattern of results in both verbal production performances indicates that the active available verbal representation system is important to source monitoring performances in 3- to 5-year-old children. This is consistently true for reality monitoring, for internal source monitoring and for external source monitoring performances and in the case of internal source monitoring independent of an action and a verbal encoding mode.

Experiment 1 also supports the assumption that the active available verbal representation system is particularly important for internal source monitoring performances. This was assumed to be true because in the internal imagined sources a high number of verbal characteristics should be contained through the mental activity “thinking” as it is mainly carried out verbally and should therefore create mainly verbal memory characteristics (Johnson et al., 1993). The results found in experiment 1 support this assumption for the active vocabulary level as well as for morphological rule using. The highest relations were found to internal source monitoring performances. The role of the active available verbal representation system for internal source monitoring performances is supported by the finding that the relations were consistently found in the verbal and in the action encoding mode. This was also similarly the case for the active vocabulary level and for morphological rule using performance. Thus, experiment 1 clearly showed that the active available verbal representation system is particularly important for internal source monitoring performances in the 3- to 5-year-old children.

It was expected that the found relations are independent of the age of the children. The results obtained in experiment 1 showed that this was the case for the relations between the active vocabulary level and internal source monitoring in both encoding modes and external source monitoring in the action encoding mode. In contrast, the relation between the active vocabulary level and reality monitoring in the action encoding mode depended on age. The same was true for all relations of morphological rule using. One possible explanation for the age dependency of the relation between the active vocabulary level and reality monitoring could be that only older children start to use (nondeliberately or deliberately) their better active available verbal representation system in their source monitoring performances. This could be particularly the case during retrieval and during the source decision processes. Older children may start to use verbal characteristics more systematically and strategically in their source monitoring performances and may start to use specific searches for verbal memory characteristics. This might be not the case for younger children. Although they are able to attribute reality monitoring

sources correctly to their memories at an above chance level, they may use more perceptual characteristics in their source monitoring performances that already allow correct source monitoring performances above chance level (i.e., Welch-Ross, 1995). This might be an explanation for the age dependency of the relation between the active vocabulary level and reality monitoring in the action encoding mode. However, this possible explanation needs to be tested empirically in follow-up research. It was not possible to test this assumption in experiment 1 because the sample size of 12 children per age group is too small to allow for such an examination. An explanation of the age dependency of the relations to morphological rule using could be that only older children benefit from their better morphological rule using performances. It could be the case that younger children may still learn morphological rules and therefore this verbal ability does not support source monitoring yet. In comparison to the active vocabulary level, morphological rule using is a more formal indicator of the active available verbal representation system (concerning grammar of the verbal representation system), that may support source monitoring at a later time because it is acquired later and may need a more strategic use. This could be an explanation for the age dependency of the relations between the morphological rule using and source monitoring. However, this possible explanation needs to also be tested in follow-up research because it was not possible to test this assumption in experiment 1 based on the small sample size of the age groups.

In contrast to the hypotheses, experiment 1 revealed that reality monitoring and external source monitoring in the verbal encoding mode was not related to the active vocabulary level nor to morphological rule using. This result is surprising particularly because this was the case in the verbal encoding mode in that many verbal characteristics are contained. However, the absent relations to external source monitoring are in line with the empirical findings of Drummey and Newcombe (2002). They also found no relation between their external source monitoring task and their verbal production performance “verbal fluency” in the 4- and 6-year-old children used as participants. A relation to the active available verbal representation system was also expected because many verbal characteristics were contained in their fact-source task. The study by Drummey and Newcombe (2002) showed that this was not the case. As pointed out in the theoretical background, a relation may not have been found in the study because the verbal production ability “verbal fluency” might have not been such a representative indicator of the active available verbal representation system because it *only* informs about the breadth and depth of single category knowledge (categories: Animals, fruits and vegetables) and its time-restricted retrieval. In connection to the absent relations in experiment 1 between external source monitoring and the active vocabulary level and morphological rule using, the findings of Drummey and Newcombe (2002) and experiment 1 seem to indicate that verbal based external source monitoring performances are not related to the active available verbal representation system. The same might be true for the verbal based reality monitoring performances although at this point of time, experiment 1 is the only study examining these relations.

Is it possible to explain these absent relations somehow? One possible explanation could be the number of verbal characteristics contained. It might be possible that in mainly verbal source tasks too many (similar) verbal characteristics and too less distinctive source specific memory characteristics are available and that a broad and deep active available representation system is not sufficient for correct source attributions and discriminations. As discussed in relation to the passive available verbal representation system, in mainly verbal source tasks (nondeliberate or deliberate) retrieval strategies and/or source decision strategies might be needed to discriminate the external sources from each other and to attribute them correctly to memories. Thus, relations may not exist between mainly verbal based external source monitoring performances and the verbal production performances active vocabulary level, verbal fluency and morphological rule using. The same might be true for mainly verbal based reality monitoring performances. In my opinion, this is a plausible explanation of the absent relations between the verbal production performances and reality monitoring and external source monitoring in the verbal encoding mode. Nevertheless, this explanation needs to be tested in following research before this assumption can be accepted for explaining the absent relation. With this pattern of results, experiment 1 indicates that the supportive effect of the active available verbal representation system may have a boundary. This boundary may have been reached in the verbal encoding mode in the reality monitoring and in the external source monitoring condition in experiment 1 and in the study of Drummey and Newcombe (2002). The task of following research is therefore to examine whether such a boundary really exists and if so, why this is the case. Besides this, it is also important to examine whether other verbal production performances are not related to mainly verbally based reality monitoring and external source monitoring performances. This will help in specifying the relevance of the active available verbal representation system for early source monitoring performances.

On principal, verbal abilities are central for early source monitoring performances. I think it is important in following research to go beyond correlational analyses and to test the meaning of the verbal representation system in causal experimental designs. Based on such experimental designs, it will be possible to determine and specify the role of the passive and the active available verbal representation system and their single functions for early source monitoring performances.

2.4.2.3 The relation between source monitoring and false-belief understanding

Theory of mind abilities seem to play an important role in source monitoring and its development (e.g., Naito, 2003; Perner & Ruffman, 1995; Price & Ford, 2006; Roberts, 2002; Ruffman et al., 2001; Welch-Ross, 2000). Performances and developmental progresses in theory of mind abilities can enhance source monitoring because the more comprehensive the

understanding of different mental states is, the better (internal) source monitoring might be carried out. I now discuss in detail whether this is the case for the theory of mind ability false-belief understanding when examining internal source monitoring.

Mental-state understanding requires the realization that mental states may reflect reality and may be manifest in overt behaviour, but are internal and mental, and thus distinct from real events, or behaviours (Wellman et al., 2001). The understanding that a person has a *false-belief understanding* provides evidence for appreciating such a distinction between the mind and the world (e.g., Dennett, 1979, Perner, 1991, Wellman, 2002; Wimmer and Perner, 1983). Because such a distinction between the mind and the world seems to be required in internal source attributions about imagined mental representations (Welch-Ross, 1995), I assumed in experiment 1 that children who have a mental state understanding which includes such a distinction between the mind and the world (i.e., false-belief understanding) are able to attribute a higher number of internal sources correctly to their memories. This positive relation was expected to be found across both sources in the internal source monitoring tasks of experiment 1. The same was expected for the single sources of the internal source-monitoring tasks (said-/thought-source; thought-source) because in both single sources a mental-source needs to be distinguished from a reality-source thereby requiring a more comprehensive mental state understanding. The relations were expected to be found in the action and in the verbal encoding mode because the distinction between the mind and the world is contained in both internal source monitoring tasks and is independent of the characteristics of the encoding mode.

Experiment 1 showed that children who have a false-belief understanding attributed a higher number of internal sources correctly to their memories. This was true across both internal source monitoring sources in the action encoding mode and in the verbal encoding mode. This was also true in the performed-source and in the thought-source in the action encoding mode as well as in the said-source in the verbal encoding mode. With the exception of the thought-source in the verbal encoding mode, experiment 1 clearly showed the expected positive relations between false-belief understanding and internal source monitoring. The uniform pattern of results makes it clear that false-belief understanding is relevant to internal source monitoring. This is the case in an action and in a verbal encoding mode and is true for both internal sources and the single internal source monitoring sources. The only exception was the missing relation between false-belief understanding and the thought-source in the verbal encoding mode. However, the moderator analyses of the working memory performance “phonological working memory performance” revealed that the thought-source in the verbal encoding mode was also positively related to false-belief understanding if the phonological working memory performance was controlled statistically. This finding shows that the thought-source in the verbal encoding mode is related to false-belief understanding. However, this relation is partly covered by the phonological working memory performance. The question that then comes up is why this moderator influence between this specific single source and false-belief understanding exists and

why the moderator influence of the phonological working memory performance does not exist between the other single sources in the verbal and in the action encoding mode and false-belief understanding. One possible explanation could be that in the thought-sources in the verbal encoding mode more phonological working memory performances are required than in the other single sources because the phonological characteristics could be the critical source specific memory characteristics for the correct source attributions. Unfortunately, it is not possible to test this possible explanation in the post-hoc analyses of experiment 1. This needs to be done in following-research. Nevertheless, experiment 1 showed that the thought-source in the verbal encoding mode is related to false-belief understanding but phonological working memory performances need to be controlled to make the expected relation observable.

In experiment 1 I also expected that the relations between false-belief understanding and internal source monitoring exist independent of the verbal ability “active vocabulary level”. This independence was expected because the main reason for the relations is assumed to be the more comprehensive mental state understanding about the distinction between the mind and the world (Welch-Ross, 1995).

Experiment 1 showed that, in contrast to expectation, each relation between false-belief understanding and internal source monitoring was influenced by the verbal ability “active vocabulary level”. Each meaningful positive relation disappeared if the active vocabulary level was controlled statistically. Thus, contrary to the hypotheses the relations between false-belief understanding and internal source monitoring were moderated by the verbal ability “active vocabulary level”. This uniform pattern of results indicates that the common ground between false-belief understanding and internal source monitoring are verbal abilities marking the breadth and the depth of the active available verbal representation system and not as previously expected the more comprehensive mental state understanding about the distinction between the mind and the world (Welch-Ross, 1995). Based on the empirical findings that false-belief understanding and internal source monitoring are both related to verbal abilities (e.g., Astington & Jenkins, 1995, 1999; Carlson & Moses, 2001; de Villiers, 2000; de Villiers & Pyers, 2002; Lockl et al., 2004; Perner, 1991; Ruffman et al., 2003; Wellman et al., 2001), it can be expected that verbal abilities may also play a role in the relation between false-belief understanding and source monitoring. Nevertheless, it was not expected in experiment 1 that the positive relations between false-belief understanding and internal source monitoring disappear completely if verbal abilities are controlled because the main reason for the relation was expected to be the mental state understanding (Welch-Ross, 1995). Experiment 1 indicates that this is not the case.

Unfortunately, other empirical findings or theoretical explanations are not available to help explaining these findings. However, one possibility to clarify the question of whether the more comprehensive mental state understanding is or is not relevant for the relation between false-belief understanding and internal source monitoring is to examine the relations and the influence

of verbal abilities in 4- and 5-year-old children only. Both age groups usually respond correctly to the false-belief question and are in principle able to attribute internal source monitoring performances correctly to their memories. This would lead to a more homogenous group that could be necessary to answer this question. The lower numbers of correct internal source attributions and false-belief responses of the 3-year-old children may cover the relations between false-belief understanding and internal source monitoring and thereby not showing that the relations are independent of verbal abilities. Therefore, in post-hoc analyses of experiment 1 the 4- and 5-year-old children were tested with regards to whether the relations between false-belief understanding and internal source monitoring exist independent of the verbal ability “active vocabulary level”. These post-hoc analyses revealed that the relation between false-belief understanding and internal source monitoring in the verbal encoding mode remained significant if the active vocabulary level was controlled. This was true across both sources and in the single said-source. However, this was not true in the single thought-source or for all relations in the action encoding mode. Nevertheless, these additional analyses clearly show that a more comprehensive mental state understanding about the mind and the world is at least relevant for the relation between false-belief understanding and internal source monitoring in a verbal encoding mode. This does not seem to be the case in the action encoding mode or in the thought-source in the verbal encoding mode. Otherwise, the relations would have remained significant as well. In the action encoding mode and in the thought-source in the verbal encoding mode verbal abilities obviously play an important role in the relations between false-belief understanding and internal source monitoring. In following research, it is necessary to examine why this is the case and why it differs from the other sources in the verbal encoding mode.

Besides this, I expected that the relations between false-belief understanding and internal source monitoring exist independent of the working memory performance “phonological working memory performance” because the main reason for the relations is thought to be the more comprehensive mental state understanding about the distinction between the mind and the world.

Experiment 1 showed that the relations between false-belief understanding and internal source monitoring in the verbal encoding mode remained significant if the phonological working memory performance was controlled. This was the case across both sources and in the single said-source. The analyses showed as well that the relation between false-belief understanding and the thought-source became significant indicating that this relation was covered by the phonological working memory performances. Thus, conforming to the hypotheses the relations between false-belief understanding and internal source monitoring in the verbal encoding mode exist independent of the working memory performance “phonological working memory performance”. This is true for the said- and in the thought-source. This pattern of results indicates that the mental state understanding about the mind and the world is relevant in the relations.

In relation to the action encoding mode, experiment 1 showed that the relations between false-belief understanding and internal source monitoring disappears if the working memory performance “phonological working memory performance” was controlled. This was the case across both sources and in the single sources of the internal source monitoring task. This uniform pattern of results indicates that in the action encoding mode the common ground between false-belief understanding and internal source monitoring again is not the mental state understanding about the mind and the world. Instead, phonological working memory performances (and verbal abilities) seem to be relevant for the relations but not the expected mental state understanding. One reason for the *unimportance* of the mental state understanding could be that in an action encoding mode other distinctive source specific memory characteristics are available that already allow the children to attribute the internal source monitoring correctly to their memories. This mainly concerns characteristics about the performed actions. Based on that, the mental state understanding might be not necessary (anymore) to carry out the source attribution correctly. Unfortunately, at present other empirical findings or theoretical explanations are not available for the relation between false-belief understanding and internal source monitoring (in an action encoding mode) to help explain the moderator effects in the action encoding mode. It is therefore the task of following research to examine what is relevant for the relations between false-belief understanding and internal source monitoring in an action encoding mode and why mental state understanding does not seem to play a role in those relations.

A very important task of following research is to replicate the findings of experiment 1 because the relations between false-belief understanding and internal source monitoring performances have only been examined in this experiment so far. Second, the nature of this relation is to be examined as well as an investigation to determine the single processes carried out in both performances. Third, the task of future research is to extend the examination to other possible types of source monitoring and source combinations to uncover their possible relations to false-belief understanding. On principal, false-belief understanding is of particular interest for source monitoring performances and I think it is important in following research to go beyond correlational analyses and to test the meaning of false-belief understanding for source monitoring in causal experimental designs. Based on such experimental designs, it will be possible to determine and specify the role of false-belief understanding for (internal) source monitoring performances.

2.4.2.4 The relation between source monitoring and social factors

As the fourth group of factors, social variables seem to be important for early source monitoring. Changes in the social environment of the child seem to stimulate source monitoring in a meaningful way by providing the child with more opportunities for social interactions (cf.,

Phillips et al., 2006; Rubin et al., 1998; Vandell et al., 2006). With these enhanced opportunities, more source attributions and discriminations need to be carried out. In the following section, I discuss in detail whether and how social variables within and outside the family are relevant to early source monitoring performances.

In experiment 1, I expected that the external source tasks reality monitoring and external source monitoring are positively related to the number of hours the child spends with the mother per day, the number of hours the child spends with the father per day, the number of hours the child spends with another person per week and to the weekly contacts the child has to peers, younger and older children. This hypothesis is based on the assumption that the more interactions with the members of the family (e.g., mother, father, peers, another person of the family) and persons outside the family (e.g., peers, younger and older children) a child has, the more potential source discriminations and practice with external real-person sources have been made. The relations were expected to be found in the verbal and in the action encoding modes. It was also explored whether the relations exist independent of the age of the children.

The results are congruent with the held expectation that higher number of hours the father spends with the child per day, the more correct source attributions in the reality monitoring and in the external source monitoring tasks in the action encoding mode are made. This was the case independent of age and underpins that the number of hours the father spends with the child per day is a relevant social variable for the external source monitoring performances reality monitoring and external source monitoring. Nevertheless, the relation is limited to the action encoding mode. The results show differences in the correlational patterns between the action and the verbal encoding mode. This indicates that the number of hours the father spends with the child is only relevant for external source monitoring performances in which mainly contain perceptual characteristics. However, based on the used social marker variables of experiment 1 it is not possible to draw further conclusions about the meaning and the origin of these relations. The number of hours was used as the sole marker, which does not give information about the kinds and qualities of the interactions meaningful for both relations. The task of future research is to therefore replicate and to specify the relations on a behavioural level.

Besides this, experiment 1 showed that children spending more time with younger children outside the family per week attributed more reality monitoring sources correctly to their memories in the verbal encoding mode. However, this finding depends on age and disappears if age is controlled statistically. Nevertheless, the finding shows that the weekly contacts of the child to younger children are relevant to the external source task reality monitoring although the relevance is limited to the verbal encoding mode, which mainly contains verbal characteristics. However, it is not possible to draw further conclusions about that relation and about the quality of specific social interaction behaviours because only the quantity of social interactions was used as a marker. Based on the small sample sizes within each age group it is also not possible to

examine in what age groups the relation between the weekly contacts to peers and reality monitoring exists. Both questions need to be addressed in following research.

Experiment 1 reveals that contrary to the hypotheses the remaining social variables number of hours the mother spends with the child per day, number of hours another person within the family spends with the child per week, and the weekly contacts to peers and to older children outside the family were not related to reality monitoring or external source monitoring in the action nor in the verbal encoding mode. Thus, experiment 1 indicates that these social variables are not related to external source tasks reality monitoring and external source monitoring.

Nevertheless, the selected social interaction marker variables might have been too superficial to display the expected relations of these social variables. It is possible that the relations between these social variables and the main types of source monitoring do exist, but only at a behavioural level of social interaction. Because in experiment 1, the quantity of social interactions was used as a marker, conclusions about the social interaction at the behavioural level cannot be drawn.

The task of follow-up research is therefore to test the social interactions at the behavioural level so that the question of whether or whether not these social variables are relevant to early source monitoring can be addressed. An alternative explanation for the absent relations in experiment 1 could be that the relations differ between the 3-, 4- and 5-year old children. In experiment 1, it is not possible to test this alternative explanation in a reliable way because the single age groups were small ($n = 12$ children) and do not allow reliable age comparisons in correlational analyses. Thus, this alternative explanation needs to be tested in follow-up research as well.

At present other theoretical attempts and empirical findings are not available. Thus, it is not possible to relate and discuss the findings of experiment 1 to other theoretical attempts and empirical findings.

Besides this, I expected specific positive relations between internal source monitoring and the number of hours the child spends with the mother per day and the number of hours the child spends with the father per day. These hypotheses are based on the assumption that the mother and the father may provide the child with adequate information and practice on how to handle the different kinds of internal sources (c.f., Bauer, 2007; Fivush, 2009; Fivush & Hamond, 1990; Nelson, 1993).

Experiment 1 revealed that conforming to the expectations, the more hours the father spends with the child per day the higher the numbers of correct source attributions in the internal source monitoring task were in the verbal encoding mode. This holds true independent of age. If age is controlled additionally then the higher number of hours the father spends with the child per day also goes along with a higher number of correct source attributions in the action encoding mode. Nevertheless, this relation narrowly failed to be meaningful if age is not controlled indicating that age needs to be controlled to show that specific relation. Thus, the number of

hours the father spends with the child per day is also a relevant social variable for internal source monitoring. This is the case in the action and in the verbal encoding mode although the age needs to be controlled in the action encoding mode. However, it is not possible to draw further conclusions about the meaning and the origin of the relations because in experiment 1 the number of hours was used as the only behavioural indicator of the father. The task of future research is therefore to replicate the relation and to specify the social interactions on a behavioural level that are relevant for the relations.

In relation to the social variable number of hours the mother spends with the child, experiment 1 showed that contrary to the hypotheses no relation exists between the number of hours the mother spends with the child per day and internal source monitoring. This was true in the action and in the verbal encoding mode. Thus, the results obtained in experiment 1 indicate that the number of hours the mother spends with the child per day is not a social variable relevant to internal source monitoring. Nevertheless, it is possible that the assumed relations exist but can only be seen at a more behavioural level. The used marker variable “number of hours” in experiment 1 might be too limited to show that relation. Even though these absent relations seem clear, these relations need to be specified and tested in follow-up research to exclude the alternative explanation that an existing relation between both variables have been overlooked through the use of limited social interaction variables. It is also possible that a relation between the number of hours the child spends with the mother and internal source monitoring can only be found in single age groups. Based on the small sample sizes in the single age groups of experiment 1, it is not possible to examine this assumption. This needs to be examined in follow-up research. Because at present no other theoretical attempts and empirical findings exist, it is not possible to relate and discuss these findings of experiment 1 to other theoretical attempts and empirical findings.

In post-hoc analyses I explored whether relations exist between reality, internal and external source monitoring in the action and in the verbal encoding mode and the number of siblings, the position the child has in the row of siblings, the duration a crèche/nursery school/kindergarten has been attended and the number of courses the child visits regularly.

The results showed that the lower the number of siblings was the higher the number of correct internal source monitoring performances was. This was the case in the action and in the verbal encoding mode although the relation in the verbal encoding mode depended on the age of the children. Thus, the social variable number of siblings is relevant to source monitoring although the relevance is limited to internal source monitoring. The same is true for the position the child has in the row of the siblings. The lower the position of the child in the row of siblings is the higher the numbers of correct internal source monitoring performances in the action encoding mode and reality monitoring performances in the verbal encoding mode are. This was the case independent of the age of the children. However, the position the child has in the row of siblings

was not related to the remaining types of source monitoring in the action and in the verbal encoding mode indicating their specific relevance to single types of source monitoring in single encoding modes. Thus, experiment 1 showed that siblings are relevant social variables for internal source monitoring and for reality monitoring whereby the presence of siblings exclusively goes along with lower correct source monitoring performances. The task of following research is now to replicate the relations between source monitoring and the number of siblings and the position the child has in the row of siblings and to try to identify the behavioral reasons for the negative relations.

In relation to the social variable duration a crèche/nursery school/kindergarten has been attended, experiment 1 revealed that the longer the duration was the higher the correct source attributions were in reality monitoring in the verbal encoding mode and in internal source monitoring in the action and in the verbal encoding mode. Thus, experiment 1 indicates that the duration a crèche/nursery school/kindergarten has been attended is a relevant social variable for internal source monitoring independent of the encoding mode and for reality monitoring in the verbal encoding mode. Because the duration allows no further conclusions about the reasons for this relations on a behavioral level, the task of follow-up research is (to replicate and) to specify the relevant social interactions on the behavioural level.

In relation to the number of courses a child visits regularly, experiment 1 revealed that the higher the number of courses was the higher the number of correct source attributions in the internal source monitoring in the action encoding mode was. Relations to the remaining types of source monitoring in the action and in the verbal encoding mode did not exist. Thus, the number of sources a child visits regularly is also a social variable relevant to internal source monitoring. Because yet again further conclusions cannot be drawn for the social variable marker number of courses, follow-up research needs to examine why this relation exists and how it can be explained.

Experiment 1 clearly underpins the assumption that social variables within and outside the family are of particular interest for early source monitoring. In my view, the task of follow-up research is to replicate and to further identify social variables relevant to early source monitoring. Besides this, it is necessary to go beyond the social interaction markers and to analyze the relations at a behavioural level. Based on such empirical findings, it will be possible to specify the role of social variables within and outside the family relevant for early source monitoring performances.

2.5 Conclusions of Experiment 1

The aim of experiment 1 was to identify a favourable encoding condition for early source monitoring and to identify and specify factors relevant to early source monitoring. Experiment 1 clearly showed that this was possible. Experiment 1 revealed that young children attributed the sources in an action encoding mode better correctly to their memories than in a verbal encoding mode, which served as a control encoding mode. The additional visual, motor and cognitive source specific memory characteristics of the performed actions seemed to allow the children to attribute more sources correctly in the action encoding mode than in the verbal encoding mode in which these additional source specific memory characteristics were not available. The better source monitoring attributions of the children existed in the external source monitoring sources and in the reality monitoring sources. However, they did not exist in the internal source monitoring sources indicating that these types of sources are improved differently or at a later point in time by action related memory characteristics. Experiment 1 also showed that the advantage of the action encoding mode depended on age and first appeared at 4 years of age in the external source monitoring sources. At the age of 5 years, the advantage existed in the reality monitoring sources indicating the increasing effective use of the additional available source specific memory characteristics of the performed actions. However, the advantage of the action encoding mode did not exist at all in the 3-year-old children although it can be expected theoretically and empirically that they should also profit from the additional source specific memory characteristics. The absent advantage of the action encoding mode in the 3-year-old children could have resulted from encoding and/or retrieval difficulties of the additional available source specific memory characteristics and/or from the supposed deliberate and strategic processing of these characteristics in the source decision processes.

Experiment 1 also revealed that the 4-year-old children were able to attribute the external source monitoring sources in the action encoding mode correctly above chance level to their memories earlier than in the verbal encoding mode. However, this was not the case for the reality monitoring and for the internal source monitoring performances. At the age of 3 years, the reality monitoring and the internal source monitoring sources in the action encoding mode were not attributed correctly above chance level but at the age of 4 years the reality monitoring and the internal source monitoring sources were attributed correctly above chance level in the action and in the verbal encoding mode. Thus, experiment 1 showed that both types of source monitoring were not attributed correctly above chance level at an earlier point in time in the action encoding mode. Within the scope of this analysis, experiment 1 revealed that the 3-year-old children attributed the reality monitoring sources in the verbal encoding mode correctly above chance level to their memories showing that they were already able to attribute reality monitoring sources correctly to their memories.

Besides this, experiment 1 indicated that, uniformly in all age groups, the sources of the subject-performed actions were not attributed better than the sources of the experimenter-performed

actions and than the sources of the imagined action phrases in the reality and the internal source monitoring condition in the action encoding mode. The specific source task conditions of experiment 1 may lead to this pattern of results because in other source task conditions better source attributions for sources of subject-performed actions were found.

In sum, the action encoding mode is a favourable condition of early source monitoring in which early source monitoring performances can be improved and in that early source monitoring performances are above chance level earlier than in other encoding conditions.

The second aim of experiment 1 was to identify and specify factors relevant to early source monitoring. The first factor, I assumed to be relevant to early source monitoring was working memory. Experiment 1 revealed that children with better memories for sentences as an indicator of episodic buffer performances attributed more reality and external source monitoring source correctly to their memories in the action encoding mode. In contrast, the memory for sentence performances were not meaningfully related to internal source monitoring in the action encoding mode and to reality, to internal and to external source monitoring in the verbal encoding mode. Besides this, experiment 1 revealed that children with better phonological working memory performance for nonwords as an indicator of phonological working memory attributed more reality and internal source monitoring sources correctly to their memories in the action encoding mode. In contrast, phonological working memory performances were not meaningfully related to external source monitoring in the action encoding mode and to reality, to internal and to external source monitoring in the verbal encoding mode. In sum, experiment 1 revealed that working memory performances is a relevant factor to early source monitoring but specific relations exist to single types of source monitoring and to the single encoding modes.

The second factor, I assumed to be relevant to source monitoring was verbal abilities. Experiment 1 revealed that children with a better comprehension for sentences as an indicator of the passive available verbal representation system attributed more internal source monitoring sources correctly to their memories in the action encoding mode. In contrast, the comprehension for sentences was not meaningfully related to reality and to external source monitoring in the action encoding mode and to reality, to internal and to external source monitoring in the verbal encoding mode. Experiment 1 also indicated that children with better active vocabulary levels and morphological rule using abilities as indicators of the active available verbal representation system attributed more reality, internal and external source monitoring in the action encoding mode and more internal source monitoring sources in the verbal encoding mode correctly to their memories. In contrast, this was not the case for reality and for external source monitoring in the verbal encoding mode. However, experiment 1 revealed that the relations to morphological rule using and the relation between the active vocabulary level and reality monitoring were moderated by age. In sum, the findings of experiment 1 show that passive and active available verbal abilities were relevant to early source monitoring although not all verbal abilities were

related to the three types of source monitoring in the action and in the verbal encoding mode and although single relations depended on the age of the children.

The third factor, I assumed to be relevant to early internal source monitoring was false-belief understanding. Experiment 1 revealed that children who have a false-belief understanding attributed more internal source monitoring sources in the action and in the verbal encoding mode to their memories. The relations between false-belief understanding and internal source monitoring in the verbal encoding mode were independent of the verbal ability active vocabulary level and the working memory performance phonological working memory performance. In contrast, the relations between false-belief understanding and internal source monitoring in the action encoding mode depended on the verbal ability active vocabulary level and on the working memory performance phonological working memory performance indicating that verbal abilities and working memory performances meaningfully influence these relations. Taken together, experiment 1 indicated that false-belief understanding was a meaningful factor for early internal source monitoring although the relations in the action encoding mode were moderated by active available verbal abilities and working memory performances.

The fourth factor, I assumed to be relevant to early source monitoring was social variables. Experiments 1 revealed that single social variables within and outside the family were relevant to early source monitoring. This was the case for the hours the father spends with the child per day, which goes along with a higher number of correct reality monitoring and external source monitoring performances in the action encoding mode. The same was true for the variable weekly contacts of the child to younger children, which was related to a higher number of correct reality monitoring source attributions in the verbal encoding mode.

Experiment 1 revealed that the remaining social variables number of hours the mother spends with the child per day and the weekly contacts to younger and to older children were not relevant to source tasks containing external sources. Besides this, experiment 1 showed that social variables within the family were relevant to internal source monitoring. This was the case for the number of hours the father spends with the child per day equally in the verbal and in the action encoding mode. In contrast, the number of hours the mother spends with the child per day was not related to internal source monitoring. The post hoc analyses revealed that single social variables within and outside the family were relevant to internal source monitoring and to reality monitoring. Experiment 1 showed that the lower the number of siblings was the higher the internal source monitoring performances were in the action encoding mode. The same was true for the position in the row of siblings. The lower the position of the child in the row of siblings was the higher the numbers of correct internal source monitoring performances in the action encoding mode and reality monitoring performances in the verbal encoding mode were. Besides this, experiment 1 revealed that the longer the duration a crèche/nursery school/kindergarten has been attended the higher the correct source attributions were in reality monitoring in the verbal encoding mode and in internal source monitoring in the action and in the verbal encoding mode.

In addition, the higher the number of courses the child visits regularly per week was the higher the number of correct source attributions in the internal source monitoring in the action encoding mode was. Therefore, the overall findings in experiment 1 revealed that single social variables were relevant to early source monitoring but these relations partly depended on age and varied in the action and in the verbal encoding mode. In contrast, other social variables within and outside the family context were not relevant to early source monitoring.

In sum, experiment 1 revealed that an action encoding mode is a favourable condition for early source monitoring. It was therefore possible to identify a favourable encoding condition in which young children's source monitoring performances can be improved and which allows source monitoring performances above chance level earlier than in a verbal encoding mode. The task of following research is now to systematically specify and to explain the origin and the boundaries of the action encoding mode as a favourable condition of early source monitoring. It is also the task of following research to identify further favourable conditions of early source monitoring and to discover under what conditions early source monitoring performances are possible and how they can be improved.

Besides this, in experiment 1 it was also possible to identify and specify working memory performances, verbal abilities, theory of mind abilities (i.e., false-belief understanding) and social variables as factors relevant to early source monitoring. These relational findings are very important from theoretical and empirical perspectives because they reveal meaningful insights into the single performances that may be contained in early source monitoring performances. Besides this, the relational findings can be the starting point for causal analyses in which the assumed sub-processes and relevant performances are controlled and examined empirically. The task of following research is now to further identify and specify factors relevant to early source monitoring and to systematically explain and examine the revealed (specific) relations.

3 Experiment 2

In my second experiment, I examine whether the familiarity with the person source is a favorable condition of early reality and external source monitoring performances, when multiple source attributions in a multiple source attributions condition are possible and whether the internal source monitoring instruction can be optimized for 3-year-old children. I also examine whether inhibition performances, verbal abilities, theory of mind abilities and social variables are relevant to the early source monitoring performances.

I describe experiment 2 in five sections. In the first section, I describe and discuss the theoretical and empirical foundation of my research questions (3.1). In the second section, I present the method (3.2) and then describe in the results in the third section (3.3). In the fourth section, I discuss in detail the empirical findings and theoretical meanings of the research questions of experiment 2 and point out the tasks of following research (3.4). In the fifth section, I then present the conclusion (3.5).

3.1 Theoretical and empirical foundation

I divided the theoretical and empirical foundation of experiment 2 into two sections. In the first section, I present the theoretical background of the possible favourable conditions of early source monitoring (3.1.1) and in the second section, I present the theoretical background of the four factors assumed to be relevant to early source monitoring (3.1.2).

3.1.1 Conditions of early source monitoring

In this section, I present the theoretical and empirical foundations of the three possible favourable conditions of early source monitoring. I first examine whether the familiarity with the person source is a favourable condition of early source monitoring (3.1.1.1) and then examine when multiple source attributions are possible in a multiple source attribution condition (3.1.1.2). After that, I examine whether the internal source monitoring instruction can be optimized for the 3-year-old children (3.1.1.3).

3.1.1.1 The familiarity with person sources

Research on memory development indicates that particularly younger children have difficulties in retrieving their (specific) memories (e.g., Bauer, 2007, Ornstein, Baker-Ward, Gordon & Merritt, 1997; Fivush, 1997, 2002; Howe & Courage, 1997; Hayne, 2007; Schneider & Bjorklund, 1998). In relation to source monitoring, this means that younger children may fail to

attribute the sources correctly to their memories because they may not yet be able to retrieve a sufficient number of source specific memory characteristics by themselves. In the following, they might not be able to attribute the sources correctly to their memories although they may have the necessary conceptual understandings about the sources available.

Taking up this difficulty, one research approach could be to provide younger children with external retrieval cues during retrieval to help them retrieve more source specific memory characteristics. Another research approach could be to enhance the encoding, storage and retrieval of an event and with it provide the younger children with more retrievable source specific memory characteristics for the source decision processes. In contrast to the first research approach, no direct external retrieval cues are used but the retrieval would be supported indirectly by enhancing the chance of retrievable memory characteristics. This research approach has the advantage that the source monitoring processes would not be influenced or altered by external retrieval cues. This research approach may also allow examining the successful conditions of early source monitoring performances and might be able to unveil the beginning of verbal source monitoring performances.

How can the number of source specific memory characteristics be enhanced during encoding, storage and retrieval?

One characteristic that may have the potential to provide children with more source specific characteristics during encoding, storage and retrieval is the familiarity with a person as the possible source of a later memory. If a familiar person *is* the source then the person-specific knowledge of that familiar person can enhance the encoding, storage and retrieval of the source specific characteristics (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). Person-specific knowledge includes the behaviour, the sound of the voice, specific verbal phrases typically used by the person and various verbal or nonverbal interaction forms of the person (Baker-Ward et al., 1990; Chi & Koeske, 1983). This person-specific knowledge can enhance the encoding of an event because the event can be either embedded into the existing representations or networks about the person or the person-specific knowledge can be easily connected to the event (e.g., Baker-Ward & Ornstein, 2002; Baker-Ward et al., 1990; Bauer, 2007; Begg & Snider, 1987; Chi, 1978; Drumme & Necombe, 2002; Engelkamp, 2001; Fivush, 1997; Johnson & Raye, 2000; Nairne & Wider, 1988; Neisser, 2004; Nelson, 1993, 2007; Ornstein, Shapiro, Clubb, Follmer & Baker-Ward, 1997; Symons & Johnson, 1997; see also Craik & Lockardt, 1972). In both cases, the memory trace of the event is enriched and many connections through different pathways within the representational network should be made available. In this way, the storage of the event can also be enhanced because more details about the event might be stored successfully over time and the details are better connected to the preexisting knowledge (Baker-Ward et al., 1990; Bauer, 2007; Engelkamp, 2001; Johnson et al., 1993; Johnson & Raye, 2000; Nelson, 2007; Ratner et al., 2000; Symons &

Johnson, 1997; see also Craik & Lockardt, 1972). In the following, the retrieval can also benefit from the better encoding and storage because the access to the memories can be easier through the multiple pathways connected with the specific event and more source specific memory characteristics should be retrievable (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). Besides this, it might be easier to get access to critical source specific memory characteristics during specific searches and through the multiple pathways and networks associated with it (e.g., Baker-Ward et al., 1990; Johnson et al., 2000; Symons & Johnson, 1997). Based on these assumptions, more familiar person sources should be attributed correctly and reliably to the children's memories. Nevertheless, it is possible that the additional available source specific memory characteristics may lead to the opposite effect because the higher number of source specific memory characteristics could likewise increase the familiarity to other memories that contain similar characteristics. However, this might be the case only if a low number and/or a less distinctive number of source specific memory characteristics is available and if the similarity to source specific memory characteristics of other existing memory characteristics is high. If this is the case, then it can be expected that familiarity can decrease the number of correct source specific memory characteristics. If this is not the case however, then it can be expected that the person-specific knowledge of familiar persons increases the number of correct source attributions.

The additional person-specific knowledge is not available for unfamiliar or less familiar persons (Baker-Ward et al., 1990; Lindsay et al., 1991; Symons & Johnson, 1997). This means that events involving unfamiliar or less familiar persons should be more difficult to encode because the event cannot be embedded into a broad pre-existing (person-specific) knowledge and connected to associated representations (Lindsay et al., 1991). This means that more cognitive effort might be necessary to encode the event. Additionally, it seems to be the case that a lower number of event characteristics might be encoded and that a lower number of associations and pathways are generated and connected. The same should be true with regards to the storage of an event. In this case, the access and the retrieval of the source specific memory characteristics should be more difficult which would correspond with a lower number of retrieved source specific memory characteristics (Baker-Ward et al., 1990; Lindsay et al., 1991; Symons & Johnson, 1997). This could make source attributions more difficult and may lead to a lower number of correct source attributions for unfamiliar or less familiar person sources.

Nevertheless, it is also possible that unfamiliar or less familiar persons are more concise than familiar persons and can lead to a higher number of encodable and retrievable source specific memory characteristics. However, such more concise source specific memory characteristics may need a more strategic encoding and retrieval behavior to increase the number of source specific memory characteristics. Such a systematic encoding and retrieval behavior seems first become available during the first school years (Schneider & Lockl, 2006) and is not yet available

in 3- to 5-year-old children. Thus, it can be assumed that the opposite effect of unfamiliar and less familiar persons is not visible at that young age.

There are different ways to classify the familiarity of persons as a source. One possibility is to classify familiarity according to the type of the person source. Familiarity can be associated with internal as well as with external person sources. Internal person sources are high familiar person sources per se because the internal source is the same as the person who carries out the (internal) source attributions. Research on internal source attributions clearly underpins the advantage of (public) internal sources and internal source attributions (e.g., Baker-Ward et al. 1990; Ratner et al., 2000; Sussman, 2001; Welch-Ross, 1995; for a review see Roberts, 2000). The familiarity of external sources can vary on different dimensions. A low extent of familiarity can be assumed for unknown people that have not been met previously. A higher extent of familiarity can be assumed for known people that have been frequently met like acquaintances, peers and friends. A high extent of familiarity can usually¹ be assumed for close family members (e.g., mother-child) or for long-time intimate partners (e.g., Symons & Johnson, 1997). Although there might be finer-grained gradations between high familiarity and intimate relations (e.g., Symons & Johnson, 1997), both relations stand for a high or the highest extent of familiarity respectively.

Based on the assumption that person specific knowledge of high familiar persons enriches the memory trace through an embedment into existing representations and the generation of multiple pathways (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997), it can be assumed that high familiar external¹⁷ person sources are better attributed to their memories than less or unfamiliar person sources. In contrast, less or unfamiliar external² person sources should have a weaker memory trace and a lower number of pathways within the representational network because no or a small number of person specific knowledge is available during encoding, storage and retrieval. This should lead to a lower number of correct source attributions in comparison to high familiar person sources.

Empirical studies examining familiarity in source attributions in preschoolers are not available to my knowledge. There is only one empirical study available in which older children are involved. In this study, Baker-Ward et al. (1990, Experiment 2) examined source attributions for self-performed actions, and other-performed actions in 24 third graders. The actions were carried out either by more familiar peers or by less familiar peers. The authors tested whether children that have more extensive representational networks for frequently playmates, integrate more information concerning familiar peers and thus attribute a higher number of sources correctly to their memories compared to less familiar peers. The study showed that the children in the more

¹⁷ To increase the legibility, the addition “external” for the terms high familiar sources and unfamiliar or less familiar sources is not used in the following. Nevertheless, the terms high familiar and unfamiliar or less familiar sources are always related to external sources.

familiar peer condition tended to recall more information than the children in the less familiar peer condition ($p = .07$) and thus indicate a marginal advantage of familiarity. One explanation for the only marginal differences is that the differences between more and less peers are not as clear as for high familiar and low or unfamiliar persons. The study conducted by Baker-Ward et al. (1990, Experiment 2) revealed as well that the information about more familiar and less familiar peers was equally available in memory (free recall, cued recall) and indicates that parts of the facilitative effect of familiarity come from differences in the ease of access to the stored information (see also Chi & Koeske, 1983).

Further studies examining familiarity in source attributions in younger or older children are not available to my knowledge. However, the study conducted by Baker-Ward et al. (1990, Experiment 2) indicate a marginal advantage for more familiar peer sources compared to less familiar peer sources in third graders. Clearer differences may exist between closer family members like parents and less or unfamiliar persons. It is possible that the differences between the more and less familiar sources in the study of Baker-Ward et al. (1990, Experiment 2) were too low to show the clear advantage of familiar sources that can be expected based on the previous presented assumptions and conclusions (Baker-Ward et al., 1990; Chi & Koeske, 1983; Symons & Johnson, 1997).

Because young children already have an extensive person specific knowledge about high familiar persons (Bauer, 2007; Fivush, 1997; Nelson, 1993; Symons & Johnson, 1997), it can be assumed that they also profit from their pre-existing person specific knowledge and encode, store and retrieve new information about events more successfully (e.g., Baker-Ward & Ornstein, 2002; Baker-Ward et al., 1990; Bauer, 2007; Begg & Snider, 1987; Fivush, 1997; Johnson & Raye, 2000; Nairne & Wider, 1988; Nelson, 1993; Ornstein, Baker-Ward, Gordon & Merritt, 1997; Symons & Johnson, 1997). Based on that, younger children should attribute high familiar person sources better to their memories than unfamiliar or less familiar person sources.

A high level of familiarity might also be suitable to examine the point in time when children first start to attribute sources correctly to their memories. As pointed out before, younger children may need more external support to encode, to store and to retrieve their memories (e.g., Bauer, 2002, 2007; Bauer & Wewerka, 1997; Bauer et al., 2000; Bjorklund et al., 2009; Brown, Bransford, Ferrara, & Campione, 1983; Ceci & Howe, 1979; Fivush, 2002; Fivush & Hamond, 1990; Hayne, 2007; Myers et al., 1987; Nelson, 2007; Nelson & Ross, 1980; Peterson & Rideout, 1998; Pipe et al., 1993; Steward et al., 1996). A high level of familiarity can enhance the encoding, storage and retrieval because it provides the children with more memory characteristics about the event and thus enhances the number of retrievable source specific memory characteristics. This additional knowledge might be particularly necessary for younger children because they might not be able to compensate the missing information otherwise (e.g., Bauer, 2002, 2007; Bauer & Wewerka, 1997; Bauer et al., 2000; Ceci & Howe, 1979; Fivush &

Hamond, 1990; Myers et al., 1987; Nelson, 2007; Nelson & Ross, 1980; Peterson & Rideout, 1998; Pipe et al., 1993; Steward et al., 1996). Using this additional knowledge, younger children might be able to attribute high familiar sources correctly to their memories earlier than unfamiliar sources.

The advantage of high familiar persons may also allow younger children to attribute reality monitoring (high¹⁸) familiar sources correctly to their memories earlier than reality monitoring unfamiliar sources. The higher number of retrievable source specific memory characteristics of high familiar person sources may increase the number of correct reality monitoring familiar source attributions and with it lead to source attribution rates above chance level (Baker-Ward et al., 1990; Symons & Johnson, 1997). Such an increase should not exist in the unfamiliar sources in a reality monitoring unfamiliar condition because the numbers of the retrievable memory characteristics are not enhanced by the pre-existing person specific knowledge, as there is not such knowledge available. Thus, a lower number of reality monitoring unfamiliar sources might be attributed correctly and with it, lead to later reality monitoring unfamiliar performances above chance level.

The assumption about earlier reality monitoring familiar performances should be true only for children younger than 4 years of age because children at 4 years of age attribute reality monitoring sources reliably and consistently to their memories (e.g. Baker-Ward et al., 1990; Roberts & Blades, 1999; Sussman, 2001; Welch-Ross, 1995; Experiment 1). Children at the end of the second year of life generally discriminate the own person from other persons (e.g., Bretherton & Beeghly, 1982; Eckensberger & Plath, 2006; Foley & Johnson, 1985; Gergely, 2002; Meltzoff & Brooks, 2001; Meltzoff & Moore, 1997; Perner & Ruffman, 1995; Povinelli, 2001; Premack, 1990; Wellman, 2002) and thus should be able to discriminate these persons as potential sources of memories. The high familiar person sources may allow the children younger than 4-years of age to attribute the reality monitoring familiar sources earlier than the reality monitoring unfamiliar sources because more source specific memory characteristics are available during the source decision processes. Because reality monitoring conditions always contain an internal source, it can be assumed that differences between different types of reality monitoring only result from the external familiar and unfamiliar sources. Possible systematic differences in the internal sources should be found, if they exist at all, equally in the different reality monitoring conditions and should be independent of the external reality monitoring sources. Thus, it can be assumed that differences between different reality monitoring conditions result from the different external source characteristics. This should be true as far as other source monitoring task conditions are identical in the reality monitoring conditions.

¹⁸ To increase the legibility, this addition is not used in the following but the term reality monitoring familiar condition is always related to high familiar person sources.

Besides this, the advantage of high familiar persons may also allow children below 4 years of age to attribute external source monitoring sources correctly to their memories. Children younger than 4 years of age usually have difficulties attributing external source monitoring sources correctly above chance level to their memories. Although they should have the conceptual understanding about the different external persons (e.g., Bretherton & Beeghly, 1982; Eckensberger & Plath, 2006; Foley & Johnson, 1985; Gergely, 2002; Meltzoff & Brooks, 2001; Meltzoff & Moore, 1997; Perner & Ruffman, 1995; Povinelli, 2001; Premack, 1990; Wellman, 2002), previous research shows that children younger than 4 years of age fail to attribute the external source monitoring sources correctly above chance level to their memories (Experiment 1). One reason for this finding seems to be that external sources contain a lower number of distinct source specific memory characteristics because they are more similar to each other (Lindsay et al., 1991; Johnson et al., 1993; Roberts, 2000). This makes external source monitoring performances more difficult in general (Johnson et al., 1993) and especially for younger children (Lindsay et al., 1991; Roberts, 2000; Experiment 1). If one external source is a high familiar person then more retrievable memory characteristics might be available for the high familiar source (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997) and with it a higher number of retrievable source specific memory characteristics. This may allow the children to attribute more high familiar external sources correctly to their memories and may help to discriminate the high familiar sources better from the less familiar or unfamiliar external sources (e.g., Lindsay et al., 1991; Johnson et al., 1993; Roberts, 2000). Based on that children younger than 4 years of age might be able to attribute so many external source monitoring sources correctly to their memories that their external source monitoring performances are above chance level. Thus, the advantage of high familiar persons may also allow children below 4 years of age to attribute external source monitoring sources correctly above chance level to their memories.

Based on the previous assumptions and conclusions I expected in experiment 2 that more familiar person sources are attributed correctly to their memories than unfamiliar person sources. This expectation is based on the assumption that for high familiar persons pre-existing person specific knowledge is available that can enhance the encoding, storage and retrieval of events (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). The enhancing effect of high familiar persons is expected to exist in the clustered high familiar sources across a reality monitoring and an external source monitoring condition as well as in the single sources in an external source monitoring condition. The advantage is expected to be found in younger 3-year-old children, in older 3-year-old children, in 4-year-old children and in 5-year-old children because all children already have a high person specific knowledge about familiar persons and thus should profit from this pre-existing knowledge (Bauer, 2002, 2007; Fivush, 1997; Nelson, 1993; Symons & Johnson, 1997).

In experiment 2, I also expected that the advantage of high familiar persons allow younger and older 3-year-old children to attribute earlier reality monitoring familiar sources correctly above chance level to their memories than reality monitoring unfamiliar sources. The higher number of retrievable source specific memory characteristics of high familiar external sources should increase the number of correct reality monitoring familiar source attributions and with it lead to source attribution rates above chance level (Baker-Ward et al., 1990; Symons & Johnson, 1997). Although it is possible that the additional person-specific knowledge of high familiar persons can increase the familiarity to other memories, I do not assume this to be the case in experiment 2. The main reason for this is that distinct events that are unknown to most of the children are used in the experiment. Thus, there should be a sufficient number of specific event characteristics available and therefore the person-specific memory characteristics should not be the only available source specific memory characteristics. Therefore, the person-specific knowledge should not make the source attributions more difficult in this experiment.

Besides this, I expected in experiment 2 that the advantage of high familiar persons also allows younger and older 3-year-old children to attribute external source monitoring sources correctly above chance level to their memories. Based on the higher number of retrievable source specific memory characteristics the children should be able to attribute the high familiar sources correctly to their memories (Baker-Ward et al., 1990; Symons & Johnson, 1997) and should be able to discriminate the high familiar and unfamiliar sources better from each other (e.g., Lindsay et al., 1991; Roberts, 2000). Thus, it is expected that the 3-year-old children attribute the external source monitoring sources correctly above chance level to their memories.

In experiment 2, the role of familiarity and multiple source attributions in a simultaneous source attribution condition are tested in the same experiment. It is possible that the procedure used for multiple source attributions in the simultaneous source attribution condition affects source attributions in the single source monitoring conditions and with it the source conditions containing high familiar and unfamiliar sources (reality monitoring familiar, reality monitoring unfamiliar, external source monitoring). If the multiple source attributions in the simultaneous source attribution condition affect source attributions in a negative manner, then it is not possible to draw conclusions about the role of familiarity anymore. Therefore, a pilot study tested whether the procedure of multiple sources in the simultaneous source attribution condition affects source attributions in the single reality monitoring and external source monitoring conditions. The pilot study (n= 16; 3- to 5-year-old children) showed no higher numbers of source confusions in the single reality monitoring and external source monitoring conditions (criterion: Number of source errors is significantly higher than chance level), thereby indicating that the multiple source attribution procedure does not affect these source attributions in a negative way. A higher number of source errors should have been found if the multiple source

attribution procedure affected the reality monitoring and external source attributions but this was not the case in the pilot study.

3.1.1.2 Multiple source attributions in simultaneous source attribution conditions

One important question in the development of source monitoring is when children are able to attribute sources correctly to memories about events in which more than two different types of sources are involved. On the one hand, this is an important theoretical question because if children are able to attribute multiple sources correctly to their memories then they have acquired the conceptual prerequisites of the single types of sources and reached a high level of flexibility in their source monitoring performance. This would indicate a more complex (nondeliberate) knowledge about the various types of sources of memories, about source decisions and about the source specific memory characteristics. Such a complex (nondeliberate) knowledge about source monitoring might also be the starting point for the development of explicit knowledge about source monitoring. On the other hand, this is an important question regarding the validity of daily life because in daily life usually more than two sources are involved in interactions or in events (Lindsay, 2002; Roberts, 2002). If children are able to discriminate between multiple sources of interactions or events then their source monitoring performance meets the requirements of the complexity of daily life. It is also of theoretical and practical interest how children discriminate between these various types of sources and what nondeliberate and/or deliberate strategies they use in their “simultaneous multiple source decisions”. Besides this, if children are able to discriminate between multiple sources of interactions or events then they should be able to recall and describe interactions and events more accurately.

From there, the aim of experiment 2 is to examine whether younger and older 3-year-old, 4-year-old, and 5-year-old children are able to attribute multiple sources in a simultaneous source attribution condition correctly to their memories. Besides this, the aim of experiment 2 is to specify what types of source errors they make that reveal insights in their (nondeliberate and/or deliberate) conceptual understandings and/or strategy use in complex source monitoring performances.

From a theoretical point of view, it can be assumed that children at the age of 3 years are able to attribute reality and external source monitoring sources correctly to their memories because they acquired the necessary conceptual understanding and differentiate between themselves from others (e.g., Bretherton & Beeghly, 1982; Foley & Johnson, 1985). Beyond this, at the age of 4 years it can be assumed that children are able to attribute imagined and performed internal source monitoring sources correctly to their memories because they obviously have the necessary more comprehensive conceptual understanding of imagined internal sources (Sussman, 2001; Welch-

Ross, 1995; Experiment 1). Research on children's source monitoring confirms that at the age of 3 years children attribute reality monitoring sources correctly to their memories (Hala et al., 2007; Roberts & Blades, 1995; Welch-Ross, 1995; Experiment 1). Nevertheless, no empirical evidence is available to show that 3-year-old children attribute two external sources correctly to their memories above chance level (Experiment 1). However, the available empirical data suggests that the poor external source monitoring performances in 3-year-old children may result from similar source task items and suboptimal source conditions that seem to underestimate young children's external source monitoring performances (Experiment 1). At the age of 4-years, children attribute reality, external and internal source monitoring sources correctly to their memories (Lindsay et al., 1991; Roberts & Blades, 1999; Sussman, 2001; Welch-Ross, 1995; Experiment 1). This shows that in source task conditions in which two or three sources are contained (e.g., source 1 vs. source 2, (and) new item), children at the age of 3 years are able to attribute reality monitoring sources and at the age of 4 years are able to attribute reality monitoring, internal and external source monitoring sources correctly to their memories.

If more than two or three sources are contained in a source task condition, the complexity of source monitoring processes usually increases because more types of sources could be the source of a specific memory and may need to be discriminated from each other (Bright-Paul, Jarrold, & Wright, 2005; Roberts & Blades, 1999). In such a multiple source task condition, higher cognitive demands and memory loads obviously exist. On the one hand, the source specific knowledge of each of the single sources needs to be available during the source monitoring processes in comparison to the source specific knowledge of a single or two different sources. This seems to lead to higher cognitive demands in multiple source task conditions. On the other hand, during the source decision processes the source may need to be discriminated not from only one other source but from two or three other sources that are (by itself) more or less distinctive from each other. This seems to lead to a higher memory load. The additional cognitive demands and the higher memory load might not be mastered by younger children (Bright-Paul et al., 2005) and can go along with a higher number of source errors if the memory loads extends the processing capacity. Younger children might be more vulnerable to such a cognitive overload than older children and younger children might be not able to compensate the higher cognitive demands and/or memory load otherwise (e.g., through the verbal representation system, through more extensive knowledge, through more extensive experiences with sources). Thus, it could be assumed that it is more difficult to attribute sources in a multiple source task condition correctly to their memories than in a single source task condition (e.g., Ferguson et al., 1992; Johnson et al., 1993; Roberts & Blades, 1999). However, this seems to be the case only if the single sources need to be discriminated from each other. This is not the case if the memory trace is vivid and clear enough so that the source can be attributed to its memory without discrimination(s) from other sources.

Another factor that may complicate source attributions of multiple sources in a simultaneous source attribution condition could be the variable time. Information about the temporal context is a source specific cue in source monitoring decisions (Johnson et al., 1993; Johnson & Raye, 1981; Pearse, Powell & Thomson, 2003; Powell & Thomson, 1997; Roberts & Blades, 1999). If events occur close together in time (e.g., within an hour), the temporal context may be a less effective source specific cue than the temporal context of events that do not occur close together in time. Single empirical studies indicate that memories are more confused when the events are presented close together in time rather than when they are not presented close together in time (Anastasi & Payne, 1995 cited by Roberts & Blades, 1999; Lindsay, 1990; Poole & Lindsay, 1995). However, at present it is not clear how the temporal context may influence young children's source attributions in different retrieval conditions (Roberts & Blades, 1999). Nevertheless, it seems to be the case that the sources of events that are presented closed together in time are more difficult to discriminate than events that are not presented close together in time (Anastasi & Payne, 1995; Lindsay, 1990). In relation to multiple source attributions, this means that multiple sources might be more difficult to attribute correctly to their memories because they are presented close together in time and thus temporal information cannot be used as an efficient source specific memory cue.

However, source attributions of multiple sources in a simultaneous source attribution condition can enhance source-monitoring performance as well. This possible advantage based on the assumption that in traditional recognition procedures, (intact) source information is used in a sub-optimal manner and may cause source confusions (Bright-Paul et al., 2005; Chambers & Zaragoza, 2001; Lindsay & Johnson, 1989; Zaragoza & Lane, 1994). According to Bright-Paul et al. (2005) inspecting all possible sources simultaneously could be a crucial factor in achieving an optimal retrieval procedure for source information. Empirical findings show that participants are more likely to incorrectly recall that they had "seen" items which they had in fact generated if they were asked "Did you see x?" than if they were asked "Was the item seen, generated or new?" (Marsh & Hicks, 1998). Based on this finding Bright-Paul et al. (2005) concluded that it is "plausible that independent consideration of each source in the verbal "question pair" method may inadvertently induce a "source in question" bias" (p. 3, Bright-Paul et al., 2005). Bright-Paul et al. (2005) conducted a study that shows that using a source misinformation paradigm encouraging consideration of source information during retrieval can reduce 3- to 4- and 6- to 7-year old children's suggestibility. Besides this, the effectiveness of reducing suggestibility by orienting the source is more effective when all sources are considered simultaneously (both sources, film only, story only, new in a source box condition with pictures) rather than the sources are considered sequentially via source question pairs (yes-no source question pairs in a source question condition). Bright-Paul et al. (2005) concluded that young children's suggestibility could be at least partially accounted for an under-use of intact source information.

The use of indirect strategies in form of simultaneous source options and source posting boxes obviously lead to a reduction of suggestibility (Bright-Paul et al., 2005).

The conclusions and empirical findings presented by Bright-Paul et al. (2005) suggest an advantage of source attributions of multiple sources in a simultaneous source task condition because more source specific information might be used during the source decisions. This advantage seems to already exist in 3- to 4-year-old children although media sources and not real-person sources have been used. Based on this assumption and the empirical findings it can be assumed that children as young as 3- to 4-years-old can attribute multiple sources in a simultaneous source attribution condition correctly to their memories and may even attribute a higher number of sources correctly to their memories.

When source attributions of multiple sources are examined in a simultaneous source attribution condition, the question comes up about whether open-ended or closed-ended source questions should be used. On principle, both open-ended and closed-ended source questions can be used in a simultaneous source attribution condition. However, the two types of questions place different demands on memory (Drumme & Newcombe, 2002; Poole & Lindsay, 1995; Roberts & Blades, 1998; Lamb, Orbach, Warren, Esplin & Hershkowitz, 2007) and define the conclusions to be drawn out of the used question type. The main characteristic of open-ended memory or source questions is that no limitations concerning the answer exist. The responding person can freely recall what s/he remembers about the asked event or source. This is particularly the case for open-ended wh- questions (e.g., Lamb et al., 2007; Poole & Lindsay, 1995). Research has repeatedly shown that the responses to open-ended wh- questions are usually very accurate (e.g., Bauer, 2002; Fivush, Peterson & Schwarzmüller, 2002; Hamond & Fivush, 1991; Hudson, 1990; Poole & Lindsay, 1995; Roberts & Blades, 1998; Lamb, Sternberg, Orbach, Esplin, Stewart & Mitchell, 2003; Lamb et al., 2007). In free recall, higher accuracy is also supported by the tendency that persons mainly report memories and/or sources that they are confident of (Lamb et al., 2007; Roberts & Blades, 1998). Another advantage of open-ended questions is that typically no indirect or direct pressure is created to report a certain number of memories or sources (Lamb et al., 2007; Roberts & Blades, 1998). Besides this, open-ended questions avoid implying that the interviewer prefers a particular response, and open-ended questions make it easier for children to answer, “I don’t know” if they cannot answer the question (Peterson, Dowden & Tobin, 1999). Nevertheless, open-ended questions are more demanding because only general retrieval cues are available in the question (Lamb et al., 2007). The specific memory needs to be identified first and then the single memory characteristics or the source of that memory needs to be retrieved without any additional cue. On the one hand, this requires a sufficient memory trace of that specific memory and it requires the use of memory (nondeliberate or deliberate) strategies if the access is not possible or the memory trace is too weak. In relation to open-ended source question, it is also necessary to identify the possible

sources of that specific memory because the possible sources are typically not contained in an open-ended source question. If the possible sources are not identified, the correct source cannot be attributed to its memory (as far as the source cannot be attributed correctly to its memory based on the specific memory trace only).

In contrast, the main characteristic of closed-ended memory or source questions is that the question contains the possible answer and in many cases all different possible alternatives (Lamb et al., 2007; Roberts & Blades, 1998). In some closed-ended questions, only the recognition of a memory or a source is required. Thus, in closed-ended questions more memory or source specific cues are contained that can aid retrieval. Closed-ended questions are therefore less demanding and have a lower memory load compared to open-ended questions (Bright-Paul, et al., 2005; Roberts & Blades, 1998). However, the memory load of closed-ended questions could be high as well, especially in long questions that contain various response alternatives. Thus, closed-ended questions contain both possibilities,- they could be less demanding and contain a lower memory load but can be more demanding and contain a higher memory load as well. Besides this, research shows that closed-ended questions go along with lower memory accuracy and source accuracy in adults and in children (Flin, Boon, Knox & Bull, 1995; Poole & Lindsay 1995; Poole & White, 1991, 1993). One of the reason for this seems to be that uncertain memory characteristics are used in closed-ended question responses that may cause the lower accuracy (Roberts & Blades, 1998). Besides this, closed-ended memory or source questions can imply a direct or indirect pressure to provide the interviewer with a response and prompt adults and children to respond to the question although a memory is not available or is quite uncertain (Lamb et al., 2007; Roberts & Blades, 1998).

Considering the aim of examining whether children, attribute multiple sources in a simultaneous source task condition correctly to their memories, open-ended source questions seem to be better suited than closed-ended source questions. The reasons are that in open-ended source questions (1) source accuracy is higher, (2) the memory load caused by long sentences is reduced and (3) typically do not imply (indirect or direct) pressure to provide the interviewer with a response although a correct response cannot be given (e.g., Lamb et al., 2007; Roberts & Blades, 1998). Nevertheless, open-ended source questions bear the risk that the cognitive and memory demands are too high particularly for younger children. One solution for the employment of open-ended questions in younger children would be that first, an open-ended source question is asked. If the child cannot answer this question, a closed-ended source question could be used in that only the correct source and the source alternatives are presented. This would provide the younger children with the necessary cues if they cannot answer the source question without them. A closed-ended source question in which only the sources are contained would also reduce the cognitive demands and the memory load of this question because new items or new sources are not contained and therefore do not need to be discriminated from the old items. Thus, the use of a closed-ended source question after an open-ended source question takes the cognitive demands

of younger children into consideration and still allows the examination of source attributions if the open-ended question could not be answered. In experiment 2, an open-ended source question will be used first and if the child cannot answer this question a closed source question will be asked.

The examination of the ability to attribute multiple sources in a simultaneous source attribution condition also allows analysing the source errors children make if they cannot attribute the source correctly to their memories. Such source errors can give insights in the conceptual understanding and the conceptual changes of the children (Welch-Ross, 1995) and can allow conclusions whether and how such source errors could be controlled or reduced.

In open-ended source questions of the type “Who looked [under the magic window of this picture book]?” two main types of systematic source errors can be distinguished:

Intraexperimental source errors and extraexperimental source errors. *Intraexperimental source errors* are source errors in which the alternative source of the source condition in the experimental situation is falsely selected as the correct source (Drummey & Newcombe, 2002). For example, in a reality monitoring source condition the intraexperimental source error would be if a child *misattributes* the experimenter as the external source to an action the child has been carried out by itself. In simultaneous source attribution conditions, a second type of intraexperimental source errors can appear. These are intraexperimental source errors in that the source from another source monitoring condition of the experimental situation is falsely selected. For example, in a reality monitoring source task such an intraexperimental source error would be if a child *misattributes* the mother as the external source to a previously carried out action although the mother does not participated in that source condition. To distinguish these two possible types of intraexperimental source errors from each other, it is useful to name the first type of error as intra-intraexperimental source errors and the second type of source error as inter-intraexperimental source errors. *Intra-intraexperimental source errors* then refer to errors relating to sources that are contained in the respective source condition of the experimental situation. *Inter-intraexperimental source errors* then refer to errors relating to sources that are not contained in the respective source condition but are in another source condition within the experimental situation. With the inter-intraexperimental source errors, a problem that arises is that the same source (e.g. the experimenter as the external source) can be contained in more than one source condition. In such a case, it would be necessary to further specify the source task in order to identify if the error made really was an inter-experimental source error or actually an intra-experimental source error. Besides intraexperimental source errors, the second main type of source errors are extraexperimental source errors. *Extraexperimental source errors* involve source errors in which the alternative source is a source from outside the experimental situation (Drummey & Newcombe, 2002). For example, in a reality monitoring source condition an extraexperimental source error could be the kindergarten teacher. Because the kindergarten

teacher does not belong to the sources included in the conducted source experiment it is an extraexperimental source error.

Based on the source monitoring framework, differences between the three types of systematic source errors can be derived. The source monitoring framework contains the assumption that with a decreasing number of source specific memory characteristics during the source decision processes, the number of source errors can increase because less distinctive memory characteristics are available that allow a clear and reliable source attribution (Johnson et al., 1993; Johnson & Raye, 2000; Lindsay, 2002; Lindsay et al, 1991). It can therefore be assumed that intra-intraexperimental source errors might be higher than inter-intraexperimental and extraexperimental source errors because a lower number of source specific memory characteristics are contained in that type of source. This is the case for contextual source cues and time-related source cues. In intra-intraexperimental sources the source task context is usually very similar (e.g., identical picture book page) and may not contain so much distinctive source specific contextual cues. Besides this, the coincidence of the single items is usually high and thus time related cues might be not available as well. From there, in intra-intraexperimental sources less or no distinctive contextual and time related cues are available in the source decisions processes and thus can lead to a higher number of source errors.

In comparison, inter-intraexperimental source errors should be lower than intra-intraexperimental source errors because more contextual cues (e.g., different picture-book pages) and time related cues (e.g. time interval between the single tasks) should be available in the source decision processes. These additional contextual and time related cues should reduce the number of inter-intraexperimental source errors in comparison to the number of intra-intraexperimental source errors. In contrast, the number of extraexperimental source errors should be lowest in comparison to intra-intraexperimental source errors and to inter-intraexperimental source errors because on principle distinctive contextual and time related cues should be available during the source decision process. Both types of cues should reduce the number of extraexperimental source errors.

Currently, there are single direct and indirect empirical findings available about the assumed differences between the three types of source errors. The first empirical finding comes from a study conducted by Drummey and Newcombe (2002). They examined (intra-) intraexperimental and extraexperimental source errors in a fact source task in one-hundred-sixty-seven 4-, 6- and 8-year old children. In their fact source task, children were presented 10 novel facts, five by an experimenter and five by a puppet. After a one-week delay, source-monitoring performances were assessed by an open-ended source question and if the child did not respond to that question a closed-ended source question was asked (source alternatives: experimenter, puppet, parents, teachers). The study showed that a higher number of intraexperimental source errors than extraexperimental source errors were made in 6- and 8-year-olds. In contrast, 4-year-olds showed higher extraexperimental source errors than intraexperimental source errors after the

one-week delay. With these findings, the study of Drummey and Newcombe (2002) supports in principle the previous derived assumption that less extraexperimental source errors are made than intraexperimental source errors. Nevertheless, empirical support for this assumption depends on age and was only found in 6- and 8-year old children after a one-week delay. In 4-year-old children the opposite error distribution was found indicating that younger children may not use contextual and time related cues as effectively as older children and thus are more susceptible to extraexperimental source errors. One explanation for the age differences in intraexperimental and extraexperimental source errors seems to be the one-week delay. Drummey and Newcombe (2002) reported that in two further groups of 4-year-old children, almost no extraexperimental source errors (2 %) were made in an immediate source test and a low number of extraexperimental source errors (13 %) were found after a five-minute delay. Both extraexperimental source errors were lower than the intraexperimental source errors. These additional findings indicate that the time delay seems to be a critical factor for the type of source errors young children make. Nevertheless, these additional findings support the assumption that 4-year-old children also make less extraexperimental source errors than intraexperimental source errors after short delays.

To my knowledge, further empirical studies examining the differences between (intra-) intraexperimental and extraexperimental source errors in children below 6 years of age are not available. The same is true for direct comparisons between extraexperimental and inter-intraexperimental source errors and for direct comparisons between intra-intraexperimental source errors and inter-intraexperimental source errors. To my knowledge, no studies exist examining these types of source errors in younger children. Nevertheless, empirical studies examining single types of source monitoring indicate that (intra-intraexperimental) source errors increase if less or no contextual or time related cues are available (e.g., Sussman, 2001; Roberts & Blades, 1998). Besides this, a high level of similarity between the source task items and the sources increases the number of (intra-intraexperimental) source errors as well (e.g., Johnson et al., 1993; Lindsay et al., 1991). Thus, it can be assumed that if a higher number of contextual and time related cues are available in intra-experimental sources then source errors should be reduced. The same could be expected for inter-experimental sources. If a higher number of contextual and time related cues are available in inter-experimental sources then source errors should be low.

The empirical findings support the assumption that intra-intraexperimental source errors are higher than inter-intraexperimental and extraexperimental source errors because a low number of contextual and time related cues are available that can be used in the source decision processes. Besides this, it can be assumed that inter-intraexperimental source errors are higher than extraexperimental source errors because a lower number of contextual cues are available and leading to higher source errors. This assumption has empirical support for short source test delays and at least for children at 4 years of age.

In experiment 2, I expected that the 3-, 4- and 5-year-old children attribute the selected multiple sources correctly to their memories in the simultaneous source attribution condition with the open-ended source question, “Who previously looked under that magic window (and told what was seen)?” (e.g., Bright-Paul et al., 2005). In relation to the *4- and 5-year-old children*, I expected that they attribute all sources correctly to their memories because they already acquired the conceptual understandings about the single types of sources (e.g., Lindsay et al., 1991; Sussman, 2001; Welch-Ross, 1995, Experiment 1). Thus, they should attribute the sources correctly without additional information in the open-ended source question. In the case of the internal source monitoring sources, it is expected that the 4- and 5-year-old children differentiate between the two internal sources by themselves. In relation to the *younger and older 3-year-old children*, it is expected that they attribute the reality monitoring sources and the external source monitoring sources correctly to their memories because they should have acquired the conceptual understanding of these types of sources (Roberts & Blades, 1999, Welch-Ross, 1995; Experiment 1). In the case of the internal source monitoring sources, it is expected that the younger and older 3-year-old children are at least able to identify the performed and imagined source as the internal child source in the simultaneous source attribution condition (c.f., Bright-Paul et al., 2005). However, it is not expected that the 3-year-olds further specify these two internal sources because it was assumed that they need additional external cues to attribute internal source monitoring sources correctly to their memories (cf., Chapters regarding the optimization of the internal source monitoring instruction). In experiment 2, the criterion of successful source attributions in the simultaneous source attribution condition is that the source attribution rates of each type of source monitoring are above chance level.

Another prediction made in experiment 2 is that the 3-, 4- and 5-year-old children make more intra-intraexperimental source errors than inter-intraexperimental source errors. I expected that the 3-, 4- and 5-year-olds make more intra-intraexperimental source errors than extraexperimental source errors. Both hypotheses are based on the assumption that compared to the two other types of sources in the intra-intraexperimental sources, a lower number of contextual and time related source cues are available. This makes source attributions more difficult and goes along with a higher number of source errors (cf., Johnson et al., 1993, Lindsay et al., 1991; Roberts, 2000). Because the highest number of contextual and time related cues are available in extraexperimental sources, I also expected that the extraexperimental source errors are lower than the inter-intraexperimental source errors.

The analyses of the intra- and extraexperimental source errors require that source errors are made in the first place. For an adequate interpretation of the source errors, it is also necessary to know how the source errors are distributed in the four source conditions and in the four age groups. Otherwise, there is a risk that conclusions are drawn for all conditions or groups that are actually only valid for single conditions or groups. For this reason, the frequencies and the distribution of

the source errors are discussed first followed by the discussion of the differences between the two intraexperimental and the extraexperimental source errors.

3.1.1.3 Optimizing the internal source monitoring instruction

Research on internal source monitoring shows that 4-year-old children attribute internal source monitoring sources correctly (above chance level) to their memories (Sussman, 2001; Welch-Ross, 1995; Welch-Ross, 2000; Experiment 1). In contrast, 3-year-old children are not able to attribute internal source monitoring sources containing an imagined source correctly at an above chance level to their memories (Welch-Ross, 1995; Welch-Ross, 2000; Experiment 1). The difficulty of 3-year-old children with internal source attributions seems to lie in the imagined internal sources. Otherwise, 3-year-old children would not be able to attribute performed internal and reality-monitoring sources correctly to their memories (Hala et al., 2007; Roberts & Blades, 1995; Welch-Ross, 1995; Experiment 1). In this section, I examine the specific difficulties 3-year-old children seem to have with imagined internal sources and I derive how internal source monitoring instructions can be optimized to allow 3-year-old children to make correct internal source attributions at an above chance level.

One reason for 3-year-olds' difficulty with imagined internal sources might be because they still do not have a comprehensive and stable mental state understanding the correspondence of imagined entities to the real physical world (Estes, et al., 1989; Flavell, et al., 1983; Wellman & Estes, 1986; Woolley, 1997; Woolley & Bruell, 1996; Woolley & Phelps, 1994; Woolley & Wellman, 1990, 1993; Welch-Ross, 1995). For correct imagined internal source attributions the understanding that imaginations do not filter into the physical world seems to be necessary (Foley & Johnson, 1985; Welch-Ross, 1995). If children understand imagined mental representations as existing in the physical world, although they (already) know that they are internally generated and violate physical entities, then they may handle imagined representations as really being carried out in their imagined internal source decisions. This would mean that 3-year-old children *attribute* imagined internal sources correctly to their memories correspondingly to their understanding of imagined representations, but *misattribute* imagined internal sources because they treat imagined representations similar or as *not* distinct from reality-based mental representations. In contrast, if children have acquired the understanding that imagined representations do not filter into the physical world then they should attribute imagined sources correctly to their memories. This comprehensive understanding of the distinction between the mind and the world exists in 4-year-old but not in 3-year-old children (Wellman & Estes, 1986; Woolley & Phelps, 1994; Woolley & Wellman, 1993; Welch-Ross, 1995). Consequently, 4-year-old children should be able to attribute imagined internal sources correctly to their memories, as is the case in 4-year-old children. They seem to have the necessary conceptual understanding of

imagined internal sources available (Sussman, 2001; Welch-Ross, 1995; Welch-Ross, 2000; Experiment 1). This leads to the conclusion that if a more comprehensive understanding of the distinction between the mind and the world is available (cp., Wellman & Estes, 1986; Woolley & Phelps, 1994; Welch-Ross, 1995), then imagined internal sources can be attributed successfully to memories (cf., Welch-Ross, 1995; Experiment 1). One reason for the difficulty of 3-year-old children with imagined internal source attributions seems to be their *less* comprehensive and stable mental state understanding about the correspondence of imagined entities to the real physical world.

A second reason for 3-year-olds difficulties with imagined internal sources could be that they have difficulties understanding and responding correctly to the verbal imagined internal source question. Although 3-year-old children understand that thinking differs from reality (e.g. Estes et al., 1989; Flavell, Green & Flavell, 1995; Watson, Gelman & Wellman, 1998; Woolley & Phelps, 1994; Wellman & Estes, 1986; Wellman, Hollander & Schult, 1996), they may have difficulties understanding and responding correctly to the question “Did you think it (previously) (in your head)”. It is possible that the contents and/or the grammatical structure of the question are (still) too demanding for 3-year-old children (cf., Fritzley & Lee, 2003; Imhoff & Baker-Ward, 1999; Lee & Eskritt, 1999). At that age, the verbal representation system is still developing. Central quantitative and qualitative changes take place in the verbal representation system that influence children’s abilities to understand and to act with more demanding verbal questions, orders, statements and narratives (e.g., Bauer, 2007; Goody, 1978; Grimm, 2001, 2003; Hoff, 2006; Lee & Eskritt, 1999; Nelson, 1996; Siegal, 1997; Weinert, 2006). This seems to be true as well for mental state understanding and the specific verbal abilities that seem to be necessary for such understandings (e.g., Astington & Jenkins, 1999; Carlson & Moses, 2001; de Villiers & Pyers, 2002; Lockl et al., 2004; Olson, 1993; Perner, 1991; Ruffman et al., 2003; Sodian & Thoermer, 2006; Wellman et al., 2001). Although 3-year-old children may already understand each single word of the imagined internal source question, they may not understand the question as a whole or single (essential) parts of it (e.g., Fritzley & Lee, 2003; Harner, 1975; Goody, 1978; Lee & Eskritt, 1999; Siegal, 1997; Walker, 1994). Another possibility could be that 3-year-old children understand the single words and the grammatical structure of the question correctly but fail to respond verbally to the question (e.g., Fritzley & Lee, 2003; Harner, 1975; Lee & Eskritt, 1999; Siegal, 1997; walker, 1994). If any of the reasons are correct then the verbal responding format should be adapted to the special needs of the 3-year-old children.

A third possibility of the difficulties of 3-year-old children is that the imagined internal source question may not contain enough appropriate (verbal) cues for the 3-year-old children to get the correct meaning of the question (c.f., Bright-Paul et al., 2005). Based on their rudimentary meta-cognitive knowledge (e.g., Bjorklund et al., 2009; Drummey & Newcombe, 2002; Johnson et al., 1993; Lindsay et al., 1991; Schneider & Bjorklund, 1998; Schneider & Lockl, 2006; Schneider & Pressley, 1997; Sussman, 2001), they might be not able to generate or to use additional cues to

get the correct meaning of the question (Brown, Bransford, Ferrara & Campione, 1983; Hammond & Fivush, 1991; Flavell et al., 1993; Steward et al., 1996).

However, if the reason for the 3-year-olds difficulty with imagined internal sources are their verbal understanding/responding to the imagined internal source questions “Did you think it (previously) (in your head)”, then an adaptation of the imagined internal source question to the specific verbal abilities of the 3-year-olds should lead to correct imagined internal sources attributions. If 3-year-old children were able to attribute imagined internal sources correctly to their memories in an optimized imagined source question condition, then this would mean that they already have the necessary conceptual understanding of imagined internal sources (i.e., a more comprehensive understanding about the correspondence of imagined entities to the real physical world). In contrast, if 3-year-old children were not able to attribute imagined internal sources correctly in an optimized source question condition, then this would indicate that the used adaptation of the imagined internal source question is not appropriate. In such a case, it needs to be tested whether the selected verbal terms, the encoding of imagined specific memory characteristics or the mental state conceptualisation prohibit younger children to understand and/or respond correctly to imagined internal source question. If 3-year-old children attribute imagined internal sources correctly to their memories under an optimal source question condition, it would show what the optimal internal source instructions are and whether/how, internal source monitoring in 3-year-olds children can be supported. The question that then comes up is, how can the imagined internal source question or the imagined internal source instruction be adapted to the specific abilities of 3-year-old children?

There are several possibilities. First, the single words of the question can be replaced by easier, high familiar words. Second, the grammatical structure of the question can be adapted to the grammatical abilities of the 3-year-olds. Third, specific cues can be added to the question to support the understanding/responding of the question. Such cues could be perceptual cues (e.g., seen, smelled), time-related cues (e.g., this morning), event-related cues (e.g., when we were in the zoo at the lion cage) or cues related to source specific mental activities (e.g., when I thought it silently in my head). It is also possible to use a combination of verbal and nonverbal source questions or to use exclusively nonverbal source instructions. However, before using combined verbal and nonverbal source questions or nonverbal instructions, the different possibilities of verbal questions/responses should be exhausted because nonverbal questions/responses go along with special experimental qualities that influence the conclusions¹⁹.

In relation to the typically used source question, “Did you think it (previously) (in your head)?” using easier single words are not possible because the easiest single words are already used. The same is true for the grammatical structure. The easiest grammatical structure is already used and

¹⁹ Nevertheless, such instructions or procedures are inalienable in children that do not have yet a more comprehensive verbal representation system.

the grammatical structure is familiar to 3-year-old children. One characteristic that seems to have the potential to optimize further the internal source question is the use of a cue that specifies the mental state source “thinking”. Although 3-year-old children understand, what “thinking” is and that it differs from reality (e.g., Estes et al., 1989; Flavell et al., 1995; Woolley & Phelps, 1994; Wellman et al., 1996; Wellman, 2002) they may have difficulties understanding and/or identifying their previous actions as thoughts when asked about them. The term “thinking” might already be known but the term might not yet be used correctly in other verbal contexts. Using the term “thinking” correctly in other verbal contexts, younger children may require additional concrete cues for this source specific mental activity. Such a concrete cue for the mental activity “thinking” might be the perceptual characteristic “silent”. “Thinking” is carried out silently with no auditory information. The addition of the perceptual characteristic “silent” in an imagined internal source question may allow the 3-year-old child to identify its previous action as thoughts because their (previous) thoughts were “carried out” silently.

Indications for the usefulness of a perceptual cue come from single research areas. Younger children mainly use perceptual information and are highly familiar with perceptual characteristics (e.g., Posner et al., 1976; Welch-Ross, 1995). This is particularly the case for visual and auditory information (e.g., Lewkowicz, 1994; Posner et al., 1976). Research on theory of mind also indicates that 3-year-old children already identify the perceptual source of objects that were seen or told before (Estes et al., 1989; Flavell et al., 1986; Gopnik & Graf, 1988; O’Neill et al., 1992; O’Neill & Chong, 2001; O’Neill & Gopnik, 1991; Sodian & Wimmer, 1987; Wellman & Estes, 1986; Wimmer, Hogrefe & Perner, 1988; Wimmer, Hogrefe & Sodian, 1988). Thus, the use of the perceptual characteristic “silent” seems to be an appropriate external source cue for the mental activity “thinking” because such perceptual characteristics are mainly used and are highly familiar to 3-year-old children. It can be assumed that the source specific perceptual cue “silent” allows 3-year-old children to attribute internal source monitoring sources correctly at an above chance level to their memories if the reason for the difficulty with the imagined internal source is that they need external source specific cues to identify the mental state activity “thinking” correctly. Besides this, if the term “loud” is used for the performed internal source, it may also help 3-year-old children to discriminate between the two internal sources

However, using the *perceptual cue “silent”* for imagined internal sources would also consider the idea that 3-year-olds’ difficulties with imagined internal sources may result from the encoding of sensory/perceptual characteristics only (Welch-Ross, 1995). Corresponding to the source monitoring framework, memories derived from thoughts or imaginations consists mainly of cognitive operations and contain less sensory/perceptual characteristics (Johnson et al., 1993). In contrast, performed or observed actions (or events respectively) consist mainly of sensory/perceptual characteristics and include less cognitive operations (Johnson et al., 1993). If only sensory/perceptual memory characteristics are available during the source decision

processes then it might not be possible to attribute imagined internal sources correctly because too little or no cognitive operations are available that allow the identification of imagined sources (Welch-Ross, 1995). Thus, source confusions (may) occur and lead to source attribution rates at or below chance level. This seemed to be case in a study conducted by Welch-Ross (1995) and lead to her to conclude that 3-year-old children appeared to encode imagined, (and performed and pretended) actions according to the sensory/perceptual characteristics rather than according to cognitive operations. Thus, their 3-year-old children could not attribute imagined sources on a significant level (Welch-Ross, 1995). If the perceptual cue “silent” is used in an internal source task, then sufficient (sensory/) perceptual characteristics might be available for imagined sources and thus it might be not necessary to use (additional) cognitive operations in the internal source decision process. Using the perceptual cue “silent” in the internal source question can compensate the missing encoded cognitive operations in 3-year-old children and allow imagined internal source attributions on perceptual characteristics only. If this is the case, then it needs to be specified in the following whether the performance results from the source decisions based on the encoded sensory/perceptual characteristics or from the assumption that the perceptual cue helps children identify their previous carried out mental activity “thinking”. This specification is necessary in the following because both reasons are confounded in such a source question condition.

Using the perceptual cue “silent” for imagined internal sources also takes the idea into account that 3-year-olds’ difficulties with imagined internal sources may result from the encoding of sensory/perceptual characteristics only and thereby lead to imagined internal source attribution rates at only a chance level.

Empirical studies examining how the (imagined) internal source monitoring question or instructions can be optimized for younger children are not available to my knowledge. However, research about internal source monitoring shows that using the typical imagined internal source question “Did you think it (previously) (in your head)?”, children below 4 years of age are *not* able to attribute internal source monitoring sources correctly to their memories (Sussman, 2001; Welch-Ross, 1995; Experiment 1). Derived from the previous theoretical considerations, it can be assumed that the perceptual characteristics “silent” for the imagined internal source and “loud” for the performed internal source are appropriate optimizations of the internal source questions to the cognitive abilities of 3-year-old children and thus should allow them to attribute internal source monitoring performances correctly to their memories.

In experiment 2, it is assumed that in imagined internal source decisions 3-year-old children need an external source specific cue to identify their previous actions as “thoughts”. It is further assumed that for 3-year-old children a perceptual cue is an appropriate source specific external

cue because 3-year-olds mainly use (i.e., encode, store and retrieve) and are more familiar with perceptual information (e.g., Posner et al. 1993; Welch-Ross, 1995). Therefore, the external perceptual cue “*silently* thinking in your head” is used for the imagined internal source. Besides this imagined internal source cue, in experiment 2, a perceptual source cue is also used for the performed internal source because it is assumed that such a perceptual cue make the performed actions more distinctive and thus enhances performed internal source attributions. Therefore, the external perceptual cue “said it loudly” is used for the performed internal source.

In experiment 2 it is expected that younger and older 3-year-old children attribute internal source monitoring sources correctly at an above chance level to their memories if the internal source question “Did you previously think it silently in your head (or) did you say it previously out loud” is used. This is expected to be true across both sources of the internal source monitoring task and in the two single internal sources (imagined and performed internal source).

Hypotheses about the facilitating effect of the perceptual cues for internal source questions should not apply for 4- and 5-year old children because children above 4 years of age are already able to attribute internal source monitoring sources correctly to their memories if the typical source question “ Did you perform it or did you think it (previously) (in your head)?” is used (Sussman, 2001; Welch-Ross, 1995; Experiment 1).

In experiment 2, the combined internal source instruction “Did you previously think it *silently* in your head or did you say it previously out *loud*” will be used as the optimization of the internal source questions in the internal source monitoring task²⁰.

It is possible that the multiple source attribution procedure in the simultaneous source attribution condition affects the examination of the internal source monitoring instruction. This could be the case because first the open-ended source question is used. If the children are already able to attribute the internal source monitoring sources correctly after that question, then it would not be necessary or maybe even incomprehensible for the children to ask them a second internal source question. Based on the low internal source attribution rates in internal source monitoring studies (e.g., Welch-Ross, 1995) and the previously pointed out explanations, it seems to be improbable that the 3-year-old children attribute both internal sources correctly to their memories after the open-ended source question by themselves. Nevertheless, this is possible and needs to be examined and controlled experimentally if the optimization of the internal source monitoring instruction will be tested. Because no information is available, on whether and how much 3-year-old children attribute the two internal sources correctly to their memories in a simultaneous source attribution condition with an open-ended source question, this need to be tested in experiment 2. If too many 3-year-olds attribute both internal sources correctly to their memories

²⁰ The internal source question will be asked always after the child identified itself as the internal source.

after the open-ended source question, then the optimization of the internal source monitoring instruction cannot be examined in a meaningful manner. In relation to the smaller sample sizes of experiment 2 in each of the age groups, it is defined that no more than 2 children per age group should attribute the two internal source monitoring sources correctly to their memories after the open-ended source question. This seems to be a logical assumption from a theoretical and a statistical point of view. If more 3-year-olds attribute the two internal sources correctly to their memories after the open-ended source question, then the examination of the optimization of the internal source monitoring instruction will be terminated. In this case, no meaningful conclusion about the optimization of the internal source monitoring instruction can be drawn in a simultaneous source attribution condition. Then the optimization of the internal source monitoring instruction for 3-year-old children needs to be tested in a single source monitoring condition. There, it will first be tested whether the 3-year-old children attributed the internal sources (told or thought) correctly to their memories after the open-ended source question. If this is the case and the source attributions are above the fixed cut-off rate, then the analyses about the effects of the optimization of the internal source instruction will not be carried out.

3.1.2 Identifying factors relevant to early source monitoring

Now I turn to my second aim of experiment 2 and examine in four sections whether inhibition, verbal abilities, theory of mind abilities and social variables are factors relevant to early source monitoring performances²¹. I start with the relation between inhibition and source monitoring (3.1.2.1). After that, I derive and discuss the relations between verbal abilities and source monitoring (3.1.2.2) and continue with the relation between theory of mind abilities and source monitoring (3.1.2.3). Finally, I analyse the relation between selected social variables and source monitoring (3.1.2.4).

3.1.2.1 The relation between inhibition and source monitoring

The ability to inhibit irrelevant information may play a central role in source monitoring. In this section, I analyse the available theoretical assumptions and empirical findings to get an answer to the question whether and how inhibition is relevant to source monitoring. I begin with pointing out the theoretical relation between both abilities, then present the available empirical findings and derive the hypotheses that are tested in experiment 2.

²¹ The predictions of source monitoring by the four groups of factors are also not included in this treatise because of the limited space available.

The relation between inhibition and source monitoring has been taking up in research on source monitoring in the last years. A few years ago, Roberts and Powell (2005) specified the possible relation between inhibition and source monitoring on a theoretical and on an empirical level. Based on the empirical findings that children can retrieve target and non-target information (e.g., Powell & Roberts, 2002), Roberts and Powell (2005) assumed that accurately reporting target information and its source seem to involve the inhibition of target irrelevant information. Inhibition itself is a central construct of the executive functions (Rothbart & Posner, 1985) that encompass a heterogeneous set of skills that aid monitoring and controlling thoughts and actions (e.g., Carlson, Moses & Breton, 2002; Zelazo, Carter, Reznik & Frye, 1997). Executive functions include the following skills: inhibitory control, planning, attentional flexibility, self-monitoring, error correction, error detection, and resistance to interference (Carlson et al., 2002; Pennington, Rogers, Bennetto, Griffith & Shyu, 1997; Welsh, Pennington & Groisser, 1991; Zelazo et al., 1997). The ability, to inhibit information, thought processes and actions of irrelevant target information, is known as inhibitory control (e.g., Luria, 1973; Zelazo et al., 1997, Zelazo, Müller, Frye & Marcovitch, 2003). Inhibitory control starts developing at the age of 3 years and reaches adult level at the age of 12 (e.g., Diamond, Prevor, Callender & Druin, 1997; Kochanska, Murray & Coy, 1997; Zelazo et al., 1997; Zelazo et al., 2003). Most researchers acknowledge that the central improvements in inhibitory control during the preschool and school year result from frontal lobe developments (e.g., Dempster, 1993; Frye et al., 1995; Gerstadt, Hong & Diamond, 1994; Kochanska, Murray, Jacques, Koenig & Vandergeest, 1996; Passler, Isaac & Hynd, 1985; Zelazo et al., 1997; Zelazo et al., 2003). At the same early age period, children become more competent in monitoring the source of their memories, knowledge and beliefs (e.g., Johnson et al., 1993; Lindsay, 2002; Roberts, 2002). Although for example Schacter (1987) argues that source monitoring does not necessarily require executive functions and that source monitoring and inhibition tend to co-occur because they rely on the same brain regions, Roberts and Powell (2005), Ruffman et al. (2001) and Wheeler, Stuss and Tulving (1997) proposed that source monitoring seems to require executive functions or inhibition respectively. This is the case because source monitoring relies partly on strategic processes which themselves require some forms of self monitoring and metacognitive memory strategies (cf., Friedman, 1993; Johnson et al., 1993; Roberts & Powell, 2005; Ruffman et al., 2001; Wheeler et al., 1997). Empirical evidence for such a link between source monitoring and inhibition comes from a study conducted by Ruffman et al. (2001). They found that inhibitory control was meaningfully related to 6- to 10-year-old children's ability to identify correctly the source of items presented in a video. Ruffman et al. (2001) concluded that the link between inhibition and the video-only source tasks conforms to the assumption that stronger familiarity cues in source tasks require the inhibition of automatic familiarity-based retrieval processes to allow clear source identifications. Based on these empirical findings, Roberts and Powell (2005) supposed that inhibitory control seems to be one of the strategic and reflective processes contained in source monitoring processes that allow correct source attributions.

According to Roberts and Powell (2005) it is plausible that the success in a (source) memory test on a target event involves the use of efficient processes that identifies target information. Such processes might be automatic memory processes or strategic metacognitive memory processes. Roberts and Powell (2005) concluded that automatic memory processes or strategic metacognitive memory processes could contribute to successful source monitoring (memory retrieval and false-memory editing) and seem to be most successful when both processes are involved (cf., Brainerd & Reyna, 2002; Johnson et al., 1993; Koriat & Goldsmith, 1996).

Besides this, Roberts and Powell (2005) referred to Harnishfeger's (1995) distinction between unintentional and intentional inhibition. Unintentional inhibition operates unconsciously and contains the suppression of activated irrelevant information to allow processing of relevant information (Harnishfeger, 1995; Roberts & Powell, 2005). In contrast, intentional inhibition contains a deliberate suppression of (irrelevant) information (Harnishfeger, 1995; Roberts & Powell, 2005). Both types of inhibition can enhance correct source identification by inhibiting irrelevant source-type specific memory characteristics (Roberts & Powell, 2005). Although Roberts and Powell (2005) do not specify it, it can be assumed that intentional inhibition is available in older children only because they require strategic metacognitive monitoring processes, which is not (fully) available in the preschool years (Flavell, 1985; Koriat & Goldsmith, 1996; Schneider & Lockl, 2006; Schneider & Pressley, 1997). In contrast, the enhancing effects of unintentional inhibition could be available earlier. This might be empirically visible in the early inhibitory control competences in children at the age of 3 to 6 years.

Currently, the attempt presented by Roberts and Powell (2005) is the most comprehensive attempt in describing and explaining the relation between inhibition and source monitoring. As pointed out by the authors, their attempt needs to be underpinned empirically before further reliable conclusions can be drawn. Nevertheless, the attempt presented by Roberts and Powell (2005) is a theoretically well-developed foundation, which can serve as a starting point for the systematic examination of the relation between inhibition and source monitoring.

Based on Roberts and Powell (2005) inhibition-source-monitoring attempt, it can be assumed that children who can inhibit irrelevant source specific memory characteristics and processes (e.g., familiarity-based reasoning) are better able to identify and attribute the source to a specific memory. Thus, a positive relation between inhibition and source monitoring should exist. Thus, a positive relation between inhibition and source monitoring should exist. Such a relation should exist independently of the type of source if the memory characteristics of the single sources are comparably familiar. According to Ruffman et al. (2001), inhibitory control should not be related to memories that were never inaccurately described because there would be less need to inhibit irrelevant details and target details that can be identified on familiarity only (cf., Roberts & Powell, 2005). Nevertheless, in single events a stronger inhibitory control of (automatic) familiarity-based retrieval processes seem to be necessary if the familiarity cues available that

allow clear source identifications are not sufficient (Melinder, Endestad & Magnussen, 2006; Ruffman et al., 2001). However, if enough familiarity cues are available (e.g., distinct event details, repeated (correct) event presentation), source attributions should be possible even without inhibitory control (Ruffman et al., 2001).

At this point, only a few studies are available that examines the relation between inhibition and single types of source monitoring. The first empirical study is the already cited study by Ruffman et al. (2001). They presented sixty-one 6-, 8- and 10-year-old children a videotape (5 min.) and an audiotape (3 min.) about a dog. Some information about the story was repeated in these two external sources (videotape vs. audiotape) - some were presented only in one source. Some information about the story was repeated in these two external sources (videotape vs. audiotape) - other information was presented only in one source. After both tapes were presented, children were asked various “happen” and source questions. Inhibitory control was measured by a Stroop task in that children were shown rows of digits on a computer screen for 1 second (e.g., “2-2-2”). The task of the children was to count the number of digits and press the corresponding number on the keypad (e.g., “3”). Thus, children needed to inhibit the automatic tendency to decode the digit (e.g., “2”). The study showed that inhibitory control was positively related to correct source attributions of the video-only source. The relation remained significant if vocabulary and age were partialled out. Ruffman et al. (2001) concluded that the link between inhibition and the video-only source questions conforms to the idea that there are stronger familiarity cues in visual information (in contrast to auditory information), that require the inhibition of automatic familiarity-based retrieval processes. In contrast, inhibition was not necessary in the tape-source or in both sources together. From there, the study reported by Ruffman et al. (2001) indicates that inhibitory control is necessary in specific source tasks.

The second empirical study examining the relation between inhibition and source monitoring comes from Melinder et al. (2006). They presented one-hundred-fifteen 3-, 4-, 5- and 6-year-old Norwegian children two video films with 16 events (8 events were contained in both films, 8 in only one film). Immediately after presentation, children were asked various memory and source questions. Inhibition was measured by the Stroop-like day/night inhibition task developed by Gerstadt et al. (1994). In contrast to their expectations, Melinder et al. (2006) found no relation between their external source task and their inhibition task. The external source attributions to video-sources are obviously not associated with the conflicting stroop-like inhibition task in 3- to 6-year-old Norwegian children. However, Melinder et al. (2006) explained their absent relation with ceiling effects in their used inhibition task. Thus, their study may cover the expected relation between inhibition and external source monitoring.

To my knowledge, further studies examining the relation between inhibition and source monitoring directly are not available. However, the cited studies indicate that a relation between inhibitory control and external source monitoring exist in children although this relation seems to

be limited to a specific type of source (Ruffman et al., 2001). Nevertheless, an empirical relation between inhibitory control and external source monitoring was not found in children below 6 years of age (Melinder et al., 2006). However, the reason for this lack may lie in the used inhibition task and requires the re-examination of the relation.

Based on Roberts and Powells (2005) inhibition-source-monitoring attempt and the findings reported by Ruffman et al. (2001), I expected in experiment 2 that children who can inhibit irrelevant information are better at identifying and attributing the source to a specific memory. I expected that the positive relation between inhibition and source monitoring exists independent of the type of sources because inhibition of irrelevant source specific memory characteristics is necessary in all source-monitoring tasks as long as a low number of familiarity cues are available (i.e., reality monitoring familiar, reality monitoring unfamiliar, internal source monitoring, external source monitoring). The positive relations are expected to be found at the level of the source tasks as well as at the level of the single sources. Differences in the relations between the four age groups are not assumed because in all age groups the inhibition of task irrelevant information is expected to be necessary for successful source monitoring.

3.1.2.2 The relation between verbal abilities and source monitoring

Verbal abilities as the indicator of the complexity of the verbal representation system seem to be important for source monitoring and its development. Performances and developmental progresses in the verbal representation system obviously enhance source monitoring performances because the broader and deeper the verbal representation system is, the more source specific memory characteristics can be used in source monitoring. In the following section, I analyse how verbal abilities representing the active available verbal representation system are related to the source monitoring performances of experiment 2. First, I derive the theoretical relation between verbal abilities and source monitoring and then I discuss the available empirical findings. After that, I derive the hypotheses to be tested in experiment 2.

Research on memory development indicates that the verbal representation system plays an important role for memory performances (e.g., Bauer, 2002, 2007; Baddeley, 2007; Fivush, 2002b; Grimm, 2001; Hayne & Simcock, 2009). It supports memory processing during encoding, storage and retrieval and with it enhance memory performances in different important ways (e.g., Bauer, 2002, 2007; Baddeley, 2007; Grimm, 2001; Hayne & Simcock, 2009).

Various studies have shown that children with better verbal abilities often show better memory performances (for an overview see Bauer, 2007; Weinert, 2006; Hayne & Simcock, 2009). Such an enhancement of memory performances seem to be true as well for the complex memory performance “source monitoring” (Experiment 1). The broader and deeper the available verbal

representation system is, the more source specific verbal memory characteristics can be used during encoding, storing and retrieving for source monitoring and can lead to a higher number of correct source attributions. The verbal representation system may also support the use of verbal based searching strategies and verbal based nondeliberate and deliberate source decision strategies (i.e., Johnson et al., 1993). The use of verbal based searching strategies can likewise enhance the retrieval of the source specific (critical) memory characteristics and in the following support the source decision processes because more and possibly more distinctive source specific memory characteristics are available. This may lead to an increase of the number of correct source attributions. A more flexible and complex verbal representation system may allow as well using nondeliberate and deliberate source decision strategies and with it enhance the number of correct source attributions (i.e., Johnson et al., 1993).

Based on these considerations, it can be assumed that the retrieval and the strategy benefit of a flexible and efficient available verbal representation system enhance source monitoring performances. This can be assumed to be independent of the types of sources because in all types of sources the retrieval and the decision about the source specific memory characteristics are contained (Johnson et al., 1993). Nevertheless, it is necessary to consider that verbal characteristics of a memory or representation are (only) *one* source specific component (Johnson et al., 1993). On principle, memory characteristics from other modalities are source specific components as well and vary regarding the event or the specific source task conditions (Johnson et al., 1993). Thus, the supportive effect of the verbal representation system can vary regarding the extent of verbal information involved in the event or in the source task. The same seems to be true for the type of memory characteristics used in a certain source condition. In single source conditions, other memory characteristics might be used primary before for example verbal characteristics are used because they vary in their availability or contain more source distinctive memory characteristics (Experiment 1). Nonetheless, the effect of a more flexible and efficient available verbal representation system should be found in verbal events or verbal source tasks because of their higher number of verbal characteristics contained.

Based on these considerations, the verbal representation system can support internal source monitoring performances in particular. This seems to be the case because in the internal imagined source a high number of verbal characteristics are be contained. The reason for that is that the mental activity “thinking” is carried out mainly verbally or at least verbally based (Johnson et al., 1993). Besides this, the imagined internal sources are mainly based on cognitive operations that are also carried out verbally (Johnson et al., 1993). Thus, the verbal representation system is obviously very important for internal source monitoring sources (Experiment 1). The more efficient and flexible available verbal representation system obviously support particularly internal source monitoring performances by enhancing the encoding, storage and retrieval of the internal source specific verbal characteristics of the cognitive operations and of the mental activity “thinking” (Experiment 1). Through the imagined internal source, internal

source monitoring should always contain verbal characteristics and therefore should be related always to the verbal representation system. In comparison to other types of source monitoring (e.g., public reality monitoring, external source monitoring), the relation to the verbal representation system should be stronger because of the additional verbal characteristics of the imagined internal source.

Empirical evidence for these considerations comes from experiment 1. Experiment 1 showed that the active vocabulary level as the core indicator of the active available verbal representation system was positively related to reality monitoring, to internal and to external source monitoring performances in the action encoding mode and to internal source monitoring performances in the verbal encoding mode. The same relational patterns were found for morphological rule using another indicator of the active available verbal representation system. With this consistent pattern of result, experiment 1 indicates clearly that 3- to 5-year old children with a broader and deeper active available verbal representation system attribute more source monitoring sources correctly to their memories. Besides this, experiment 1 underpins clearly the assumption that the active available verbal representation system is strongly related to internal source monitoring performances. This is consistently the case for the active vocabulary level and for morphological rule using and this is the case independent of an action and a verbal encoding mode. However, experiment 1 revealed as well that the relation between the active vocabulary level and reality monitoring and all relations between morphological rule using and source monitoring depended on the age of the children. Thus, some relations between the verbal representation system and source monitoring only existed in specific age groups. Based on the small sample sizes, it was not possible in experiment 1 to specify in what age groups the relations exist only or come up respectively. Besides this, experiment 1 showed that the active available verbal representation system was not related to reality monitoring or to external source monitoring in the verbal encoding mode indicating that in a verbal encoding mode and in specific source monitoring performances the relations vary. This is even the case in source task conditions in that a high number of verbal characteristics are contained. However, this is not the case for internal source monitoring performances (Experiment 1).

As already described in experiment 1, source task specific absent relations between the active available verbal representation system and external source monitoring have been reported as well in the study of Drummey and Newcombe (2002). They presented one-hundred-sixty-seven 4-, 6- and 8-year old children ten facts about various topics (e.g., “What animal cannot make any sounds?) by an experimenter and by a puppet. After a one-week-delay, children were asked about the facts and if they answered the fact question correctly, then they were asked where the information was learned. They examined verbal fluency in a time restricted category generation task (categories: Animals, fruits and vegetables). Drummey and Newcombe (2002) found no

relations between verbal fluency and their external source monitoring task in 4- and 6-year-old children.

Other studies examining the relations between the active available verbal representation system and source monitoring are not available to my knowledge. However, the empirical available findings showed that the active available verbal representation system is relevant to specific source monitoring performances (Experiment 1).

In experiment 2, I examine only verbal abilities representing the active available verbal representation system. Because the active vocabulary level is the broadest indicator for the active available verbal representation system (Dunn et al., 1982; Dunn & Dunn, 1997; Kiese-Himmel, 2005), I use this verbal ability in experiment 2. Because of limited time resources, I did not include other verbal abilities.

Based on the assumption that a broader and deeper active available verbal representation system can support source monitoring through a better encoding, storage and retrieval of source specific verbal characteristics I expected in experiment 2 that the verbal ability “active vocabulary level” is positively related to source monitoring. Because verbal characteristics are contained in each source condition in the picture-book source task of experiment 2, I expected that the active vocabulary level is related to reality monitoring familiar, to reality monitoring unfamiliar, to internal and to external source monitoring. The relations are expected to exist across both sources per source condition and in the single sources per source condition. However, a very strong relation between the active vocabulary level and internal source monitoring is expected because through the involvement of the verbal based cognitive operations the most source specific verbal memory characteristics are contained in the internal source monitoring sources (e.g., Johnson et al., 1993) and thus should go along with a very strong relation. The relations between the active vocabulary level and source monitoring are also expected to be independent of the age of the children because the verbal representation system should support source monitoring equally in each age group.

3.1.2.3 The relation between theory of mind abilities and source monitoring

Theory of mind abilities seem to play a meaningful role in source monitoring processes and might be necessary for qualitative developmental progresses in children between 3 and 6 years of age (e.g., Naito, 2003; Perner & Ruffman, 1995; Price & Ford, 2006; Ruffman et al., 2001; Welch-Ross, 2000). In this section, I take up this assumption as well and analyse whether and why relations exist between source monitoring and the three central theory-of-mind abilities false-belief understanding, appearance-reality understanding and source-of-knowledge understanding. In three single subsections, I present the theoretical and empirical relation between each single theory of mind ability and source monitoring and derive the hypotheses that

are to be tested in experiment 2. I start with the analysis of the specific relation between false-belief understanding and internal source monitoring²². I then continue to analyse the relation between appearance-reality understanding and source monitoring and finally I analyse the relation between source-of-knowledge understanding and source monitoring.

The relation between false-belief understanding and internal source monitoring

The ability to attribute mental states to oneself and to others is a cornerstone in cognitive development (e.g. Wellman, 2002; Perner, 1991). Mental-state understanding requires a realisation that mental states may reflect reality and may be manifest in overt behaviour, but are internal and mental, and thus distinct from real events, or behaviours (Wellman et al., 2001). The understanding that a person has a *false-belief* provides evidence for appreciating such a distinction between the mind and the world (e.g., Dennett, 1979, Perner, 1991; Wellman, 2002; Wimmer and Perner, 1983).

The distinction between the mind and the world seems to be required in internal source attributions about imagined mental representations (Welch-Ross, 1995). Imagined mental representations require (1) an understanding that they are distinct from reality-based mental representations and (2) that imaginations do not reflect the way the world really is and/or that imaginations do not filter into the physical world (Welch-Ross, 1995). It can therefore be assumed that children who have a mental state understanding in which such a distinction between the mind and the world is contained should be able to correctly attribute internal sources to their memories. Empirical evidence for this assumption comes from experiment 1. Experiment 1 revealed that 3- to 5-year-old children who had a false-belief understanding attributed a higher number of internal source monitoring sources correctly to their memories. This was true in the action and in the verbal encoding mode. However, the relations between false-belief understanding and internal source monitoring in the verbal encoding mode dependent on the verbal ability “active vocabulary level” but were independent of the working memory performance “phonological working memory performance”. If the performances of the 4- and 5-year-old children were contained only in the statistical analyses then the relations between false-belief understanding and internal source monitoring in the verbal encoding mode were independent of the verbal ability “active vocabulary level”. Regarding the action encoding mode, experiment 1 revealed that the relations between false-belief understanding and internal source monitoring dependent on the verbal ability “active vocabulary level” and on the working memory performance “phonological working memory performance”. The relations disappeared as well if only the performances of the 4- and 5-year-old children were analyzed. From a

²² The analyses was limited to internal source monitoring performances because a mental state understanding between the mind and the world seems to be required in source attributions about imagined mental representations only.

theoretical point of view, false-belief understanding should be related to internal source monitoring independent of verbal abilities and working memory performances because the common ground for the relation should be the mental state conceptualization about the distinction between the mind and the world (Welch-Ross, 1995). However, it is possible in single source tasks that the common ground between false-belief understanding and internal source monitoring are also verbal abilities because false-belief understanding and internal source monitoring are strongly related to verbal abilities (e.g., Astington & Jenkins, 1999; Carlson & Moses, 2001; de Villiers & Pyers, 2002; Lockl et al., 2004; Perner, 1991; Ruffman et al., 2003; Experiment 1). To disentangle the possible reasons for the relation between false-belief understanding and internal source monitoring it is necessary to control the effect of verbal abilities. If the relation between false-belief understanding and internal source monitoring remains stable after verbal abilities have been controlled then it can be concluded that the relation between both variables exists because both contain a mental state understanding. If the relation disappears after verbal abilities have been controlled then it can be concluded that the reason for the relation between false-belief understanding and internal source monitoring are verbal abilities.

In the case of the verbal encoding mode, experiment 1 supports the first explanation. In the case of the action encoding mode, experiment 1 supports the second explanation. These patterns of results indicate that the relations between false-belief understanding and internal source monitoring are moderated differently depending on the specific source task characteristics. At present further empirical findings about the relations between false-belief understanding and internal source monitoring are not available.

However, from a theoretical point of view a relation between false-belief understanding and internal source monitoring can be expected because both performances contain a mental state understanding about the distinction between the mind and the world (Welch-Ross, 1995; Experiment 1). This relation should exist independent of the verbal abilities contained in both performances although both performances are strongly related to verbal abilities.

Based on the assumption that false-belief understanding and internal source monitoring requires a mental state understanding reflecting the distinction between the mind and the world (Welch-Ross, 1995; Experiment 1), I expected a positive relation between false-belief understanding and internal source monitoring in the source task of experiment 2. This relation is expected to be found across both sources and in the single sources of the internal source-monitoring task (said-source; thought-source) because in both single sources a mental source seems to be distinguished from a reality source, which seems to require a mental state understanding. The relation is assumed positive because children who have a false-belief understanding are expected to show a higher number of correct internal source attributions. The reason for this is that mental state understanding is also contained in internal source monitoring performances.

In experiment 2, I expected that the relation between false-belief understanding and internal source monitoring exists independent of the verbal abilities contained in both performances. From this, it is expected that the relation between false-belief understanding and internal source monitoring remains significant if the verbal ability “active vocabulary level” is controlled statistically. Although this hypothesis stands (partly) in contrast to the results of experiment 1, the false-belief-internal-source monitoring relation is expected to result from the mental state conceptualization and not from verbal abilities.

Differences between the four age groups were not tested in experiment 2.

The relation between appearance-reality understanding and source monitoring

The understanding of the distinction between what something really is and what it appears to be might be important for source monitoring and its development (Flavell et al., 1983; Taylor & Flavell, 1984). If such an understanding of the distinction between appearance and reality is not available, then source attributions might be not possible at all and may lead to source confusions about the reality or about the appearance of the own memories.

The understanding of the distinction between appearance and reality is an abstract metaconceptual notion that is pervasive in adults thinking about the world (e.g., Taylor & Flavell, 1984). Adults may not always know what the reality of an object/event is but they are aware of the possibility that its appearance might be deceived and differs from reality (Taylor & Flavell, 1984). In typical appearance-reality tasks (e.g., Flavell, 1993; Flavell et al., 1983), the understanding of the distinction between appearance and reality is examined by showing a deceptive object (e.g., a candle that looks like a lemon) and asking about what the object looks like. After that, an appearance question (e.g., “What does it look like? Does it look like a candle or does it look like a lemon?”), and a reality question is asked (e.g., “What is it really, really? Is it really, really a candle or is it really, really a lemon?”). Four- and 5-year-old children generally respond correctly to the appearance and reality questions whereas most 3-year-olds fail to answer the questions correctly (Braine & Shanks, 1965; Flavell et al., 1983; Flavell, Flavell & Green, 1987, Flavell, Green & Flavell, 1986; Flavell, Green, Wahl & Flavell, 1987; Flavell, Zhang, Zou, Dong & Qi, 1983; Taylor & Hort, 1990; Taylor & Flavell, 1984). Young children make either a phenomenism error (i.e., they report the object’s appearance when asked about reality) or an intellectual realism error (i.e., they report the object’s reality when asked about appearance). Although nonverbal tasks indicate that 3-year-olds can answer the appearance and reality *questions* correctly (Sapp, Lee & Muir, 2000; Wooley & Wellman, 1990), nevertheless this is consistently not the case in verbal appearance-reality tasks before the age of 4 (e.g., Flavell, et al., 1983; Flavell et al, 1986; Flavell, 1998).

The distinction between appearance and reality is a related conceptual problem of mental state understanding (Flavell, 1986). The understanding of mental states requires the appearance-reality

distinction because the own perception as the source of the appearance identity of the object needs to be conceptualized (Sodian & Thoermer, 2006). Besides this, the appearance-reality distinction requires the simultaneous processing of dual conflicting representations of the same entity (i.e. the appeared identity vs. the real identity) and is therefore similar to mental state processes contained in false-belief understanding (Flavell, 1986; Flavell & Miller, 1998; Sodian & Thoermer, 2006). The appearance-reality understanding might be important for internal source monitoring performances, just like false-belief understanding is, because (1) the simultaneous processing of dual (sometimes conflicting/similar) representations of the same entity or event is contained and (2) the own perception as a source of an appearance or reality of the entity/event needs to be conceptualized in internal source monitoring performances. Such an assumption has already been presented 25-years ago by Flavell et al. (1983) and by Taylor and Flavell (1984). They assumed that the absence of the conceptual understanding of the distinction between appearance and reality in younger children may lead to confusions about appearance and reality in cognitive tasks like conversation, reality monitoring (as described by Johnson & Raye, 1981²³) and perspective taking (Flavell et al., 1983; Taylor & Flavell, 1984). Young children may find it difficult to report only a segment or aspect of a currently salient representation such as the immediate perceptible one (i.e., a single representation). This difficulty seems to underlie young children's occasional confusions between facts and fantasy (Flavell et al., 1983). For example, children may innocently tell a lie because they fail to attribute the imaginative source of their representation (Flavell, et al., 1983). The understanding of the distinction between appearance and reality seems to help children reflect on the fact that a representation might be real but can appear in another way as well (Flavell et al., 1983).

Therefore, it can theoretically be expected that an understanding of the appearance-reality distinction go along with successful internal source monitoring. This assumption can be made because in both performances dual representations are processed simultaneously and the own perception as a source of an appearance or reality of an entity/event is conceptualized and can be distinguished. To my knowledge empirical studies examining the direct relation between appearance, reality understanding and internal source monitoring or other types of source monitoring (e.g., reality monitoring, external source monitoring), are not available.

Based on the theoretical assumption that the appearance-reality understanding and internal source monitoring contain the simultaneous processing of dual (conflicting/similar) representations of the same entity/event (Flavell et al., 1983; Taylor & Flavell, 1984) and the conceptualization/ability to distinguish between the own perception as a source of an appearance or reality of an entity/event (cf., Sodian & Thoermer, 2006), I expected a positive relation

²³ Thus, it relates to internally generated "reality monitoring" performances. This type of source monitoring corresponds to internal source monitoring as it is used since 1993 when Johnson et al. (1993) presented their source monitoring framework.

between appearance-reality understanding (i.e., correct appearance understanding, correct reality understanding) and internal source monitoring. This relation is expected to be found across both sources and in the single sources of the internal source monitoring task (said-source; thought-source). The relationship is assumed to be positive because children who have an appearance-reality understanding are expected to show a higher number of correct internal source attributions. The reason for this is that both performances contain the simultaneous processing of dual representations and the conceptualization of the own perception as a source of an appearance or reality of an entity/event. Hypotheses about appearance-reality errors are not tested.

Besides this, I use post-hoc analyses to explore whether positive relations exist between the appearance-reality understanding and reality monitoring familiar, reality monitoring unfamiliar and external source monitoring performances across both sources per source task. This analysis will give information about the question whether the appearance-reality understanding is limited to a single type of source monitoring (i.e., internal source monitoring) or whether it goes along with higher source monitoring performances in other types of source monitoring as well.

Differences between the four age groups were not tested in experiment 2.

The relation between source of knowledge understanding and source monitoring

The understanding of how different sources of information (e.g., by seeing, telling, hearing) leads to different knowledge and mental states might be important for the understanding of how children differentiate between their memories from different (person) sources. This might be the case because before a person being the source can be attributed correctly to a memory, it might be necessary to first identify the perceptual source of that memory (e.g., whether it was seen or told). Only when the perceptual source(s) of a memory is/are known, then that knowledge can be connected to a specific person as the possible (internal or external) source of that memory. Thus, it can be assumed that children who gain an understanding that different sources of information lead to different knowledge or mental states should be able to attribute real-person sources correctly to their memories because they know the perceptual source and based on that knowledge attribute the perceptual source to its person source.

Despite of their conceptual similarity, the approaches source of knowledge and source monitoring have seldom been compared or connected on the theoretical or on the empirical level (Drumme & Newcombe, 2002; Leichtman et al., 2000; Perner, 2000; Naito, 2003; Robinson, 2000). On the theoretical level, the relation between source of knowledge and source monitoring seems to be quite close because in both performances, decisions about the source of information are carried out (e.g., Drumme & Newcombe, 2002; Naito, 2003; cf. Johnson et al., 1993). In the case of source of knowledge, mainly the perceptual source (e.g., seeing, hearing, inferences) of

objects or beliefs are identified (e.g., Flavell & Miller, 1998). The source-of-knowledge approach has its origin in the theory of mind research and examines the understanding of informational access as a source of (the own) knowledge and/or beliefs and its meaning for mental state development (Astington, 1993; Bartsch & Wellman, 1995; Flavell & Miller, 1998; Montgomery, 1992; O’Neill, 1996; O’Neill & Gopnik, 1991; Perner, 1991; Sodian & Thoermer, 2006; Taylor, 1996; Wimmer, Hogrefe & Sodian, 1988).

In contrast, source monitoring, public and private (e.g., telling, thinking) internally or externally generated memories, knowledge and beliefs of real-person sources (e.g., child, unknown adult) or medium sources (e.g., videotape, newspaper) are identified (Johnson, et al., 1993). The source monitoring approach has its origin in memory research and examines the (memory) processes responsible for source monitoring performances (Drummey & Newcombe, 2002; Johnson, 2000; Johnson & Raye, 1981; Johnson et al., 1993; Roberts, 2000; Lindsay, 2002). The different origins of both approaches and the core aims of each approach might have lead to the circumstance that both approaches are not as closely connected as they could be.

On the processing level, the same source attribution processes should be contained in source of knowledge and in source monitoring performances (e.g., Drummey & Newcombe, 2002; Naito, 2003). From an information-processing perspective, it would be meaningless and not economical if such similar performances would base on different information-processing pathways. Rather, it can be assumed that both performances *share* the same source monitoring processes but differ in their types or class of sources and information included. Based on this similarity on the processing level both – source of knowledge and source monitoring tasks - have been categorized recently as source monitoring tasks (Drummey & Newcombe, 2002; Leichtman et al., 2000; Naito, 2003; Robinson, 2000).

The assumption of similar source monitoring processes is supported by the co-occurrence of the beginning of both performances and the finding that central developmental changes take place between 3- and 5-years of age. Research on source of knowledge understanding indicates that children begin to understand that visual access leads to knowledge at around 3 years of age (e.g., Hogrefe, Wimmer & Perner, 1986; Pillow, 1989; Pratt & Bryant, 1990). At around 4 years of age, children become capable of connecting what they know to the sense modality of their original experience (e.g., Gopnik & Graf, 1988; O’Neill et al., 1992; O’Neill & Chong, 2001; O’Neill & Gopnik, 1991; Perner, 1991; Sodian & Wimmer, 1987; Wimmer, Hogrefe & Perner, 1988; Wimmer, Hogrefe & Sodian, 1988). However, developmental changes continue to take place beyond the age of 5 indicating that the source-of-knowledge understanding is not fully developed at that age yet (Flavell & Miller, 1998; Sodian & Thoermer, 2006; Wellman, 2002; Wimmer, Hogrefe & Sodian, 1988). As pointed out previously, children start to attribute sources correctly above chance level to their memories at the age of 3 (e.g., Experiment 1; Welch-Ros, 1995) and central developmental changes take place in source monitoring between 3- and 5-years of age (e.g., Roberts, 2000, 2002; Lindsay, 2002). It can be assumed that the co-occurrence

of source of knowledge and source monitoring performances is not purely coincidentally, but rather that the same developmental progresses in source monitoring processes might be responsible for both developmental changes. Nevertheless, at present it cannot be specified exactly what developmental progresses in the source monitoring processes are responsible for these developmental changes. However, the co-occurrence is a first but not a sufficient indication of similar source monitoring processes in both performances that need to be specified in following research.

A second explanation of the connection between source of knowledge and source monitoring comes from Perner and Ruffman (1995). They proposed that children's capability of connecting what they know to the sense modality of the original experience might aid children in distinguishing between their own knowledge, the knowledge of others and between personally experienced events about which they have been told. It could therefore be assumed that children who gained that capability are also able to distinguish between public and private internal and external generated memories, as it is required in *classical* source monitoring tasks. The meaning of source of knowledge proposed by Perner and Ruffman (1995) could be specified because it can be assumed that the enhancing effect of source of knowledge understanding (or correct source attributions respectively) might be highest in source attributions that concern the same modality or modalities contained in the source monitoring source attributions.

Perners and Ruffmans (1995) assume that children's capability of connecting what they know to the sense modality of the original experience may aid children in distinguishing between their own knowledge and the knowledge of others. Based on this, it is conceivable that before a person as a source can be attributed correctly to a memory (knowledge or belief respectively) it might be necessary to first identify the perceptual source of that memory (e.g., whether it was seen or told). Only when the perceptual source(s) of a memory is/are known, then that knowledge might be connected to a specific person as the possible (internal or external) source of that memory. Thus, the understanding that different sources of information lead to different knowledge, mental states (i.e., memories) might be a prerequisite for successful public and private internal or external real-person or medium sources. Following this thought, it can be assumed that a relation exists between both classes of source monitoring performances.

Despite the categorization of source of knowledge and source monitoring tasks as similar types of cognitive performances (Drumme & Newcombe, 2002; Leichtman et al., 2000; Naito, 2003; Robinson, 2000), both types of tasks measure slightly different aspects of source monitoring performances because they contain different classes of sources and examine slightly different aspects of the source monitoring processes (e.g., informational access as the source of knowledge, focussing on single modalities). Consequently, it is meaningful to examine the relation between two tasks of the same theoretical construct that should share the same information processing processes to specify the meaning of the single class of sources.

However, are there empirical data available that support the presented theoretical assumptions about the relation between source of knowledge and source monitoring? Yes, there are. The first empirical study examining the relation between source of knowledge and source monitoring tasks comes from Evans and Roberts (2005). They presented fifty 3- to 5-year-old children a video with a knowledgeable interviewer. Afterwards the children were interviewed by a knowledgeable interviewer and by a naïve interviewer. After a 5- to 7-days-delay, children answered 24 yes/no recognition questions (12 misleading, 12 non-misleading) in a recognition task. In a following source-monitoring part, children were asked about the source of each recognition question (i.e., video, knowledgeable interviewer or naïve interviewer). Children's source of knowledge understanding was assessed by a see-know task (adapted from Pillow, 1989). Results showed that the see-know understanding was not related to external source monitoring accuracy. The authors concluded that other aspects of theory of mind abilities are possibly strongly tied to source monitoring. Nevertheless, the relation between the source of knowledge and the external source monitoring task might be covered by the used misleading questions and the duration of the delay because they can affect source attribution in important ways (e.g., Roberts, 2002; Lindsay, 2002). However, the study reported by Evans and Roberts (2005) did not show that a relation between their external source monitoring task and the selected source of knowledge task exists.

The second study examining the relation between source of knowledge and source monitoring is the already cited study by Kovacs and Newcombe (2006). They presented eighty 4- and 5-year-old children an audiotape of two dissimilar speakers (male and female speaker). The authors used two dolls for their source task to make it easier for the children to identify the two sources. Kovacs and Newcombe (2006) used three separate lists of five statements (5 each for source 1, source 2 and new items as distractors), each expressing opinions on topics relevant for children (e.g., dislikes and likes of activities like swimming). After a two-minute-delay, a memory test about the opinions and their sources was given. Children's source-of-knowledge understanding was examined by a source of knowledge task adapted from Perner and Ruffman (1995) in that the see-know and the told-know understanding of objects was assessed. Results showed that correct source discrimination in the external source-monitoring task was not related to the source-of-knowledge task. Thus the study reported by Kovacs and Newcombe (2006) indicates that although on a theoretical level source-of-knowledge and source-monitoring tasks should contain the same source monitoring processes, a relation was not found. One possible explanation for the absent relations might be the presentation of the facts by an audiotape or the self- and other-focus encoding conditions that were used in that study as well. This might have lead to the finding that children made a lower number of source attributions and thus the relation failed to reach significance.

Despite these empirical findings, on the theoretical level source of knowledge understanding should be meaningfully related to source monitoring performances because in both performances

(1) source monitoring processes are carried out and (2) the source of knowledge understanding might be necessary for successful source attributions of real-person sources of memories.

The assumption is that in source of knowledge and source monitoring performances (1) (similar) source monitoring/decision processes are carried out (Drummey & Newcombe, 2002; Johnson et al., 1993; Leichtman et al., 2000; O’Neill & Gopnik, 1991; Naito, 2003; Perner & Ruffman et al., 1995; Robinson, 2000) and (2) that the source of knowledge understanding might be necessary or a prerequisite for successful source attributions of real-person sources to memories. Based on this, I expected positive relations between both performances in experiment 2. Because the perceptual modality “seeing” is contained in the public and private internal picture-book-source tasks in experiment 2, the seeing-source of the source of knowledge task was expected to correlate highly with the internal sources of the reality monitoring familiar (child-source), the reality monitoring unfamiliar (child-source) and the internal source monitoring tasks (said-source, thought source, across both sources). The reason for this is that the internal real-person sources *see* the content of the picture-book episodes and thus “seeing” is the perceptual foundation of the sources. The same is expected for the perceptual modality “telling” and the public internal and public external sources. The telling-source of the source-of-knowledge task is expected to correlate highly with reality monitoring familiar (child-source, external-source; across both sources), reality monitoring unfamiliar (child-source, experimenter-source; across both sources), external (external-source, experimenter-source; across both sources) and internal source monitoring (said-source) because the single real-person sources verbally *tell* the content of the picture-book episodes and thus “telling” is the perceptual foundation of the sources. The relations are assumed to be positive because children who can attribute the seeing- or telling-source correctly to previously presented objects are expected to show a higher number of correct internal and external source attributions in the four types of source monitoring because both source monitoring performances contain the same class of source specific memory characteristics and the same source monitoring processes. Differences between the four age groups were not tested in experiment 2.

Besides this, in experiment 2 I also explored whether positive relations exist between the feeling-source of the source of knowledge task and reality monitoring familiar, reality monitoring unfamiliar and external source monitoring performances (across both sources per source task). Because “feeling” as a perceptual foundation of the source is not contained in the picture-book-source tasks of experiment 2, the relation between the feeling-source of the source of knowledge task and the source monitoring tasks will be tested by post-hoc analyses only. However, this analysis will give information about the question whether correct feeling-source attributions may support source attributions on a basic processing level and might be transferred to other types of source attributions.

3.1.2.4 The relation between social variables and source monitoring

As already pointed out in experiment 1, social variables seem to also be relevant to early source monitoring. In the following section, I therefore analyze the possible relations between social variables within and outside the family context and the four types of source monitoring. I start the section by first briefly discussing the theoretical relations and available empirical findings. At the end of the section, I derive the hypotheses to be tested in experiment 2.

Changes in the social environment of the child can stimulate the development of source monitoring in a certain way (e.g., Phillips et al., 2006; Rubin et al., 1998; Vandell et al., 2006). One change in the social environment of the child *outside the family* is the entry in the kindergarten²⁴. In kindergarten, the child has regular contact to peers, younger children, older children and adults outside the family and outside the circle of friends of their parents. Every person as well as the child itself can be the source of different statements, actions, beliefs, emotions and knowledge. Memories of all these different statements, actions and so on can be generated and might be retrieved after shorter or longer times. For these representations, it may become more and more important to specify the source because the child might talk about them or might be asked about them by various persons. Therefore, it can be assumed that the number of contacts to peers, younger and older children may go along with better source monitoring performance. This might be mainly the case for external source attributions because the various persons in this *new* environment are external real-person sources to the child (e.g., reality monitoring and external source monitoring). The same assumption seems to be true for the length of time the child has visited a kindergarten/crèche. With increasing length of time, the child gets more experiences with different external sources and therefore may make source attributions and discriminations more often, which then enhance the child's source monitoring performance gradually. Besides the kindergarten, a child may also regularly visit courses for children (e.g., swimming, learning to play musical instruments). Like the kindergarten, these activities are carried out mainly in groups of children of different ages, which may support source monitoring by dealing with external sources and their discrimination. Besides the kindergarten and additional courses, the child may also have regular contacts to peers, younger and older children. Such contacts can enhance external source monitoring performances as well, because the child gets more experienced with the (special) qualities of external source attributions and their discriminations. The same might be true for visits the parents make to adults with or without children and for visits; the parents receive at home from adults with or without children. Such visits seem to be an additional source of external real-person sources of

²⁴ The designation kindergarten is used in the following for care taking institutions for children between 3 and 6 years.

memories, knowledge, emotions and beliefs and can enhance external source monitoring performances as well because source attributions and discriminations might be carried out.

Besides social variables outside the family, social variables *within the family* might be just as important for source monitoring. The time the child spends with the mother per day, the time the child spends with the father per day and the time the child spends with another (familiar) person per week seem to be of particular interest. As it is known from research about autobiographical memory development, younger children start to take over the structure of narratives of their parents, particularly from the person who spends the most time with the child (e.g., Bauer, 2007; Fivush, 2002b, 2009; Fivush & Hamond, 1990; Nelson, 1993, 1996). Parents obviously serve as meaningful models for the child's memory development and probably for the memory performance "source monitoring" as well. For example, parents attribute sources to their own memories, emotions or beliefs and help their child attributing sources to their own memories. They encourage the child to consider sources of memories or beliefs and correct/explain incorrect source attributions to their child during various interactions. Such interactions with the parents can enhance children's understanding and use of external source attributions in a meaningful way.

The mother and the father may also play an important role for the understanding of internal source attributions. The child may increasingly learn (from the mother/father) that public and private internal sources of the child (and mother/father) exist and that they can be discriminated from each other. The mother/father may provide the child with adequate information and interpretations through her parenting/narrative style and thus enhance the child's understanding for different internal sources. This assumption is (partly) analogue to findings of the importance of parenting style and shared activities for children's memory performance and children's social-cognitive development (e.g., Bauer, 2007; Fivush, 2002a, Fivush, 2009; Ratner et al., 2002; Rogoff, 1998; Ruffman et al., 1997; Tomasello, 2008; Tomasello et al., 1993; Wellman, 2002).

Besides the mother and the father, another person in the closer family can serve as a meaningful model as well and can enhance source monitoring performances equally. The same might to be true for siblings (e.g., Hayne & Simcock, 2009). Like parents, siblings are external sources in the closer family and can enhance external source monitoring performances because more external source discriminations of memories, knowledge, emotions and beliefs are carried out. Nevertheless, the beneficial effect of siblings can vary regarding the position the child has in the row of its siblings because the beneficial effects could be different for older and younger siblings.

As pointed out in experiment 1, the relation between social variables and source monitoring has not been examined systematically before. To my knowledge, empirical data about the relation between source monitoring and social variables are available only from experiment 1.

Experiment 1 revealed that the lower the number of siblings and the lower the position the child has in the row of siblings, the higher the internal source monitoring performance of the 3- to 5-year old children was in the verbal encoding mode. These results indicate that the time spend with the child might be relevant for internal source monitoring performances. If no or a low number of siblings live in the family then the parents can devote more of their time to the child. The same might be true for the position in the row of siblings. Parents of children with a lower position in the row of siblings (i.e., first-born children) can devote more time to the child. This additional time seems to enhance internal source monitoring performances in a meaningful way. Besides this, experiment 1 showed against the expectations that the remaining social variables within and outside the family were not related to either reality, internal or external source monitoring performances in the verbal encoding mode. One possible explanation for the absent relations was that the used social marker variables (e.g., number of hours, courses, contacts) were too coarse to display the enhancing effects of the interactions assumed to be marked by the selected social variables. A second explanation for the absent relation was that the relations might exist in single age groups only. Experiment 1 did not allowed an analyses of the relations in each age group because the sample sizes were comparably low ($n = 12$). Besides this, partial correlation analyses were used in experiment 1. Using this statistical procedure, age specific relations might have been removed in the analyses. Therefore, the relations between the social variables within and outside the family and source monitoring reported in experiment 1 can only give a first insight in the possible relations. However, these relations need to be tested and methodically varied (e.g. by using interactions) before more reliable conclusions can be drawn²⁵. In summary, the available empirical findings indicate that specific relations between single social variables and internal source monitoring exist. Although relations between different social variables within and outside the family and the three main types of source monitoring were not found in 3- to 5-year old children, it is possible that the theoretical relations exist but were covered by the special methodical features of experiment 1.

Based on the previous conclusions, I expected in experiment 2 that the social variables: number of hours the child spends with mother per day, number of hours the child spends with father per day, number of hours the child spends with another person per week, weekly contacts of the child to peers outside the family (within the kindergarten; outside the kindergarten), weekly

²⁵ Although, the relations between social variables inside the family and outside the family and the three main types of source monitoring have been examined in experiment 1 in an action encoding mode as well, the results will not reported here because the used source task in experiment 2 uses verbal narratives only.

contacts of the child to younger children outside the family (within the kindergarten; outside the kindergarten), weekly contacts of the child to older children outside the family (within the kindergarten; outside the kindergarten), number of visits the parents make with the child per week, number of visits the parents receive at home with the child, number and type of courses the child visits regularly and the duration a crèche/nursery school/kindergarten has been attended are positively related to the external source tasks reality monitoring familiar, reality monitoring unfamiliar and external source monitoring. This expectation based on the assumption that the higher the number of interactions to external person sources is (e.g., mother, siblings, peers, unfamiliar adults), the more correct external source attributions have been made. This is so because the child has more practice in handling and discriminating external from each other.

Besides this, I expected that internal source monitoring is positively related to the hours the child spends with the mother per day and the hours the child spends with the father per day. The explanation behind this is that the more time the mother and the father spends with the child, the more explanations and practice about how to handle public and private internal sources can be received and made.

Based on the findings of experiment 1, specific negative relations were expected between internal source monitoring and the number of older siblings, the number of younger siblings and the position the child has in the row of siblings in experiment 2. A lower number of younger/older siblings should go along with a higher number of correct internal source attributions because more time and attention have been devoted to the child with fewer siblings living in the family. The same finding is expected for the position the child has in the row of siblings. The lower the position is, the fewer siblings live in the family and the more time and attention can be devoted to the child.

Differences between the four age groups were not tested in experiment 2.

3.2 Method

In this section, I describe the method of experiment 2. I start by describing the sample of experiment 2 (3.2.1), then go on with the experimental design (3.2.2) and after that describe the materials and the procedure (3.2.3).

3.2.1 Sample

Forty-eight children were recruited from local nursery schools, kindergartens, pedestrians and institutions offering activities for preschoolers in Kiel, Germany. Of the participants there were twelve children who were *younger* 3-year-olds ($M = 38$, range 36 to 41 months, 7 girls, 5 boys), twelve who were *older* 3-year-olds ($M = 45$, range 42 to 47 months, 3 girls, 9 boys), twelve 4-year-old ($M = 56$, range 51 to 59 months, 8 girls, 4 boys) and twelve 5-year-old children ($M = 65$, range 60 to 71 months, 9 girls, 3 boys). All participants were normally developed children from German middle class families. They were all native German-speaking children. Educational levels of mothers (O-level: 12; Abitur/Fachabitur: 16; Bachelor/Master: 20) and of fathers (O-level: 12; Abitur/Fachabitur: 12; Bachelor/Master: 24) were very high and comparably distributed across the age groups. Occupation status differed between mothers (full-time: 6; part-time: 25; non: 17) and fathers (full-time: 36; part-time: 4; non: 5) but were comparably distributed across the age groups. Eight additional children were tested but excluded from the final sample because of failure to complete the tasks (one younger 3-year-old child, three older 3-year-old children and one 4-year-old child) and technical errors (one older 3-year-old child, one 4-year-old child and one 5-year-old child). Participants received 15 € for running expenses for the two test sessions.

3.2.2 Design

The design was a 4 (type of source monitoring: Reality monitoring familiar vs. reality monitoring unfamiliar vs. internal vs. external source monitoring) x 4 (age group: 3_{young}- vs. 3_{old}- vs. 4- vs. 5-year-old children) mixed-model design with the within-subject factor “type of source monitoring” and the between-subject factor “age group”. The experimental design is presented in Table 3.

Table 2 Experimental design of experiment 2 ^R

		Factor A			
		“Type of source monitoring”			
		Reality familiar	Reality unfamiliar	Internal	External
Factor B „Age“	3;0 – 3;5	\bar{y}_{rec} $\bar{y}_{coc, soc}$	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}
	3;6 – 3;11	\bar{y}_{rec} $\bar{y}_{coc, soc}$	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}
	4;0 – 4;11	\bar{y}_{rec} $\bar{y}_{coc, soc}$	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}
	5;0 – 5;11	\bar{y}_{rec} $\bar{y}_{coc, soc}$	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}	\bar{y}_{rec} \bar{y}_{sar}

Depend variables: \bar{y}_{rec} = Recognition (old, new),

\bar{y}_{sar} = Source attribution rates (source a, source b)²⁶

\bar{y}_{coc} = Cognitive variables (inhibition, verbal abilities, theory of mind abilities)

\bar{y}_{soc} = Social variables (within the family, outside the family)

3.2.3 Material and procedure

In the following subsections, the materials and procedure of experiment 2 are described. The first subsection portrays the material and the procedure of the single tasks and the second subsection explains the chronological procedure of experiment 2.

²⁶ Besides the source attribution rates, a source decision explanation and a free recall of the content of the magic windows were assessed in experiment 2. However, both dependent variables were not included in this treatise because of the limited space available.

Material and procedures of the single tasks

The test sessions of the children were recorded completely onto a digital dictating machine (Olympus Digital Voice Recorder, VN-480PC). Before coding, the written protocols of each task were checked with the use of the audio protocols and completed/corrected if necessary.

The materials of each task were covered by green clothes. The covered tasks per test session were arranged in a game line (tasks 1-2 in a bent line beginning at the top of the circle, tasks 3-6 in a circle).

Source task. Source monitoring performance was measured using one source task. The source task consisted of four source task conditions that were presented as one compact source task. In the reality monitoring familiar condition, the public internal source is the child and the public high familiar external source is the parent of the child. In the reality monitoring unfamiliar condition, the public internal source is the child and the public unfamiliar external source is a female experimenter. In the internal source monitoring condition, the public internal and the private internal source is the child. In the public internal source, the phrases were verbally expressed and in the private internal source, the phrases were merely thought about. In the external source condition, the high familiar external source to the child is the parent and the unfamiliar external source is the female experimenter. In experiment 2, a high difference between the familiarity of external person sources was selected to examine the maximum familiarity differences of external sources to the child.

For each source task condition one page of the picture-book “Busy places – A lift-the-flap book” (Kent, 2005) was used. The picture-book pages contained scenes in typical busy places. For the four source task conditions, the busy locations of a zoo (reality monitoring familiar), a farm (reality monitoring unfamiliar), a department store (externals source monitoring) and an amusement park (internal source monitoring) were selected out of eight busy locations. When the flap is lifted, the picture reveals typical objects and people of the place. On each page, two flaps were used as test items (zoo: Reptile house, beast of prey house; farm: Stable, workshop; department store: Elevator, changing cubicle; amusement park: Ice-rink, castle tower) and the remaining third flap was used as a distractor item (zoo: Bush; farm: Cowshed; department store: Entertainment department; amusement park: Marquee). The order of the source task conditions and the single real-person sources per source task were as follows (1) external source monitoring (1. female experimenter, 2. parent), (2) reality monitoring familiar (1. child, 2. parent), (3) reality monitoring unfamiliar (1. child, 2. female experimenter), and (4) internal source monitoring (1. child thinking, 2. child saying). The order of the source task conditions was identical for all children. A “secret” folding top (18 x 31cm) was used to ensure that the person looked under the flap (magic window).

Figure 8 illustrates the used picture-book source task and the active vocabulary task, the appearance-reality task and the day/night-inhibition task.



Figure 8 Illustration of the picture-book source task (on the left) and the active vocabulary test, the appearance-reality task, the day/night inhibition task (on the right)

The source tasks were presented at a low child appropriate table. The child sat on the long side of the table on a chair designed for children. The experimenter and the parent sat on each short side of the table. The second experimenter sat face to face with the child. The picture book and the folding top were placed in the middle of the low table. At the beginning of the task, the experimenter told the child, “Now we will play a game with this picture-book. In this game, your mom/dad can join us if s/he wants. For the game, we need a secret folding top, because only the one whose turn it is allowed to look under a “magic window”. The others are not allowed to look under the magic window. I will always say whose turn it is and which magic window should be opened. Before that, nobody is allowed to look under a magic window.”

Encoding²⁷. The experimenter asked the child to turn the pages to the first scene and enthusiastically said, “Oh look at this! This is a [department store, farm, zoo, amusement park]. Look over here there is a [.....] (Experimenter draws the child’s attention to two places on each page). Can you see the magic windows of this page? Can you point to them?” After the child pointed to the three magic windows, the experimenter told the child who and what magic window is next. The first person was the experimenter. She placed the book in front of her. After that, she placed the secret folding top around the magic window and opened the window. The first time she commended on her actions verbally “I take the secret folding top and place it around the window so that you cannot see the window. Now I open the window and tell you what I can see under the magic window. Under the window is [.....] (experimenter used

²⁷ Training of the source tasks were not employed because pilot testing showed that children carry out the game correctly after instruction and watching a person playing the game.

standardized descriptions for her windows). That’s all. Now I close the window and remove the secret folding top.” The experimenter placed the book and the folding top back to the middle of the table. Then the experimenter said who and what window is next. The trials with the remaining magic windows were opened and described in the same way. If the child only named 1 to 3 objects in a trial the experimenter asked, “Can you see something else? What are they doing there?” After the two windows of one source task have been opened and described, the page was turned without saying that one source task condition is over. In the internal source task condition “thinking”, the experimenter said to the child, “Now you should think what you see silently in your head. If someone thinks in their head, no one can hear it.” If the child started describing the episode loudly out or whispered it, the experimenter put her index finger on her lips and whispered, “shhht, very quietly”. The book was closed after the last magic window was presented.

Recall. Immediately after the presentation, the recall took place. The experimenter told the child the following “Now I want to know how good you can remember our game” The experimenter turned the first page and asked the child whether they played with that page before²⁸. If the page was one of the pages played with before, the child was asked the old recognition question of the magic windows, “Under what magic windows have we looked and told what is under the window?”, and the new recognition question “Under what magic window(s) haven’t we looked and told what is under the window?”. After that, the experimenter asked the open-ended source question for each window recognized as old, “Who looked under the magic window and told what is under the window?” If the child did not specify the internal source (saying or thinking) in the internal source monitoring condition, the experimenter asked, “Did you say it out loud or did you think it silently in your head?”. The order of the two alternatives within the two-choice questions was assigned randomly. After each source question, the children were asked how they know that [.....] looked under the magic window (source explanation question) and were asked to make a free recall of the contents of the window (episode recall).²⁹ During recall, the magic windows were not opened again. The seven pages of the picture book were presented one after another. The selected pages for the source tasks were equivalent to the encoding order.

The whole source task took 18 to 22 minutes. Correct answers of old/new recognition and source recall were counted with one point each. Incorrect answers were counted with zero points. The numbers of answers were added up to correct and incorrect old/new recognition totals and source attribution totals for each single source task.

²⁸ In this treatise, page recognition were used as a control variable but not included in the analyses of experiment 2 because of the limited space available.

²⁹ In this treatise, the depend variables source decision explanation and were not included because of the limited space available.

Inhibition. Inhibition was measured by the Stroop-like “day/night inhibition test” developed by Gerstadt et al. (1994). According to Gerstadt et al. (1994; see also Carlson & Moses, 2001; Zelazo et al., 2003), the selected Stroop-like day/night-inhibition task is an appropriate task to measure reliable and valid (conflicting) inhibitory control. The used task materials and task procedure were identical to the task described by Gerstadt et al. (1994). A set of 18 cards were used for the task (2 training cards, 16 testing cards; dimension: 13.5 x 10 cm). The front half of the cards was white with a bright yellow sun on it. The front of the second half of the cards was black with a moon and stars on it. In the training and pretest phase, the experimenter told the child that they are going to play a funny game together. The experimenter showed the child a black moon card and told the child, “When you see this card, I want you to say “day”. Please repeat “day”.”³⁰ Then the experimenter put the card aside, and showed a white sun card. The experimenter told the child “When you see this card, I want you to say “night”, Please repeat “night”.” The experimenter then showed the child a white sun card but gave no instruction. If the child hesitated to give an answer, the experimenter asked, “What do you say for this one?” If the child’s response was correct, the experimenter praised the child and turned around a black moon card. If the child responded correctly to the moon card as well, then the child was praised and the first two trials were counted as trial 1 and 2 of testing. The testing continued from there. If the child responded incorrectly, then these two trials were counted as practice and the experimenter reminded the child of the rules beginning with the card the child responded incorrectly to. The experimenter showed the previously presented white sun card again to the child. If the child responded correctly, the experimenter praised the child and turned to the block moon card. If the child was correct again, both trials were counted as trials 1 and 2 of testing and the testing was continued. If the child was incorrect on either card, the trials were counted as practice and the experimenter reminded the child of the two rules starting with the card the child responded to wrong. Testing started from here for these children. During testing, sixteen trials were used in which eight “day” and eight “night” cards were presented in a pseudorandom sequence (night (n), day (d), d, n, d, n, n, d, d, n, d, n, n, d, n, d). If the child hesitated during testing, the experimenter asked, “What do you say for this one?” without saying “day” or “night”. Feedback was not given during testing. The test took five to six minutes. Correct answers were counted with one point and incorrect answers were counted with zero points. The numbers of correct answers were added up to a task total.

Verbal abilities. The active vocabulary level was used as an indicator for verbal abilities. The *active vocabulary level* was tested by the Active Vocabulary Test for 3- to 5-year-old children – Revised (Kiese-Himmel, 2005); a picture-naming task. Picture-naming itself is a complex cognitive performance requiring the following steps of processing (Kiese-Himmel, 2005): (1) perceptual analyses of the picture, (2) activation of a picture representation, (3) activation of the

³⁰ Instructions in this task were quotations of the original instructions used by Gerstadt et al. (1994, pp. 134-136).

lexical concept (e.g., action concept), (4) lexical selection and access to the belonging word form, (5) phonological encoding and syllable forming, (6) the release of a speaking program concerning the articulation, and (7) naming. In the picture-naming task, the children were asked to name 75 puristic colored drawings of a representative number of German nouns (51) and verbs (24). The complete test took ten to twelve minutes. Objectivity (realization, evaluation, interpretation), reliability (split-half, $\alpha = .86$) and validity (content, construct, criterion validity) were sufficient in the Active Vocabulary Test. Correct answers³¹ were added up to test totals and transformed into T-values. The active vocabulary test bears the risk of ceiling effects in children older than 65 month of age. In experiment 2, four children above 65 month of age completed the active vocabulary test. The analysis of the correct test totals showed that none of the four children above 65 month of age reached the maximum of 75. From there, the active vocabulary level of the four children was not underestimated by the active vocabulary test. Therefore, the test totals from the four children above 65 month of age remain in the final sample.

Theory of mind abilities. The children's theory of mind abilities were measured with a false-belief task, a not-own-belief task, an appearance-reality task and a source of knowledge task.

The used *false-belief task*³² was based on the false-belief task used by Lang und Perner (2002). For the false-belief task a folding book of a farm (4 scope rooms; Cousins, 2001) and Playmobile® figures (dog, kennel, master, bone, sunflowers (sheep stable was a part of the book)) were used. The false-belief task contained an unexpected transfer. The unexpected transfer involved a story character (Bello the dog) placing an object (bone) in one location (kennel), leaving (going for a walk), and another character (Bello's master) moving the object to a new location (sheep stable) while the first character was not present. Four control questions were asked to ensure that the child followed the story (after the first character left: (1) "Where is the bone?" after placing the object into the second location: (2) "Do you remember where Bello put his bone?" (3) "Where is the bone now?" (4) "Did Bello see that the bone was moved to another location?"). After the first character returned, the child was asked the belief question ((5) "Where will Bello look for his bone?") and two memory control questions ((6) "Where is the bone really?" (7) "Where did Bello put his bone in the beginning?"). The false-belief task took three to five minutes. Correct answers were counted with one point. Incorrect answers were counted with zero points. Numbers of correct answers were added to a memory total (questions 1, 2 and 7), a reality total (question 3 and 6), a location total (question 4) and a false-belief total (question 5).

³¹ The answer of the test items were coded according to the rules of the test manual.

³² A second false-belief task was used in experiment 2. This task was used as a final task for the children in that it received a piece of chocolate as a reward. The results of that task were not included in experiment 2.

The used *appearance-reality task* was based on the classical appearance-reality task described by Flavell, Flavell and Green (1983). Appearance-reality tasks of the chosen type are reliable and valid tasks measuring (identity) appearance-reality understanding (e.g., Flavell et al., 1983; Flavell et al., 1987; Taylor & Flavell, 1984). The stimulus object used in experiment 2 was a realistic looking green wax apple (height: 5.5 diameter: 3 cm). The experimenter held the apple up and said, “When you look at this, what does it look like to you?” If the child answered correctly, the experimenter gave explicit feedback (e.g., “That’s right, it looks like an apple”). The true nature of the apple was demonstrated nonverbally by rubbing the apple with the fingers and verbally by saying “But look at this, the apple is quite waxy. Feel it yourself (the experimenter gave the child the wax apple). What is this really, really?” After the identification of the reality of the apple, the child was asked the reality test questions “When you look at this, does it look like an apple or does it look like a candle?” and the appearance question “What is this really? Is this an apple or a candle?” The order of the appearance and reality questions was counterbalanced across the children. The ordering of the two alternatives within the two-choice questions was assigned randomly. The task took one to two minutes. Correct answers were counted with one point and incorrect answers were counted with zero points. A single score for the reality and the appearance question was formed.

The *source of knowledge* (or belief respectively) was tested by a source of knowledge task developed by O’Neill and Gopnik (1991). Source of knowledge tasks of the chosen type are reliable and valid tasks measuring source of knowledge understanding in children between 3- and 6-years of age (e.g., Flavell & Miller, 1998; O’Neill & Gopnik, 1991; Perner & Ruffman, 1995; Sodian & Thoermer, 2006). The used task materials and task procedure were identical to the task described by O’Neill and Gopnik (1991). For the task, a tunnel was constructed out of theatre cardboard (30 x 25 x 15 cm). The tunnel was pasted with a red felt. At both ends, red felt flaps covered the two round openings. The three objects used in the training phase were a toothbrush, a plastic cup and a toy helicopter. The six objects in the testing phase were a box of colored crayons, a toy car, a plastic spoon, a toy horse, a soft ball and a pair of toy scissors. Besides this, a (shoe) carton pasted with a golden glitter foil was used to hide the objects (31 x 21.5 x 21 cm). A large green cloth was placed over the tunnel and the carton while transferring the objects from the carton to the tunnel. The child and the experimenter were seated facing each other on a small table. The carton was placed in front of the experimenter and the tunnel was placed in front of the child. The experimenter instructed the child: “This is my big red tunnel. In this game, I’m going to put different objects in the tunnel. Then I’m going to let you look and see what’s inside; or I’m not going to let you look inside but I’ll tell you what’s inside; or I’ll let you put your hands inside the tunnel so you can feel what’s inside and guess what it is. Then I’ll ask you what’s inside and how you knew what was inside.”³³. In the training phase of the SEE trial,

³³ All presented instructions in this task were quotations of the original instructions used by O’Neill and Gopnik (1991, pp. 391-392).

the toy helicopter was placed under the cloth in the tunnel and the experimenter told the child “Lift the tunnel up and look inside. Can you see what’s inside?” In the TELL trial, the toothbrush was placed in the tunnel without the child being able to see it and the experimenter said, “This time you can’t look inside, but I’m going to tell you what’s inside. There’s a toothbrush inside.” In the FEEL trial, the cup was placed in the tunnel without the child being able to see it and the experimenter told the child “This time you can’t look inside, but you can put your hands inside and feel what’s inside.” The training objects were presented in a random order. After each object was covered by the tunnel again, the child was asked what is inside the tunnel. The source was explicitly named in the training phase (e.g., “What did you see inside the tunnel”). When the child identified the object correctly, they received the source question “How do you know that’s what’s inside the tunnel?” If the child answered immediately, children were scored either correct or incorrect and received an explicit feedback (e.g., “That’s right, you saw the helicopter” or “No, you saw the helicopter”). If the child did not respond immediately, the source question was repeated and the child was presented the three-choice alternatives that specified the three sources of information (e.g., “Did you see it, did I tell you or did you feel it?”). The alternatives were presented separately to the child and it was allowed to respond with yes or no. Explicit feedback followed the answer of the child. The order of the forced-choice alternatives was counterbalanced in the training and in the testing phase. In the experimental trials, the six objects were presented in a counterbalanced order. In the two SEE trials (box of crayons or toy horse), the experimenter said, “There’s something in the tunnel. Lift the tunnel up.” In the TELL trials, the experimenter said, “There’s something inside the tunnel. There is a [toy car or pair of toy scissors] inside.” In the FEEL trials (a soft ball or a spoon), the experimenter said, “There’s something inside the tunnel. Put your hands inside.” After the child received the information about the object in the tunnel, the child was asked, “What’s inside?” After that, the experimenter asked the source question as described in the training phase, except that no feedback was given. The task took 5 to 6 minutes. Correct source question answers were counted with one point and incorrect answers were counted with zero points. The child received a score of 0-6 (i.e., 0-2 for the seeing-, telling and feeling-source), depending on the correct source answers (in either open-ended or forced-choice form).

Social variables and behavior control. The *social variables* were examined in the exploration by asking the parent. The social variables were divided into variables within the family and outside the family context. The selected social variables *within the family* were (a) language(s) spoken at home, (b) birth dates of siblings, (c) the position the child has in the row of siblings, (d) number of hours the child spends with mother per day, (e) number of hours the child spends with father per day and (f) number of hours the child spends with another person per week. The selected social variables *outside the family* were (g) weekly contacts of the child to peers outside the family (within the kindergarten; outside the kindergarten), (h) weekly contacts of the child to

younger children outside the family (within the kindergarten; outside the kindergarten), (i) weekly contacts of the child to older children outside the family (within the kindergarten; outside the kindergarten), (j) number of visits the parent makes with the child per week (to adults with and without children), (k) number of visits the parent and child receives at home (from adults with and without children), (l) number and type of courses the child visits regularly and (m) duration a crèche or nursery school has been attended.

Besides the above, the following *socioeconomic variables*³⁴ were examined in the exploration of the parent: (a) education of mother, (b) education of father, (c) occupation of mother, (d) occupation of father, (e) occupation group of mother and (f) occupation group of father. In addition, the parent was asked about the child's birth, current medical treatment and the impression of the child's fitness during the test sessions.

Behavior control. The experimenter evaluated the behavior of the children (i.e., attention, interaction and emotional state) in each test session and across both test sessions. A dichotomy respond format was used (“given”, “not-given”).

Besides this, *memory span* was measured to control that all children had a minimum memory span of three items. Memory span was measured by the subtest “memory span for words” taken from the Language Development Test for 3- to 5-year-old Children (Grimm, 2001). In the memory span task, children were presented sequences of 2 – 6 words (e.g., ship-ball-child-tower). Immediately after, children were asked to repeat the sequence of the words in the same order. The test took three to four minutes. Objectivity (realization, evaluation, interpretation) and validity (construct and criterion validity) are sufficient for the Language Development Test. Reliability was not calculated for this subtest. The maximum number of the correct repeated words of a sequence (2 – 6 words) defines the length of the memory span.

In addition, in experiment 2 a sticker-book source task, a pretend-play task, a not-own-belief task and a second false-belief task “Maxi's chocolate” was carried out. However, the additional tasks are not the subject of this treatise and therefore not described here.

Procedure of experiment 2

In this subsection, I present the chronological procedure of the test sessions of experiment 2.

Children's performances in the previously described tasks were measured on two separate test sessions using a one-week-delay. The complete procedure per test session lasted 35 to 45

³⁴ The selected socioeconomic variables were assessed as control variables only. They are not described or discussed in this treatise.

minutes on average. Children were tested either at home or in a child appropriate laboratory room at the University³⁵. Two female experimenters tested each child individually.

The procedure of experiment 2 began with a short introduction into the tasks of the study and its course. All tasks of the study were introduced as games. After the short introduction, the child's attention was drawn enthusiastically to the game line of the covered games. The child was told that they would play all games hidden under the cloth today. Then the child was asked to lift the cloth of the first game. The experimenter asked the child to help arrange the game and put his attention to the different components of the task in an interactive manner. Then the task was explained to the child and the training/testing phase began. After the task was over, the child was asked to help tidy up the game. Finally, the child was asked to put the cloth over the game. Then the experimenter and the child turned to the next game.

During the games, the parent and the second experimenter sat on chairs close to a low table and looked at the child and the (first) experimenter. The parent was asked to not give the right answers to the child or correct the child during the tasks. If the child was too shy or did not want to play alone with one of the experimenter, the parent was asked to sit with the child during the game.

The order of the games in the two test sessions was identical for all children with the exception of the source tasks. In test session 1, children got either the picture-book source task or a sticker-book³⁶ source task. In test session 2, children always got the other source task. The type of source task per test session was counterbalanced across all children to control position effects of the source tasks.

At the beginning of each test session, the child was told that a break could be made whenever the child wants one. If the experimenter or the parent had the feeling that the child needs a break (if the child was tired, exhausted, distracted, fooling around or bored), a break was made.

In **test session 1**, the first game was the false-belief task “Bello’s bone”. After that, either the picture-book or the sticker-book source task with the four source monitoring terms, were played. In the following, the day/night task, the pretend-play task³⁶ and the memory-span task³⁷ were played. The last game of test session 1 was the appearance-reality task. After all games of test session 1 were played, the child was told that all games of the day were over and the child was

³⁵ Participants tested at home or at university are distributed equally over the independent variables. They did not differ in their performance. The decision to test children in either place was based on parent’s estimations and on their specific claims (e.g., siblings, time available etc.).

³⁶ The task is not the subject of this treatise and therefore not described here.

³⁷ This subtest was contained as a control variable only.

asked whether it wants to play new games next week with the experimenters. Afterwards the child and the parent were said goodbye.

In test session 1, experimenter 1 played the false-belief task, the source task and the memory-span-task with the child. Experimenter 2 played the day/night task, the pretend-play task and the appearance-reality task with the child. The change of the experimenter was made to maintain the attention of the experimenter at an optimal level. The experimenter who was not playing with the child recorded the answers of the child in the task protocols.

In **test session 2**, the first game was the source of knowledge tunnel task. After that, either the sticker-book or the picture-book source task with the four source monitoring conditions was played. Afterwards, the false-belief task³⁶ “Maxi’s chocolate” and the not-own-belief task³⁶ was played. The last game of test session 2 was the active vocabulary task. In the end, the child was told that all games of the day were over and the parent was asked to answer the exploration questions. During the exploration, the child was asked to play with experimenter 2 one or two of the games of the test sessions again. After the exploration, the parent and the child received 15 € for their participation and the experimenters expressed their thanks and said goodbye to the child and the parent.

In test session 2, experimenter 1 played the source task and the active vocabulary task with the child. Experimenter 2 played the know-how-tunnel task, the false-belief task and the not-own-belief task with the child. The experimenter who was not playing with the child recorded the answers of the child in the task records.

3.3 Results

Now I present the results of experiment 2 in two sections. In the first section, I analyse the three favourable conditions of early source monitoring (3.3.1) and in the second section, I analyse the four selected factors relevant to early source monitoring (3.3.2).

The statistical analyses were carried out with the Statistical Program for Social Science 15.0 for Windows. For all statistical analyses a .05 level of confidence was used. Deviations of this level were specified in single cases. In the correlational analyses, one asterisk indicates a .05 level of confidence ($* = p < .05$) and two asterisks indicates a .01 level of confidence ($** = p < .01$).

3.3.1 Conditions of early source monitoring

In this section, I analyse the results of the three favourable conditions of early source monitoring. I start with the preliminary analyses in which I test old recognition performances and other possible group differences that can influence the following analyses (3.3.1.1). Then I examine whether the familiarity with person sources is a favourable condition of early source monitoring (3.3.1.2). After that, I examine when multiple source attributions in a simultaneous source attribution condition are possible (3.3.1.3) and whether the internal source instruction can be optimized for young children (3.3.1.4).

3.3.1.1 Preliminary analysis

In the preliminary analyses I first test whether differences in old recognition performances exist that need to be considered in the statistical analyses and conclusions about source monitoring. Sex differences are not expected in the correct old recognition scores. Using a .20 level of confidence, the 2 x 4 x 4 Mixed-model analysis of variance (sex x type of source monitoring x age group) showed no sex differences in the old recognition scores. Thus, data were collapsed and tested across sex groups in the following statistical analyses.

The means of old recognition performance (total number of items correctly recognized as old per source task) per age group are presented in Figure 9.

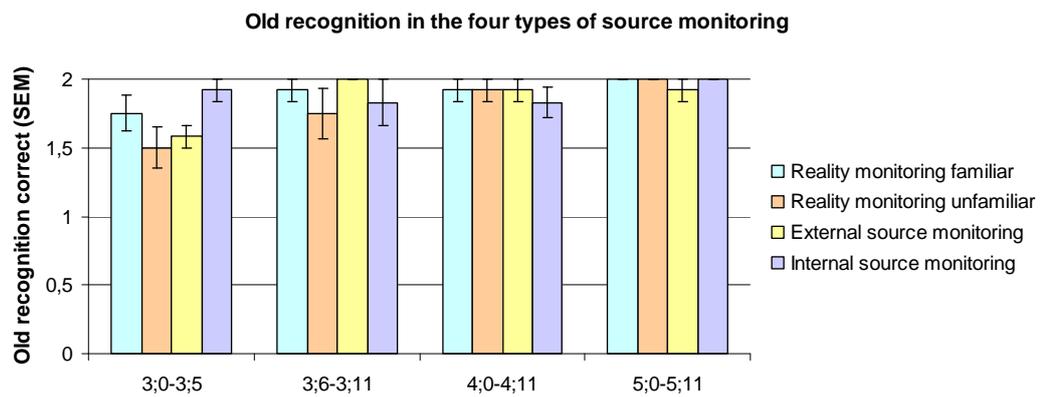


Figure 9 Old recognition performance (Maximum = 2 items) in the four age groups in the four types of source monitoring (SEM = Standard error of measurement)

Differences in old recognition rates (totals of items correctly recognized as old) between the four age groups were tested using analyses of variance (age group: 3;0-3;5 vs. 3;6-3;11 vs. 4;0-4;11 vs. 5;0-5;11). The analyses revealed significant age differences in old recognition in the reality monitoring unfamiliar source task, $F_{\text{age}}(3,44) = 3.14$, $p = .035$. The remaining source tasks however did not reveal any age differences.

Post-hoc analysis with Bonferroni α -adjustment revealed significantly higher old recognition performances in 5-year-old children compared to younger 3-year-old children in the reality monitoring unfamiliar source task. Further age differences were not found.

The results show that old recognition performance is very high in almost all age groups. Because the aim of the study is not to examine the meaning and the maximum of old recognition performances, the ceiling effects in the old recognition performances in the different source conditions can be disregarded. Nevertheless the results show as that specific age differences in old recognition performances exist between younger 3-year-old and 5-year old children in the reality monitoring unfamiliar source task. The lower old recognition rates in younger 3-year-olds has to be considered in the (source) discrimination proportion scores in the reality monitoring unfamiliar source task because in this score correct source attributions are divided by old recognition rates. Because every old recognition rate enters as an equivalent rate in such a score, a score with a lower old recognition rate compared to a score with a higher old recognition rate overestimates the performance displayed in the score of those persons who reached lower recognition rates. In experiment 2, this overestimation exists in younger 3-year-olds in the reality monitoring unfamiliar condition.

For each of the four types of source monitoring Discrimination Proportion Scores (DPS) were calculated by dividing the total number of correct source attributions per source task by the total

number of items correctly recognized as old per source task. Single source attribution scores were calculated in a similar way for the clustered and single sources per source task (condition).

Sex differences were not expected in the correct DPS across the two sources per source task, in the single sources and in the source misattribution rates. Using a .20 level of confidence, a 2 x 4 x 4 Mixed-model analysis of variance (sex x type of source monitoring x age group) showed no sex differences in the correct DPS across the two sources per source task, in the single sources and in the source misattribution rates. It is therefore possible to collapse all data and analyze across sex groups in the following statistical analyses.

It was also tested whether differences exist in the old recognition rates and in the DPS (across the two sources per source task, single sources, source misattribution rates) between children tested at home and children tested at the University lab. Using a .20 level of confidence, the 2 x 4 x 4 Mixed-model analysis of variance (test place x type of source monitoring x age group) showed no test place differences in the old recognition rates and in the correct DPS across the two sources per source task, in the single sources and in the source misattribution rates.

3.3.1.2 The familiarity with person sources

In experiment 2, it is expected that children attribute a higher number of high familiar person sources correctly to their memories compared to unfamiliar person sources. The advantage of the high familiar sources is expected to exist in the clustered external sources (DPS clustered high familiar external sources: Total of the single high familiar sources of the reality monitoring familiar and external source monitoring condition versus DPS clustered unfamiliar sources: Total of the single sources of the reality monitoring unfamiliar and external source monitoring condition) and in the single sources of the external source monitoring condition (DPS high familiar source versus unfamiliar source). This advantage is expected to be found in younger 3-year-old, in older 3-year-old, in 4-year-old and in 5-year-old children. The means of correct source attributions in the clustered and single external sources per age group are presented in Figure 10.

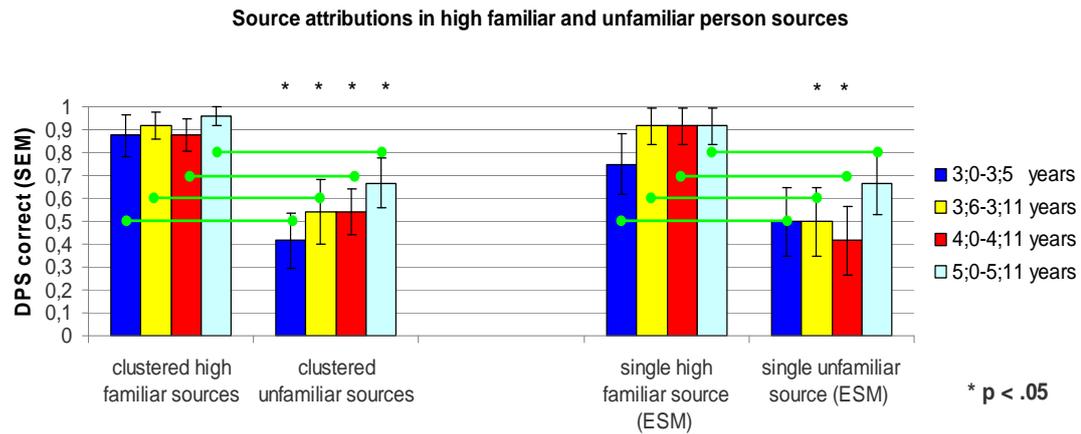


Figure 10 Means of correct source attributions (DPS= Discrimination Proportion Score) in the clustered and single high familiar and unfamiliar sources per age group (SEM= Standard error of measurement; ●—● = marks the pairs of the comparisons made)

The differences between the clustered and single high familiar and unfamiliar sources (DPS correct across the two clustered sources, DPS correct of the single sources) were tested by single Analyses of variance for repeated measurement (familiarity person source: high familiar vs. unfamiliar). The analyses show that a higher number of clustered high familiar sources was attributed correctly compared to the number of clustered unfamiliar sources. This was true for the younger 3-year-old, $F_{3;0-3;5 \text{ cluster}}(1, 11) = 16.04, p = .002$, the older 3-year-old, $F_{3;6-3;11 \text{ cluster}}(1, 11) = 6.06, p = .032$, the 4-year-old, $F_{4;0-4;11 \text{ cluster}}(1, 11) = 8.80, p = .013$, and the 5-year old children, $F_{5;0-5;11 \text{ cluster}}(1, 11) = 6.49, p = .024$. The analyses of the single sources showed that more single high familiar sources than single unfamiliar sources were attributed correctly in the external source monitoring condition. This was true for the older 3-year-old children, $F_{3;6-3;11 \text{ single ESM}}(1, 11) = 7.86, p = .017$, for the 4-year-old children, $F_{4;0-4;11 \text{ single ESM}}(1, 11) = 11.00, p = .007$, and from a tendency for the younger 3-year-old children, $F_{3;0-3;5 \text{ single ESM}}(1, 11) = 3.67, p = .082$ and for the 5-year old children $F_{5;0-5;11 \text{ single ESM}}(1, 11) = 3.67, p = .082$.

These results show that, conforming to the hypotheses; children attributed a higher number of high familiar person sources correctly to their memories compared to unfamiliar person sources. The advantage of the high familiar sources was independent of age and was found in the clustered external sources. In the single sources of the external source monitoring condition the advantage was found as well in the older 3-year-old and in the 4-year-old children. In the younger 3-year-old and in the 5-year-old children only a tendency was found for the advantage of the familiar sources in comparison to the unfamiliar sources.

In experiment 2, the second prediction is that the younger and the older 3-year-old children attribute the reality monitoring familiar sources correctly above chance level earlier than the reality monitoring unfamiliar sources. Besides this, an expectation held in experiment 2 is that

the younger and the older 3-year-old children attribute the external source monitoring sources correctly above chance level to their memories. The means of correct source attributions in the reality monitoring familiar, the reality monitoring unfamiliar and the external source monitoring condition are presented in Figure 11.

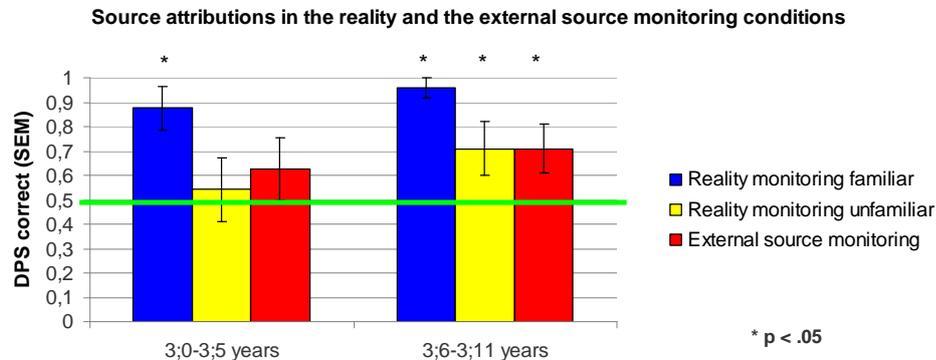


Figure 11 Means of correct source attributions (DPS = Discrimination Proportion Score) in the reality monitoring familiar, the reality monitoring unfamiliar and the external source monitoring condition in the younger and older 3-year-old children (— chance level, SEM = Standard error of measurement)

Because in each source condition, participants chose between two sources, the expected value for chance was 50 %. One-sample t tests (fixed test value .50) were used to test whether the source attribution rates (DPS correct) in the reality monitoring familiar, the reality monitoring unfamiliar and in the external source monitoring condition were significantly above chance level. The analyses showed that the younger and the older 3-year-old children attributed the reality monitoring familiar sources correctly at a significant above chance level $t_{3;0-3;5}(11) = 4.18$, $p = .001$ (one-tailed), $t_{3;6-3;11}(11) = 11.00$, $p = .001$ (one-tailed). In the reality monitoring unfamiliar condition, the 3-year-old children attributed the sources correctly at a significant above chance level, $t_{3;6-3;11}(11) = 1.82$, $p = .048$ (one-tailed). In the case of the external source monitoring condition, only the older 3-year-old children attributed the external source monitoring sources correctly at a significant above chance level, $t_{3;6-3;11}(11) = 2.16$, $p = .027$ (one-tailed).

In relation to the reality monitoring sources, the younger and the older 3-year-old children attributed the reality monitoring familiar sources correctly above chance level to their memories. In contrast to the expectation, the older 3-year-old children also attributed the reality monitoring unfamiliar sources correctly above chance level to their memories. Thus, conforming to the hypotheses the younger 3-year-old children attributed the reality monitoring familiar sources correctly to their memories earlier than the reality monitoring unfamiliar sources. These differences did not hold anymore for the older 3-year-old children.

Conforming to the hypothesis, the older 3-year-old children attributed the external source monitoring sources correctly above chance level to their memories. In contrast to the expectation, this was not the case for younger 3-year-old children. They did not attribute the external source monitoring sources correctly above chance level to their memories.

3.3.1.3 Multiple source attributions in simultaneous source attribution conditions

In experiment 2, it is expected that 4- and 5-year-old children attribute the reality monitoring familiar, reality monitoring unfamiliar, internal and external source monitoring sources in the simultaneous source attribution condition correctly above chance level to their memories.

Besides this, it is expected that the younger and older 3-year-old children attribute the reality monitoring familiar, reality monitoring unfamiliar and external source monitoring sources in the simultaneous source attribution condition correctly above chance level to their memories. In the case of the internal source monitoring sources, it is expected that the younger and older 3-year-old children are at least able to identify the performed and imagined source as the internal child source in the simultaneous source attribution condition. This is tested first.

The descriptive analyses of the types of source question (frequencies of the responses to open-ended and to the closed-ended source question) showed that the children in all four age groups identified the performed and imagined internal sources correctly as internal sources in the open-ended source question. Therefore, all children have been asked the closed-ended internal source question. Thus, the source attribution rates in the internal source monitoring condition base on the responses to the closed-ended internal source question.

In the case of the 4- and 5-year-old children, this result stands in contrast to the expectations. They did not differentiate between the two internal sources in the open-ended source question by themselves. Therefore, like the 3-year-old children, the 4- and 5-year-old children were also asked the closed ended-internal source question.

The means of the correct source attributions across both sources per source tasks are presented in Figure 12.

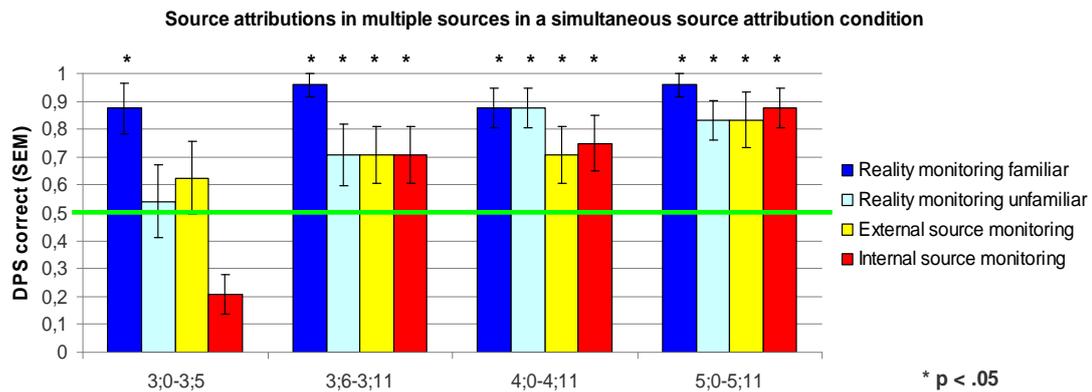


Figure 12 Means of correct source attributions (DPS = Discrimination Proportion Score) in the four source monitoring tasks per age group (— chance level, SEM = Standard error of measurement)

One-sample t tests were used (fixed test value .50³⁸) to test whether correct source attributions in the four types of source monitoring³⁹ (DPS correct across the two single sources of the source task) were above chance level in the four age groups. The results of the analyses show that in the reality monitoring familiar source task, the correct source attributions were significantly above chance level in each of the four age groups, $t_{3;0-3;5}(11) = 4.18$, $p = .001$ (one-tailed), $t_{3;6-3;11}(11) = 11.00$, $p = .001$ (one-tailed), $t_{4;0-4;11}(11) = 5.74$, $p = .001$ (one-tailed), $t_{5;0-5;11}(11) = 11.00$, $p = .001$ (one-tailed). In the reality monitoring unfamiliar source task the source attributions were significantly above chance level only in older 3-year-old children, the 4- and the 5-year old children $t_{3;6-3;11}(11) = 1.82$, $p = .048$ (one-tailed), $t_{4;0-4;11}(11) = 5.74$, $p = .001$ (one-tailed), $t_{5;0-5;11}(11) = 4.69$, $p = .001$ (one-tailed). The same pattern of result was found in the external source monitoring task, $t_{3;6-3;11}(11) = 2.15$, $p = .027$ (one-tailed), $t_{4;0-4;11}(11) = 2.15$, $p = .027$ (one-tailed), $t_{5;0-5;11}(11) = 3.54$, $p = .002$ (one-tailed) and in the internal source monitoring task, $t_{3;6-3;11}(11) = 2.19$, $p = .027$ (one-tailed), $t_{4;0-4;11}(11) = 2.56$, $p = .013$ (one-tailed), $t_{5;0-5;11}(11) = 5.74$, $p = .001$ (one-tailed). The means of the correct source attributions in younger 3-year-old children in the reality monitoring unfamiliar, internal and external source monitoring tasks were not significantly above chance level.

Thus, conforming to the hypotheses 4- and 5-year-old children attributed the selected multiple sources in a simultaneous source attribution condition correctly above chance level to their memories. This was also true for older 3-year-old children. Beyond previous expectations, older

³⁸ Although the four types of single sources child telling, child thinking, familiar telling and unfamiliar telling are the possible alternative sources in simultaneous source attributions in the multiple source recall of experiment 2, the chance level of 50 % was used because it was not assessed whether the children always use the three alternatives in their source decisions. Using a 50 % chance level (based on the two single sources per source task) gives a cautious estimation of the source attributions above chance level.

³⁹ The one-sample t tests carried out in the previous section for the analyses of source monitoring above chance level were used in this section as well because the same depend variables were tested.

3-year-old children also attributed internal source monitoring sources correctly to their memories and thus attributed all multiple sources correctly above chance level. The 4- and 5-year-old children made internal source attributions after asking the closed-ended internal source question. This shows that contrary to the hypotheses, the 4- and 5-year-olds needed to be asked this additional question to attribute the two internal sources correctly to their memories.

In contrast to the expectations, younger 3-year-old children attributed only reality monitoring familiar sources correctly to their memories but not reality monitoring unfamiliar and external source monitoring sources. Younger 3-year-old children did not attribute the selected multiple reality and external source monitoring sources in a simultaneous source attribution condition correctly to their memories at an above chance level.

Now I turn to the analyses of the source errors. The analyses of the source errors require that source errors were made at all and that the distributions of the source errors in the four source monitoring conditions and in the four age groups are known. Experiment 2 showed that a low number of source errors were made in the 3-, 4- and 5-year-old children. In all 48 children, 57 intra- and inter-intraexperimental source errors and no extraexperimental source errors were made from 384 possible correct and from 576 total decisions (correct and incorrect decisions) across all conditions and age groups. The absolute frequencies of the source errors are presented in Table 4.

Table 3 Frequencies of the intra- and inter-intraexperimental source errors in the four source monitoring conditions in the four age groups. Intra-intraexperimental source errors are shown in normal type and *inter*-intraexperimental source errors are shown in italics.

	3;0 – 3;5 years	3;6 – 3;11 years	4;0 – 4;11 years	5;0 – 5;11 years	Sum
RM familiar					
child	1				1
parent			1		1
<i>experimenter</i>	<i>1</i>		<i>2</i>	<i>1</i>	<i>4</i>
					6
RM unfamiliar					
child	1			1	2
experimenter		1	1		2
<i>parent</i>	<i>4</i>	<i>3</i>	<i>4</i>	<i>3</i>	<i>14</i>
					18
ESM					
parent	3		4	3	10
experimenter		1	1		2
<i>child</i>	<i></i>	<i>3</i>	<i>2</i>	<i></i>	<i>5</i>
<i>(said or thought)</i>	<i></i>	<i></i>	<i></i>	<i></i>	<i>17</i>
					17
ISM					
said	2	1	1	1	5
thought	2	2	2	2	8
<i>parent</i>	<i>3</i>	<i></i>	<i></i>	<i></i>	<i>3</i>
<i>experimenter</i>	<i></i>	<i></i>	<i></i>	<i></i>	<i>16</i>
					16
Sum	17	11	18	11	57

Table 4 shows that the lowest number of source errors were made in the reality monitoring familiar condition (6 source errors). In the other three source monitoring conditions, a comparably higher number of source errors was found (18, 17 and 16 source errors). Nonparametric statistical analysis showed that the number of source errors differ meaningfully between the four source monitoring conditions, Kendall-Wallis = .066, $p = .023$.

Comparing the four age groups, Table 4 show that in the younger 3-year-olds and in the four year-olds the highest number of source errors were made (17 and 18 source errors) compared to the older 3-year-olds and to the 5-year olds. The nonparametric statistical analyses (Kruskal-Wallis) revealed that the number of source errors did not differ meaningfully between the four age groups.

It can therefore be concluded that across all 48 children higher source errors were made in the reality monitoring unfamiliar, external and internal source monitoring conditions but the distribution of source errors did not differ between the four age groups.

In experiment 2 it is expected as well that 3-, 4- and 5-year-old children make more intra-intraexperimental source errors (i.e., the other source of the same source monitoring condition of the experimental situation is chosen) than inter-intraexperimental source errors (i.e., another source from another source monitoring condition of the experimental situation is chosen) and than extraexperimental source errors (i.e., another source not contained in the experimental situation is chosen). Besides this, it is expected that a higher number of inter-intraexperimental source errors be made than in extraexperimental source errors. The means of the source misattributions are presented in Figure 13.

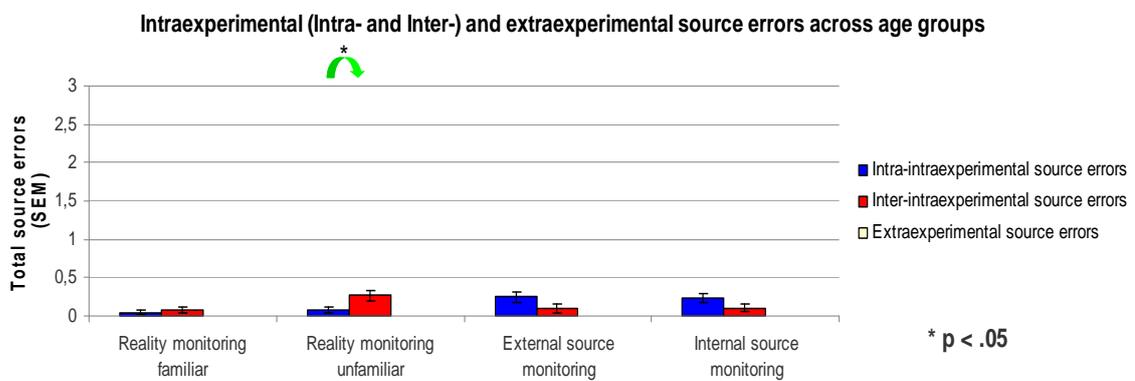


Figure 13 Means of the total intra-intraexperimental, inter-intraexperimental and extraexperimental source errors across age groups in the reality monitoring familiar, the reality monitoring unfamiliar, the internal and the external source monitoring tasks (SEM = Standard error of measurement;  = expected direction of the advantage)

Because in experiment 2, no extraexperimental errors were made, the hypotheses about the differences between the extraexperimental source errors and the intra-intraexperimental and inter-experimental source errors were not tested with inference statistics. The differences between the intra-intraexperimental source errors (total source errors of the two sources of the source monitoring condition) and the inter-intraexperimental source errors (total source errors of the sources outside the source monitoring condition) across age groups in the reality monitoring familiar task, the reality monitoring unfamiliar task, the internal and the external source monitoring task were tested by single Analyses of variance for repeated measurement (intraexperimental source error: intra vs. inter). The analysis showed that in the reality monitoring unfamiliar condition more inter-intraexperimental source errors were made than

intra-intraexperimental source errors, $F_{RMu}(1, 47) = 5.96, p = .018$. In the reality monitoring familiar, the external and the internal source monitoring condition the intra- and the inter-intraexperimental source errors did not differ significantly from inter-intraexperimental source errors.

So, in contrast to the hypotheses, none of the four source tasks showed a higher number of intra-intraexperimental source errors than inter-intraexperimental source errors. Besides this, in experiment 2, no extraexperimental source errors were made in any of the children and consequently the hypotheses about the extraexperimental source errors could not be tested. Contrary to the hypotheses, in the reality monitoring unfamiliar condition more inter-intraexperimental source errors were made than intra-intraexperimental source errors.

3.3.1.4 Optimization the internal source monitoring instruction

In experiment 2, it is expected that the internal source instruction “Did you previously think it *silently* in your head or did you say it previously out *loud*” allow younger, and older 3-year-old children to attribute internal source monitoring sources above chance level correctly to their memories. This is expected to be true across both sources of the internal source monitoring task as well as in the single imagined (or thought) source and the single said source. Before these hypotheses can be tested, it is necessary to first examine whether the 3-year-old children already attributed the two internal sources correctly in the open-ended source question. The descriptive analyses of the types of source questions (frequencies of the responses to the open-ended and closed-ended source question) showed that all 3-year-old children failed to specify the two internal sources in the open-ended source question condition. All of them were asked the closed-ended source question. Thus, the hypotheses about the optimization of the internal source monitoring instruction can be tested. The means of the discrimination proportion scores of the internal source monitoring condition of the 3-year-olds are presented in Figure 14.

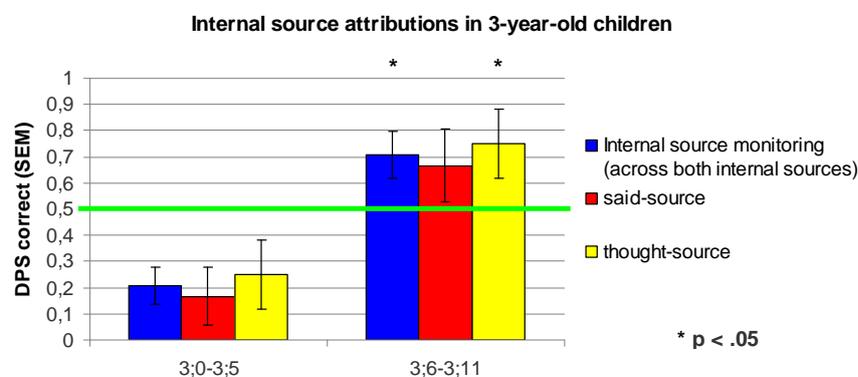


Figure 14 Means of correct source attributions (DPS = Discrimination Proportion Score) of the younger and older 3-year-old children in the internal source monitoring task (— chance level, SEM = Standard error of measurement)

One-sample t tests (fixed test value .50) were used to test whether source monitoring attributions across both sources and in each single source (DPS correct) were above chance level. Results showed that the correct source attributions of the older 3-year-old children were significantly above chance level in the internal source monitoring task across both internal sources, $t(11) = 2.16$, $p = .025$ (one-tailed) and in the single thought source, $t(11) = 1.92$, $p = .040$ (one-tailed). In contrast, younger 3-year-olds source attributions were not significantly above chance level in the internal source monitoring task across both sources and in the two single sources. The same is true for the said source in older 3-year-old children.

These results show that, conforming to the hypothesis, older 3-year-old children attributed internal source monitoring sources above chance level correctly to their memories across both sources and the imagined internal source (i.e., thought source) if the internal source question “Did you say it *loudly* or did you think it *silently* in your head” were used in the internal source monitoring task. In contrast to the expectation, younger 3-year-old children did not attribute internal source monitoring sources above chance level to their memories (across both sources and the single imagined and said source) if the internal source question with the perceptual cues “silent” and “loud” were used. The same is true for the single said source in older 3-year-old children. They did not attribute the said source correctly above chance level to their memories.

3.3.2 Identifying factors relevant to early source monitoring

In this section of the results, I present the relational analyses of source monitoring and the four groups of factors relevant to source monitoring. I start with the relational analyses of inhibition and source monitoring (3.3.2.1). After that, I present the results of the relation analyses of the verbal abilities and source monitoring (3.3.2.2) and of the relational analyses of the theory of mind abilities and source monitoring (3.3.2.3). At the end, I present the relational analyses of the social variables and source monitoring (3.3.2.4).

The correlation analyses include single, independent pairs of variables and therefore do not require an α -correction (Bortz, 1998).

3.3.2.1 Inhibition and source monitoring

Inhibition performance was tested first to identify possible extreme values. The boxplots showed no extreme values in all age groups. Besides this, it was tested whether sex differences existed in the inhibition task. Using a confidence level of .20, the Mann-Whitney-Tests revealed no sex differences across age groups. Therefore, data was analyzed across sex groups.

Pearson product-moment correlations were used to test the relations between inhibition (sum scores) and reality monitoring familiar, reality monitoring unfamiliar, internal and external source monitoring performances (total of correct source attributions, all children). In experiment 2, it was expected that inhibition be positively related to correct source attributions in the reality monitoring familiar, reality monitoring unfamiliar, internal and external source monitoring tasks. The positive relations were expected to be found at the level of the source tasks as well as at the level of the single sources.

The Pearson product-moment correlation analyses (one-tailed) showed that inhibition was not related to any of the four types of source monitoring. The same pattern of result was found in the single sources; inhibition was related to neither of the single sources. From there, contrary to the hypotheses inhibition was not positively related to any type of source monitoring.

3.3.2.2 Verbal abilities and source monitoring

The active vocabulary scores were first checked for extreme values. The boxplots showed no extreme values in the four age groups. Besides this, the scores of each active vocabulary score was compared to the test norms to checkup if they are comparable to the norm groups of normal developing German speaking children. The T-scores of the active vocabulary performances of each age group lay within two standard deviations around the mean of the test norms. In addition, it was tested whether sex differences exist in the active vocabulary scores. The Mann-Whitney-Tests revealed no sex differences in the active vocabulary scores either across age groups or in the single age groups at the confidence level of .20. Thus, data was analyzed across sex groups.

Pearson product-moment correlations were used to test the relations between the active vocabulary level (sum scores) and reality monitoring familiar, reality monitoring unfamiliar, internal and external source monitoring performances (total of correct source attributions across both sources per source task condition and of each single source per source task condition). After that, it was examined whether the correlations remain significant if age was controlled in partial correlation analyses (controlled for age in month, one-tailed).

In experiment 2, it was expected that positive relations exist between the active vocabulary level and correct source attributions in the reality monitoring familiar, reality monitoring unfamiliar, internal and external source monitoring tasks. The positive relations were expected to be found at the level of the source task conditions and at the level of the single sources. Besides this, it was expected that the relations are independent of the age of the children. On the level of the source task conditions, the Pearson product-moment correlation analyses (one-tailed) showed that the active vocabulary level was positively related to the internal source monitoring (.639**) and to reality monitoring unfamiliar (.313*). The active vocabulary level was not related to reality

monitoring familiar and to external source monitoring. The results of the partial correlation analyses (controlled for age, one-tailed) showed that the relation between the active vocabulary level and internal source monitoring task remained significant if age was controlled (.428**). This was not true for the relation between the active vocabulary level and reality monitoring unfamiliar.

From there, experiment 2 showed on the level of the source task conditions conforming to the hypotheses that the active vocabulary level was meaningful related to internal source monitoring and to reality monitoring unfamiliar performances. However, only the relation to internal source monitoring was independent of the age of the children. In contrast to the expectations, the active vocabulary level was not related to reality monitoring familiar and to external source monitoring performances.

On the level of the single sources per source task, the Pearson product-moment correlation analyses (one-tailed) showed that the active vocabulary level was positively related to the said-source (.393*) and the thought-source (.602**) in the internal source monitoring condition and to the child-source (.261*) and the experimenter-source (.242*) in the reality monitoring unfamiliar condition. The partial correlation analyses (controlled for age, one-tailed) showed that the relations to the said-source (.254*) and the thought-source (.361**) in the internal source monitoring condition remain significant if age was controlled. The single sources of the reality monitoring familiar and the external source monitoring sources were not related to the active vocabulary level.

From there, experiment 2 showed conforming to the hypotheses, that the single sources of the internal and the reality monitoring condition were positively related to the active vocabulary level. However, only the relations to the internal sources were independent of the age of the children. In contrast to the hypotheses, the single sources of the reality monitoring familiar and the external source monitoring conditions was not related to the active vocabulary level.

3.3.2.3 Theory of mind abilities and source monitoring

Possible sex differences were tested first in the four theory-of-mind abilities. The Mann-Whitney-Tests revealed sex differences on the confidence level of .20 in the seen-source ($p < .17$, female > male) and in the said-source ($p < .02$, female > male) of the source-of-knowledge task. Both sex differences were controlled statistically in the following correlational analyses. No sex differences were found in the remaining theory-of-mind abilities; thus, data was analyzed across sex groups.

Pearson product-moment correlation analyses and partial correlation analyses were used to test the relations between false-belief understanding, the reality-correct score in the appearance-reality task, the appearance-correct score in the appearance-reality task, the seen-source in the source of knowledge task and the said-source in the source of knowledge task (sum scores) and

reality monitoring familiar, reality monitoring unfamiliar, internal and external source monitoring performances (total of correct source attributions).

In experiment 2, a positive relation between *false-belief understanding* and internal source monitoring was hypothesized. The positive relation was expected to be found at the level of the source task and at the level of the single sources. The relations were expected to be independent of the active vocabulary level. The Pearson product-moment correlation analyses (one-tailed) showed that false-belief understanding was positively related to the internal source monitoring task (.463**), to the said-source (.306*) and to the thought-source (.413**) in the internal source monitoring task. The results of the partial correlation analyses (controlled for active vocabulary level, one-tailed) showed that the relation between false-belief understanding and internal source monitoring across both sources remains significant (.275*) if the active vocabulary level was controlled. In contrast, the positive relations between false-belief understanding and the two single sources of the internal source-monitoring task disappeared if the active vocabulary level was controlled in the partial correlation analyses.

Conforming to the hypotheses false-belief understanding goes along with a higher number of correct internal source attributions. This is true across both sources of the internal source-monitoring task as well as in the said-source and in the thought-source of the internal source-monitoring task. However, the relations between false-belief understanding and the two single sources of the internal source-monitoring task were moderated by the active vocabulary level.

In experiment 2, positive relations were expected between the *appearance-correct score* of the *appearance-reality task* and internal source monitoring across both sources and the said-source and the thought-source of the internal source-monitoring task. The Pearson product-moment correlation analyses (one-tailed) showed that the appearance-correct score was positively related to internal source monitoring across both sources (.307*) and to the said-source of the internal source monitoring task (.281*). In contrast, the appearance-correct score was not related to the thought-source. In accordance with the hypotheses, a higher rate in the appearance-correct score of the appearance-reality task goes along with a higher number of correct internal source attributions across both sources and in the said-source. This is not true for the thought-source and the appearance-correct score.

Besides this, positive relations were expected between the *reality-correct score* of the *appearance-reality task* and internal source monitoring across both sources and the said-source and the thought-source of the internal source-monitoring task. The Pearson product-moment correlation analyses (one-tailed) showed that the reality-correct score was positively related to internal source monitoring across both sources (.314*) and to the thought-source of the internal source monitoring task (.297*). In contrast, the reality-correct score was not related to the said-

source. Thus, conforming to the hypotheses a higher rate in the reality-correct score of the appearance-reality task goes along with a higher number of correct internal source attributions across both sources and in the thought-source. This is not true for the said-source and the reality-correct score.

In addition, it was tested whether meaningful relations exist between the appearance/reality-correct scores and the correct source attributions across both sources in the reality-monitoring familiar, reality-monitoring unfamiliar and external source monitoring tasks. The correlation analyses (Pearson product-moment correlations, one-tailed, Bonferoni α -adjusted) showed that the reality-correct score was positively related to reality monitoring unfamiliar across both sources (.328*). In contrast, reality monitoring familiar and external source monitoring was not related to the reality-correct source in the appearance reality task. Besides this, the appearance-correct score was not related to either type of source monitoring. Thus, a higher rate in the reality-correct score of the appearance-reality task goes along with a higher number of correct reality monitoring unfamiliar attributions across both sources. This was not true for the remaining types of source monitoring or for the appearance-correct score.

In experiment 2, positive relations were expected between the *seeing-source* of the *source of knowledge task* and internal source monitoring across both sources, the said-source and the thought-source of the internal source-monitoring task, the child-source of the reality monitoring familiar task and the child-source of the reality monitoring unfamiliar task. The partial correlation analyses (controlled for sex, one-tailed) revealed that the seeing-source was positively related to internal source monitoring across both sources (.555**), to the said-source (.407**) and to the thought-source (.454**) of the internal source-monitoring task, to the child-source of the reality monitoring familiar task (.319*) and to the child-source of the reality monitoring unfamiliar source (.545**). Thus, conforming to the hypotheses children who attribute the seeing-source correctly in the source of knowledge task make more correct source attributions in the internal source-monitoring task across both sources, in the said-source and in the thought-source of the internal source monitoring task, and in the child-sources of the reality monitoring familiar and unfamiliar tasks.

In addition, in experiment 2 positive relations were expected between the *telling-source* of the *source of knowledge task* and reality monitoring familiar (across both sources, child-source, external-source), reality monitoring unfamiliar (across both sources, child-source, external source), external source monitoring (across both sources, external-source, experimenter-source) and the said-source in the internal source monitoring task. The partial correlation analyses (controlled for sex, one-tailed) showed that the telling-source was related to the thought-source in the internal source monitoring task (.364**). In contrast, the remaining sources of the source monitoring tasks were not related to the telling-source of the source-of-knowledge task. In contrast to the hypotheses, children who can attribute the telling-source correctly in the source of

knowledge task do not show more correct source attributions in the internal and external sources of the reality monitoring familiar, reality monitoring unfamiliar and in the external source monitoring task. However, conforming to the hypotheses children who attributed the telling-source correctly showed a higher number of correct source attributions in the said-source in the internal source monitoring task.

In addition, it was tested in post hoc whether meaningful relations exist between the *feeling-source* of the *source of knowledge* task and the correct source attributions across both sources in the reality-monitoring familiar, reality-monitoring unfamiliar, internal and external source monitoring tasks. The correlation analyses (Pearson product-moment correlations, one-tailed, Bonferoni α -adjusted) showed that the feeling-source was positively related to reality monitoring unfamiliar (.428**) and internal source monitoring (.582**). In contrast, the feeling-source was not related to reality monitoring familiar and to external source monitoring. This leads to the conclusion that, children who attributed the feeling sources correctly in the source of knowledge task showed also a higher number of correct source attributions in the reality monitoring unfamiliar and in the internal source-monitoring task. This was not true for reality monitoring familiar and external source monitoring.

3.3.2.4 Social variables and source monitoring

Mann-Whitney-Tests were used to examine whether sex differences in the social variables within and outside the family exist. A confidence level of .20 was used. Results showed sex differences in the number of older siblings ($p < .05$, female $>$ male), in the position the child has in the row of siblings ($p < .05$, female $>$ male), in the number of hours the child spends with the father per day ($p < .01$, male $>$ female), in the number of hours the child spends with another person per week ($p < .11$, female $>$ male) and in the number of visits the family receives at home from adults without children ($p < .16$, male $>$ female). These sex differences were controlled for statistically in partial correlation analyses. The remaining variables were analyzed across both sex groups.

Pearson product-moment correlations and partial correlations were applied to test the relations between reality monitoring familiar, reality monitoring unfamiliar, external source monitoring (total of correct source attributions) and the sum scores of the number of hours the child spends with the mother per day, the number of hours the child spends with the father per day and the number of hours the child spends with another person per week, the weekly contacts of the child to peers (within the kindergarten; outside the kindergarten), weekly contacts of the child to younger children within the kindergarten (within the kindergarten; outside the kindergarten), weekly contacts of the child to older children within the kindergarten (within the kindergarten; outside the kindergarten), duration since a crèche/kindergarten has been attended and the number

of courses the child visits regularly, the number of visits the parent makes per month with the child to adults with children, number of visits the parent makes per month with the child to adults without children, number of visits the parent and the child receive at home per month with the child from adults with children and number of visits the parent and the child receive per month at home with the child from adults without children.

In experiment 2, it was expected that a high value in the selected social variables go along with higher correct source monitoring performances in source tasks containing external sources (reality monitoring familiar, reality monitoring unfamiliar and external source monitoring). The results of the correlational analyses showed that this is the case between reality monitoring familiar and the weekly contacts to peers outside the kindergarten (.329*), between reality monitoring unfamiliar and the duration a crèche/kindergarten has been attended (.348**) and between external source monitoring and the weekly contacts to peers outside the kindergarten (.243*). In contrast to the hypotheses, the remaining social variables within and outside the family and the source types containing external sources are not positively related to each other.

Likewise, against the hypotheses, experiment 2 revealed negative relations between reality monitoring unfamiliar and visits the parent/child receives at home per month from persons with children (-.344*), between external source monitoring and visits parent/s make per month with the child to adults with children (-.273*), between external source monitoring and weekly contacts to peers within the kindergarten (-.260*), between external source monitoring and weekly contacts to younger children within the kindergarten (-.260*) and between external source monitoring and weekly contacts to older children (-.260*). This means that a higher number of correct source attributions go along with a lower value in these social variables.

Pearson product-moment correlations and partial correlations were applied to test the relations between internal source monitoring (total of correct source attributions) and the sum scores of the number of hours the child spends with the mother per day and the number of hours the child spends with the father per day.

In experiment 2, specific positive relations were also expected between internal source monitoring and the number of hours the mother and the number of hours the father spends with the child per day. The results showed that these relations were not found in experiment 2. Thus, in contrast to the hypotheses higher correct source monitoring performances do not go along with a higher number of hours the mother or the father spends with the child per day.

Pearson product-moment correlations and partial correlations were applied to test the relations between internal source monitoring (total of correct source attributions) and the sum scores of the number of older siblings, the number of younger siblings and the position the child has in the row of siblings.

In experiment 2, specific negative relations were hypothesized between internal source monitoring and the number of older siblings, the number of younger siblings and the position the child has in the row of siblings. The expected relations were not found in experiment 2. Thus, a higher number of internal source monitoring does not go along with a lower position or a low number of younger and older siblings.

3.4 Discussion

Now I discuss in detail the empirical findings of experiment 2. I divided the discussion into two sections. In the first section, I discuss the three favourable conditions of early source monitoring (3.4.1) and in the second section; I discuss the four selected factors relevant to source monitoring (3.4.2).

3.4.1 Conditions of early source monitoring

In this section, I discuss the three possible favorable conditions of early source monitoring. I start with the familiarity with the person source (3.4.1.1), go on with the multiple source attributions in a multiple source attribution condition (3.4.1.2) and finally discuss whether the internal source monitoring instruction can be optimized for younger children (3.4.1.3).

3.4.1.1 The familiarity with person sources

In studying the beginning and the conditions of early source monitoring, a very useful and promising research approach is the familiarity with person sources. If high familiar persons are the source of memories, then the specific knowledge about that person can be used during the source monitoring processes. This additional knowledge may ease the retrieval of (more) source specific memory characteristics and allow for the correct and reliable attribution of the sources the children's memories. Particularly younger children may need such additional *cues* to get access and to be able carry out source attributions at all. I therefore took up this research approach in experiment 2 and examined the meaning of familiarity for early source monitoring performances. In the following section, I discuss in detail the empirical findings of experiment 2 and point out their theoretical implications. I start with the question of whether and how familiarity enhances 3-, 4- and 5-year olds source monitoring performances. Then I turn to the question of whether familiarity allows 3-year-old children to attribute reality monitoring familiar sources correctly to their memories earlier than reality monitoring unfamiliar sources and whether familiarity allows for successful external source monitoring performances to take place at that age.

In experiment 2, I expected that familiarity with the person source facilitate young children's source monitoring performances. This expectation is based on the assumption that for high familiar persons pre-existing person specific knowledge is available that can ease and facilitate the encoding, storage and retrieval of an event (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). The reason behind this is that the event can be embedded and connected to the existing representations and thus enrich the memory trace and allow for a more flexible retrieval of the memory characteristics through multiple pathways (e.g.,

Baker-Ward & Ornstein, 2002; Baker-Ward et al., 1990; Bauer, 2007; Begg & Snider, 1987; Chi, 1978; Chi & Koeske, 1983; Drummey & Necombe, 2002; Engelkamp, 2001; Fivush, 1997; Nairne & Wider, 1988; Nelson, 1993, 2007; Ornstein, Shapiro, Clubb, Follmer & Baker-Ward, 1997; Symons & Johnson, 1997; see also Craik & Lockardt, 1972). Based on the higher number of retrievable (source specific) memory characteristics I expected in experiment 2 that more high familiar person sources were attributed correctly to their memories than unfamiliar person sources. The expectation was that the enhancing effect of the high familiar person exists in the clustered familiar person sources across the reality monitoring and the external source monitoring conditions. The same expectation was held for the single sources in the external source monitoring condition. The advantage was expected to be found in younger 3-year-old children, in older 3-year-old children, in 4-year-old children and in 5-year-old children because all of these children already have a high person specific knowledge about familiar persons and thus should be able to profit from this pre-existing knowledge (Bauer, 2002, 2007; Fivush, 1997; Nelson, 1993; Johnson & Raye, 2000; Symons & Johnson, 1997).

Experiment 2 showed that in each age group the children attributed more high familiar person sources correctly to their memories than unfamiliar person sources. This was true in the clustered high familiar sources across the reality monitoring and external source monitoring conditions and also in the single high familiar source in the external source monitoring condition for the older 3- year-old and the 4-year-old children and from a tendency for the younger 3-year-old and the 5-year-old children. The clear and consistent advantage of high familiar person sources shows that familiarity is important in and for source monitoring performances. The reason for this overall advantage obviously lies in the pre-existing person specific knowledge available for high familiar persons (e.g., Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). This pre-existing person specific knowledge seem to ease and facilitate the encoding of the event because the event can be embedded and connected to the existing representations (e.g., Baker-Ward & Ornstein, 2002; Baker-Ward et al., 1990; Bauer, 2007; Begg & Snider, 1987; Chi, 1978; Drummey & Necombe, 2002; Engelkamp, 2001; Fivush, 1997; Nairne & Wider, 1988; Nelson, 1993, 2007; Ornstein, Baker-Ward, Gordon & Merritt, 1997; Symons & Johnson, 1997; see also Craik & Lockardt, 1972). This way, the memory trace of the event is enriched and many connections through different pathways in the representational network should be available. In the same way, the storage of the event can be facilitated because more details about the event can be stored and the details are better connected to the existing representations (Baker-Ward et al., 1990; Bauer, 2007; Engelkamp, 2001; Nelson, 2007; Symons & Johnson, 1997; see also Craik & Lockardt, 1972). In the following, the retrieval of the information is clearly facilitated by the enhanced encoding and storage because the access to the memories is more available through the multiple pathways connected with the specific event and more source specific memory characteristics are retrievable (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). Besides this, it should be

easier to get access to critical source specific memory characteristics during specific searches and through the multiple pathways networks associated with it (e.g., Baker-Ward et al., 1990; Johnson & Raye, 2000; Symons & Johnson, 1997). Based on that, high familiar sources should be attributed easier and more reliable to their memories. The additional person specific knowledge is not available for unfamiliar persons (Baker-Ward et al., 1990; Lindsay et al. 1991; Symons & Johnson, 1997). Thus, events in which unfamiliar persons are involved are more difficult to encode because the event cannot be embedded into a broad pre-existing (person specific) knowledge and connected to associated networks. This means that obviously more cognitive effort might be necessary to encode the event in the first place. It seems to also be the case that a lower number of memory characteristics are encoded and that the memory is less embedded and/or connected to existing representations. The same should be true for the storage of the event. In the following, the access and the retrieval of the source specific memory characteristics should be more difficult and a lower number of source specific memory characteristics should be retrievable (Baker-Ward et al., 1990; Symons & Johnson, 1997). As clearly shown in experiment 2 this makes source attributions more difficult and results in a lower number of correct source attributions compared to high familiar person sources.

Experiment 2 also showed that the advantage of high familiar persons is independent of age. The younger 3-year-olds, the older 3-year-olds, the 4-year-olds and the 5-year-olds profited equally from the high familiar persons. This finding reveals that younger children can already use their pre-existing person specific knowledge effectively and with it facilitate their memory retrieval and carry out source monitoring performances successfully (e.g., Baker-Ward & Ornstein, 2002; Baker-Ward et al., 1990; Bauer, 2007; Begg & Snider, 1987; Fivush, 1997; Johnson & Raye, 2000; Nairne & Wider, 1988; Nelson, 1993; Ornstein, Baker-Ward, Gordon & Merritt, 1997; Symons & Johnson, 1997). Nevertheless, in relation to the single sources of the external source monitoring condition, only a tendency for the advantage of the familiar sources were found in the younger 3-year-old children and in the 5-year-old children indicating that age differences seem to exist at the level of the single sources. It could be the case that in the younger 3-year-old children the external source monitoring performances might be still not as stable as in the older 3-year-old children and therefore only a tendency for the advantage of the familiar source might be visible in that age group. This assumption is supported by the lower old recognition rates of the younger 3-year-old children in the external source monitoring condition and as well by the source attribution rates in the external source monitoring condition, which are not significantly above chance level. Particularly the lower old recognition rates may have prevented to show the advantage below the 5% confidence level. However, this assumption need to be examined in a follow-up study to control that not other explanations may cause the tendency of the advantage. Nevertheless, the found tendency in the single sources of the external source monitoring condition indicate clearly that the younger 3-year-old children already profit from the additional

person-specific knowledge of the familiar source and attribute from a tendency more familiar sources correctly to their memories than unfamiliar sources.

In relation to the 5-year-old children, the tendency of the advantage of the familiar sources can be explained by their high source attribution rates in the unfamiliar external sources. The 5-year-old children are obviously able to attribute a high number of unfamiliar external sources correctly to their memories that their unfamiliar source attribution rates were almost as good as their familiar source attribution rates. The source attribution rates of the 5-year-old children in experiment 2 clearly underpin this conclusion. Because in experiment 2 only two sources per source task condition has been used, the clear advantage for the familiar sources below the 5% confidence level might have been prevented but would and should exist in this age group in a source task condition in that a higher number of sources are contained. Thus, ceiling effects in the external source monitoring condition obviously prevented the clear advantage of the single familiar source in the 5-year-old children. Although both explanations should be tested empirically, it can be concluded that the advantage of the familiar sources is also independent of age at the level of the single sources in an external source monitoring condition.

The overall advantage of the high familiar sources in experiment 2 specifies and extends the theoretical assumptions and empirical findings of Baker-Ward et al. (1990). Baker-Ward et al. (1990) found a marginal advantage for more familiar peer sources compared to less familiar peer sources in third graders. Although their results are not as clear as the results of experiment 2, the study already shows a tendency for the advantage of familiarity. However, the study reported by Baker-Ward et al. (1990) and experiment 2 indicate that differences in the advantage of familiarity exist depending on the level of familiarity. The advantage of familiarity is largest between high familiar person sources and unfamiliar person sources (Experiment 2). In contrast, the advantage is marginal between peers that are more familiar and less familiar (Baker-Ward, et al., 1990). The reasons for the differences lie in the different extensive representational networks available for the person sources (c.f., Symons & Johnson, 1997). The highest extensive representational networks are available for high familiar persons and the lowest extensive representational networks are available for unfamiliar persons. Thus, the differences in source attributions are highest between these two person sources. If the differences between the representational networks are not so large, then the advantage of familiarity seems to get smaller, as it was the case between more familiar and less familiar peers (Baker-Ward et al., 1990). Thus, experiment 2 specifies and extends the theoretical assumptions and the empirical findings reported by Baker-Ward et al. (1990) as well as underpin the important meaning of familiarity in early source monitoring performances. The task of follow-up research is to examine systematically the different levels of familiarity and to determine their effects for early source monitoring performances. This will give further insights into what characteristics young children use in their source attributions and help understand how they carry out source monitoring performances. Besides this, it can reveal insights in the beginning of (nondeliberate and

deliberate) strategy use in source monitoring performances if the children start to use information about familiar persons systematically.

In experiment 2, another expectation was that the advantage of high familiar person sources allows younger and older 3-year-old children to attribute reality monitoring familiar sources correctly above chance level to their memories earlier than reality monitoring unfamiliar sources. The higher number of retrievable source specific memory characteristics of high familiar external sources should increase the number of correct reality monitoring familiar source attributions and with it lead to source attribution rates above chance level (Baker-Ward et al., 1990; Symons & Johnson, 1997). Such an increase is not expected for the unfamiliar sources in the reality monitoring unfamiliar condition because the number of the retrievable memory characteristics is not increased by the pre-existing person specific knowledge. Thus, a lower number of reality monitoring unfamiliar sources should be attributed correctly and with it, reality monitoring unfamiliar sources should take longer to be attributed correctly above chance level.

Experiment 2 showed that the older 3-year-old children attributed the reality monitoring familiar sources and the reality monitoring unfamiliar sources correctly above chance level to their memories. The younger 3-year-old children only attributed the reality monitoring familiar sources correctly above chance level to their memories. This indicates that the advantage of familiarity also exists in a reality monitoring condition and leads to the finding that reality monitoring familiar sources are attributed correctly above chance level earlier than reality monitoring unfamiliar sources. Apparently, younger 3-year-old children already use the higher number of retrievable source specific memory characteristics of high familiar sources in a reality monitoring condition. This then leads to successful reality monitoring familiar source attributions at that age.

This finding indicates that such source attributions might also be possible at an earlier age. Therefore, the task of follow-up research is to examine whether younger children can also attribute reality monitoring familiar sources correctly above chance level to their memories. The variable familiarity may have the potential to show source monitoring performances in children younger than 3-years of age and thereby help to identify the beginning and the conditions of such early source monitoring performances.

However, experiment 2 showed that in the case of the older 3-year-old children the hypothesized differences between the two reality monitoring conditions were not found. The older 3-year-old children are clearly able to encode and to retrieve the source specific memory characteristics of the unfamiliar source in such an effective way that they can attribute reality monitoring unfamiliar sources correctly above chance level. This result is conforming to studies in which “unfamiliar” external sources were used in reality monitoring conditions (Welch-Ross, 1995; Experiment 1). Thus, experiment 2 showed that reality monitoring familiar sources are attributed

correctly above chance level earlier than reality monitoring unfamiliar sources in younger 3-year-old children. This difference does not exist anymore however in older 3-year-old children.

Another expectation held in experiment 2 was that the advantage of high familiar persons allows younger and older 3-year-old children to attribute external source monitoring sources correctly above chance level to their memories. Based on the higher number of retrievable source specific memory characteristics (Baker-Ward et al., 1990; Symons & Johnson, 1997) the children should attribute a high number of familiar sources successfully to their memories in the external source monitoring condition. Based on the higher number of retrievable memory characteristics, the children should also discriminate the familiar and unfamiliar sources better from each other because more distinctive memory characteristics should be available (e.g., Lindsay et al., 1991; Roberts, 2000). This should lead to a higher number of correct familiar and unfamiliar external source attributions.

Experiment 2 showed that the older 3-year-old children attributed the external source monitoring sources correctly above chance level to their memories. The higher number of retrievable memory characteristics evidently allowed the older 3-year-old children to attribute the external source monitoring sources correctly above chance level to their memories. This result shows that older 3-year-old children can already attribute external source monitoring sources successfully to their memories and have the conceptual understanding about the external source monitoring sources (e.g., Eckensberger & Plath, 2006; Gergely, 2002; Meltzoff & Brooks, 2001; Perner & Ruffman, 1995; Povinelli, 2001; Premack, 1990; Wellman, 2002). Nevertheless, older 3-year-old children seem to need a higher number of retrievable and distinctive memory characteristics in order to attribute external source monitoring sources correctly above chance level to their memories. If this were not the case they should have been able to attribute those sources in other source monitoring tasks as well (e.g., Experiment 1). Thus, experiment 2 indicates that one reason for the low external source attribution rates in 3-year-old children might be the low and/or less distinctive number of source specific memory characteristics. However, if a higher number of memory characteristics are available as in the case of memories involving high familiar persons, then external source monitoring performances above chance level are already possible in older 3-year-old children.

In relation to the younger 3-year-old children, experiment 2 showed that their external source attribution rates in the external source monitoring condition were not significantly above chance level. Therefore, in the case of the younger 3-year-old children, experiment 2 revealed that they were not able to attribute the external source monitoring sources correctly above chance level to their memories. The higher number of retrievable memory characteristics does not allow them to attribute a higher number of familiar sources correctly and/or to discriminate and attribute the familiar and the unfamiliar sources better to their memories. It seems to be the case that the younger children may not be able use the additional memory characteristics effectively and

attribute external source monitoring sources correctly to their memories yet. This seems to be the case although they profit from the high familiar sources and are able to attribute reality monitoring familiar sources correctly above chance level (i.e., Experiment 2). The reason for the external source attribution rates at chance level seems to lie in the unfamiliar external source attributions. As the results show, the younger 3-year-olds did not attribute the reality monitoring unfamiliar sources correctly above chance level to their memories and as shown in the results, their unfamiliar source attribution rates were low in general and lower than the rates of the older 3-year-old children. It is possible that the younger 3-year-old children could not retrieve a sufficient number of memory characteristics regarding the unfamiliar external sources and thus may fail to attribute them or to discriminate them from the familiar external sources. Another alternative explanation for the external source attributions at chance level could be that the younger 3-year-old children may fail to encode and/or store a sufficient number of memory characteristics of the unfamiliar sources and thus could not retrieve enough memory characteristics to attribute a higher number of unfamiliar sources correctly. It might be also the case that the working memory load during encoding, retrieval and/or the source decision might have been too high for the younger 3-year-old children and thus they could not attribute the unfamiliar sources correctly in the external source monitoring condition. Another reason could be that the younger 3-year-old children have not yet developed the conceptual understanding of the two external sources available and therefore have difficulties attributing both external sources correctly above chance level to their memories.

Unfortunately, these different explanations cannot be examined in post hoc analyses in experiment 2. It is therefore the task of future research to disentangle and to identify the possible reasons for the external source attribution rates at chance level in the younger 3-year-old children. This will shed light in the reasons to what limits 3-year-olds external source monitoring performances and what developmental changes take place in the middle of the third year of life in the ability to attribute external source monitoring sources correctly to their memories.

The task of following research is now to systematically examine the different levels of familiarity with the aim of specifying their individual meaning for young children's source monitoring performances. It is also important to examine what exactly causes the advantage of familiarity and how the children use information about familiar persons in the single parts of their source monitoring processes. Besides this, the advantage of familiarity seems to have the potential to unveil the beginning of (verbal) source monitoring performances at an earlier age. Experiment 2 clearly indicates that familiar source attributions should be possible in children younger than three years of age.

In following research, it is also important to examine what reasons cause the transitions at the middle of the third year of life allowing unfamiliar source attributions to take place and making it possible to carry out reality monitoring unfamiliar and external source monitoring

performances. Besides this, the advantage of familiarity allows for the investigation of the beginning of the nondeliberate and deliberate strategy use in source monitoring performances. These examinations will extend our theoretical and empirical knowledge about the beginning, the processes, the strategies and the role of familiarity for early source monitoring performances enormously and with it make it possible to specify the developmental course of source monitoring in children.

3.4.1.2 Multiple source attributions in simultaneous source attribution conditions

One important question in the development of source monitoring arises when children attribute multiple sources in a simultaneous source attribution condition correctly to their memories. If children are able to do this then they can select the relevant sources without additional source cues, they must have acquired a comprehensive conceptual understanding of each single source and be able to use that knowledge in their source monitoring performances independent of the number and types of alternative sources. Besides this, if children are able to discriminate between multiple sources in a simultaneous source attribution condition then they have met the requirements of daily life in that usually more than two sources are involved (Lindsay, 2002; Roberts, 2002) and should therefore be able to recall events more accurately (e.g., Bright-Paul et al., 2005; Welch-Ross, 2000; Roberts, 2002). In experiment 2, I explored this question and examined when 3- to 5-year-old children are able to attribute multiple sources in a simultaneous source attribution condition correctly to their memories. Besides this, I examined what types of source errors children made in the simultaneous source attribution condition to examine what strategies children may use if they cannot attribute the sources correctly to their memories. In the following section, I discuss in detail, these examinations and point out their theoretical and empirical meanings. I start with the question of whether 3- to 5-year old children are able to attribute multiple sources in a simultaneous source attribution condition and then turn to the question concerning what types of source errors are made.

Multiple source attributions in a simultaneous source attribution condition

In experiment 2, I expected that the 3-, 4- and 5-year-old children attribute the selected multiple sources correctly to their memories in the simultaneous source attribution condition with the open-ended source question, “Who previously looked under that magic window (and told what was seen)?” (e.g., Bright-Paul et al., 2005). In relation to the *4- and 5-year-old children*, it was expected that they attribute all sources correctly to their memories because they already acquired the conceptual understandings about the single types of sources (Lindsay et al., 1991; Sussman, 2001; Welch-Ross, 1995, Experiment 1) and thus should attribute the sources correctly without additional information in the open-ended source question. In the case of the internal source monitoring sources, it was expected that the 4- and 5-year-old children differentiate between the

two internal sources by themselves. In relation to the *younger and older 3-year-old children*, I expected that they attribute the reality monitoring sources and the external source monitoring sources correctly to their memories because they should have acquired the conceptual understanding of these types of sources (Roberts & Blades, 1998, Welch-Ross, 1995; Experiment 2). In the case of the internal source monitoring sources, it was expected that the younger and older 3-year-old children are at least able to identify the performed and imagined source as the internal child source in the simultaneous source attribution condition (c.f., Bright-Paul et al., 2005). However, it was not expected that the 3-year-olds further specify these two internal sources because it was assumed that they need additional external cues to attribute internal source monitoring sources correctly to their memories (cf., Chapters regarding the optimization of the internal source monitoring instruction). In experiment 2, the criterion of successful source attributions in the simultaneous source attribution condition was that the source attribution rates of each type of source monitoring were above chance level.

In relation to the *4- and 5-year-old children*, experiment 2 showed that they were able to attribute the selected multiple sources correctly above chance level to their memories. This result indicates that at the age of 4-years children use their conceptual understanding about different types of sources in such a flexible way that they attribute multiple sources in a simultaneous source attribution condition correctly to their memories without additional source cues. Besides this, the source task and the single source task items obviously provided the children with an extensive and distinctive self-contained source condition context that allow the identification of the relevant sources of the task and the high number of correct source attributions. With it, experiment 2 showed that 4-year-old children are on principle able to identify event related sources by themselves without external source cues.

Nevertheless, experiment 2 revealed that in the case of the internal source monitoring sources it was necessary to ask the 4- and 5-year-old children explicitly about the differentiation between the performed and the imagined internal source because they just responded that they themselves were the sources of those memories. They did not differentiate between these two sources in their first, direct response. However, they were able to attribute both internal sources correctly above chance level if they were asked the closed-ended internal source question. Although it was expected that the 4- and 5-year-old children specify the two internal sources by themselves, this result indicates that the question might not have been clear enough to also differentiate between these two internal sources. This seems to be an effect of the used open-ended question type. It can be assumed that if the 4- and 5-year-olds would have been asked to attribute additional internal sources in experiment 2, they would have differentiated between the internal sources in the following by themselves. However, because two internal sources of the internal source monitoring condition were only used in experiment 2 and the magic windows of the internal sources were always the last two ones, the 4- and 5-year-olds could therefore not show that they

differentiate the internal sources in the following by themselves. Although this needs to be verified empirically, it can be assumed that 4- and 5-year-old children are able to differentiate between the two internal sources by themselves and thus are able to attribute all selected multiple sources correctly to their memories in a simultaneous source attribution condition.

Experiment 2 also showed, that 4- and 5-year-old children were able to identify more than two or three sources in a single source task. Therefore, they are able to carry out more complex source monitoring performances in which higher cognitive demands and a higher memory load are contained. In multiple source tasks with simultaneous source attributions higher cognitive demands are demanded (e.g., Bright-Paul et al., 2005) because the source specific knowledge of each of the single sources needs to be available during the source monitoring processes compared to the source tasks containing two sources only. Besides this, during the source decision processes the source may need to be discriminated not from only one other source but from two or three other sources that are (by itself) more or less distinctive from each other. Such a discrimination and attribution increases the memory load of the task during the source decision processes. Experiment 2 revealed that the higher cognitive demands and the higher memory load could already be mastered by 4- and 5-year-old children and show that complex source monitoring performances are possible at that age.

In this connection, experiment 2 also indicates that the close temporal context of the multiple sources could be mastered by the 4- and 5-year-old children. Otherwise, their source attributions would have decreased as is reported in single empirical studies (Anastasi & Payne, 1995 cited by Roberts & Blades, 1998; Lindsay, 1990). Nevertheless, it is not possible to draw a more detailed conclusion about the temporal context in experiment 2 because it was not varied systematically and the temporal characteristics were always confounded with the other context characteristics. This needs to be examined in follow-up research.

In relation to the *younger and older 3-year-old children*, experiment 2 showed that the *older 3-year-old children* attributed the reality monitoring (familiar and unfamiliar) and the external source monitoring sources in the simultaneous source attribution condition correctly above chance level to their memories. Besides this, they identified the two internal source monitoring sources correctly to their memories and were able to differentiate them after asking the closed-ended internal source question. The source task and the single source task items obviously provided the older 3-year-olds with an extensive and distinctive self-contained source condition context that allow the identification of the relevant sources of the task and the high number of correct source attributions. Thus, experiment 2 showed that older 3-year-old children on principle are able to retrieve the source specific memory characteristics and to use their conceptual understanding about the different types of sources in such a flexible way that multiple source attributions in a simultaneous source attribution condition are possible. Besides this, experiment 2 showed that older 3-year-old children are able to identify more than two or three

sources in a single source task condition and can therefore successfully carry out more complex source monitoring performances, which demand higher cognitive demands and a higher memory load. This result conforms to the empirical findings reported by Bright-Paul et al. (2005) and show that 3-/4-year-old children can already master such complex source tasks with a simultaneous source attribution condition.

Experiment 2 also indicates that the older 3-year-old children mastered the close temporal context of the multiple source task condition. Otherwise, their source attribution rates would have been decreased as it was reported in single empirical studies (Anastasi & Payne, 1995 cited by Roberts & Blades, 1998; Lindsay, 1990). As pointed out for the 4- and 5-year-old children, it is not possible to draw a more detailed conclusion about the temporal context in experiment 2 because it was not varied and the temporal characteristics were always confounded with the other contextual characteristics. The role of the temporal context needs to be tested systematically in follow-up research.

In the case of the *younger 3-year-old children*, experiment 2 showed that the younger 3-year-old children only attributed the reality monitoring familiar sources correctly above chance to their memories in the simultaneous source attribution condition. In contrast, they did not attribute the reality monitoring unfamiliar and the external source monitoring sources correctly above chance level to their memories. In relation to the internal source monitoring sources, the younger 3-year-old children identified the internal source monitoring sources correctly as internal child sources. Nevertheless their internal source monitoring performances were significantly below chance level showing that the younger 3-year-old children have fundamental problems attributing internal source monitoring sources correctly to their memories. Thus, experiment 2 showed that the younger 3-year-old children were principally not able to attribute the multiple sources in a simultaneous source attribution condition correctly to their memories. This pattern of results stand in contrast to the hypotheses of experiment 2, which assume that younger 3-year-old children already attribute reality (familiar and unfamiliar) and external source monitoring sources in a simultaneous source attribution condition correctly above chance level to their memories. How can this divergent finding be explained? There are several explanations possible. The first explanation could be that the younger 3-year-old children may not encode, store and/or retrieve sufficient memory characteristics to differentiate and to attribute the reality monitoring unfamiliar and external source monitoring sources correctly to their memories. As pointed out previously, younger children usually encode and retrieve a lower number of memories (e.g., Bauer, 2002, 2007; Fivush, 2002; Fivush & Hamond, 1990; Hayne, 2007; Ornstein, Baker-Ward, Gordon & Merritt, 1997; Peterson & Rideout, 1998). It is possible that the younger 3-year-olds could not encode, store and retrieve enough source specific memory characteristics by themselves and thus could not attribute the reality and external sources correctly in the following. In this connection, it is also possible that younger 3-year-olds may retrieve memory

characteristics that are not distinctive enough. As pointed out in the previous chapter, both – the reality monitoring unfamiliar and the external source monitoring sources – are more difficult to attribute because a lower number of distinctive memory characteristics are available and thereby complicate the source decision process (e.g., Lindsay et al., 1991; Roberts, 2000, Experiment 1, 2). It is possible that in experiment 2 the younger 3-year-old children needed more distinctive source specific memory characteristics to attribute the reality monitoring unfamiliar and the external sources correctly to their memories. Because the retrieved memory characteristics were not directly examined in experiment 2 it is not possible to assess whether the younger 3-year-olds did not encode, store or retrieve enough memory characteristics or whether the source specific memory characteristics were not distinct enough. Both explanations are possible explanations in experiment 2. Whether the first or the second explanation is correct needs to be tested in future research.

Another explanation of the low source attribution rates of the younger 3-year-old children could be the temporal context. As pointed out before, if events occur close together in time (e.g., within an hour) then the temporal context can be a less effective source specific cue than the temporal context of events that do not occur close together in time (Anastasi & Payne, 1995 cited by Roberts & Blades, 1998; Lindsay, 1990). In experiment 2, the items of the source monitoring conditions were presented closer together in time and may in addition make the unfamiliar reality and external source attributions more difficult for the younger 3-year-old children because a lower number of distinctive temporal memory characteristics are available. It is therefore possible that the temporal context may lead to the low source attribution rates of the younger 3-year-olds. The possible negative effect seems to be not so problematic in the familiar reality monitoring condition. In that condition, enough other source specific memory characteristics might have been available that allowed source attributions above chance level. However, at present it is not clear how and to what extent the temporal context influences young children's source monitoring performances (Roberts & Blades, 1998). As pointed out for the (older) 3-, 4- and 5-year-old children, it is not possible to draw more detailed conclusions about the temporal context because it was not varied in experiment 2. Nevertheless, it is a possible explanation that the lower temporal context characteristics may complicate the younger 3-year-olds source attributions and may lead to their low source attribution rates.

Another explanation could be that the younger 3-year-olds could not use their conceptual understanding about the reality and external source monitoring performances in such a flexible way that they attributed these sources correctly in the simultaneous source attribution condition to their memories. In this connection, three explanations can be examined and evaluated on how they fit as a possible explanation. The first explanation is that the younger 3-year-old children may not have yet acquired the necessary conceptual understanding to attribute the unfamiliar reality monitoring sources correctly to their memories. As pointed out previously, at the age of 2 ½ to 3-year children should on principle be able to distinguish between unfamiliar external

person sources (Roberts & Blades, 1998, Welch-Ross, 1995; Experiment 2). That younger 3-year-old children and partly 2-year-old children are generally able to attribute unfamiliar reality monitoring sources has been shown in the studies reported by Welch-Ross (1995) and by Hala et al. (2007). Thus, it can be assumed that younger 3-year-old children generally have acquired the conceptual understanding of unfamiliar reality monitoring sources and therefore should have been able to attribute these sources correctly to their memories. This explanation can therefore be excluded in experiment 2. What is about the conceptual understanding of the external source monitoring sources? Although on a theoretical level, it can be expected that they are generally able to differentiate between external sources (e.g., Eckensberger & Plath, 2006; Gergely, 2002; Perner & Ruffman, 1995; Povinelli, 2001; Wellman, 2002), empirical evidence is still not available at this point. It is a possible explanation that the younger 3-year-olds may not have the conceptual understanding about the external sources available and therefore failed to attribute these sources correctly to their memories. The third explanation for the results in experiments 2 is that it is possible that the (already acquired) knowledge about the conceptual understanding of unfamiliar reality and external source monitoring sources could only be used successfully in single source monitoring conditions. Their knowledge could (still) be not flexible enough to use it in a simultaneous source attribution condition. This is a possible explanation for the low source attributions of the younger 3-year-old children as well. Unfortunately, both possible explanations about the conceptual understanding cannot be examined or verified in experiment 2 because the performance in single source monitoring conditions was not tested. This needs to be tested in a further studies.

Another possible explanation of the low source attributions rates of the younger 3-year-old children is related to the type of source question and to the cognitive demands that go along with it. In the simultaneous source attribution condition, the open-ended source question “How do you know that?” was used. It is possible that the cognitive demands and the memory load of this question were too high for the younger 3-year-old children. However, based on the finding that they attributed the familiar reality monitoring sources correctly to their memories a general difficulty with the open-ended source question might be excluded or can be compensated in optimal source monitoring conditions. Otherwise, they would not have been able to attribute the familiar reality monitoring sources correctly. It seems to be the case that the younger 3-year-olds need additional external source cues in an open-ended source question to attribute unfamiliar reality and external monitoring sources correctly to their memories in a simultaneous source attribution condition. They might not be able to compensate the missing unfamiliar reality and external source cues otherwise.

Besides this, open-ended source questions go along with higher cognitive demands and a higher memory load (Bright-Paul et al., 2005). The higher cognitive demands and the higher memory load might not be mastered yet by younger children (Bright-Paul et al., 2005) and can go along with a higher number of source errors if the memory loads and the cognitive demands exceeds

the processing capacity. Younger children might be more vulnerable to such a cognitive overload than older children might and younger children might be not able to compensate the higher cognitive demands and/or memory load otherwise (e.g., through the verbal representation system, through more extensive knowledge, through more extensive experiences with sources). Experiment 2 suggests that in the unfamiliar reality monitoring and external source monitoring condition the cognitive demands and the memory load of the open-ended source questions was too high for the younger 3-year-old children. To reduce the cognitive demands and the memory load of the open-ended source question, in experiment 2 a closed-ended source question with the alternative sources as external source cues could have been asked if the child was not able to answer the open-ended source question. Closed-ended source questions reduce the cognitive demands and the memory load of this question (Bright-Paul, et al., 2005; Lamb et al., 2007; Roberts & Blades, 1998) because they contain specific external source cues that are relevant only and new items/sources do not need to be discriminated from the old items. However in experiment 2, most of the younger children responded to the open-ended question in the unfamiliar reality monitoring and external source monitoring condition. Thus, they were not asked the closed-ended question. Based on the results, this may have been useful because then it would have been possible to disentangle whether their source difficulties come from the missing external cues in the open-ended source question. Now it is not possible to test this assumption afterwards. So, based on experiment 2 it can only be concluded that the open-ended source question might have been too demanding for the younger 3-year-old children but it is not clear what and how external cues and the cognitive demands can explain the low source attribution rates.

Based on the included depend variables in experiment 2 it is not possible to specify where the difficulty of the younger 3-year-olds came from. Unfortunately, at present no further empirical findings are available that allow conclusions about the possible reasons. It is also possible that a combination of the different possible reasons lead to the low unfamiliar reality and external source attributions in the younger 3-year-old children. However, just as the previously described single explanations need to be tested in follow-up research, so does a combination of these explanations.

Nevertheless, based on experiment 2 it can be concluded that younger 3-year-old children did not attribute familiar, unfamiliar and external source monitoring sources in a simultaneous source attribution condition correctly above chance level to their memories. Their source attribution rates above chance level were limited to the familiar reality monitoring sources. Now the need arises to systematically test whether the encoding/storage/retrieval of the source specific memory characteristics, the conceptual understandings of the unfamiliar reality and external source monitoring sources, the open-ended source question with their higher cognitive demands and memory load or a combination does not allow younger 3-year-old children to attribute multiple sources correctly to their memories in a simultaneous source attribution condition.

Experiment 2 also indicates a quantitative and a qualitative change at the middle of the third year of life in the ability to attribute multiple sources in a simultaneous source attribution condition. The task of following research is now to identify and specify the factors and abilities that cause these changes and allow such complex source monitoring performances. This knowledge will help understand and explain what developmental changes in source monitoring take place at the age of 3 years and what factors cause these developmental changes.

Besides the previously presented conclusions, the empirical finding that (older) 3-, 4- and 5- year old children answered correctly an open-ended source question in a simultaneous source attribution condition and attributed successfully multiple sources to their memories has additional important implications. First, in open-ended questions the accuracy is usually very high (e.g., Bauer, 2002; Fivush et al., 2002; Hamond & Fivush, 1991; Hudson, 1990; Lamb et al., 2007; Poole & Lindsay, 1995; Roberts & Blades, 1998). This was also the case in the open-ended source question of experiment 2 in that the source attribution rates were almost perfect. However, the high accuracy in experiment 2 or complete correct source attributions respectively does not solely come from the question type, but is also promoted by the type of source task (e.g., picture-book, item number, item characteristics, delay), the contained sources (e.g., familiar, unfamiliar external sources) and the comprehensive conceptual understanding of source monitoring. All these conditions seem to lead to the high accuracy in the responses to the open-ended source question and thus should be used in situations in that a high accuracy is required. Second, because the indirect/direct pressure to report a certain number of memories or sources (c.f., Lamb et al., 2007; Roberts & Blades, 1998) is reduced in open-ended source questions, this type of question should be preferred in situations in which memory accuracy has to be very high. Experiment 2 showed that this is possible at the age of 3-years. Third, because open-ended source questions avoid implying that the interviewer prefers a particular response (e.g., Lamb et al., 2007; Roberts & Blades, 1998) they are also appropriate in situations in which such an influence has to be reduced or prevented. Experiment 2 showed that at the age of 3 years, children could respond to such questions und thus this external influence can be controlled by using open-ended source questions. Fourth, open-ended questions make it easier for children to answer, “I don’t know” if they cannot answer the question (Peterson, Dowden, & Tobin, 1999) and thus they should be preferred in situations in which confabulations and false memories need to be reduced. Experiment 2 revealed that (older) 3-, 4- and 5-year-old children respond correctly to the open-ended source questions and thereby indicate that this question type can be used by children at least that age. At present, this conclusion has to be limited to reality monitoring and external source monitoring sources because the (older) 3-, 4- and 5-year-olds needed additional cues in a closed-ended source question to attribute internal source monitoring sources correctly to their memories. Besides this, it has to be considered that younger 3-year-old children are not able to correctly answer the open-ended source question and attribute the multiple sources in the

simultaneous source attribution condition correctly to their memories. Nevertheless, around the middle of the 3 year of age, qualitative cognitive changes occur that will then allow multiple source attributions in a simultaneous source attribution condition.

Source errors in the simultaneous source attribution condition

The simultaneous source attribution condition additionally allows the examination of various types of source errors. Based on that, it is possible to identify what types of source errors are made at all and to examine whether the source errors differ meaningfully from each other. With it, the source errors reveal as well what nondeliberate or deliberate strategies children may use if they cannot attribute the sources in a simultaneous source attribution condition correctly to their memories. In experiment 2, three types of source errors stand in the focus of interest: Intra-intraexperimental source errors, inter-intraexperimental source errors and extraexperimental source errors. *Intra-intraexperimental source errors* are source errors in which the other source of the source monitoring condition in the experimental situation is selected. In contrast, *inter-intraexperimental source errors* are source errors in which one source from the other source monitoring conditions in the experimental situation is selected. Finally, *Extraexperimental source errors* are source errors in which a source from outside the experimental situation is selected.

In experiment 2, it was expected that the 3-, 4- and 5-year-old children make more intra-intraexperimental source errors than inter-intraexperimental source errors. Besides this, it was expected that the 3-, 4- and 5-year-olds make more intra-intraexperimental source errors than extraexperimental source errors. Both hypotheses base on the assumption that compared to the two other types of sources in the intra-intraexperimental sources a lower number of contextual and time related source cues are available which in turn makes source attributions more difficult and goes along with a higher number of source errors (cf., Johnson et al., 1993, Lindsay et al., 1991; Roberts, 2000). Because the highest number of contextual and time related cues are available in extraexperimental sources, it was also expected that the extraexperimental source errors are lower than the inter-intraexperimental source errors.

The analyses of the intra- and extraexperimental source errors require that source errors were made in the first place. For an adequate interpretation of the source errors, it is also necessary to know how the source errors are distributed in the four source conditions and in the four age groups. Otherwise, the risk is given that conclusions are drawn for all conditions or groups that are valid only for single conditions or groups. Therefore, the frequencies and the distribution of the source errors are discussed first, followed by the discussion of the differences between the two intraexperimental and the extraexperimental source errors. Experiment 2 showed that 57 source errors were made across all children and across all single source items. Compared to the

possible error rates of 384 (576 total decisions), the number of source errors is low. All 57-source errors were intra- and inter-intraexperimental source errors. Extraexperimental source errors were not made in experiment 2. The low number of source errors is quite surprising and stands partly in contrast to other findings (e.g., Drumme & Newcombe, 2003). Nevertheless, the low number of source errors in experiment 2 can be explained (1) by the selected source task items, (2) by the reality monitoring familiar and the internal source monitoring conditions and (3) by the response option “I-don’t-know”. Compared to other source task items (e.g., facts, verbal phrases), the selected picture-book windows are quite distinctive. This is the case within each single source condition as well as in the four different source conditions. Thus, more source specific memory characteristics might have been available in the source decision processes and thereby accounting for the low number of source errors. The low number of source errors can also be explained by the reality monitoring familiar and the internal source monitoring condition. The reality monitoring familiar condition also provided the children with a high number of distinctive source specific memory characteristics. As pointed out before, this lead to a high number of correct source attributions and goes along with a lower number of source errors. The same seems to be true in the internal source monitoring condition. Based on the optimization of the internal source monitoring instruction, the number of source errors was low as well. The low number of source errors can also be explained by the response option “I-don’t-know” in experiment 2. This response alternative may have lead to a lower number of source errors because in the case of uncertainty, the children could choose that response instead of making a source error. The selected source task items, the reality monitoring familiar condition, the internal source monitoring condition and the response option “I-don’t-know” all provide possible explanations for the low number of source errors in experiment 2.

Regarding the distribution of the source errors, experiment 2 showed meaningful differences between the four source monitoring conditions. Across all age groups, the lowest number of source errors occurred in the reality monitoring familiar condition. This pattern of result fits well to the empirical findings that in the three other source monitoring conditions a lower number of distinctive source specific memory characteristics are available that can lead to a higher number of source errors (e.g., Johnson et al., 1993; Lindsay et al., 1991; Roberts, 2000). Regarding the distribution of source errors in the four age groups, experiment 2 revealed no meaningful age differences. This indicates that the source errors are distributed equally across the four age groups.

However, the preliminary source error analyses show that only a low number of source errors were made in experiment 2 all together. On the one hand, this is a very good finding. On the other hand, the conclusions about the variety of source errors and their meaning are limited and in the case of the extraexperimental source errors, it is not possible to test the hypotheses about the differences between the extraexperimental and the intraexperimental source errors in a meaningful way.

Now I turn to the hypotheses about the differences between the three types of source errors. Experiment 2 showed that across the four age groups no higher intra-intraexperimental source errors than inter-intraexperimental source errors were made. This was the case in each of the four source monitoring conditions. This clear result is surprising and stands in contrast to the expectations. Based on the lower number of contextual and time-related source cues in the intra-intraexperimental sources, it was expected that the source errors are higher in the intra-intraexperimental sources compared to the inter-intraexperimental sources. This expectation was derived from the source monitoring framework and is underpinned by the empirical findings that a lower number of distinctive memory characteristics or a high level of similarity complicate source monitoring performances (e.g., Johnson et al., 1993; Johnson & Ratner, 2001; Lindsay, 2002; Lindsay et al., 1991). The findings of experiment 2 indicate that this might not be always the case. How can this divergent finding be explained?

One explanation could be that the number of source errors might have been too low to show the differences between the two intraexperimental source errors. As pointed out before, the number of source errors was quite low in experiment 2 (57 source errors across all 48 children and across all 4 source monitoring conditions). It could be the case that at a higher number of source errors is needed to show stable and statistically significant differences between the two intraexperimental source errors. Unfortunately, no other empirical findings are available that help in evaluating this possible explanation.

Another explanation concerns the differentiation of systematic and unsystematic source errors. In experiment 2, it was assumed that source errors are systematic source errors. These systematic source errors were theoretically and empirically derived and contain the expectation that more intra-intraexperimental source errors than inter-intraexperimental source errors should exist because in intra-intraexperimental sources a lower number of contextual and time-related cues are available that should make source attributions more difficult and thus lead to a higher number of source errors. It is possible that these assumed systematic source errors also contain unsystematic source errors and by themselves or in combination with the low source error rates of experiment 2, do not display the expected differences. It is also possible that the assumed systematic source errors might only be found in older children and/or might depend on a more comprehensive meta-cognitive knowledge and strategy use (e.g., Bjorklund et al., 2009; Johnson & Raye, 2000; Lindsay, 2002; Schneider & Bjorklund, 1998; Schneider & Lockl, 2006; Schneider & Pressley, 1997). The low source error rates of experiment 2 and their distribution in the 4- and 5-year-old children might inhibit the assumed differences. Another possible explanation could be that different strategies are used in different source attribution decisions. If this were the case then differences between the types of source errors would not exist across several source attribution decisions. However, at present other empirical findings are not available that help evaluating the different possible explanations. In sum, experiment 2 showed that, in contrast to the expectations that 3-, 4- and 5-year-old children did not make more intra-

intraexperimental source errors than inter-intraexperimental source errors in the simultaneous source attribution condition. In following research should focus on what lead to the absent differences between the two intraexperimental source errors.

However, experiment 2 revealed one meaningful difference between the inter-intraexperimental and the intra-intraexperimental source errors. In the reality monitoring unfamiliar condition, the 3- to 5-year-old children made more inter-intraexperimental source errors were made than intraexperimental source errors. This was as well a surprising result and stand in contrast to the hypotheses that more intra-experimental source errors should have been made than intra-intraexperimental source errors. The analyses of the frequencies of the single source errors showed that the familiar person was mostly frequently selected as the alleged correct source. In contrast, almost no inter-intraexperimental source errors regarding the (internal) child source (said or thought) were made. This distribution of the inter-intraexperimental source errors indicates that the selection of the familiar person source could have been a strategy the children used in a situation of uncertainty. The children might have been uncertain about the correct source because they may encoded/stored/retrieved too less distinctive source specific memory characteristics and then may have selected the familiar source because this was the other possible type of source in the reality monitoring condition. The frequency of the intraexperimental source errors seems to support this conclusion. The selection of the familiar person source might be then a kind of “You-(familiar-person)-did-it”-bias indicating the use of a non-deliberate/deliberate source decision strategy as it is reported for example by Ratner et al. (2000). If this is indeed a source decision strategy then this would be an early source decision strategy of children below 6 years of age. However, such an uncertainty-source-decision strategy can have important practical implications. This is particularly the case if memory accuracy has to be high or need to be evaluated. If in more than one reality monitoring source situations a familiar and an unfamiliar person source is involved than in the unfamiliar reality monitoring situation the risk for source misattributions is higher and the familiar person source is misattributed more often than the unfamiliar person source. Regarding the evaluation of memory accuracy in forensic context this familiar-person-bias can have important, and highly problematic consequences if for example the familiar person would be accused falsely based on such a source attribution bias or error that might not be discovered otherwise. However, the frequencies of the inter-intraexperimental source errors in the reality monitoring familiar and in the external source monitoring condition did not support such an uncertainty-source decision bias indicating that this familiar-person bias might limited to reality monitoring conditions or situations. It could be also the case that the higher number of inter-intraexperimental source errors in the unfamiliar reality monitoring condition might be limited to multiple source attribution retrieval condition and do not exist in single source attribution retrieval condition. It might be also possible that this inter-intraexperimental source error distribution depends only on the materials used in this experiment. However, each of these possible limitations needs to be examined in follow-up research. Then

the meaning of the familiar-source-decision bias would be clearer and it would be possible to specify more clearly what and when younger children start to use nondeliberate or deliberate source decision strategies. Nevertheless, it should be kept in mind that the numbers of source errors in experiment 2 were very low and the found intraexperimental source errors come up rarely.

Based on the absent extraexperimental source errors in experiment 2, the hypotheses concerning differences between the extraexperimental and the two intraexperimental source errors could not be tested. It is therefore not possible to draw any scientific conclusions about the assumed differences between these types of source errors. These conclusions can only be drawn from studies in which these types of source errors are found.

Nevertheless, it is possible to draw some conclusions about the existence of extraexperimental source errors in a simultaneous source attribution condition. Experiment 2 showed that all of the 48 children made no extraexperimental source errors. This was true in each of the four age groups and in each of the four source monitoring conditions. Experiment 2 revealed that extraexperimental source errors do not always occur in younger children and in all source monitoring conditions. Even in younger children and in an open-ended source question in a simultaneous source attribution condition these errors do not occur. In experiment 2, the whole source task was processed as a self-contained event in that no additional information from outside the experimental situation was included (with the exception of the knowledge about the internal and the external familiar sources). The type of source task (e.g., 4 conditions, open-ended source question, short delay, number of items) and the type of sources (real-person sources) seem to be convenient conditions for such processing. Besides this, the findings of experiment 2 shows that in specific conditions, extraexperimental source errors may not exist at all and might be controlled or reduced. The task of following research is now to further identify and specify the conditions in that extraexperimental source errors come up or do not come up and to find out how these source errors can be avoided.

Nevertheless, the absent extraexperimental source errors stand in contrast to the findings reported by Drummey and Newcombe (2002). In their fact-source task, they found that 4-year-old children made 60 %, 6-year-old children made 13 % and 8-year-old children made 19 % extraexperimental source errors after a one-week delay. In two further groups of 4-year-old children, they found in an immediate source test lead to 2 % of extraexperimental source errors and in a five-minute delay source test, 13 % of extraexperimental source errors were made. Thus, the study reported by Drummey and Newcombe (2002) showed that extraexperimental source errors in a fact-source task were highest in 4-year-olds compared to 6- and 8-year olds. Besides this, they found extraexperimental source errors in 4-year-olds after different time delays. Their findings show that the error rates were highest after a one-week-delay. The differences to experiment 2 seem to result from the type of source task and from the type of sources. Fact-

source tasks provide the children with other and maybe with a lower number of memory characteristics compared to picture-book source tasks. They can make source attributions more difficult and thus increase the number of source errors. Besides this, Drummey and Newcombe (2002) used an unfamiliar real-person source and a fictitious external source that may also provide the children with a lower number of source specific memory characteristics compared to the real-person sources contained in experiment 2. These may also complicate source attributions and thus increase the number of source errors in the study of Drummey and Newcombe (2002). Another important aspect to consider is that there are many different, more or less familiar persons (e.g., parents, teachers), who generally teach facts. In the case of uncertainty, the fact source task as a self-contained event may not provide the children with enough source specific cues. It could then be an nondeliberate and deliberate strategy of the 4-year-olds to consider other sources from which they usually learn facts (i.e. parents or teachers). This could be the case for the older children as well, although they showed a lower number of extraexperimental source errors. Thus, the apparent contradicting findings between experiment 2 and the study reported by Drummey and Newcombe (2002) can be explained by the different source task characteristics and thereby indicate that extraexperimental source errors are task-dependent. Based on experiment 2 it was possible to specify the conditions of extraexperimental source errors and to extend our knowledge about that type of source errors. The task of following research is to examine other source task conditions and precise our knowledge about extraexperimental source errors in young children.

On principal, multiple source attributions in a simultaneous source attribution condition are possible at the middle of the 3rd year of life. An important task of following research is now to identify what specific performances allow –and in the case of younger children do not allow– multiple source attributions in a simultaneous source attribution condition. Besides this, it is important to examine the different types and conditions of source errors of simultaneous source attribution conditions. This knowledge will extent our theoretical and empirical knowledge about multiple source attributions in simultaneous source attribution conditions in children enormously and allows the examination of a child’s developmental course.

3.4.1.3 Optimizing the internal source monitoring instruction

Research shows that 3-year-old children have difficulties with internal source monitoring (Welch-Ross, 1995; Experiment 1). In experiment 2, I addressed this difficulty and examined how the internal source monitoring instruction can be optimized for 3-year-old children. In this section, I discuss in detail, whether the source specific external perceptual cues “silent” and “loud” help 3-year-old children to identify and to attribute imagined and performed internal source monitoring sources correctly to their memories.

Children at the age of 3 years have difficulties attributing two internal sources correctly to their memories (Welch-Ross, 1995; Experiment 1). Their difficulties seem to result mainly from the imagined internal source “thinking”; otherwise (c.f., Foley & Johnson, 1985; Foley et al., 1983; Kosslyn, 1978; Parker, 1995), they would not be able to attribute performed internal sources correctly to their memories (e.g., Hala et al., 2007; Roberts & Blades, 1999; Welch-Ross, 1995; Experiment 1). Although 3-year-old children already understand, what “thinking” is and that it differs from reality, (e.g., Estes et al., 1989; Flavell et al., 1995; Woolley, 1997; Woolley & Phelps, 1994; Wellman et al., 1996; Wellman, 2002) they seem to have difficulties identifying their previous *actions* as thoughts if they are asked about it using internal source monitoring instructions like “Did you think it or did you say it (previously)?”. Younger children may need additional external source specific cues to identify imagined internal sources and to discriminate them from performed internal sources. The aim of experiment 2 was therefore, to examine whether external source specific cues in the internal source monitoring instruction help 3-year-old children to identify and to attribute imagined and performed internal source monitoring sources correctly to their memories. Because younger children mainly process and use perceptual information (e.g., Lewkowicz, 1994; Posner et al., 1976; Welch-Ross, 1995), source specific perceptual cues seem most reasonable and were therefore used in experiment 2. The perceptual cue “silent” was used for the *imagined* internal source “thinking” because the mental activity “thinking” is carried out silently. The perceptual cue “loud” was used for the *performed* internal source “telling” because verbal statements are told aloud.

In experiment 2, it was expected that younger and older 3-year-old children attribute internal source monitoring sources correctly above chance level to their memories if the internal source monitoring instruction “Did you previously think it silently in your head (or) did you previously tell it out loud” with the two external perceptual source specific cues “silent” and “loud” is used. The two perceptual cues were expected to allow 3-year-old children to attribute and to differentiate between the two internal source monitoring sources because they provide the children with the necessary source specific cues which they still can not generated internally by themselves (e.g., Bauer, 2007; Bjorklund et al., 2009; Fivush & Hamond, 1990 Fivush, 1997; Flavell et al., 1993; Nelson, 1993; Peterson & Rideout, 1998). Correct source attributions above chance level were expected across both internal source-monitoring sources and in the imagined (“thinking” source) and performed (“telling” source) internal source monitoring source. These hypotheses were limited to the younger and older 3-year-old children because 4- and 5-year-old children already attribute internal source monitoring sources correctly to their memories (Sussman, 2001; Welch-Ross, 1995, 2000; Experiment 1). Because it is possible that in experiment 2 the 3-year-old children have already attributed the two internal source question correctly to their memories after the open-ended source question, it is necessary to first examine whether no more than 2 children per age group have been asked the closed-ended internal source question. The analyses of the frequencies revealed that all 3-year-old children have been asked

the closed-ended internal source question after the open-ended source question. Therefore, the hypotheses about the enhancing effects of the internal source monitoring instruction were carried out and the results can be discussed without reservation.

Regarding the *older 3-year-old children (3;6 – 3;11 years)*, experiment 2 showed that if the source specific external perceptual cues “silent” and “loud” are added into the source monitoring instruction “Did you previously think it silently in your head (or) did you previously tell it aloud”⁴⁰, then the older 3-year-old children attributed the two internal sources correctly above chance level to their memories. The same was true for the imagined internal source “thinking”. However, in contrast to the hypothesis the older 3-year-old children did not attribute the performed internal source “telling” correctly at an above chance level to their memories, indicating that the effect of the external perceptual cues differ between the performed and the imagined internal source.

Nevertheless, the results of experiment 2 clearly showed that, in principle, older 3-year-old children already have the necessary source monitoring processes and the conceptual understanding of internal sources available to them and are able to attribute internal source monitoring sources correctly to their memories. With this pattern of results, experiment 2 is the first empirical study to show that children younger than four years of age attribute internal source monitoring sources above chance level correctly to their memories. Using external perceptual cues specifying the two internal sources obviously help older 3-year-old children to distinguish and to attribute the internal source monitoring sources correctly. If more concrete source specific characteristics are available, then older 3-year-olds carry out internal source monitoring performances successfully. The benefit of external source cues is conform to research about memory development and underpins that children younger than 4-years of age need such external cues to retrieve a higher number of memories or to retrieve (specific) memories at all (e.g., Bauer, 2007; Bright-Paul et al., 2005; Ceci & Howe, 1979; Fivush, 1997; Flavell et al., 1993; Myers et al., 1987; Nelson, 1993; Pearse et al., 2003; Peterson & Rideout, 1998; Pipe et al., 1993; Steward et al., 1996). Experiment 2 showed that this is also the case for the complex memory performance “source monitoring” - although the benefit of this seems to be weaker in the performed internal sources.

Perceptual cues obviously play a core role in early source monitoring performances (Welch-Ross, 1995). The reason for this seems to be that children mainly use perceptual information from early age on (e.g. Posner et al., 1976; Welch-Ross, 1995) and thus are able to use this information as external cues effectively. Besides this, research on theory of mind has shown that 3-year-old children can already identify the perceptual source of objects that were seen or told before (e.g., Estes et al., 1989; Flavell et al., 1986; Gopnik & Graf, 1988; O’Neill & Chong,

⁴⁰ As pointed out in the previous section, the closed-ended internal source question was asked in all children because in the open-ended source question the two internal sources were not specified by the children.

2001; O'Neill & Gopnik, 1991; Sodian & Wimmer, 1987; Wellman & Estes, 1986; Wimmer, Hogrefe & Perner, 1988). The use of perceptual cues (and the ability to identify the perceptual source) obviously fits best to younger children's cognitive abilities and thus allows them to master complex cognitive tasks like internal source monitoring.

However, the results of experiment 2 also show, that in contrast to 4-year-old children, 3-year-old children need source specific external cues to attribute internal source monitoring sources correctly to their memories. If such external cues are not available, then correct internal source monitoring performance is not above chance level (Welch-Ross, 1995; Experiment 1). This means that qualitative differences exist between 3- and 4-year-old children. One qualitative difference between 3- and 4-year-olds seems to be that 4-year-old children can (nondeliberately and deliberately) generate and use perceptual cues by themselves (e.g., Bauer, 2007; Nelson, 1993; Peterson & Rideout, 1998) to distinguish and to attribute the two internal sources to their memories. Four-year-old children may not need such external cues (anymore) and thus are able to attribute internal source monitoring sources correctly in source tasks containing source questions without external source specific cues. Another qualitative difference between 3- and 4-year-olds could be that 4-year-old children may start to use cognitive operations in their internal source attributions (Welch-Ross, 1995). If cognitive operations are used as source specific memory characteristics then additional perceptual cues might not be necessary because sufficient source specific memory characteristics are available during the source decision process to attribute and discriminate internal source monitoring sources correctly. It is also possible that 4-year-old children retrieve more source specific memory characteristics than 3-year-old children retrieve (c.f., Bauer, 2007; Nelson, 1993) and thus have (independent of perceptual characteristics and/or cognitive operations) sufficient source specific memory characteristics available to attribute the internal source monitoring sources correctly to their memories.

However, at present it is not possible to answer the question of where the qualitative differences between 3- and 4-year-old children come from. One reason for this is that empirical findings on the possible cause(s) are not available. Thus, following research should examine where the alleged qualitative differences between 3- and 4-year-old children come from.

Besides this, the appropriateness of the perceptual cues indirectly supports the conclusion that 3-year-old children appear to encode imagined, (and performed and pretended) actions according to the sensory/perceptual characteristics rather than according to cognitive operations (Welch-Ross, 1995). If additional source specific perceptual cues are available during the source decision process then imagined as well as performed internal sources can be attributed correctly to their memory based on the perceptual cue "silent". If such perceptual cues are not available or cognitive operations are still not encoded and retrieved, then 3-year-old children do not attribute internal sources correctly to their memories (Welch-Ross, 1995; Experiment 2). Using the perceptual cue "silent" in the internal source question seems to compensate the possible missing encoded cognitive operations in 3-year-old children and thereby allows imagined internal source

attributions on perceptual characteristics. The task of following research is now to examine directly whether 3-year-old children only use sensory/perceptual characteristics.

Experiment 2 also showed that older 3-year-old children did not attribute the performed internal sources correctly above chance level. The result stands in contrast to the second specific hypothesis. This empirical finding is somewhat surprising because 3-year-old children are usually able to attribute performed internal sources correctly above chance level to their memories (Roberts & Blades, 1999; Welch-Ross, 1995; Experiment 1, 2). A general difficulty with this type of source can therefore be excluded. This is true in relation to the conceptual understanding of this type of source as well as to the source monitoring processes carried out. The use of the external perceptual cue “loud” for the performed internal source “telling” could have confused the older 3-year-old children. At that age, children may not need additional external source cues for performed internal sources. It is possible that the attention of the children was drawn away from their source decision-processing course and focused on to the external source cue. The children might have become uncertain or confused about that additional perceptual characteristic or were not able to use it as an additional source cue. Unfortunately, based on the empirical findings of experiment 2 it is not possible to specify where the lower source attribution rates come from. Nevertheless, based on the previous empirical findings it is clear that 3-year-olds are able to attribute performed internal sources correctly above chance level to their memories (Roberts & Blades, 1999; Welch-Ross, 1995; Experiment 1, 2). Whether the source attribution rates in experiment 2 result from confusion caused by the perceptual cue “loud” needs to be tested in a separate study in which the use of such a cue is varied systematically.

Regarding the *younger 3-year-old children (3;0 – 3;5 years)*, experiment 2 showed that the younger 3-year-olds did not attribute the internal source monitoring sources correctly above chance level to their memories. This was true across both internal source-monitoring sources and in the two single internal sources. Contrariwise the source attribution rates of the internal sources of the younger 3-year-old children were significantly below chance level. This finding shows clearly that, in contrast to the hypotheses, the younger 3-year-old children did not profit from the external perceptual source cues “silent” and “loud” in the internal source monitoring instruction and have cardinal problems attributing internal source monitoring sources to their memories. Thus, in experiment 2 it was not possible to adapt the source monitoring instruction successfully for the younger 3-year-olds as the findings show that even with these additional instructions, the they were unable to attribute internal source monitoring sources correctly to their memories. What might be the reason(s) for this pattern of result?

There are different possible explanations. One explanation could be that the younger 3-year-old children could not use the external perceptual information “silent” and “loud” as cues for one or for both internal sources. The difficulty might lie either in the correct understanding of the

perceptual information as cues for source attributions or in the correct use of the perceptual information during the source decision process. Unfortunately, based on experiment 2 it is not possible to draw conclusions about the correct understanding and the use of the perceptual cues because the retrieval and the source decision processes have not been verbalized. It is therefore necessary for following research to examine whether the understanding or the use of the external perceptual cues might be an explanation of their low internal source monitoring performances.

It is also possible that the source monitoring instruction was still too long or too complex for the younger 3-year-old children (c.f., Fritzley & Lee, 2003). Although they may understand such types of questions, they might be not able to process the longer internal source monitoring instruction and thus may responded to it in an incomplete way (e.g., Goody, 1978; Lee & Eskritt, 1999; Siegal, 1997). However, this explanation needs to also be tested in following research because experiment 2 does not give information on whether the source monitoring instruction might have been too long or too complex for the younger 3-year-old children.

Another alternative explanation of the low internal source attribution rates in the experiment could be that the younger 3-year-olds did not retrieve enough source specific memory characteristics of the two internal sources and thus could not attribute the sources correctly to their memories. In this case, they may not use the external perceptual cues although they might be able to do so. Because the (complete) number of retrieved source specific memory characteristics was not measured in experiment 2, it is not possible to exclude this possible explanation directly. This could only be done indirectly only but this explanation was not explored any further in experiment 2.

Another possible explanation for the low internal source attributions could be that the younger 3-year-olds may fail to encode the imagined and/or the performed internal sources correctly. This might be particularly the case in the imagined internal source. The younger 3-year-olds may not imagine the content of the magic windows at all or sufficiently and thus may fail to encode the content of the window. In experiment 2, the imagination of the imagined internal source was instructed by telling the children that they should think of what they see under the magic window silently in their heads so that no one can hear it. It was controlled that the children did not tell or whisper the content of the magic window. However, it is possible that the younger children may fail to “think” what they see under the magic window and thus could not encode the source specific memory characteristics of the imagined internal source. In the following, they might not be able to retrieve and attribute the imagined internal source successfully to their memory on the magic window. Unfortunately, in behavioural studies it is not possible to control mental activities regarding thinking otherwise in young children. Therefore, the explanation cannot be excluded in experiment 2 that the younger 3-year-old children may fail to encode the source characteristics of the imagined internal source sufficiently.

Another quite important explanation for the low internal source monitoring performances could be that younger 3-year-old children do not yet possess the sufficient conceptual understanding

about the characteristics of the two internal sources. This might be the case particularly for the imagined internal source. As pointed out before, 3-year-old children can already understand the concept of thinking and that it differs from reality (e.g. Estes et al., 1989; Flavell et al., 1995; Watson et al., 1998; Woolley & Phelps, 1994; Wellman & Estes, 1986; Wellman et al., 1996) yet, they may not have a more comprehensive understanding about the distinction between the mind and the world and may not differentiate imagined internal sources from performed internal sources (e.g., Welch-Ross, 1995). If they are not able to differentiate between the mind and the world and have an (at least nondeliberate) understanding about the source specific memory characteristics of imagined and performed internal sources then they would not be able to attribute and to differentiate these two types of sources correctly. In experiment 2 it is not clear whether the younger 3-year-olds already have these conceptual understandings (and used it in the internal source monitoring task). The findings of experiment 2 and the empirical findings about the distinction between the mind and the world (Estes et al., 1989; Wellman & Estes, 1986; Wellman, 2002; Welch-Ross, 1995; Woolley & Phelps, 1994) suggest that these understandings could not be available yet at that age and thereby lead to internal source attribution rates below chance level in imagined internal sources. Nevertheless, following research needs to examine this directly. The same is true for the (nondeliberate and deliberate) use of this knowledge in source decision processes.

However, based on the included dependent variables in experiment 2, it is not possible to specify where the difficulty of the younger 3-year-olds came from. There are no further empirical findings available currently that allow conclusions about the possible reasons and that give further specific information about how internal source monitoring can be optimized for younger children. Nevertheless, it can be concluded that if the internal source monitoring instruction with the two externals perceptual cues “silent” and “loud” is used the same way as in experiment 2, then younger 3-year-old children do not attribute internal source monitoring sources correctly above chance level to their memories. This shows that the selected optimization of the internal source monitoring instruction did not fit to younger 3-year-old children. Further research is needed to systematically test whether the selected perceptual characteristics, the verbal terms, the encoding of imagined specific memory characteristics or the mental state conceptualisation are the reasons for not allowing the younger 3-year-old children to understand and/or respond correctly to imagined internal source question. If it is possible to identify the reasons for the young children’s difficulty then it might be possible to optimize the internal source monitoring conditions for younger children or to identify the time when such source monitoring performances are possible at all.

On principal, the internal source monitoring instruction can be optimized for 3-year-old children and lead to successful internal source monitoring performance. The perceptual cues “silent” and “loud” are age appropriate external source cues that help older 3-year-old children to attribute

internal sources correctly to their memories. However, at present the optimization and the appropriateness of the two external perceptual source cues is limited to older 3-year-old children. In my opinion, the task of following research is to first examine the possible reasons for the low internal source monitoring performances in younger 3-year-old children and second to examine whether differences in the appropriateness exist between the perceptual cues “silent” and “loud” in older 3-year old children. Besides this, it is necessary to test whether the advantage of the internal source monitoring instruction exist independent of the type of source task (or type of stimuli respectively) and can be also found in a higher number of internal source attributions. It is also meaningful to examine how the three year olds carry out their internal source attributions and when and how they start to use cognitive operations. These empirical findings will extend and precise our knowledge about the beginning of internal source monitoring and provides information about the underlying processes of source monitoring, on the questions what, how and why it develops, on the reasons for source monitoring failure as well as on how source attributions can be improved effectively in younger children.

3.4.2 Identifying factors related to early source monitoring

Now I discuss whether inhibition, verbal abilities, theory of mind abilities and social variables are related to early source monitoring. I start with the relation between inhibition and source monitoring (3.4.2.1) and then turn to the relation between verbal abilities and source monitoring (3.4.2.2). Then I go on with the relation between the theory of mind abilities and source monitoring (3.4.2.3) and end with the relation between the selected social variables and source monitoring (3.4.2.4).

3.4.2.1 The relation between inhibition and source monitoring

From a theoretical point of view, inhibition seems to play a core role in source monitoring because accurate source attributions may require the inhibition of source irrelevant information and/or the use of efficient processes identifying source (ir)relevant information (Melinder et al., 2006; Roberts & Powell, 2005; Ruffman et al., 2001; Wheeler et al., 1997). Inhibitory control seems to be one of these strategic and reflective processes contained in source monitoring that allow controlling source irrelevant information (Johnson et al., 1993; Roberts & Powell, 2005). In this section, I discuss in details the theoretical and empirical relation between inhibitory control and source monitoring and derive research questions for following research.

On a theoretical level, successful source monitoring requires the inhibition of source irrelevant memory characteristics and/or the use of processes/strategies controlling source irrelevant information (Johnson et al., 1993; Melinder et al., 2006; Roberts & Powell, 2005; Ruffman et al.,

2001; Wheeler et al., 1997). Thus, in experiment 2 it was expected that children who can inhibit source irrelevant memory characteristics are better able to identify and attribute the sources correctly to their memories. In experiment 2, it was expected that this was true for all types of sources because inhibition of source irrelevant memory characteristics is required in each type of source monitoring and source attributions cannot be made on the available familiarity cues only. The positive relations between inhibition and source monitoring were expected to be found at the level of the source tasks as well as at the level of the single sources.

Experiment 2 showed that inhibition - measured by the Stroop-like day/night inhibition task (Gerstadt et al., 1994) - was not related to either type of source monitoring. This was the case at the level of the source tasks as well as at the level of the single sources. These results are surprising and stand in contrast to the theoretical assumptions about the relation between inhibitory control and source monitoring.

However, why higher⁴¹ inhibition performances do not go along with higher numbers of correct source attributions in experiment 2? The reason for the absent relation between inhibition and source monitoring may lie in the picture-book-source tasks. The single episodes in each source task were relative distinctive from each other. In experiment 2, the children obviously remembered the content of the single picture-book episodes quite well and could attribute the sources clearly to the remembered episodes. The familiarity cues of the single episodes were obviously sufficient and may not require the inhibition of irrelevant highly familiar or highly similar source specific memory characteristics. This seems to be the case although the single picture book episodes were presented only once. As pointed out by Ruffman et al. (2001), it is possible that after single presentations not enough familiarity cues might be available and therefore inhibitory control is required to identify clearly the source of a memory. However, based on the used picture-book episodes this was obviously not the case in experiment 2 because the single episodes and the persons presenting the content of the episodes were sufficient distinctive remembered by the 3-, 4- and 5-year old children. The interpretation of sufficient familiarity cues is clearly underpinned by the high number of correct source attributions in the entire four source tasks in experiment 2. I.e., the older 3-year-olds, the 4- and 5- year olds attributed most of the eight person sources correctly to the picture-book episodes. Besides this, even the younger 3-year-olds attributed the reality monitoring familiar sources correctly to the episodes at an above chance level. This shows that, the content of the episodes and the persons presenting the episodes were obviously remembered so well in experiment 2 that sufficient distinctive familiarity cues were available for the children and therefore they do not need to inhibit source irrelevant memory characteristics (cf., Roberts & Powell, 2005; Ruffman et al, 2001). Thus, the theoretical proposed relations between inhibition and source monitoring performance by Roberts and Powell (2005; cf., Ruffman et al., 2001; Wheeler et al., 1997) were

⁴¹ Or the opposite respectively. That applies as well for all following relational analyses in this treatise.

not visible. In my opinion, this explanation explains best the absent relations between inhibition and source monitoring in experiment 2. Nevertheless, this explanation needs to be tested empirically. The correctness of this explanation can be examined easily by using picture-book source tasks with similar episodes/sources. If not sufficient distinctive cues are available during retrieval, then positive relations should exist between inhibition and source monitoring in 3- to 5-year old children.

Although the study reported by Melinder et al. (2006) also found no relation between 3- to 6-year-olds inhibition and external source monitoring performance, it cannot be concluded that no relation exists between inhibition and source monitoring in children below 6 years of age. The reason for that is that in the study by Melinder et al. (2006) ceiling effects in the inhibition task cannot be excluded. Besides this, it is also possible that the children in the Melinder et al. (2006) study remembered sufficient similar cues and therefore did not require to inhibit source irrelevant memory characteristics. Likewise, in experiment 2 such an examination is necessary in the study conducted by Melinder et al. (2006) as well before it can be concluded that no relation exists between inhibition and source monitoring in 3- to 6-year-old children. If these empirical data are available, then the question can be answered whether the theoretical expected relation between inhibition and source monitoring in preschoolers exists or not.

However, another alternative explanation for the absent relation between inhibition and source monitoring in experiment 2 might be that a relation between inhibition and source monitoring only exists in older children. This would be plausible if only explicit or intentional inhibition processes/strategies are relevant to source monitoring processes. This might be the case and would be conforming to the current available theoretical assumptions about inhibition and source monitoring (Johnson et al., 1993; Roberts & Powell, 2005; Ruffman et al., 2001; Wheeler et al., 1997; Zelazo et al., 1997). However, although the results of the study reported by Ruffman et al. (2001) support this assumption, it is necessary to systematically examine the relation between source monitoring and unintentional/intentional inhibition in children first before such a specification of the relation between inhibition and source monitoring can be drawn. At present, neither reliable empirical data about the relation between inhibition and source monitoring is available in children younger than 6 years of age nor has the intentionality been examined systematically in the relation between inhibition and source monitoring. Thus, the question whether relations exist between intentional inhibition and source monitoring only, cannot be answered based on the available empirical findings. However, answering that question will help enormously in specifying the relation between inhibition and source monitoring.

On principal, inhibition is of particular interest for source monitoring processes (Johnson et al., 1993; Roberts & Powell, 2005; Ruffman et al., 2001; Wheeler et al., 1997; Zelazo et al., 1997). In my opinion, the task of follow-up research is to further examine systematically the relations between different types of inhibition performances (e.g., intentional, unintentional, delayed,

conflicting, verbal) and source monitoring performances (e.g., various types of person and non-person sources, correct sources, source errors, similarity of source characteristics). These empirical findings will extend and precise our knowledge about source monitoring and inhibition enormously because it gives information on the underlying processes of source monitoring, on the questions what, how and why develops, on source monitoring failure and on how source attributions can be improved in children.

3.4.2.2 The relation between verbal abilities and source monitoring

The verbal representation system seems to be very important for source monitoring and its development. Performances and developmental progresses in the verbal representation system can enhance source monitoring performances because the broader and deeper the verbal representation system is the more source specific memory characteristics can be used in source attributions. In the following section, I discuss in detail whether this enhancing effect exists for the core indicator of the active available verbal representation system “active vocabulary level” and whether it is also visible in the different source monitoring performances of experiment 2.

The verbal representation system is important for memory performances (e.g., Bauer, 2002, 2007; Baddeley, 2007; Fivush, 2002b; Hayne & Simcock, 2009). It can support memory processing during encoding, storage and retrieval and with it enhance memory performances in various important ways (e.g., Bauer, 2002, 2007; Baddeley, 2007; Fivush, 2002b; Grimm, 2001; Hayne & Simcock, 2009; Weinert, 2006). In experiment 2, it was assumed that this is the case for the complex memory performance “source monitoring”. It was therefore expected that the broader and deeper the active available verbal representation system is, the more source specific verbal memory characteristics could be used in source monitoring. This was expected to be true for reality monitoring familiar, for reality monitoring unfamiliar, for internal source monitoring and for external source monitoring performances because the retrieval and the decision processes of verbal memory characteristics are contained in each source monitoring condition in the picture-book source task of experiment 2. The relations were expected to be found across both sources per source condition and in the single sources per source condition. Likewise a very strong relation was expected between the active vocabulary level and internal source monitoring because of the involvement of the mental activity “thinking”, which is mainly carried out verbally and therefore contains the most source specific verbal memory characteristics (e.g., Johnson et al., 1993). The relations between the active vocabulary level and the four types of source monitoring were expected to be independent of the age of the children because the active available verbal representation system should support source monitoring equally in each of the four age groups.

Experiment 2 showed that the active vocabulary level as the core indicator of the active available verbal representation system was positively related to internal source monitoring and to reality monitoring unfamiliar. The positive relations were consistently found across both sources per source condition and on the level of the single sources per source condition. Thus, conforming to the hypotheses experiment 2 revealed that children with a broader and deeper active available verbal representation system attributed more reality monitoring unfamiliar and more internal source monitoring sources correctly to their memories. This pattern of results conforms to the findings of experiment 1 and indicates that the active available verbal representation system is relevant to reality monitoring (unfamiliar) and to internal source monitoring performances in 3- to 5-year-old children independent of the source task conditions and in the case of reality monitoring independent of an action encoding mode.

Experiment 2 also supports the assumption that the active available verbal representation system is important particularly for internal source monitoring performances. This was argued because in the internal imagined sources a high number of verbal characteristics should be contained through the mental activity “thinking” (Johnson et al., 1993) and thus should lead to a very strong relation. Experiment 2 clearly supports this assumption and shows that the active vocabulary level was strongly related to internal source monitoring. On the level of the single sources, the results of experiment 2 also revealed that the highest relation existed between the active vocabulary level and the thought-source supporting the assumption that the strong relation results from the verbally carried out mental activity “thinking” in the thought-source. Experiment 2 therefore was able to replicate the strong relation between the active vocabulary level and internal source monitoring in 3- to 5-year-old children and revealed beyond this that the highest relation exists between the active vocabulary level and the thought-source. With this, experiment 2 shows that the mental activities such as “thinking” are central for the relation between the active available verbal representation system and source monitoring.

Besides this, it was also expected in experiment 2 that the found relations are independent of the age of the children. Experiment 2 showed that this was the case for the relations between the active vocabulary level and internal source monitoring across both sources and in the single sources of the internal source monitoring condition. In contrast, the relation between the active vocabulary level and reality monitoring unfamiliar depended on age. This was the case across both sources and on the single sources of the reality monitoring unfamiliar condition. However, both the independency of age of internal source monitoring and the dependency of age of reality monitoring unfamiliar are consistent to the findings of experiment 1 and indicate that the age independency and dependency is also independent of the source task conditions and an action encoding mode. As pointed out in experiment 1, a possible explanation for the age dependency of the relation between the active vocabulary level and reality monitoring unfamiliar could be that only older children start to use (nondeliberate and deliberate) their more advanced active available verbal representation system in their source monitoring performances. This could be

particularly the case during retrieval and during the source decision processes. Older children may start to use verbal characteristics more systematically and strategically in their source monitoring performances and may start to use specific searches for verbal memory characteristics. This might not be the case for younger children. Although they are able to attribute reality monitoring unfamiliar sources correctly to their memories at an above chance level, they may rely more on perceptual characteristics in their source monitoring performances. This reliance on perceptual characteristics might lead to the correct source monitoring performances above chance level (i.e., Welch-Ross, 1995, Experiment 1). This seems to be a plausible explanation for the age dependency of the relation between the active vocabulary level and reality monitoring unfamiliar in experiment 2 and in experiment 1. However, this possible explanation needs to be tested empirically in following research. Like in experiment 1, it was not possible to test this assumption in experiment 2 because the sample sizes of 12 children per age group are too small to allow such an examination.

In contrast to the hypotheses, experiment 2 revealed that the active vocabulary level was not related to reality monitoring familiar and to external source monitoring performances. This result is surprising particularly for the reality monitoring familiar condition because the reality monitoring unfamiliar condition was meaningfully related to the active vocabulary level. One explanation for the absent relation could be that for the familiar source attributions children may use mainly memory characteristics regarding the familiar person and thus may use less or no verbal memory characteristics. Therefore, children with a broader and deeper active available verbal representation system may not attribute more reality monitoring familiar sources correctly to their memories because they mainly use their pre-existing familiar person specific knowledge. This knowledge comprises of knowledge (and memory characteristics) from all modalities and does not contain mainly or only verbal characteristics. This would explain why a relation between the active vocabulary level and reality monitoring familiar was not found. However, this explanation needs to be tested empirically in further research to clarify whether this is the reason for the absent relation. Nevertheless, this pattern of results shows again that the relation between the active vocabulary level and reality monitoring depends on specific source task conditions and seems to vary regarding the number and distinctiveness of the contained verbal memory characteristics. In single source task conditions with more and distinctive verbal memory characteristics, relations exist between the active vocabulary level and reality monitoring (Experiment 2: Reality monitoring unfamiliar; Experiment 1: Reality monitoring in the action encoding mode) but in source task conditions with high verbal memory characteristics (Experiment 1: Reality monitoring in the verbal encoding mode) and in conditions containing other types of memory characteristics (Experiment 2: Reality monitoring familiar) no relations exist in 3- to 5-year-old children.

Besides reality monitoring familiar, the active vocabulary level was not related to external source monitoring. Although a relation was expected, the absent relation between the active vocabulary level and external source monitoring conforms to the empirical findings of Drummey and Newcombe (2002). They also found no relation between their external source monitoring task and their verbal production performance “verbal fluency” in 4- and 6-year-old children. The same is true for the external source monitoring performances in the verbal encoding mode in experiment 1. Again, no relation was found between the active vocabulary level and external source monitoring. Nevertheless, experiment 1 revealed that the active vocabulary level was meaningfully related to external source monitoring in the action encoding mode indicating that in a very distinctive source task condition a relation exists between the active available verbal representation system and external source monitoring. However, the findings of experiment 1 and 2 as well as those of Drummey and Newcombe (2002) consistently show that verbally based external source monitoring performances are not related to verbal abilities representing the active available verbal representation system. One possible explanation for this absent relationship could be the number of verbal characteristics. In mainly verbal external source monitoring tasks too many (similar) verbal characteristics and not enough distinctive source specific memory characteristics are available and thus a broad and deep active available representation system might not be sufficient for correct source attributions and discriminations. As discussed in experiment 1, in mainly verbal source tasks (nondeliberate and deliberate) retrieval strategies and/or source decision strategies could be needed to discriminate the external sources from each other and to attribute them correctly to memories. Thus, relations may not exist between mainly verbal based external source monitoring performances and the verbal production performances active vocabulary level, verbal fluency and morphological rule using. Nevertheless, this explanation needs to be tested in following research before it is clear that this explanation is indeed the reason for the absent relation. Besides this, it is important to systematically test whether other verbal abilities representing the active available verbal representation system are also not related to mainly verbal based external source monitoring performances.

The task of following research is now to examine the relations between the active available verbal representation system and source monitoring in more narrow age groups. Such an examination will replicate the available empirical findings and allow the examination of age groups in which these relations exists and when they come up. Besides this, it is important in following research to examine why mainly verbal based source monitoring performances are (partly) not related to verbal abilities although from a theoretical perspective this is where the strongest relation should exist. In this connection, it is important to examine whether in mainly verbal based source monitoring tasks (nondeliberate and/or deliberate) retrieval strategies and/or source decision strategies are required to attribute the sources correctly to memories. These analyses will allow for important insights into when children start to use such strategies, what

types of strategies they use and how they use these strategies. In my opinion, it is also necessary in future research to extend the relational analyses to other verbal abilities representing the active available verbal representation system and to determine their relevance for early source monitoring.

On principal, verbal abilities are central for early source monitoring performances. The task of following research is therefore to go beyond correlational analyses and to test the meaning of the verbal representation system in causal experimental designs.

3.4.2.3 The relation between theory of mind abilities and source monitoring

Theory of mind abilities seems to play an important role in source monitoring and its development (e.g., Naito, 2003; Perner & Ruffman, 1995; Price & Ford, 2006; Roberts, 2002; Ruffman et al., 2001; Welch-Ross, 2000). Performances and developmental progresses in theory of mind abilities can enhance source monitoring performances because the more comprehensive the understanding of mental states and their origin is, the better source decision processes might be carried out. In the following section, I discuss in details whether this enhancing effect exists for the three theory of mind abilities false-belief understanding, appearance-reality understanding and source-of-knowledge understanding. I begin by discussing the question whether false-belief understanding is meaningfully related to internal source monitoring. After that, I discuss whether appearance-reality understanding is related to source monitoring and answer the question how source of knowledge understanding is linked to specific types of source monitoring.

The relation between false-belief understanding and internal source monitoring

Mental-state understanding requires the realisation that mental states may reflect reality and may be manifest in overt behaviour, but are internal and mental, and thus distinct from real events, or behaviours (Wellman et al., 2001). The understanding that a person has a *false-belief understanding* provides evidence for appreciating such a distinction between the mind and the world (e.g., Dennett, 1979; Perner, 1991, Wellman, 2002; Wimmer and Perner, 1983).

Because such a distinction between the mind and the world seems to be required in internal source attributions about imagined mental representations (Welch-Ross, 1995; Experiment 1), it was assumed in experiment 2 that children who have a mental state understanding in that such a distinction between the mind and the world is contained (i.e., false-belief understanding) are able to attribute a higher number of internal sources correctly to their memories. This positive relation was expected to be found across both sources and in the single sources of an internal source-monitoring task (said-source; thought-source) because in both single sources a mental-source needs to be distinguished from a reality-source requiring a mental state understanding.

Experiment 2 showed that children who have a false-belief understanding attributed a higher number of internal sources correctly to their memories on picture-book episodes. This was true for both sources of the internal source-monitoring task as well as for the single said-source and for the single thought-source of the internal source-monitoring task. This result conforms to the finding of experiment 1 and clearly supports the theoretical assumption that false-belief understanding is meaningfully related to internal source monitoring performances. The common ground for the relation seems to be the mental state understanding about the distinction between the mind and the world (Welch-Ross, 1995).

However, I assumed that the relation between false-belief understanding and internal source monitoring results from the mental state understanding necessary in both tasks and not from verbal abilities. Thus, I expected that the relation exists independent of the verbal abilities contained in both tasks. Experiment 2 showed that the relation between false-belief understanding and internal source monitoring remained significant if the verbal abilities were controlled for statistically. Thus, the assumption that the common ground between false-belief understanding and internal source monitoring are verbal abilities only, can clearly be rejected. From there, experiment 2 supports as well the theoretical conclusion that the relation between false-belief understanding and internal source monitoring result from the mental state understanding of the distinction between the mind and the world necessary in both performances.

Nevertheless, experiment 2 revealed that the relations between false-belief understanding and the said-source and the thought-source did not remain significant if verbal abilities were controlled for statistically. In the case of the thought-source, this result is surprising because especially in that source, the mental state understanding about the distinction between the mind and the world is necessary. Nevertheless, this pattern of result is conforming to the results of experiment 1 in the verbal encoding mode indicating that verbal abilities play a larger role in the relation between false-belief understanding and the thought-source attributions in internal source monitoring. The task of following research is therefore to try to examine why this is the case independent of the source task characteristics.

In experiment 2, another explanation for the absent relations between false-belief understanding, the thought- and the said-source might be that the thought- and said-source attributions were measured by one single item only. It is possible that based on the single source attributions, the two single relations were not stable enough to remain significant if verbal abilities were controlled for statistically. However, this alternative explanation can be tested easily by using a higher number of thought-source attributions.

Another explanation might be as well that the relations between false-belief understanding and the single internal sources may remain significant in single age groups only. This might be the case for children at 4 years of age because children acquire only at that age a false-belief understanding (e.g., Perner, 1991; Sodian & Thoermer, 2006; Wellman, 2002). Because of the comparably small sample sizes in each age group of experiment 2 ($n=12$), this alternative

explanation cannot be tested meaningfully for the four age groups in experiment 2. This alternative explanation can therefore not be excluded in experiment 2 but the assumption about age-depend relations can be tested easily in an additional study.

However, the height of the relation between false-belief understanding and internal source monitoring clearly showed that verbal abilities are partly responsible for that relation as well. It can therefore be concluded that besides mental state understanding about the distinction between the mind and the world, verbal abilities can explain parts of the relation between false-belief understanding and internal source monitoring. The task of future research is to specify and determine the causes for the relation between false-belief understanding and internal source monitoring and discover the single (sub)performances contained in both (social-cognitive) tasks.

The relation between appearance-reality understanding and source monitoring

The understanding of the distinction between appearance and reality seems to be meaningful for source monitoring because it may help children to reflect on the fact that a representation might be real but can also appear in another way (Flavell et al., 1983; Taylor & Flavell, 1984). As pointed out in the theoretical background, such a distinction is obviously required in internal source attributions about real and imagined mental representations and thus appearance-reality understanding and internal source monitoring should be related. In other words, in appearance-reality understanding as well as in internal source monitoring, the ability (or conceptualization) to distinguish the own perception as a source of an appearance or reality of an event is required (cf., Sodian & Thoermer, 2006). In addition, appearance-reality understanding and internal source monitoring contain the simultaneous processing of dual (conflicting/similar) representations of the same entity or event (Flavell et al., 1983; Taylor & Flavell, 1984) that needs to be distinguished from each other. It was assumed in experiment 2 that children who have an appearance-reality understanding (correct appearance attribution; correct reality attribution) are expected to show a higher number of correct internal source attributions because both performances contain the simultaneous processing of dual representations and the conceptualization of the own perception as a source of an appearance or reality of an event. This positive relation was expected to be found across both sources and in the single sources of the internal source-monitoring task (said-source; thought-source) because in both single sources the distinction between appearance and reality seems to be required.

Experiment 2 showed that children who have an appearance understanding of an ambiguous object attributed a higher number of internal sources correctly to their memories. The same was true for the reality understanding. This shows that the relations between appearance and reality understanding and internal source monitoring clearly underpin the theoretical assumptions about that relation. However, based on experiment 2 only, it cannot be specified whether the dual-

representation explanation (Flavell, 1998; Flavell et al., 1983; Taylor & Flavell, 1984) or the source-conceptualization explanation (Sodian & Thoermer, 2006) is responsible for the relation between appearance-reality understanding and internal source monitoring. This needs to be tested in future research so that the single explanations are controlled experimentally.

Nevertheless, based on experiment 2 it is clear that a relation between appearance-reality understanding and internal source monitoring exists in 3- to 5-year-old children.

In experiment 2, positive relations were also expected between appearance and reality understanding and the said- and the thought-source of the internal source monitoring task. Experiment 2 showed that children who have an appearance understanding of an ambiguous object showed a higher number of correct source attributions in the said-source. In contrast, this was not true for reality understanding. Experiment 2 also showed that children who have a reality understanding of an ambiguous object attributed a higher number of thought-sources correctly to their memories. However, this was not true for the appearance understanding. Thus, experiment 2 revealed that both the appearance understanding and the reality understanding are related to the single internal source monitoring sources as well. Nevertheless, in contrast to the hypotheses appearance and reality understanding were not related to both single internal sources. Rather specific relations exist between appearance and reality understanding and the said-source and the thought-source. This pattern of correlations indicates that in the said-source, the understanding and distinction of the appearance of an ambiguous object is central and not the distinction of reality. In the case of the thought-source, the understanding and distinction of the reality of an ambiguous object is central and not its appearance. This pattern of result shows that in each case the opposite mental state understanding needs to be discriminated (i.e., said-appearance vs. thought-reality) and thus helps the children to attribute the internal sources correctly to their memories. Although, these results demand replication before further conclusions can be drawn, the results clearly show that (only) the opposite mental state understanding said-appearance and thought-reality are central for successful internal source attributions. Follow-up research will show how reliable and stable this relations are and what theoretical implications they contain.

Besides this, in experiment 2 it was examined by post-hoc analyses whether appearance and reality understanding was related to reality monitoring familiar, reality monitoring unfamiliar and external source monitoring. Experiment 2 showed that children who have a reality understanding attributed a higher number of (both) reality monitoring unfamiliar sources to their memories. This relation was not found for the appearance understanding. In contrast, neither reality nor appearance understanding was related to reality monitoring familiar or external source monitoring performances. In experiment 2, only a specific relation was found between reality understanding and reality monitoring unfamiliar source attributions. The reason for this relation seem to lie in both reality monitoring unfamiliar sources (child vs. unfamiliar person

(experimenter)) because otherwise relations would have been found between reality monitoring familiar (child vs. familiar person) and external source monitoring (unfamiliar person (experimenter) vs. familiar person) as well. The task of follow-up research therefore to specify this relation on a theoretical and on an empirical level. However, it can already be concluded that the appearance understanding is obviously not meaningful for all three types of source monitoring. Nevertheless, it should be examined in future research whether age-specific relations may exist between appearance understanding and reality monitoring familiar, reality monitoring unfamiliar and external source monitoring performances. It is possible that such age-specific relations are not covered by experiment 2. The same should be examined for reality understanding and the three types of source monitoring. These analyses will give precise information about the question on how appearance-reality understanding goes along with higher source monitoring performances in other types of source monitoring as well.

The relation between source of knowledge understanding and source monitoring

The understanding of how different sources of information (e.g., by seeing, telling, hearing) lead to different knowledge and mental states, may aid children to distinguish between their own knowledge, the knowledge of others and between personally experienced events which children have been told about (Perner & Ruffman, 1995). Because in source of knowledge and in source monitoring performances (similar) source monitoring/decision processes are carried out (Drumme & Newcombe, 2002; Johnson et al., 1993; Leichtman et al., 2000; O'Neill & Gopnik, 1991; Naito, 2003; Robinson, 2000), the source monitoring processes might be transferred from one source task to another source task. This then aids children to distinguish between different sources in their memories. Also, before a person as a source can be attributed correctly to a memory, it might be necessary to first identify the perceptual source of that memory (e.g., whether it was seen or told). Only when the perceptual source(s) of a memory is/are known, then that knowledge can be connected to a specific person as the possible (internal or external) source of that memory. The enhancing effect of source of knowledge understanding should be highest in source attributions that concern to the same modality or modalities of the source of knowledge task. Although similar source monitoring processes are carried out in all source attributions, the same modality characteristics should strengthen the relation above these general source monitoring processes because more similar processes are carried out and more similar perceptual characteristics are used that should lead to a closer relation of the two performances. Because the perceptual modality “seeing” is contained in the public and private internal picture-book-sources in experiment 2, the seeing-source of the source of knowledge task was expected to correlate highly with the internal sources of the reality monitoring familiar (child-source), the reality monitoring unfamiliar (child-source) and the internal source monitoring tasks (said-source, thought source, across both sources). The reason for this is that the internal real-person sources

see the content of the picture-book episodes and thus “seeing” is the perceptual foundation of the both sources.

Experiment 2 revealed that children who attributed a higher number of seeing-sources correctly in the source-of-knowledge task showed a higher number of correct internal source attributions in the reality monitoring familiar task (child-source), in the reality monitoring unfamiliar task (child-source), in the internal source monitoring task across both sources and in the said-source and thought-source of the internal source monitoring task. Conforming to the expectation, the seeing-source of the source of knowledge task goes along with a higher number of correct internal source attributions that contain the modality *seeing* as the perceptual source of memories. These clear findings support the assumption that the enhancing effect of source of knowledge understanding is highest in source attributions that concerns the same modality in the source-monitoring task(s). In addition, the results underpin the theoretical conclusion that in both types of tasks similar source monitoring processes are carried out (e.g., Drumme & Newcombe, 2002; Johnson et al., 1993; Leichtman et al., 2000; O’Neill & Gopnik, 1991; Naito, 2003; Robinson, 2000) and that source of knowledge understanding aids children to distinguish between the knowledge from different sources (Perner & Ruffman, 1995). If this were not the case, such strong relations would not have been found. However, based on experiment 2 it cannot be specified which single source monitoring processes are carried out in both tasks and whether children in the source monitoring tasks first identify the perceptual source before they attribute the real-person source to their memory. These questions need to be tested in detail in future research.

Besides this, I expected that the telling-source of the source of knowledge task is correlated highly to reality monitoring familiar (child-source, external-source; across both sources), reality monitoring unfamiliar (child-source, experimenter-source; across both sources), external (external-source, experimenter-source; across both sources) and internal source monitoring (said-source) because the single real-person sources *tell* the content of the picture-book episodes and thus “telling” being the perceptual foundation of the sources. The relations were assumed positive because children who attribute the telling-source correctly were expected to show a higher number of correct internal and external source attributions in the four types of source monitoring. The reason for this is that because both source monitoring performances contain the same class of source specific memory characteristics (i.e., telling).

Experiment 2 revealed that children who attributed a higher number of the telling-sources correctly in the source of knowledge task showed a higher number of correct internal source attributions in the internal source monitoring task (said-source). In contrast to the expectations, the remaining internal and external sources from the reality monitoring familiar task, reality monitoring unfamiliar and external source monitoring tasks were not related to the telling-source of the source of knowledge task. This pattern of results is quite surprising because it was

assumed that the understanding that *telling* leads to knowing aids children to distinguish between their own knowledge (or memory respectively), the knowledge of others and between personally experienced events about which children have been told about (cf., Perner & Ruffman, 1995). On the correlational level, this was clearly not the case in experiment 2. Nevertheless, with the exception of the relation between telling and the said-source of the internal source monitoring task, the results of experiment 2 conform to the empirical findings reported by Kovacs and Newcombe (2006). Kovacs and Newcombe (2006) found no relations between external source monitoring performances and the told-know source of their source of knowledge tasks. Both studies - the study reported by Kovacs and Newcombe (2006) and experiment 2 - indicate that the telling-source might be not as meaningful for (external) source attributions as expected. This might be the case because the understanding that telling leads to knowing might not give enough source specific information that aid children in their external source attributions (or source monitoring processes respectively). It is possible that the content of the statements of the persons and the person specific behaviours is of prior interest for successful (public) source attributions and not the knowledge that telling leads to knowing per se.

It might be also the case that the consideration of *telling* as a source of knowledge is used only by older children or in more strategic source decisions. This would mean that age specific relations exist between the telling-source and the internal and/or external source attributions. Possibly older children may profit only from the understanding of telling as a source of knowledge in source monitoring performances. In experiment 2 and in the study conducted by Kovacs and Newcombe (2006), such age specific relations were not tested. Thus, it is not possible to examine this alternative explanation in experiment 2 but it needs to be tested further in follow-up research.

In this connection, an alternative explanation could also be that children between 3- and 5-years of age may focus mainly on information acquired visually (or by seeing respectively) and thus the understanding that *seeing* leads to knowledge is more important than told information and the understanding that telling leads to knowledge. Experiment 2 underpins this explanation partly for private and public internal source attributions. However, this explanation needs to be tested for the external sources as well because such an analyses was not reported in this study. This analysis will show whether this explanation is true.

However, experiment 2 also revealed that the telling-source of the source-of-knowledge task was related to the said-source in the internal source monitoring task. In this source attribution, the telling-source is quite salient in comparison to the other types of sources because if children do not specify the said- or the thought-source, they were asked directly whether they said or thought what was on the picture-book window. Such direct source questions are usually not asked in the other types of sources (unless they do not answer to the open-ended source question). It is possible that this direct source question aids children to pay attention whether they said or told what was under the picture-book window and thus the understanding that telling leads to

knowledge is meaningfully related to the said-source attribution. If this conclusion is correct then this would indicate that children between 3- and 5-years of age may use the telling source understanding only in highly salient situations and do not use them spontaneously without such direct (question) advices (in a sense of a production deficit hypothesis; Bjorklund et al., 2009; Schneider & Bjorklund, 1998; Schneider & Pressley, 1997). This assumption would also conform to idea that older children only use their understanding that telling leads to knowledge. Besides this, it supports the assumption about age specific relations between the telling-source and internal and external source attributions. If this empirical finding can be replicated and specified in follow-up research, then this will have important theoretical implications for the understanding of the relation between source of knowledge and source monitoring and the causes of conceptual developmental changes in source monitoring.

In experiment 2 it was also explored whether positive relations exist between the feeling-source of the source of knowledge task and reality monitoring familiar, reality monitoring unfamiliar, internal and external source monitoring performances (across both sources per source task) using post-hoc analyses. The aim of this analysis was to examine whether correct feeling-source attributions may support source attributions on a basic processing level and likewise enhance other types of source monitoring.

Experiment 2 revealed that children who attributed a higher number of feeling-sources correctly in the source of knowledge task showed a higher number of correct reality monitoring unfamiliar and internal source attributions. In contrast, reality monitoring familiar and external source monitoring were not related to the feeling-source. Experiment 2 therefore revealed specific relations between the feeling-source of the source of knowledge task and reality monitoring unfamiliar and internal source monitoring. The reason for these specific relations seems to lie in the salience of the feeling-source. According to O'Neill and Gopnik (1991), feeling-sources are “easier for children as young as age 3 to reflect on tactile experiences and to differentiate them from the objects that give rise to them” (O'Neill & Gopnik, 1991, p. 391; see as well Flavell, Green & Flavell, 1989). Children seem to use this knowledge to attribute more similar and lesser salient sources correctly to their memories, as it is the case in reality monitoring unfamiliar (especially unfamiliar external person source) and in internal source monitoring (in the thought- and in the said-source). Thus, a higher number of correct feeling-source attributions go along with a higher number of correct reality monitoring familiar and internal source attributions. The advantage of that knowledge is obviously not necessary in reality monitoring familiar and in external source monitoring performances in that familiar persons are contained. In these types of source monitoring, the sources are more salient and seem to provide the child with sufficient source specific memory characteristics. The findings show that relations between the feeling-source of the source of knowledge task and reality monitoring familiar and external source

monitoring were not significant. The task of future research is to specify the enhancing effect of the feeling-source for source monitoring and to examine the causes for those relations.

On principal, theory of mind abilities are meaningful related to source monitoring performances. An important task of follow-up research is to systematically examine which theory of mind abilities are relevant to source monitoring and to determine the conditions and causes for those relations. Based on such knowledge, it will be possible to discover in details the processes carried out during source monitoring and that directly or indirectly support source monitoring performances in children between 3- and 6-years of age.

3.4.2.4 The relation between social variables and source monitoring

As the fourth group of factors, social variables seem to be important for the development in early source monitoring. Changes in the social environment of the child seem to stimulate source monitoring in a meaningful (cf., Phillips et al., 2006; Rubin et al., 1998; Vandell et al., 2006) way by providing the child with more opportunities for social interactions. With these enhanced opportunities, source discriminations become necessary as well. In the following section, I discuss in detail whether and how social variables within and outside the family enhance children's source monitoring performances. I begin with the question of whether the social variables enhance external source attributions in general. After that, I discuss whether specific relations exist between internal source monitoring and single social variables within and outside the family.

In experiment 2, I expected that the social variables number of hours the child spends with mother per day, number of hours the child spends with father per day and number of hours the child spends with another person per week, weekly contacts of the child to peers outside the family (within the kindergarten; outside the kindergarten), weekly contacts of the child to younger children outside the family (within the kindergarten; outside the kindergarten), weekly contacts of the child to older children outside the family (within the kindergarten; outside the kindergarten), number of visits the parents make per week with the child, number of visits the parent and the child receive at home, number and type of courses the child visits regularly and the duration a crèche/nursery school/kindergarten has been attended are positively related to the external source tasks reality monitoring familiar, reality monitoring unfamiliar and external source monitoring. This hypothesis is based on the assumption that the more interactions with the members of the family (e.g., mother, father, siblings) and persons outside the family (e.g., peers, younger and older children) have been carried out the more potential source discriminations and practice with external real-person sources have been made.

Experiment 2 showed results that conform to the expectations that higher weekly contact rates to peers goes along with a higher number of correct source attributions in the reality monitoring familiar and external source monitoring tasks. Besides this, the longer the child visits the kindergarten, the better its reality monitoring unfamiliar source attributions was.

In experiment 2, the variables contact rates to peers, younger and older children have been subdivided into contacts within the kindergarten and outside the kindergarten. Experiment 2 revealed that the contact rates to peers outside the kindergarten goes along with higher correct reality monitoring familiar and external source monitoring source attributions. This relation also conforms to the hypotheses that social variables outside the family go along with higher external source attributions. The task of future research is now to specify the social interactions relevant to source monitoring on the behavioural level. Conclusions about the specific social interaction behaviours are not possible in experiment 2 because only social interaction markers were used. However, experiment 2 clearly showed that the used subdivision of the social variables in contacts within and outside the kindergarten is a meaningful extension of the social variables outside the family and with it specifies the relation between social variables and source monitoring.

Nevertheless, experiment 2 clearly showed that the remaining social variables within and outside the family were not positively related to either type of external source attributions. Thus, experiment 2 indicates that the selected social variables within and outside the family are not relevant to external source attributions. Although this result stands in contrast to the theoretical derived relations, the results of experiment 2 are in essence conforming to the results of experiment 1 in that some of the selected social variables were also not meaningful related to the different source monitoring performances (e.g., number of hours the mother spends with the child per day). Nevertheless, it has to be considered in experiment 2 that the selected social interaction marker variables might have been too superficial to display the expected general relations. It is possible that the relations between these social variables and the main types of source monitoring only exist at the behavioural level of social interaction. Because in experiment 2, social interaction markers have been used only, conclusions about the behavioural level of social interaction are not possible. The task of follow-up research is therefore to test more differentiated interaction behaviours and further interaction markers to clarify the question whether or whether not these social variables are meaningful source specific social variables within and outside the family.

An alternative explanation for the absent relations in experiment 1 and 2 might be that the relations differ from each other in single age groups. The relevance of the social variables for external source attributions may vary qualitatively between the ages of 3 to 5 years.

Unfortunately, it is not possible to test this alternative explanation reliably in experiment 2 because the single age groups were too small ($n=12$) to allow reliable age comparisons in

correlational analyses. Thus, this alternative explanation needs to be tested in follow-up research as well.

Against the expectations, experiment 2 revealed specific negative relations between different social variables outside the family and reality monitoring unfamiliar and external source attributions. These negative relations indicate that single social interactions are obviously counterproductive for specific types of source discriminations. This is primary the case for unfamiliar external sources as they are contained in the external source monitoring and reality monitoring unfamiliar source tasks. A high number of contact rates to peers, younger and older adults, visits at adults with children and visits received from adults with children do not enhance unfamiliar external source attributions. Rather a high number of interactions go along with low reality monitoring unfamiliar and external source attributions. However, these findings clearly indicate that a higher rate of practice with external child sources obviously does not enhance external source attributions of real-person adult sources. Rather age specific enhancing effects exist. Unfortunately, further conclusions cannot be drawn from the findings and procedures used in experiment 2. Thus, follow-up research has to examine and specify these specific negative relations.

Besides this, in experiment 2 specific positive relations were expected between internal source monitoring and the hours the child spends with the mother per day and the hours the child spends with the father per day. These hypotheses are based on the assumption that the mother and the father may provide the child with adequate information and practice on how to handle the different kinds of internal sources (cf., Bauer, 2007; Fivush, 2009; Fivush & Hamond, 1990; Nelson, 1993). The results of experiment 2 revealed no relations between the two social variables and internal source monitoring. Thus, in contrast to the hypotheses, a higher number of hours spend with the mother or the father per day does not go along with a higher number of correct internal source attributions in experiment 2. In the case of the social variable number of hours the mother spends with the child per day, the result is conforming to experiment 1. In experiment 1 no relation were found as well between both variables indicating that the number of hours the mother spends with the child per day is not relevant to internal source monitoring. In the case of the social variables number of hour the child spends with the father per day, this result stands in contrast to experiment 1 in that positive relations were found between this social variable and internal source monitoring. The relation was as well independent of age and independent of the action and the verbal encoding mode. The absent relation of between the number of hours the child spends with the father per day and internal source monitoring indicate that this is a task dependent relation and exist only in source tasks in that verbal phrases are used. Nevertheless, it is possible that the assumed relations exist in the source task of experiment 2 but can only be seen at the behavioural level. The used marker variables in experiment 2 might be

too general for that relation. This could be true for the number of hours the father and the number of hours the mother spends with the child per day. Even though these absent relations seem reasonable, they need to be further specified and tested in follow-up research to exclude the alternative explanation that an existing relation between both variables was overlooked through the use of social interaction variables that were too general.

Besides this, in experiment 2 specific negative relations were expected between internal source monitoring and the number of older siblings, the number of younger siblings and the position the child has in the row of siblings. A lower number of younger/older siblings were assumed to go along with a higher number of correct internal source attributions because more time and attention have been devoted to the child when fewer siblings are within the family. The same relation was expected for the position the child has in the row of siblings. The lower the position is the fewer siblings are within the family and the more time and attention has been devoted to the child. In contrast to these hypotheses, experiment 2 showed no relation between the three social variables and internal source monitoring.

One explanation for that finding is that the relations reported in experiment 1 are source task specific relations in that verbal abilities may play a central role. First-born children and children with a low number of siblings may use their available source specific verbal memory characteristics in mainly verbal source tasks more efficiently and thus make more correct internal source attributions. In contrast, in source tasks containing additional perceptual information, as it is the case in experiment 2, the (verbal) advantage of first-born children and children with a low number of siblings disappears because the verbal characteristics are not critical anymore. The findings of experiment 1 and experiment 2 suggest this conclusion. Nevertheless, this conclusion needs to be tested empirically by varying the amount of verbal and perceptual information systematically in internal source tasks. If this examination shows that the advantage of first-born children and children with a low number of siblings depends on the verbal characteristics, then the reliable conclusion can be drawn that the advantage is based on the availability and usage of verbal characteristics in internal source monitoring tasks.

In sum, social variables within and outside the family are of particular interest for source monitoring performances. An important research approach for following research is to consider the social environment of the child more closely and try to determine how the social environment influences the cognitive performance source monitoring. This is important for the understanding of how source monitoring develops, the type of characteristics that are encoded, stored and retrieved, how source monitoring performances can be influenced, and what source decision criteria are available and used. As pointed out in the source monitoring framework, the available memory characteristics are selective and influenced by the previous knowledge and experiences. Therefore, they can be more or less influenced by the social environment present at the time of encoding and retrieval (Johnson & Raye, 2000; Johnson et al., 1993). Besides this, the selection

and the use of the source decision criteria are influenced by the social context and by the available source decision criteria acquired in these social contexts (Johnson & Raye, 2000; Johnson et al., 1993). If source monitoring is to be explained and described more completely then it is necessary to rigorously and systematically investigate the social context. My empirical findings are a first starting point for such an analysis but as was shown before it is necessary to use more specific and more appropriate social environment indicators to examine their role for the development of early source monitoring. Additionally, it is important to extend the analysis and examine how the single source monitoring processes are influenced by social context variables, what source decision criteria are available, and how they are influenced by the social environment and previous social experiences. Based on this knowledge it is not only possible to better understand and explain source monitoring but also to understand and explain the meaning of the social environment for the cognitive development and how they both interact.

3.5 Conclusions of Experiment 2

My aim of experiment 2 was to find favourable conditions of early source monitoring and to identify factors relevant to early source monitoring. Experiment 2 revealed that this was successful in relation to the three examined conditions of early source monitoring and this was partly successful in relation to the four examined factors relevant to early source monitoring.

The first condition I examined was the familiarity with person sources. Experiment 2 revealed that high familiar person sources are better attributed to their memories than unfamiliar person sources. This was uniformly the case in the clustered sources of a reality monitoring and an external source monitoring condition and this was true in the single sources of an external source monitoring condition although in the younger 3-year-old, and in the 5-year-old children, only a tendency was found. The advantage of high familiar sources existed independently of age and indicates that 3-year-old children already profit from their pre-existing person specific knowledge and the better embedment and connection of the event characteristics into their representational networks. The high familiar person sources also allowed the younger 3-year-old children to attribute the sources of a reality monitoring familiar condition correctly above chance level to their memories earlier than the sources of a reality monitoring unfamiliar condition. Besides this, the high familiar person sources allowed the older 3-year-old children to attribute external source monitoring sources correctly above chance level to their memories indicating that such source monitoring performances are already possible at that age. Thus, the familiarity with person sources is an important favourable condition for early source monitoring showing that high levels of familiarity enhances correct source attributions and makes reality monitoring and external source monitoring performances possible.

In the second condition that seemed to be favourable, I examined whether multiple source attributions are possible in a simultaneous source attribution condition. Experiment 2 revealed that older 3-, 4- and 5-year-old children attributed the multiple reality, internal and external source monitoring sources in a simultaneous source attribution condition correctly to their memories. This finding indicates that young children can use their conceptual understanding about the different types of sources in a very flexible way and that they are generally able to identify different types of event related sources by themselves in an open-ended source question. However, in the case of the internal source monitoring sources, it was necessary to ask the children explicitly about the performed and the imagined internal sources because it was not clear enough that they should differentiate between these two internal sources as well. In contrast, the younger 3-year-old children were generally not able to attribute the multiple sources in a simultaneous source attribution condition correctly to their memories. Additionally, experiment 2 revealed that the children only made intra- and inter-intraexperimental source errors but no extraexperimental source errors. The 3- to 5-year-old children made no more intra-

intraexperimental source errors than inter-intraexperimental source errors in each of the four source monitoring conditions. Nevertheless higher inter-intraexperimental source errors than intra-experimental source errors were made in the unfamiliar reality monitoring condition and more familiar person source were attributed falsely to the memories. With this pattern of results, experiment 2 revealed that multiple source attributions in a simultaneous source attribution condition are possible at the middle of the third year of life. However, experiment 2 indicates that this is not yet an appropriate early source monitoring condition for younger 3-year-old children.

In the third condition that seemed to be favourable, I examined whether the internal source monitoring instruction can be optimized for younger children. Experiment 2 revealed that it was possible to optimize the internal source monitoring instruction for older 3-year-old children. The older 3-year-old children were able to attribute the internal source monitoring sources correctly to their memories if the internal source monitoring instruction was used “Did you previously think it silently in your head (or) did you previously tell it out loud”. This optimized instruction with the two perceptual cues “silent” and “loud” evidently allowed the older 3-year-old children to attribute the internal sources correctly to their memories and with it showed that internal source monitoring performances are possible at that age. Nevertheless, experiment 2 showed that the older 3-year-old children did not attribute the single performed internal source “telling” correctly, thereby indicating that the benefit of the external perceptual cues differs between the two internal sources and seems to be stronger for the imagined source “thinking”. Experiment 2 revealed that the internal source monitoring instruction could not be optimized for younger 3-year-old children. Thus, the results of experiment 2 indicate that the selected internal source monitoring condition was successful for older 3-year-old children and showed that internal source monitoring performances are possible at that age. However, this optimized source monitoring condition does not allow younger 3-year-old children to carry out internal source monitoring performances successfully. With this pattern of results, experiment 2 also revealed that a transition takes place at the middle of the third year of life concerning the ability to attribute internal source monitoring sources correctly to memories in an optimized source monitoring instruction condition.

In sum, all three examined conditions of experiment 2 are meaningful favourable conditions of early source monitoring and revealed when such source monitoring performances can be carried out successfully and what characteristics young children already use in their source monitoring performances.

My second aim of experiment 2 was to identify and specify factors relevant to early source monitoring.

The first factor I examined was *inhibition*. Experiment 2 showed that inhibition was not related to source monitoring in the 3- to 5-year-old children. The reason for this unexpected finding may lie in the used source tasks. The children remembered the sources in the source task quite accurately and thus inhibition of irrelevant memory characteristics might not have been necessary anymore. Thus, inhibition was not a relevant factor to source monitoring in experiment 2. However, on a theoretical level, a relation should exist between inhibition and source monitoring.

The second factor I assumed to be relevant to early source monitoring was *verbal abilities*. Experiment 2 revealed that the verbal abilities measured by the active vocabulary level were meaningfully related to internal source monitoring. This relation showed that the more comprehensive and subdivided the active available verbal representation system is, the better internal source monitoring performances are. Therefore, experiment 2 clearly revealed that verbal abilities are a meaningful factor for internal source monitoring.

The third factor I assumed to be relevant to source monitoring was *theory of mind abilities*. In experiment 2, I examine the three theory of mind abilities false-belief understanding, appearance-reality understanding and source of knowledge understanding. Experiment 2 revealed that false-belief understanding was meaningfully related to internal source monitoring, showing that children who have a false-belief understanding attribute a higher number of internal source monitoring sources correctly to their memories. Nevertheless, the relation between false-belief understanding and internal source monitoring is based partly on verbal abilities. Experiment 2 however showed that verbal abilities are not the sole reason for that relation. Besides this, experiment 2 revealed that the appearance and the reality understanding were meaningfully related to internal source monitoring, showing that children who have an appearance and a reality understanding attribute a higher number of internal source monitoring sources correctly to their memories. On the level of the single sources, experiment 2 revealed meaningful relations between appearance understanding and the said-source, as well as reality understanding and the thought-source of the internal source monitoring task. These specific relations indicate that only the opposite mental state understanding “appearance and said” and “reality and thought” are meaningfully related to the single internal sources. In reference to source of knowledge, experiment 2 revealed meaningful relations between correct seeing-source attributions in the source of knowledge task and internal source attributions in reality monitoring familiar, reality monitoring unfamiliar and internal source monitoring tasks. Besides this, a specific relation between the telling source and the said-source of the internal source monitoring task was found, indicating that the telling-source is not as meaningful for internal and external source attributions as the seeing source. In addition, experiment 2 revealed that correct feeling-source attributions go along with higher reality monitoring unfamiliar and internal source

attributions. This finding underpins the assumption that the feeling source is meaningfully related to reality monitoring unfamiliar and to internal source attributions. Thus, experiment 2 showed that each of the three selected theory-of-mind abilities were meaningfully related factors to early source monitoring although their meaning differed with regards to the type of source and the type of source monitoring.

The fourth factor I assumed to be relevant to source monitoring was *social variables*.

Experiments 2 revealed that single social variables within and outside the family were relevant to early source monitoring. This was the case for number-of-contacts-to-peers outside the kindergarten for reality monitoring familiar and correct external source monitoring source attributions. The same was true for the duration since a kindergarten/crèche has been attended and reality monitoring unfamiliar source attributions. Besides this, experiment 2 revealed specific negative relations between external source monitoring performances and contact-rates-to-children-of-different-age-groups, indicating that the practice with external child sources does not enhance external adult source attributions in a similar way. Experiment 2 showed that the remaining social variables within and outside the family were not positively related to source tasks containing external sources. Therefore, the overall findings in experiment 2 revealed that social variables are only partly relevant to early source monitoring with three of the four examined factors having a meaningful impact on single types of early source monitoring performances.

In sum, experiment 2 revealed that the familiarity with person sources, the multiple source attributions in a simultaneous source attribution condition and the optimized internal source monitoring instructions are early source monitoring conditions in which source monitoring performances can be carried out successfully. Each of the three conditions indicted when source monitoring performances are possible and what characteristics are already used by younger 3-year-old, older 3-year-old, 4-year-old and 5-year-old children. Each of the three conditions extend our knowledge on early source monitoring in a meaningful way and shows where, when and what developmental changes take place.

Besides this, it was also possible to identify and specify verbal abilities, theory of mind abilities and social variables as factors relevant to specific source monitoring performances in experiment 2. These relational findings reveal important insights into the single performances that are relevant to early source monitoring. The relational analyses clearly extend our knowledge about early source monitoring in a meaningful way and help understand how children learn to discriminate between the different sources of their memories.

4 General Discussion

In both of my experiments, I examined the research questions what are favorable conditions of early source monitoring performances and what are factors that are relevant to early source monitoring performances. In this section, I embed both research questions into the broader theoretical context and present further ideas for following research. I also point out the arising practical implications and answer the question what we now know about how young children find their way in the growing number of their memories.

I first examined whether an action encoding mode is a favorable condition of early source monitoring, enabling 3-, 4- and 5-year old children to attribute earlier and more reality, internal, and external source monitoring person sources correctly to their memories in comparison to a verbal encoding mode. My first experiment showed that this is indeed the case for the 4- and the 5-year-olds. The 4-year-old children could use the additional available visual and cognitive source specific memory characteristics of the other-performed actions and attributed earlier and more external source monitoring sources correctly to their memories compared to the repeated verbal statements in the verbal encoding mode. The 5-year-olds could use the additionally available visual, motor and cognitive source specific memory characteristics of the self-performed and the other-performed actions and attributed more reality monitoring sources correctly to their memories in the action encoding mode than in the verbal encoding mode. For the source monitoring framework, this means that the memory characteristics about self- and other-performed actions are source relevant memory characteristics and can be used by 4- and 5-year-old children without external cues or support. These memory characteristics also have the potential to increase reality and external source monitoring performances. However, based on the empirical findings of my first experiment it is not possible to specify what exact characteristic or whether a combination of multiple characteristics leads to the advantage of the performed actions because I did not ask the children what characteristics they used for their source attributions. It is also not possible to specify whether the additional memory characteristics increase the number of available source specific memory characteristics and/or whether they make the source specific memory characteristics more distinctive (c.f., Johnson et al., 1993; Lindsay et al., 1991; Lindsay, 2002) and therefore lead to a higher number of correct source attributions. Because I did not ask the children how they carried out the source attributions, I also cannot specify whether they carried out their source attributions nondeliberately or more deliberately. This needs to be addressed in following research. My first experiment also revealed that neither the 4- nor the 5-year-olds profited from the additional memory characteristics in the internal source monitoring condition. It is possible that the performed actions have produced the reverse effect and could have made the two internal sources more similar. This could have been the case if the action

phrases were merely imagined. During action imagination, motor characteristics can be produced (e.g., Engelkamp & Zimmer, 2006) that might then be harder to discriminate from the motor characteristics produced during real action execution particularly if the source decisions are carried out mainly nondeliberately as it can be assumed for 4- and 5-year-old children. The children then might also not have been able to attribute more internal sources in the action encoding mode than in the verbal encoding mode because no additional or more distinctive memory characteristics were available. If the action related memory characteristics can be used deliberately then the advantage of the action encoding mode might also exist in internal source conditions. In relation to the 3-year-olds, my first experiment revealed that the action encoding mode was clearly not a favorable condition for them. They neither attributed earlier nor better the sources of the reality monitoring, the internal or the external source monitoring sources in the action encoding mode correctly above chance level to their memories. In the case of the reality monitoring sources, even the reverse was true, thereby showing that the 3-year-old children attributed the reality monitoring sources in the verbal encoding mode correctly above chance level to their memories. This finding indicates that the 3-year-olds seem to still be vulnerable for changes of the retrieval mode and attribute the sources correctly to their memories only if the retrieval mode is identical to the encoding mode. It is also possible that the 3-year-old children do not or cannot not use the additional available memory characteristics in the action encoding mode successfully in their source attributions. In relation to the external and the internal source monitoring sources it might also be the case that the 3-year-old children may not have the more comprehensive conceptual understanding necessary to discriminate and to attribute these sources correctly. An important question for following research is therefore to identify where exactly the 3-year-olds difficulties with these types of sources come from and why the 3-year-olds do not profit from an action encoding mode like 4- and 5-year-old children.

Secondly, I examined whether the familiarity with the person source is another favorable condition of early source monitoring and therefore allows younger 3-, older 3-, 4- and 5-year-old children to attribute earlier and better reality monitoring and external source monitoring sources correctly to their memories. My second experiment revealed that this is clearly the case. All children attributed high familiar person sources better to their memories than unfamiliar person sources. Besides this, the younger 3-year-old children attributed the high familiar person sources earlier correctly above chance level to their memories than the unfamiliar person sources in the reality monitoring conditions. The same was true for the older 3-year-old children in the external source monitoring condition. With this source monitoring performance, the older 3-year-old children were already able to carry out external source attributions successfully and are no longer limited to reality monitoring source attributions. For the source monitoring framework this means that under this favorable source monitoring condition, external source attributions are possible at three years of age. Also, older 3-year-old children already have the conceptual

understanding concerning external sources available to them and can therefore attribute and differentiate such real person sources successfully. The finding that younger 3-year-olds could not attribute the external source monitoring sources correctly to their memories indicate that they may not have the comprehensive conceptual understanding about unfamiliar external source monitoring sources available yet or may not use the source specific memory characteristics efficiently to attribute and differentiate external real person sources successfully. This indicates that a qualitative developmental change may take place at the middle of the third year of life in the ability to attribute two external sources correctly to memories. One central question for following research is therefore to examine whether and why the younger 3-year-old children have specific (conceptual) difficulties with unfamiliar sources and/or could not use the specific memory characteristics of unfamiliar external sources as efficiently as the high familiar external sources.

The clear advantage of the high familiar person source attribution also show that children in each age group profit from the additional person-specific knowledge and can clearly better attribute the high familiar person sources. In relation to the source monitoring framework, this pattern of results shows that the person-specific knowledge is a favorable source specific memory characteristic that noticeably support the encoding, storage and retrieval of the source specific memory characteristics and the source decision processes because it obviously provides the children with more distinctive source specific memory characteristics. The results of experiment 2 also indicate that these memory characteristics can already be used by younger 3-year-old children and are used consistently by older 3-year-old, 4-year-old and 5-year-old children. However, based on the empirical findings of my second experiment it is not possible to specify from what stage or from what stages the person-specific knowledge come from and whether and how the person-specific knowledge supports the source decision processes. It is also not possible to examine whether the 3-, 4- and 5-year old children profit equally from the person-specific knowledge of the high familiar person sources or whether differences exist between the four age groups. These are important research questions for following. Another important research question for following research is whether the children use the person-specific knowledge nondeliberately or deliberately. It is possible that the older children will start to use these source specific memory characteristics in a more deliberate way that could mark the beginning of strategic source decision processes. It might be possible as well that familiar-person characteristics are appropriate to train younger children to use a source decision strategy and then to carry out source decision deliberately and explicitly.

Thirdly, I examined whether 3-, 4- and 5-year-old children are able to attribute multiple reality, internal and external person sources in a multiple source attribution condition correctly to their memories. My second experiment showed that this is the case at the middle of the third year of life indicating that the older 3-year-old, 4- and 5-year old children are already able to select the

different types of sources involved in a respective source task by themselves and attribute it correctly to their memories. The low error rates of the intra- and inter-intraexperimental source errors and the absent extraexperimental source errors also underpin this conclusion. However, regarding the internal source monitoring sources the children must have been asked a closed-ended source question because they did not differentiate instantly between the internal said- and the internal thought-sources by themselves in the initial open-ended multiple source question. In relation to the source monitoring framework, the findings revealed that multiple source attributions in a multiple source attribution condition are possible in the second half of the third year of life. This finding also indicates that children at that age have the necessary conceptual understanding about the sources available to them and can use this understanding independently in a flexible way to attribute and to discriminate reality monitoring (familiar, unfamiliar), internal and external source monitoring sources successfully to their memories. Nevertheless, it is possible that multiple source attributions will also require favorable source task conditions, as it is the case in experiment 2 using high familiar person sources. If such other favorable conditions are not given, multiple source attributions might be more difficult and might be above chance level at a later point of time or competences respectively. One meaningful research question for following research is therefore to examine multiple source attributions in other source task conditions and to specify when multiple source attributions are possible. Another important question for following research is to examine how exactly children carry out their multiple source attributions and how they select and differentiate between the alternative single sources. In the same vein, it is likewise interesting to examine whether children carry out their multiple source attributions nondeliberately or deliberately, as well as when they start to carry out their multiple source attributions deliberately.

However, experiment 2 also showed that younger 3-year-old children did not attribute multiple sources in a multiple source attribution condition correctly to their memories. The younger 3-year old children may not yet have the conceptual understandings about the different types of sources involved in the four source monitoring tasks of experiment 2 available and thus do not attribute and differentiate correctly between the different types of sources. A meaningful research question for following research is therefore to examine whether the conceptual understanding is indeed the reason for this source monitoring performance of the younger 3-year-old children. Another explanation that should be examined in following research is whether the younger 3-year-old children have difficulties that are more fundamental and are therefore not yet able to carry out multiple source attributions on the processing level. Their processing capacity might be limited to a smaller number of sources and therefore multiple source attributions still exceed their information processing capacity.

As the fourth favorable condition of early source monitoring, I examined whether the internal source monitoring instruction can be optimized for 3-year-old children. My second experiment

showed that this was indeed possible. The two perceptual cues “loud” for the internally said-source and “silent” for the internally thought-sources allowed the older 3-year-old children to differentiate between the two internal person sources and to attribute them successfully to their memories. In relation to the source monitoring framework, this finding shows that internal source monitoring performances are possible in older 3-year-old children and that they have the necessary source monitoring processes as well as a basic conceptual understanding about the two internal sources to carry out internal source monitoring performances. Nevertheless, the older 3-year-old children need these additional external perceptual retrieval cues to differentiate successfully between the two internal sources. An important question for following research is to examine how the 3-year-old children use the additional perceptual cues for their internal sourced attributions and whether other external cues may support internal source monitoring performances in a similar way.

My second experiment revealed that the additional perceptual cues in the internal source monitoring instruction were not helpful for the younger 3-year old children as they could not attribute the internal source monitoring sources correctly above chance level to their memories. An important question for following research is therefore to examine whether other additional external cues help younger 3-year-old children to attribute internal source monitoring sources correctly to their memories. However, it is also possible that the younger 3-year-old children still not have the necessary conceptual understanding yet to carry out internal source attributions successfully; or they may not use the available memory characteristics of the internal sources effectively; or may not retrieve enough source specific memory characteristics, and therefore could not attribute the internal sources correctly above chance level to their memories. These are important research questions for following research.

Taken together, both of my experiments showed that it was possible to create and to identify favourable conditions of early source monitoring performances. Under favourable conditions, young children carry out source monitoring successfully and can attribute reality monitoring, internal and external source monitoring sources earlier and better correctly to their memories. This pattern of results clearly indicates and supports early competences and a high representational flexibility (e.g., Eichenbaum, 1997; Roberts 2002). The increasing representational flexibility is a major hallmark of memory development (Hayne & Simcock, 2009) and likewise exists in the complex memory performance source monitoring. The representational flexibility in source monitoring increases from three to four and from four to five years of age. An important step in the exploration of the representational flexibility is now to determine the causes of the representational flexibility in the main source monitoring performances and to explore whether and how it can be further supported.

One further step in the exploration of the representational flexibility is also to examine when and how children discriminate other groups of sources correctly to their memory. The same should

be examined for other source task conditions. Generally, if source monitoring can be carried out independent of the types of sources and the source task conditions then a complete representational flexibility is reached. However, although this level of representational flexibility is reached, it is still possible that in a specific situation a person will not carry out source attributions successfully. This would mean that some unfavourable situation specific conditions affected the source attributions but the general ability to carry out source monitoring performances in a flexible way does exist. The source monitoring framework already specifies such unfavourable situation specific conditions (e.g., similarity; Johnson et al., 1993).

The early competences at the age of three and four years also indicate that source monitoring develops before the age of three years and single source monitoring performances might even be possible at an earlier age. One possible starting point for the development of basic source monitoring performances could be when the children first start to discriminate between themselves and others and when they are able to form durable representations that can somehow be retrieved. It seems to be plausible that young children may first start to discriminate between real person sources before they can discriminate between non-person sources (e.g. TV). The reason for this could be that children are more closely related to real person sources. Another important starting point seems to be shared activities or collaborative activities⁴². In shared or collaborative activities, the children experience many situations in which they are themselves or another person/s are the source of actions, utterances or statements (e.g., daily routines, games, other activities like visits etc.). The young children in their first two years of life may recognize and start to focus little by little on the person source and in succession learn to discriminate and to consider the activities carried out by the different persons and to use and consider them (implicitly / nondeliberately) in their following actions and/or statements. Whether these experiences are necessary or whether a certain (social-)cognitive state is needed first to allow the processing of the sources of information and/or a focus on the source of information (in the sense of innate modules, general induction, domain-specific naïve view/theory-theory view; e.g., Wellman & Gelman, 1998) is a very interesting and important question for following research that will help to discover the beginning of source monitoring.

Source monitoring is a highly complex memory performance and the identification of the source of a memory is an essential cognitive ability (Lindsay, 2002). This is the case because the meaning of a memory is closely tied with its source (e.g., the importance of a past statement may vary meaningfully depending on who said it). When reporting on past experiences it is often important to differentiate between the sources of the memories because otherwise it might be not

⁴² As suggested for older children for example by Roberts (2000). However, the role and the possible enhancing effect of collaborative activities may vary between very young children and older children (e.g., enhancing the source relevant cognitive characteristics in older children as supposed by Roberts (2000) for example).

clear for example whether an event was really experienced or was just imagined (Lindsay, 2002). Without the ability to identify the source of our memories “one would be bereft of autobiographical memory itself, because it is the quality of having a particular source in the personal past that makes a memory autobiographical” (Lindsay, 2002, p.83).

With it, source monitoring is an important and promising research approach for research on autobiographical memories. It can help in understanding and examining the core characteristic of autobiographical/episodic memories – the autonoetic consciousness (self-knowing) – that allow both the mental representation and to become aware of the subjective experiences in the past, present, and future (Ebbinghaus, 1885; James, 1892 cited by Perner & Ruffman, 1995; Nelson, 2003; Tulving, 1983, 1985; Wheeler, 2000; Wheeler et al., 1997). A meaningful step in following research is therefore to (more strongly) introduce the source monitoring research into the autobiographical memory research and to use its theoretical and empirical knowledge to further discover autobiographical memories and its developmental course.

Another meaningful approach for research on early source monitoring is to use further methods to examine early source monitoring performances. Such methods are subjective measures of the qualitative characteristics of memories and the phenomenal experience produced (e.g., Brewer, 1988; Gardiner, Ramponi & Richardson-Klavehn, 1998; Johnson, Foley, Suengas & Raye, 1988; Johnson et al., 1997; Mather et al., 1997; Rajaram & Roediger, 1997), are cognitive neuroscience methods (electrophysiological and imaging techniques) and are mathematical models of recognition and source monitoring processes like the multinomial processing tree models (e.g., Batchelder & Riefer, 1990; Bayen, Murnane & Erdfelder, 1996; Buchner, Erdfelder & Vaterrodt-Plunnecke, 1995; Dodson, Holland & Shimamura, 1998; Meiser & Bröder, 2002; for an overview see Erdfelder & Buchner, 2003) or signal-detection theory models (e.g., Banks, Chen & Prull, 1999; Hoffman, 1997; Yonelinas, 1994). Each of these methods can help explain single aspects of the complex memory performance source monitoring and with it help understand how we differentiate between the various sources of our memories. The subjective measures of the qualities of memories and their phenomenal experiences seem to also be very fruitful research approaches for children’s source monitoring performances and can help identify and specify how children carry out their source attributions and what source decision processes they may use.

A meaningful approach for the research on source monitoring is also to consider and to examine whether other models describing (parts of) the ability to differentiate between the sources of memories contain helpful assumptions about source monitoring performances and processes. It might be the case that other theoretical attempts contain meaningful assumptions that explain (specific) source monitoring aspects better, more precisely or consider additional theoretical and empirical aspects (e.g., fuzzy-trace theory). In this connection, it is also important to consider approaches that have their origins in other areas of psychology or from areas outside psychology but contain assumptions and explanations about the ability to differentiate between the sources of

our memories (e.g., source-of-knowledge approach of the theory of mind research). The examination of other theoretical approaches can make it possible to consider and to integrate alternative interpretations and perspectives and with it help to better understand and explain the complex memory ability to differentiate between the sources of memories. If it is the aim to discover the ability to differentiate between the sources of our memories and its developmental course then these other models, approaches and explanations should be considered.

Based on the findings of the four favorable conditions it is possible to derive different practical implications. The main practical implication refers to the evaluation of memory accuracy or memory performances in general. The evaluation of memory accuracy is relevant and important particularly in forensic contexts (for overviews see Westcott, Davies & Bull, 2002; Toglia, Read, Ross & Lindsay, 2007). In this context, it is necessary to know the possibilities and the boundaries of memory accuracy to better evaluate memory reports and draw conclusions that are more reliable because these memory reports can go along with a variety of important and grave consequences (e.g., criminal prosecutions and condemnations). For the evaluation of memory accuracy it is also important to know how and when inaccurate or false memories can come up (e.g., source confusions), to evaluate the risk of possible inaccurate or false memories (e.g., vulnerability for suggestibility) and to use appropriate methods to avoid or at least to control possible inaccurate and false memories (e.g., open-ended questions).

Based on the findings of my two experiments it can be derived that children in the first half of their third year of life are generally able to differentiate and to reliably attribute high familiar person sources correctly to their memories after short delays. However, this is limited to a reality monitoring source constellation and is not true for an external source monitoring constellation. Children at that age are also still not able to differentiate between what they said and what they merely thought even if they have perceptual external source cues available in the internal source question. Children in their first half of their third year of life are also still not able to carry out multiple source attributions in a multiple source attribution condition although their difficulties seem to result from the not available conceptual understanding about internal and external source monitoring sources. Although they are able to respond correctly to the open-ended source question and attribute the reality monitoring familiar sources correctly, this is not the case for the reality monitoring unfamiliar, the internal and the external source constellations. Children in their first half of their third year of life have difficulties attributing and discriminating these sources correctly to their memories and their source attributions lie below or at chance level only.

Children in the second half at their third year of life are on principle able to differentiate and to reliably attribute high familiar person sources correctly to their memories in reality monitoring and external source monitoring constellations. The same is true for 4- and 5-year-old children although in single sources the older children attribute more sources correctly, than the younger

children do. Besides this, children in the second half of their third year of life are generally able to attribute and to discriminate the sources of memories on what they said from what they have merely thought. However, for this discrimination older 3-year-old children need perceptual external source cues in the internal source question and need to be explicitly asked about these sources. Children in the second half of their third year of life are also on principle able to carry out multiple source attributions in a multiple source attribution condition, respond correctly to an open-source question, select, and attribute internal and external sources correctly to their memories. The same is true for 4- and 5-year old children. However, regarding the internal sources, it is necessary to ask the children explicitly to differentiate between what they said and what they thought because the different type of internal source is not clear in an open-ended source question.

Children at the age of three years do not attribute sources of performed internal and external actions better correctly to their memories than the sources of verbal statements. Children at that age seem to still be vulnerable for changes of the retrieval mode and attribute the sources correctly only if the retrieval mode is identical to the encoding mode. Their correct source attributions of single unrelated verbal statements are also limited to reality monitoring sources. External or internal source attributions of single verbal statements are not possible above chance level. Children at the age of four years attribute sources of other-performed actions in an external source constellation better to their memories than sources of verbal statements. This is not the case for reality monitoring or for internal source constellations. In contrast, children at five years of age attribute the sources of self- and other-performed actions in a reality monitoring constellation better correctly to their memories than the sources of verbal statements. This is not the case for internal and external source constellations – the source attributions are equally high. For the previous presented conclusions, it needs to be kept in mind that the source attributions were made after shorter delays. In situations of longer delays, source attributions might be lower compared to source attributions made after such shorter delays (e.g., Drumme & Newcombe, 2002). Nevertheless, based on the current available empirical findings it can be concluded that the lower source attribution rates after longer delays result from forgetting effects and not from their source monitoring processing abilities because (older) 3-, 4-, and 5-year-old children are principally able to carry out source monitoring processes (e.g., Lindsay et al., 1991; Sussman, 2001; Welch-Ross, 1995; Experiment 1, 2).

Taken together, children below six years of age already have the ability to differentiate between the sources of their memories although at the age of three years the source monitoring competences are still partly limited but can become available in favorable source monitoring conditions. This knowledge now allows evaluating memory accuracy more reliably because it specifies what memory performances are generally possible at what time of development. My two experiments revealed more source monitoring competences in favorable source monitoring conditions as known before. Nevertheless, this knowledge does not allow the conclusion that

young children always attribute reality, internal and external real person sources correctly to their memories. In single situations, like with all other person groups, their source attributions can be influenced by the factors affecting source monitoring performances in general (i.e., similarity; Johnson et al., 1993; Johnson & Raye, 2000; Lindsay et al., 1991) and always need to be evaluated in relation to the specific situation. Besides this, source attributions always depend on the event characteristics that have been encoded, stored and retrieved, and with it define the boundaries of memory and source monitoring accuracy.

Now I turn to my second research question of identifying and specifying factors relevant to early source monitoring.

The first factor was working memory and I examined whether the working memory components episodic buffer and phonological loop of the multi-component working memory model proposed by Baddeley and Hitch (1974; Baddeley, 2000, 2007) are relevant working memory performances for early source monitoring performances. My first experiment revealed that the episodic buffer performance memory-for-sentences is a cognitive ability relevant to early source monitoring and 4- and 5-year-old children with better memories for sentences that involve a retrieval and an integration of information from the phonological loop (verbatim recall of individual words and their order) and from the language processing system (semantic and syntactical analysis) attributed more reality monitoring sources (4-year-olds) and more external source monitoring sources (5-year-olds) in an action encoding mode correctly to their memories. However, the relations were limited to the action encoding condition and no relation was found to the internal source monitoring performance. My first experiment revealed as well that the phonological loop performance phonological-working-memory-performance-for-nonwords is another cognitive ability relevant to early source monitoring and 3- to 5-year old children that better repeated nonwords also attributed more reality monitoring and internal source monitoring sources in the action encoding mode correctly to their memories. Nevertheless, the relations are likewise limited to the action encoding condition and that no relation was found to the external source monitoring performance.

The second factor was inhibition and I examined whether the inhibition of task irrelevant characteristics is related to early source monitoring performances. My second experiment showed that this is not the case and inhibition performances were not related to the source monitoring performances of the 3- to 5-year-old children. However, it is possible that the reason for the absent relations lays in the used source tasks. In the used source task, the children remembered the sources of the picture-book episodes quite accurately and thus inhibition of irrelevant memory characteristics was obviously not necessary anymore. Consequently, the theoretically and empirically expected relation between inhibition and source monitoring (Roberts & Powell, 2005; Ruffman et al., 2001) could not be visible in my second experiment.

The third factor was verbal abilities and I examined whether the verbal ability sentence comprehension as the indicator of the passive available verbal representation system episodic are cognitive abilities relevant to early source monitoring. My first experiment revealed that this is the case for the internal source monitoring performances and that the 3-, 4- and 5-year-old children with better sentence comprehension abilities attributed more internal source monitoring sources in an action encoding mode correctly to their memories. However, my first experiment revealed that the relation is limited to internal source monitoring performances in an action encoding condition and no relations exist to reality monitoring and to the external source monitoring performances. Besides this, I examined whether the verbal abilities active vocabulary level and morphological rule using competences sentence comprehension as indicators of the active available verbal representation system episodic are a cognitive ability relevant to early source monitoring. My first experiment showed that this is the case and the 3-, 4- and 5-year-old children with better active vocabulary levels and better morphological rule using competences attributed more reality monitoring, internal and external source monitoring sources in an action encoding mode and more internal source monitoring sources in the verbal encoding mode correctly to their memories. The relevance of the active available verbal representation system is also supported by my second experiment. The 3- to 5-year-old children with better active vocabulary levels as the indicator of the active available verbal representation system attributed more reality monitoring (unfamiliar, familiar) and more internal source monitoring sources correctly to their memories. In contrast, no relations were found to external source monitoring performances. With it, the relation depend on the type of source task conditions and if more verbal characteristics are contained then no relation exists between both cognitive performances.

The fourth factor was theory of mind abilities and I examined whether false-belief understanding is a social-cognitive abilities relevant to early source monitoring. My first experiment revealed that 3-, 4- and 5-year-old children with better false-belief understandings indicating a more comprehensive understanding about mental states, attributed more internal source monitoring sources in the verbal and in the action encoding mode correctly to their memories. The same pattern of results was found in my second experiment supporting that a strong and consistent relation exists between false-belief understanding and internal source monitoring performances. However, my first experiment revealed that the relation between false-belief understanding and internal source monitoring in the action encoding mode was moderated by verbal abilities representing the active vocabulary level, and by working memory performances. This finding indicates that in source task conditions, containing less verbal characteristics, the understanding between the mind and the world does not play such an important role and other cognitive abilities are relevant as well. Besides this, I examined whether appearance-reality understanding is likewise a social-cognitive ability relevant to early source monitoring. My second experiment showed that this is the case and that 3-, 4- and 5-year-old children with a better appearance-reality understanding attributed more internal source monitoring sources correctly to their

memories. I examined as well whether source of knowledge understanding is also a social-cognitive ability relevant to early source monitoring. My second experiment revealed strong relations between correct seeing-source attributions in the source of knowledge task and internal source attributions in reality monitoring familiar, reality monitoring unfamiliar and internal source monitoring tasks and underpins the assumption that in both tasks similar source monitoring processes seem to be carried out. The findings also show that the relation is highest in source attributions concerning the same modality. However, my second experiment showed that the highest relation to the source concerning the same modality is not true for telling-source attributions and internal and external source attributions. My second experiment only revealed a specific relation between the telling source and the said-source of the internal source monitoring task, indicating that the telling-source is not as meaningful for internal and external source attributions as the seeing source. In addition, my second experiment showed that correct feeling-source attributions go along with higher reality monitoring unfamiliar and internal source attributions indicating that feeling-source attributions are relevant to more similar source monitoring performances and seem to be independent of the modality.

With this pattern of results, my experiments revealed that the theory of mind abilities false-belief understanding, appearance-reality understanding and source of knowledge understanding are social-cognitive abilities that are consistently relevant to early internal source monitoring and to reality monitoring performances.

The fifth factor was social variables and I examined whether social variables within and outside the family are relevant to early source monitoring performances. My first experiment revealed that this is the case for the hours the father spends with the child per day, which goes along with a higher number of correct reality monitoring and external source monitoring performances in the action encoding mode. The same is true for the variable weekly contacts of the child to younger children, which is related to a higher number of correct reality monitoring source attributions in the verbal encoding mode. Besides this, the number of hours the father spends with the child per day goes along with a higher number of correct internal source monitoring performances in the verbal and in the action encoding mode. In addition to these findings, my first experiment showed that the lower the number of siblings was, the higher the internal source monitoring performances were in the action encoding mode. The same was true for the position in the row of siblings. The lower the position of the child in the row of siblings was, the higher the numbers of correct internal source monitoring performances in the action encoding mode and reality monitoring performances in the verbal encoding mode were. Besides this, experiment 1 revealed that the longer the duration a crèche/nursery school/kindergarten has been attended, the higher the correct source attributions were in reality monitoring in the verbal encoding mode and in internal source monitoring in the action and in the verbal encoding mode. In addition, the higher the number of courses the child regularly visits per week was, the higher the number of correct source attributions in the internal source monitoring in the action encoding mode was.

My second experiment showed that the number of contacts to peers outside the kindergarten is related to reality monitoring familiar and to external source attributions. Also, the time a kindergarten/crèche has been attended is related to reality monitoring unfamiliar source attributions. With it, my two experiments reveal that single social variables within and outside the family are relevant to early source monitoring but these relations depend on the type of source monitoring and on the source task condition.

In the general introduction I supposed that the central cognitive factors working memory, inhibition, verbal abilities, the central social-cognitive factors theory of mind abilities and social factors are relevant to early source monitoring and may support and/or moderate source monitoring performances in 3-, 4- and 5-year-old children (e.g., Roberts, 2002; Thierry, Spence & Memon, 2001; Welch-Ross, 2000). With the exception of the factor inhibition, my two experiments revealed that this is indeed the case. The working memory performances, the verbal abilities, the theory of mind abilities, and the social variables are related to early source monitoring performances although no general relations only specific relations exist depending in part on the type of sources of source task items and on the age of the children. The systematic analyses in my two experiments allowed to identify and specify the meaning of each of the five factors for early source monitoring and with it helped to enhance our current knowledge about how children learn to differentiate between the sources of their memories. Based on these analyses, it is now possible to examine whether single or several factors play a causal role for early source monitoring performances. Besides this, it is possible to examine whether other cognitive, social-cognitive and social variables are likewise relevant to early source monitoring performances. My experiments revealed as well that the analyses of the relation between source monitoring and other cognitive, social-cognitive and social abilities give a first insight into the question of what relevance source monitoring has for the other cognitive, social-cognitive and social abilities and their developmental course. It is interesting to take up this specific question more closely in following research.

Now I would like to end my dissertation with the conclusion that both of my experiments reveal interesting and meaningful insights into the fascinating question about how young children learn to differentiate between the person sources of their memories and with it, how they find their way in their growing number of memories. With my two experiments, it was possible to identify favorable conditions and factors relevant to early source monitoring showing that that at the age of three years children successfully differentiate between single person sources of their memories. At the age of four, children successfully distinguish between internal and external person sources in different source constellations and have already reached a high level of representational and conditional flexibility. Thus, the basic source monitoring information processing processes are available and allow the children to find their way in their memories and to vividly remember experiences such as the dialogs/grips and their sources carried out during

building a stone dam together with another child. The next step is now to specify how exactly the young children carry out these source decision processes which allow more complex source monitoring performances such as the remarkable memory performance of remembering a dialog between the parent and a stranger about a fantastic but unsuccessful attack of three players during a football game without mixing up what was said by whom when later talking about the football game with a friend.

5 Summary (German)

Die Fähigkeit, zwischen den verschiedenen Quellen in unseren Erinnerungen zu unterscheiden, ist eine komplexe Gedächtnisleistung, die ein erfolgreiches Enkodieren, Speichern und Abrufen der relevanten Erinnerungsmerkmale und eine erfolgreiche Quellenentscheidung beinhaltet (Johnson, Hashtroudi & Lindsay, 1993). Die Entwicklung dieser Fähigkeit verläuft graduell in den Vorschuljahren mit früheren Kompetenzen in einigen und späteren Kompetenzen in anderen Quellenmonitoringleistungen (Lindsay, 2002). In meiner Dissertation untersuche ich günstige Bedingungen für frühe Quellenmonitoringleistungen, in denen es jüngeren Kindern gelingt, früher und besser verschiedene Personenquellen richtig zu ihren Erinnerungen zuzuordnen. Um eine systematische Aufstellung der relevanten kognitiven und sozialen Fähigkeiten zu bekommen, überprüfe ich ebenfalls, welche kognitiven, sozial-kognitiven und sozialen Faktoren in bedeutsamer Beziehung zu den frühen Quellenmonitoringleistungen stehen.

Die theoretische Grundlage für die Fähigkeit zwischen den verschiedenen Quellen in Erinnerungen zu unterscheiden ist das Quellenmonitoring-Rahmenmodell von Johnson, Hashtroudi and Lindsay (1993). Es ist das derzeit theoretisch und empirisch fundierteste Modell und gilt in meiner Dissertation als theoretische Grundlage.

In dem Quellenmonitoring-Ansatz wird angenommen, dass Erinnerungen aus verteilten mehr oder weniger eng verbunden Merkmalen bestehen, die aus perzeptuellen (z.B. identifizierte Objekte, Lokationen, Farben) und reflektiven Prozessen (z.B. Vorstellungen, Überlegungen, Planungen; Johnson & Raye, 2000) entstanden sind. Dies bedeutet, dass Erinnerungen von Beginn an konstruiert werden auf der Basis von Wahrnehmungen, Gedanken, Überzeugungen und Zielen, die zum Zeitpunkt des Erwerbs beteiligt sind (Bartlett, 1932; Johnson & Raye, 2000). Dies bedeutet auch, dass Erinnerungen von Beginn an rekonstruiert werden in Kontexten, in denen andere Informationen und Ziele vorhanden sind und sein können (Bartlett, 1932; Johnson & Raye, 2000). Durch diese Vagheit des Ursprungs der mentalen Erfahrung sind schlussfolgernde Prozesse erforderlich, die die Quelle einer aktivierten Erinnerung evaluieren (Johnson & Raye, 2000). Der Quellenmonitoring-Ansatz schlägt vor, dass die aktivierten Informationen evaluiert werden und auf der Basis phänomenologischer Eigenschaften und/oder ihren Beziehungen zu anderen Erinnerungen, Wissensbeständen und Überzeugungen, erschlossen werden (Johnson et al., 1993; Johnson & Raye, 1981, 2000; Lindsay & Johnson, 1989; Raye, Johnson & Taylor, 1980). Die Evaluationsprozesse können dabei variieren zwischen relativen automatischen (oder heuristischen) Prozessen bis hin zu sehr stark reflektiven und systematischen Prozessen (Johnson et al., 1993; Johnson & Raye, 2000). Die Parameter dieser Evaluations- oder Monitoringprozesse variieren als eine Funktion der ausgewählten

Entscheidungskriterien und sind situations- und zeitabhängig (Johnson et al., 1993; Johnson & Raye, 2000). Ein Entscheidungskriterium könnte beispielsweise die Fehlerkonsequenz sein (Johnson et al., 1993; Johnson & Raye, 2000).

Im Quellenmonitoring-Ansatz bezeichnet der Ausdruck *Quelle* diejenigen Merkmale, welche die Bedingungen spezifizieren unter der die Erinnerung erworben wurde (Johnson et al., 1993; Lindsay, Johnson & Kwon, 1991). Diese Merkmale können räumlich und zeitliche Merkmale sein, soziale Kontexte des Ereignisses oder Medien und Modalitäten, unter denen das Ereignis erworben wurde (Johnson et al., 1993). Die Merkmale einer aktivierten Erinnerung werden dann auf der Basis der Erwartungen über die unterschiedlichen (kennzeichnenden) Qualitäten der verschiedenen Quellen von Erinnerungen bewertet (Johnson et al., 1993). Das Ergebnis der damit verbundenen (automatischen, heuristischen und/oder systematischen) Entscheidungsprozesse ist die Quellenzuordnung (Johnson & Raye, 2000).

Die wesentlichen Erinnerungsmerkmale von den verschiedenen Quellen sind perzeptuelle (z.B. Formen, Farben, Töne), kontextuelle (z.B. räumliche, zeitliche), semantische und affektive Merkmale (z.B. Valenz) und kognitive Operationen (z.B. Schlussfolgerungen, Elaborationen, Vorstellungen, Reflektionen; Johnson & Raye, 1981; Johnson et al., 1993). Wahrgenommene Quellen enthalten häufig mehr perzeptuelle, kontextuelle, semantische und affektive Merkmale, und Quellen von Vorgestelltem enthalten häufig mehr kognitive Operationen und wenig perzeptuelle Merkmale (Johnson et al., 1993).

Es lassen sich drei Hauptarten des Quellenmonitorings unterscheiden.

Die erste Art ist das Realitätsmonitoring, in dem eine internale und eine externale Quelle enthalten ist (Johnson et al., 1993). Die internale Quelle bezieht sich auf die Person, welche die Quellenentscheidung vornimmt. Die externale Quelle bezieht sich auf jegliche Art von Quellen, die außerhalb der Person liegt, die die Quellenentscheidung vornimmt. Die Quellen können öffentlich (z.B. Gesehenes, Gesagtes) oder privat zugänglich sein (z.B. Gedachtes). Die zweite Art des Quellenmonitorings ist das Internale Quellenmonitoring, in dem zwei internale Quellen enthalten sind, die ebenfalls öffentlich oder privat zugänglich sein können (Johnson et al., 1993). Die dritte Art des Quellenmonitorings ist das Externale Quellenmonitoring, in dem zwei externale Quellen enthalten sind, die gleichermaßen öffentlich oder privat zugänglich sein können (Johnson et al., 1993).

Die Annahme, dass die drei Hauptarten distinkte Quellenmonitoringarten sind, ist durch empirische Befunde belegt, die zeigen, dass niedrige Leistungen in einer Quellenart nicht auch mit niedrigen Leistungen in einer anderen oder in allen Quellenmonitoringarten einher gehen (Durso, Reardon & Jolly, 1985; Durso, Reardon, Shore & Delys, 1991; Harvey, 1985; Hashtroudi, Johnson & Chrosniak, 1989; Johnson et al., 1993).

Da die Quelle nicht ein bestehendes Erinnerungsdetail ist, sondern auf komplexen Abruf- und Entscheidungsprozessen beruht, nehmen Johnson et al. (1993) an, dass sich das Quellenmonitoring graduell entwickelt. Die vorliegenden Forschungsarbeiten zur Entwicklung des Quellenmonitoring stützen diese Annahme (zur Übersicht siehe Roberts, 2000). Auf der Basis dieser Arbeiten ist es bereits gelungen, ein genaueres Bild früher Quellenmonitoringleistungen zu erhalten und aufzuzeigen, wo Entwicklungsveränderungen stattzufinden scheinen (z.B., Lindsay et al., 1991; Sussman, 2001; Welch-Ross, 1995; zur Übersicht Roberts, 2002).

Allerdings ist bisher verhältnismäßig wenig bekannt, was günstige Bedingungen für frühe Quellenmonitoringleistungen sind und wann die verschiedenen (verbalen) Quellen erstmalig richtig zugeordnet werden können. Ebenfalls ist bisher kaum bekannt, welche kognitiven, sozial-kognitiven und sozialen Faktoren relevant sind für diese frühen Quellenmonitoringleistungen. In meiner Dissertation greife ich beide Fragestellungen auf und untersuche in zwei Querschnittsexperimenten, ob eine Handlungsenkodierbedingung (Experiment 1) und die Vertrautheit mit Personenquellen (Experiment 2) günstige Quellenmonitoringbedingungen sind, wann multiple Quellenzuordnungen möglich sind (Experiment 2) und ob die internele Quellenmonitoringinstruktion für jüngere Kinder optimiert werden kann (Experiment 2). Darüber hinaus überprüfe ich in beiden Experimenten, ob ausgewählte Inhibitionsleistungen, Arbeitsgedächtnisleistungen, verbale Fähigkeiten, Theory-of-Mind-Fähigkeiten und soziale Variablen relevante Faktoren für diese frühen Quellenmonitoringleistungen sind.

Experiment 1

In meinem ersten Experiment habe ich bei sechsdreißig 3, 4 und 5 Jahre alten Kindern überprüft, ob eine handlungsausführende Enkodierbedingung im Vergleich zu einer verbalen Enkodierbedingung eine günstige Bedingung für frühe Realitätsmonitoring-, Internale und Externale Quellenmonitoring-Leistungen ist. Darüber hinaus habe ich überprüft, ob die erhobenen Quellenmonitoringleistungen in einer bedeutsamen Beziehung zu ausgewählten Arbeitsgedächtnisleistungen, verbalen Fähigkeiten, dem Falschen-Überzeugungsverständnis und soziale Variablen stehen.

Im folgenden skizziere ich kurz für jede dieser Teilfragestellungen die zentralen theoretischen Grundlagen, die Hauptergebnisse und die Schlussfolgerungen, die sich ableiten lassen.

In meinem ersten Experiment habe ich angenommen, dass eine Handlungsenkodierbedingung eine günstige Bedingung für frühe Quellenmonitoringleistungen sein kann und dass sie die richtigen Quellenzuordnungen der 3, 4 und 5 Jahre alten Kinder erhöhen kann. Diese Erwartung

basiert auf der Annahmen dass die zusätzlich verfügbaren motorischen, visuellen, kognitiven und individuellen Präsentationsmerkmale von ausgeführten Handlungen (Bäckman, 1985; Cohen, 1981, 1989; Engelkamp, 1998, 2001; Engelkamp & Zimmer, 2006; Foley & Ratner, 2001; Hornstein & Mulligan, 2004; Johnson et al., 1993; Nilsson, 2000; Price & Ford, 2006; Senkfor et al., 2002; Sussman, 2001; Welch-Ross, 1995) die Anzahl der enkodierbaren und abrufbaren quellenspezifischen Merkmale erhöht und zu einer höheren Anzahl an richtigen Quellenzuordnungen führt (Foley & Ratner, 2001; Senkfor et al., 2002). Da in einer rein verbalen Enkodierbedingung diese zusätzlichen motorischen, visuellen, kognitiven und individuellen Präsentationsmerkmale von ausgeführten Handlungen nicht enthalten sind, habe ich erwartet, dass die Quellenzuordnungen bedeutsam niedriger sind als in der Handlungsenkodierbedingung. Dieser Vorteil sollte gleichermaßen in den drei Hauptquellenmonitoringarten Realitätsmonitoring (Quellen: Kind vs. Versuchsleiterin 1 (VL)), Internales Quellenmonitoring (Quellen: Kind führt Handlung aus vs. Kind denkt Handlung) und Externales Quellenmonitoring (Quellen: VL1 vs. VL2) bestehen, da in jeder dieser Quellenarten verbal vorgegebene Handlungen ausgeführt wurden. In der verbalen Enkodierbedingung wurden die vorgegebenen Handlungen lediglich verbal wiederholt. Der Vorteil sollte in allen drei Altersgruppen bestehen, da erwartet wurde, dass die Kinder aller Altersgruppen die zusätzlichen Erinnerungsmerkmale bereits nutzen können. Darüber hinaus wurde in allen Altersgruppen erwartet, dass die selbst ausgeführten Handlungen häufiger korrekt zugeordnet werden als die beobachteten und gedachten Handlungen, da dort die meisten handlungsbezogenen Merkmale vorhanden sein sollten.

Experiment 1 zeigte, dass die 4Jährigen mehr Externale Quellenmonitoringquellen und die 5Jährigen mehr Realitätsmonitoringquellen und die Gedacht-Quelle in der Internalen Quellenmonitoringbedingung korrekt zuordneten. Die 4 und 5jährigen Kinder konnten offenbar die zusätzlichen motorischen, visuellen, kognitiven und individuellen Präsentationsmerkmale in der Handlungsenkodierbedingung nutzen und waren somit in der Lage bedeutsam mehr Quellen korrekt zuzuordnen im Vergleich zur verbalen Enkodierbedingung, in der diese zusätzlichen Merkmale nicht vorhanden waren. Dieses Ergebnis zeigt das die zusätzlichen perzeptuellen und kognitiven Merkmale von selbst ausgeführten Handlungen und beobachteten Handlungen die Quellenmonitoringleistungen von jüngeren Kindern bedeutsam erhöhen kann (e.g., Hornstein & Mulligan, 2004; Johnson et al., 1993; Senkfor et al., 2002; Sussman, 2001; Welch-Ross, 1995). In der Externalen Quellenmonitoringbedingung ordneten zudem die 4Jährigen früher die Quellen in der Handlungsenkodierbedingung korrekt zu als in der verbalen Enkodierbedingung, in der die Quellenzuordnungen nicht über der Zufallsgrenze lag.

Allerdings zeigen die Ergebnisse deutlich, dass dieser Vorteil lediglich bei einzelnen Altersgruppen besteht und altersbezogen abhängig ist von der Art des Quellenmonitorings. Eine Erklärung bei den 4 und 5 Jährigen könnte sein, dass in den übrigen Quellenmonitoringleistungen die zusätzlichen perzeptuellen und kognitiven Merkmale nicht oder

nicht effektiv genutzt werden konnten (bei den Internalen Quellenmonitoringquellen). Eine andere Erklärung könnte sein, dass in den anderen Quellenmonitoringarten die korrekten Zuordnungen bereits so hoch waren, dass eine signifikante Steigerung nicht mehr abbildbar waren (Deckeneffekte, Realitätsmonitoring 4Jährige, Externales Quellenmonitoring 5Jährige). Der vollständig ausgebliebene Vorteil der Handlungsenkodierbedingung bei den 3Jährigen legt den Schluss nahe, dass sie vermutlich anfällig waren für den stattgefundenen Modalitätswechsel im Abruf (handelnd-verbal zu verbal) und die zusätzlichen handlungsbezogenen Merkmale nicht nutzen konnten. Eine erhöhte Anfälligkeit für Modalitätswechsel ist in der Gedächtnisforschung bei 3jährigen Kindern wiederholt gezeigt worden (z.B. Bauer, 2007). Diese Anfälligkeit wird in Experiment 1 ebenfalls durch den Befund gestützt, dass die 3jährigen Kinder die Realitätsmonitoringquellen in der verbalen Enkodierbedingung überzufällig häufig richtig zuordnen konnten. In der Handlungsenkodierbedingung lag die richtige Zuordnungsleistung hingegen unter der Zufallsgrenze. Hinsichtlich der Internalen und Externalen Quellenmonitoringquellen ist es ebenfalls möglich, dass die 3jährigen noch nicht die konzeptuellen Verständnisse dieser Quellen besitzen um diese voneinander zu unterscheiden und überzufällig richtig in der (rein verbalen Bedingung) zuzuordnen.

Entgegen meinen Erwartungen, ordneten die 3, 4 und 5 Jahre alten Kinder nicht bedeutsam mehr selbst ausgeführten Handlungen korrekt zu als die beobachteten Handlungen und gedachten Handlungen. Dieses Ergebnis kann einerseits bedeuten, dass ein Handlungseffekt nicht gleichermaßen in den Quellenzuordnungen existiert. Allerdings ist es möglich, dass in Experiment 1 dieser Vorteil aufgrund des Modalitätswechsels (3Jährige), des noch nicht vollständig vorhandenen konzeptuelle Verständnis einzelner Quellen (3Jährige), der nicht effektive genutzten handlungsbezogene Merkmale (4Jährige) und der vorliegende Deckeneffekte (4 und 5Jährige) nicht aufgezeigt werden konnte.

Für Quellenmonitoringleistungen scheinen *Arbeitsgedächtnisleistungen* unmittelbar relevant zu sein, da sie es einerseits ermöglichen Kurzzeit- und Langzeitgedächtnisinhalte von unterschiedlichen Modalitäten abzurufen und zu integrieren (Baddeley, 1986, 2007; Baddeley & Hitch, 1974) und es andererseits ermöglichen Schlussfolgerungen aus den zur Verfügung gestellten Inhalten zu ziehen (Baddeley, 2000, 2007). In Experiment 1 habe ich daher überprüft, ob Arbeitsgedächtnisleistungen des Episodischen Puffers und der Phonologischen Schleife in bedeutsamer Beziehung zu den erfassten Quellenmonitoringleistungen stehen.

Ich habe erwartet, dass die Episodische-Puffer-Leistung „Gedächtnis für Sätze“ in einem positiven Zusammenhang mit Quellenmonitoringleistungen steht, da in beiden kognitiven Leistungen der Abruf und die Integration von unterschiedlichen Gedächtnisinhalten enthalten ist. Da dies in allen Quellenmonitoringaufgaben der Fall ist, habe ich erwartete, dass Zusammenhänge zu allen drei erfassten Quellenarten bestehen, unabhängig von der Enkodierbedingung und unabhängig vom Alter der Kinder sind (Leistung wurde

aufgabenbedingt nur bei 4 und 5 Jährigen erhoben). Experiment 1 zeigte, dass die Episodische-Puffer-Leistung „Gedächtnis für Sätze“ in einem positiven Zusammenhang mit den Realitätsmonitoring- und den Externalen Quellenmonitoringleistungen in der Handlungsenkodierbedingung steht. Dies war der Fall unabhängig vom Alter der Kinder. Allerdings zeigt dieses Ergebnis, dass die Zusammenhänge nicht unabhängig von der verbalen Enkodierbedingung sind und dass keine Zusammenhänge zu den Internalen Quellenmonitoringleistungen bestehen. Eine Erklärung für die spezifischen Zusammenhänge ist, dass die enthaltenen verbalen Erinnerungsmerkmale weniger relevant (und markant) sind für die korrekten Quellenzuordnungen als die handlungsbezogenen Erinnerungsmerkmale und daher keine Zusammenhänge in der verbalen Enkodierbedingung zu finden waren und keine Zusammenhänge in der Quellenmonitoringart, in der durch die private Quelle mehr verbale Merkmale vorhanden sind.

In Experiment 1 habe ich ebenfalls erwartet, dass die Phonologische Schleifenleistung „Phonologisches Arbeitsgedächtnis für Nichtwörter“ in einem positiven Zusammenhang mit den erhobenen Quellenmonitoringleistungen steht, da in beiden kognitiven Leistungen die Enkodierung, die Verarbeitung und der Abruf basaler verbaler Erinnerungsmerkmale enthalten ist. Da dies ebenfalls in allen Quellenmonitoringaufgaben der Fall ist, habe ich erwartet, dass Zusammenhänge zu allen drei erfassten Quellenarten bestehen, unabhängig von der Enkodierbedingung und unabhängig vom Alter der Kinder sind. Experiment 1 zeigte, dass die Phonologische Schleifenleistung Phonologisches-Arbeitsgedächtnis-für-Nichtwörter in einem positiven Zusammenhang mit den Realitätsmonitoringleistungen und den Internalen Quellenmonitoringleistungen in der Handlungsenkodierbedingung steht. Die Zusammenhänge zu den Realitätsmonitoringleistungen waren altersabhängig, die Zusammenhänge zu den Internalen Quellenmonitoringleistungen waren hingegen altersunabhängig. Allerdings zeigt auch dieses Ergebnis, dass die Zusammenhänge nicht unabhängig von den Quellenmonitoringarten und von der Enkodierbedingung sind. Eine Erklärung für die spezifischen Zusammenhänge ist, dass die enthaltenen verbalen Erinnerungsmerkmale markanter und leichter zu berücksichtigen sind in den Quellenmonitoringbedingungen, in denen mehr verbale Merkmale enthalten sind (durch die internalen Quellen) und in der Enkodierbedingung, in der nicht rein verbale Erinnerungsmerkmale enthalten sind (Handlungsenkodierbedingung).

Verbale Fähigkeiten scheinen ebenfalls von besonderer Bedeutung für Quellenmonitoringleistungen zu sein, da sie die Enkodierung, die Speicherung und den Abruf verbaler quellenrelevanter Merkmale unterstützt und somit zu einer deutlichen Erhöhung richtiger Quellenzuordnungen führen können (Roberts, 2000; Sussman, 2001). Empirische Arbeiten über die Beziehung zwischen komplexeren verbalen Fähigkeiten und Quellenmonitoringleistungen liegen derzeit noch nicht vor. In Experiment 1 habe ich daher

überprüft, ob Quellenmonitoringleistungen in einem bedeutsamen Zusammenhang stehen zu ausgewählten Sprachverständnisleistungen und Sprachproduktionsleistungen.

Dabei habe ich erwartet, dass bereits die Sprachverständnisleistung „Satzverständnis“ in einem positiven Zusammenhang zu den erhobenen Quellenmonitoringleistungen stehen, da Satzverständnisleistungen in beiden kognitiven Aufgaben enthalten sind und ein besseres Satzverständnis zu einer besseren Enkodierung und einem besserem Abruf der Quellenrelevanten Merkmale führen sollte. Die Zusammenhänge sollten unabhängig von der Art des Quellenmonitoring und vom Alter der Kinder bestehen. Experiment 1 zeigte, dass die Sprachverständnisleistung „Satzverständnis“ in einem positiven Zusammenhang mit den Internalen Quellenmonitoringleistungen in der Handlungsenkodierbedingung steht. Dieser Zusammenhang war unabhängig vom Alter der Kinder. Entgegen der Erwartung stand die Sprachverständnisleistungen nicht in Zusammenhang mit den Realitätsmonitoring- und den Externalen Quellenmonitoringleistungen. Somit zeigten sich erneut quellenartspezifische Zusammenhänge in Experiment 1. Mögliche Erklärungen sind hier ebenfalls, dass entweder Zusammenhänge nur bestehen zu Quellenmonitoringleistungen, in denen hauptsächlich verbale Merkmale enthalten sind und die durch die Enkodierbedingung gut von anderen verbalen Merkmalen zu trennen sind, dass noch nicht ausreichende vorhandene konzeptuelle Verständnis jüngerer Kinder und dass mögliche Deckeneffekte bei älteren Kindern einzelne weitere angenommene Zusammenhänge verdeckt haben könnten.

In Experiment 1 habe ich ebenfalls angenommen, dass die Sprachproduktionsleistungen „Aktiver Wortschatz“ und „Morphologische Regelbildung“ in einem positiven Zusammenhang zu den erhobenen Quellenmonitoringleistungen stehen, da gute Sprachproduktionsleistungen einer besseren Enkodierung, Speicherung und Abruf der Quellenrelevanten Merkmale führen sollte und zu einer Anzahl korrekter Quellenzuordnungen. Die Zusammenhänge sollten unabhängig von der Art des Quellenmonitoring und vom Alter der Kinder bestehen. Experiment 1 zeigte, dass die Sprachproduktionsleistung „Aktiver Wortschatz“ und die Sprachproduktionsleistung „Morphologische Regelbildung“ jeweils in einem positiven Zusammenhang mit den Realitätsmonitoringleistungen, den Internalen und Externalen Quellenmonitoringleistungen in der Handlungsenkodierbedingung und den Internalen Quellenmonitoringleistungen in der verbalen Enkodierbedingung stehen. Mit Ausnahme der Realitätsmonitoringleistungen waren die Zusammenhänge unabhängig vom Alter der Kinder. Entgegen der Erwartung stand die beiden Sprachproduktionsleistung nicht in Zusammenhang mit den Realitätsmonitoring- und den Externalen Quellenmonitoringleistungen in der verbalen Enkodierbedingung. Dieses Ergebnis war überraschend, da insbesondere in der verbalen Enkodierbedingungen Zusammenhänge hätten bestehen sollen. Eine mögliche Erklärung für dieses Ergebnis ist, dass die verbalen Merkmale in dieser Enkodierbedingung weniger distinkt für die Kinder waren und sie möglicherweise noch wenig gezielter die verbalen Erinnerungsmerkmale nutzen konnten (im Realitätsmonitoring). Eine andere Erklärung ist, dass in der Externalen Quellenmonitoringbedingung lediglich die

Quellenzuordnungen bei den 5 Jährigen über der Zufallsgrenze lagen. Damit war die Anzahl der richtigen Quellenzuordnungen geringer als in den übrigen Quellenmonitoringleistungen und es ist möglich, dass die erwarteten Zusammenhänge somit nicht sichtbar werden können in dieser Quellenmonitoringart in dieser Enkodierbedingung.

Das *Verständnis über „Falsche Überzeugungen“* ist ein Meilenstein in der kognitiven Entwicklung (Wellman, 2000; Perner, 1991). In Experiment 1 habe ich überprüft ob dieses Verständnis ebenfalls bedeutsam ist für Quellenmonitoringleistungen. Da in dem Verständnis über „Falsche Überzeugungen“ die Trennung zwischen mentalen Leistungen (d.h. Denken) und der Realen Welt enthalten ist habe ich erwartet, dass dieses Verständnis in einem positiven Zusammenhang mit den Internalen Quellenmonitoringleistungen steht, da in dieser Quellenart als einzige Quellenart ebenfalls zwischen mentalen Leistungen und tatsächlichen Äußerungen zu unterscheiden ist. Diese Zusammenhänge sollte unabhängig von der Enkodierbedingung und den Sprachproduktionsleistungen „Aktiver Wortschatz“ und „Morphologische Regelbildung“ und der Arbeitsgedächtnisleistung „Phonologische Erabitsgedächtnisleistungen“ bestehen. Experiment 1 zeigte, dass das Verständnis über „Falsche Überzeugungen“ in einem positiven Zusammenhang zu den Internalen Quellenmonitoringleistungen steht in der Handlungsenkodierbedingung und in der verbalen Enkodierbedingung. Die Zusammenhänge in der verbalen Enkodierbedingung waren unabhängig von den beiden Sprachproduktionsleistungen und der Arbeitsgedächtnisleistung, die Zusammenhänge in der Handlungsenkodierbedingung waren hingegen abhängig von den beiden Sprachproduktionsleistungen und der Arbeitsgedächtnisleistung. Diese spezifischen Abhängigkeiten zeigen, dass die Zusammenhänge in der Handlungsenkodierbedingung offenbar auf den Sprachproduktionsleistungen und den Arbeitsgedächtnisleistungen beruhen und nicht auf der Trennung zwischen mentalen Leistungen und der Realen Welt, die über das Verständnis der „Falschen Überzeugung“ erhoben wurden.

Soziale Variablen innerhalb und außerhalb des familiären Kontextes können einen ersten Hinweis liefern, welche sozialen Faktoren vorteilhaft sind für frühe Quellenmonitoringleistungen. In Experiment 1 habe ich daher überprüft ob soziale Markervariablen innerhalb und außerhalb der Familie in einem Zusammenhang zu den erhobenen Quellenmonitoringleistungen stehen. Ich habe erwartet, dass die Realitätsmonitoring- und die Externalen Quellenmonitoringleistungen in einem positiven Zusammenhang mit der Anzahl der Stunden, die das Kind mit der Mutter (pro Tag), dem Vater (pro Tag) oder einer anderen vertrauten Person (pro Woche) verbringt und den wöchentlichen Kontakten des Kindes zu Gleichaltrigen, zu jüngeren und zu älteren Kindern, da mit zunehmender Häufigkeit auch die Angabe von Personenquellen steigen sollte und die Kinder mit vielen Kontakten geübter in den richtigen Quellenzuordnungen sein sollten. Die Zusammenhänge sollten unabhängig von der Enkodierbedingung und dem Alter des Kindes

bestehen. Experiment 1 zeigte, dass die Anzahl der Stunden, die das Kind mit dem Vater verbringt unabhängig vom Alter der Kinder in einem positiven Zusammenhang mit den Realitätsmonitoring- und die Externalen Quellenmonitoringleistungen in der Handlungsenkodierbedingung steht. Ebenfalls zeigte sich ein altersabhängiger Zusammenhang zwischen der Anzahl der Stunden, die das Kind mit jüngeren Kindern verbringt und den Realitätsmonitoringleistungen in der verbalen Enkodierbedingung. Die übrigen sozialen Variablen stehen hingegen in keinem Zusammenhang zu den Quellenmonitoringleistungen. Es ist möglich, dass die ausgewählten Markervariablen Anzahl der Stunden etc. zu ungenau gewesen sind, um mögliche Zusammenhänge zu den Quellenmonitoringleistungen aufzuzeigen.

In Experiment 1 habe ich einen spezifischen Zusammenhang zwischen den Internalen Quellenmonitoringleistungen und der Anzahl der Stunden pro Tag, die das Kind mit der Mutter und dem Vater verbringt erwartete, da die Mutter und der Vater die Kinder bei der Unterscheidung zwischen mentalen Leistungen und realen Gegebenheiten besonders unterstützen (z.B. Fivush, 2009). Experiment 1 ergab, dass ebenfalls ein altersunabhängiger positiver Zusammenhang zwischen der Anzahl der Stunden, die das Kind mit dem Vater verbringt und den Internalen Quellenmonitoringleistungen in der verbalen Enkodierbedingung steht. Dieser Zusammenhang bestand nicht in der Handlungsenkodierbedingung und zu der Anzahl der Stunden, die die Mutter mit dem Kind pro Tag verbringt. Es ist auch hier möglich, dass die Markervariablen für diese Zusammenhänge zu ungenau waren oder dass die Quellenmonitoringleistungen in der Internalen Quellenmonitoringbedingung insgesamt zu niedrig ausfielen, um die erwarteten Zusammenhänge abzubilden.

Mein erstes Experiment ergab somit, dass die handlungsausführende Enkodierbedingung eine günstige Bedingung für Externalen und Realitätsmonitoringleistungen bei 4 und 5 Jahre alten Kinder ist, allerdings nicht für die Quellenmonitoringleistungen von den 3-jährigen Kindern. Mein Experiment zeigte ebenfalls, dass die ausgewählten Arbeitsgedächtnisleistungen, verbalen Fähigkeiten, das Falsche-Überzeugungsverständnis und einige soziale Variablen in bedeutsamer Beziehung stehen zu einzelnen Quellenmonitoringleistungen.

Experiment 2

In meinem zweiten Experiment habe ich an achtundvierzig jüngeren 3, älteren 3, 4, und 5 Jahre alten Kindern überprüft, ob die Vertrautheit mit der Personenquelle eine günstige Bedingung für frühe Realitätsmonitoringleistungen und Externale Quellenmonitoringleistungen ist, wann multiple Quellenzuordnungen (von Realitätsmonitoring, Internalen und Externalen Quellenmonitoring-Quellen) in einer multiplen Quellenzuordnungsbedingung möglich sind und

ob die interne Quellen-monitoringinstruktion für 3-jährige Kinder optimiert werden kann. Ebenfalls habe ich überprüft, ob Inhibitionsleistungen, verbale Fähigkeiten, Theory-of-Mind-Fähigkeiten und soziale Variablen in bedeutsamer Beziehung stehen zu frühen Realitätsmonitoringleistungen (vertraut; unvertraut), zu Internalen und zu Externalen Quellenmonitoringleistungen.

Im folgenden skizziere ich kurz für jede dieser Teilfragestellungen die zentralen theoretischen Annahmen, die Hauptergebnisse und die Schlussfolgerungen, die sich ableiten lassen.

In meinem zweiten Experiment habe ich überprüft, ob die *Vertrautheit mit der Personenquelle* eine günstige Bedingung für frühe Quellenmonitoringleistungen ist und ob 3 bis 5 Jahre alte Kinder früher und mehr Personenquellen von vertrauten Personen richtig zu ihren Erinnerungen zuordnen können. Der mögliche Vorteil von vertrauten Personenquellen beruht auf der Annahme, dass für vertraute Personen bereits ein großes Vorwissen vorhanden ist, das während der Enkodierung und des Abrufes genutzt werden kann (z.B. Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). Durch dieses Vorwissen können möglicherweise mehr erlebnisrelevante Merkmale enkodiert und in die bestehenden Wissens- und Erinnerungsnetzwerke integriert werden (z.B. Baker-Ward & Ornstein, 2002; Baker-Ward et al., 1990; Bauer, 2007; Begg & Snider, 1987; Chi, 1978; Chi & Koeske, 1983; Drummey & Necombe, 2002; Engelkamp, 2001; Fivush, 1997; Nairne & Wider, 1988; Nelson, 1993, 2007; Ornstein, Shapiro, Clubb, Follmer & Baker-Ward, 1997; Symons & Johnson, 1997; see also Craik & Lockard, 1972). Diese könnten dann im Erlebnisabruf und im Quellenentscheidungsprozess ebenfalls besser abgerufen werden und die Anzahl der relevanten quellenspezifischen Merkmale erhöhen und die verschiedenen Quellen deutlicher voneinander trennen. Dies könnte dann zu einer höheren Anzahl korrekter Quellenzuordnungen führen im Vergleich zu unvertrauten Personenquellen. Dieser Vorteil sollte gleichermaßen bei jüngeren und älteren 3-jährigen, bei 4-jährigen und bei 5-jährigen Kindern bestehen.

Experiment 2 zeigte, dass in allen vier Altersgruppen bedeutsam mehr vertraute Personenquellen korrekt zu Erinnerungen zugeordnet wurden als unvertraute Personenquellen. Dies war der Fall in den geclusterten Quellen über eine Realitätsmonitoring und eine Externale Quellenmonitoringbedingung als auch in den Einzelquellen in der Externalen Quellenmonitoringbedingung. Das vorhandene Vorwissen über vertraute Personen kann offenbar bereits von allen Kindern effektiv genutzt werden und führt zu einer höheren Anzahl an richtigen Quellenzuordnungen im Vergleich zu Quellen von unvertrauten Personen (Baker-Ward et al., 1990; Chi & Koeske, 1983; Johnson & Raye, 2000; Symons & Johnson, 1997). Experiment 2 zeigte ebenfalls, dass die jüngeren 3-jährigen Kinder früher Realitätsmonitoringquellen mit einer vertrauten externen Person korrekt über der Zufallsgrenze zuordnen konnten als die Realitätsmonitoringquellen mit einer unvertrauten externen Person. Somit sind bereits jüngere Kinder in der Lage Realitätsmonitoringquellen überzufällig richtig zu ihren Erinnerungen

zuzuordnen. Damit zeigt Experiment 2 deutlich, dass die Vertrautheit mit der Personenquelle eine günstige Bedingung früher Quellenmonitoringleistungen ist, in der früher und mehr Personenquellen korrekt zugeordnet werden können.

In meinem zweiten Experiment habe ich ebenfalls überprüft, wann 3 bis 5 Jahre alte Kinder *multiple Quellen in einer multiplen Quellenmonitoringbedingung* korrekt zuordnen können. Den Kindern wurde dazu eine Quellenaufgabe mit den vier Quellenmonitoringbedingungen Realitätsmonitoring Vertraut (Quellen: Kind vs. vertraute Person), Realitätsmonitoring Unvertraut (Quellen: Kind vs. unvertraute Person), Internales Quellenmonitoring (Quellen Kind sagt vs. Kind denkt) und Externales Quellenmonitoring (vertraute Person vs. Unvertraute Person) präsentiert und im Anschluss die Quellenzuordnung mit einer offenen (quellenbedingungsunspezifischen) Quellenfrage vorgenommen. Dabei habe ich erwartet, dass die 4 und 5 Jahre alten Kinder bereits in der Lage sind, die multiplen Quellen in einer derartigen multiplen Quellenmonitoringbedingung überzufällig richtig zuzuordnen, da sie das konzeptuelle Verständnis sämtlicher Quellen bereits zur Verfügung haben sollten und dieses Wissen in so einer Quellenbedingung flexibel einsetzen sollten. In Bezug auf die 3-jährigen Kinder habe ich erwartet, dass sie die Realitätsmonitoringquellen und die Externalen Quellenmonitoringquellen korrekt zuordnen können, da sie das konzeptuelle Verständnis dieser Quellen zur Verfügung haben sollten.

Experiment 2 zeigte, dass die älteren 3-Jährigen, die 4-Jährigen und die 5-Jährigen die multiplen Quellen in der multiplen Quellenmonitoringbedingung überzufällig richtig zu ihren Erinnerungen zuordnen konnten. Dieses Ergebnis belegt, dass unter günstigen Quellenmonitoringbedingungen ebenfalls die verschiedenen Quellen aus den drei Hauptquellenarten in einer offenen Quellenzuordnungsbedingung flexibel und korrekt zugeordnet werden können. Allerdings besitzen die jüngeren 3-jährigen Kinder offenbar noch nicht diese Flexibilität und das konzeptuelle Verständnis der verschiedenen Quellenarten und konnten lediglich die Realitätsmonitoringquellen in der vertrauten Personenquellenbedingung überzufällig richtig zuordnen.

In Experiment 2 habe ich ebenfalls überprüft, ob die *Internale Quellenmonitoringinstruktion* für 3-jährige Kinder optimiert werden kann und es ihnen dann ermöglicht, eine öffentliche und eine private internale Quelle überzufällig richtig zu ihren Erinnerungen zuzuordnen. Da 3-jährige Kinder sich hauptsächlich an perzeptuellen Merkmalen orientieren (z.B. Bauer; Welch-Ross, 1995), habe ich überprüft, ob die externen perzeptuellen Hinweise „laut“ für die öffentliche internale Quelle und „leise“ für die private internale Quelle es den 3-jährigen Kindern ermöglicht, zwischen den beiden internalen Quellen zu unterscheiden und diese überzufällig

richtig zuzuordnen. Die optimierte Internale Quellenmonitoringinstruktion lautete somit „Hast du das vorher laut erzählt oder leise in deinem Kopf gedacht?“.

Experiment 2 zeigte, dass die älteren 3-jährigen Kinder mit Hilfe dieser optimierten Internalen Quellenmonitoringinstruktion in der Lage waren, die Internalen Quellenmonitoringquellen überzufällig richtig zuzuordnen. Damit zeigen sie ebenfalls, dass sie bereits ein konzeptuelles Verständnis über die Unterschiede dieser beiden internalen Quellen zu haben scheinen und unter Verwendung der beiden externen perzeptuellen Hinweise diese Quellen auch richtig zuordnen können. Experiment 2 zeigte allerdings, dass die jüngeren 3-jährigen Kinder von diesen externen Hinweisen nicht profitieren konnten und die beiden Internalen Quellenmonitoringquellen nicht überzufällig häufig richtig zuordnen konnten. Es ist möglich, dass sie noch nicht ein umfangreicheres konzeptuelles Verständnis über die beiden internalen Quellen zur Verfügung haben und daher noch nicht zwischen gesagten und gedachten Quellen unterscheiden können. Experiment 2 zeigt dennoch deutlich, dass die optimierte Internale Quellenmonitoringinstruktion eine günstige Bedingung für frühe Quellenmonitoringleistungen ist und dass bereits ältere 3-Jährige Internale Quellenmonitoringquellen richtig zuordnen können.

Aus theoretischer Sicht scheint die *Inhibition* für Quellenmonitoringleistungen von unmittelbarer Bedeutung zu sein, da Quellenzuordnungen immer auch die Inhibition von quellenirrelevanten Informationen und Entscheidungen über relevante und irrelevante Informationen beinhalten. Daher habe ich in Experiment 2 überprüft, ob die Inhibition von irrelevanten Aufgabenmerkmalen in einem positiven Zusammenhang mit den erhobenen Realitätsmonitoringleistungen (Vertraut und Unvertraut), den Internalen und den Externalen Quellenmonitoringleistungen stehen. Ich habe erwartet, dass positive Zusammenhänge bestehen und dass diese Zusammenhänge unabhängig vom Alter der Kinder sind.

Experiment 2 zeigte allerdings entgegen der Erwartung, dass die Inhibition von aufgabenirrelevanten Merkmalen in keinem Zusammenhang zu den Quellenmonitoringleistungen stehen. Dies war der Fall für alle vier Quellenmonitoringarten. Eine mögliche Erklärung für diese ausgebliebenen Zusammenhänge sind, dass aufgrund der günstigen Quellenmonitoringbedingungen (vertraute Quellen, wenige Quellenmonitoringitems, günstige Internale Quellenmonitoringinstruktion) die Inhibition von quellenirrelevanten Merkmalen nicht erforderlich war, da die Quellen durch die zusätzlichen Merkmale und Hinweise bereits sehr gut voneinander unterscheidbar waren. Damit ist es möglich, dass die erwarteten Zusammenhänge in dieser Quellenaufgabe nicht aufgezeigt werden konnten. In Folgeuntersuchungen ist daher zu überprüfen, ob unter anderen Quellenmonitoringbedingungen die erwarteten Zusammenhänge bestehen.

Wie bereits Experiment 1 gezeigt hat, sind *verbale Fähigkeiten* relevant insbesondere für frühe (Internale) Quellenmonitoringleistungen (vgl. auch Bauer, 2002, 2007; Baddeley, 2007; Fivush, 2002b; Hayne & Simcock, 2009). In Experiment 2 habe ich daher überprüft, ob die Sprachproduktionsleistung „Aktiver Wortschatz“ als der wichtigste Indikator für das aktiv verfügbare verbale Repräsentationssystem ebenfalls in Zusammenhang steht mit den erhobenen vier Quellenmonitoringleistungen. Dabei habe ich ebenfalls altersunabhängige positive Zusammenhänge erwartet zwischen diesen beiden kognitiven Fähigkeiten.

Experiment 2 zeigte altersunabhängige positive Zusammenhänge zwischen der Sprachproduktionsleistung „Aktiver Wortschatz“ und den Internalen Quellenmonitoringleistungen und den Realitätsmonitoringleistungen Unvertraut. Dieses Ergebnis zeigt, dass Sprachproduktionsleistungen unabhängig von der Art der Quellenaufgabe in bedeutsamer Beziehung steht zu Internalen Quellenmonitoringleistungen und teilweise zu Realitätsmonitoringleistungen. Allerdings zeigte Experiment 2, dass konsistent keine Beziehungen zu Externalen Quellenmonitoringleistungen bestehen und dass offenbar bei vertrauten Personenquellen die verbalen Fähigkeiten weniger relevant zu sein scheinen. Der Grund für die deutliche und stabile Beziehung zu Internalen Quellenmonitoringleistungen scheinen die höheren Anteile an verbalen Informationen zu sein, die insbesondere in der privaten internalen Quelle enthalten sein sollten.

Die *Theory-of-Mind*-Entwicklung scheint zentral zu sein für die gesamte kognitive Entwicklung (Perner, 1991; Wellman, 2000). In Experiment 2 habe ich daher überprüft, ob das Verständnis für „Falsch Überzeugungen“, das „Schein/Sein“-Verständnis und die Fähigkeit, die Wahrnehmungsquellen korrekt anzugeben, bedeutsam ist für die vier erhobenen Quellenmonitoringleistungen.

Da in dem Verständnis über „Falsche Überzeugungen“ die Trennung zwischen mentalen Leistungen (d.h. Denken) und der Realen Welt enthalten ist, habe ich erwartet, dass dieses Verständnis in einem positiven Zusammenhang mit den Internalen Quellenmonitoringleistungen steht, da in dieser Quellenart als einzige Quellenart ebenfalls zwischen mentalen Leistungen und tatsächlichen Äußerungen zu unterscheiden ist. Diese Zusammenhänge sollte unabhängig von den Sprachproduktionsleistungen „Aktiver Wortschatz“ sein. Experiment 2 zeigte, dass das Verständnis über „Falsche Überzeugungen“ in einem positiven Zusammenhang mit den Internalen Quellenmonitoringleistungen steht. Dieser Zusammenhang ist unabhängig vom Alter der Kinder und ist ebenfalls unabhängig von den Sprachproduktionsleistungen (erfasst über den „aktiven Wortschatz“). Damit zeigt Experiment 2, dass eine stabile Beziehung zwischen dem Verständnis über „Falsche Überzeugungen“ und den Internalen Quellenmonitoringleistungen besteht. Diese Beziehung ist ebenfalls unabhängig von der Art der verwendeten Materialien in der Quellenaufgabe.

In Experiment 2 habe ich ebenfalls eine positive Beziehung zwischen dem „Schein/Sein“-Verständnis und den internalen Quellenmonitoringleistungen erwartet, da bei kognitiven Leistungen die simultane Verarbeitung dualer Repräsentationen und die Konzeptualisierung der eigenen Wahrnehmung als Quelle von einem scheinbaren und einem realen Ereignis enthalten (vgl. Flavell et al., 1983; Taylor & Flavell, 1984) sind. Experiment 2 zeigte, dass ein positiver Zusammenhang zwischen dem „Schein/Sein“-Verständnis und den internalen Quellenmonitoringleistungen besteht. Damit ist das „Schein/Sein“-Verständnis ebenfalls eine relevante Theory-of-Mind-Fähigkeit für Internale Quellenmonitoringleistungen.

In Experiment 2 habe ich weiterhin erwartet, dass die Fähigkeit, die Wahrnehmungsquellen „Sehen und Erzählen/Hören“ richtig zuzuordnen, in einem positiven Zusammenhang mit den Quellenmonitoringleistungen in den drei Hauptquellenarten steht. Diese Erwartung stützt sich auf die Annahme, dass in beiden Quellenaufgaben die gleichen Quellenmonitoringprozesse vorhanden sein sollten (Drummey & Newcombe, 2002; Johnson et al., 1993; Leichtman et al., 2000; O’Neill & Gopnik, 1991; Naito, 2003; Robinson, 2000) und daher positiv miteinander korrelieren sollten. Dabei sollten die Zusammenhänge jeweils am höchsten sein, die die gleichen Wahrnehmungsquellen enthalten. Experiment 2 zeigte, dass die korrekten Quellenzuordnungen der Sehen-Quelle in der verwendeten Wissen-Woher-Aufgabe in einem positiven Zusammenhang mit den internalen Quellen der Internalen Quellenmonitoringbedingung und den beiden Realitätsmonitoringbedingung stehen. Dieses Ergebnis zeigt, dass es deutliche Zusammenhänge gibt, in denen die gleiche Wahrnehmungsquelle enthalten ist. Darüber hinaus stützt dieser Befund die Annahme, dass in beiden Aufgaben ähnliche Quellenmonitoringprozesse enthalten sind (z.B. Drummey & Newcombe, 2002; Johnson et al., 1993; Leichtman et al., 2000; O’Neill & Gopnik, 1991; Naito, 2003; Robinson, 2000). Experiment 2 zeigte auch, dass die Erzählen/Hören-Quelle in einem positiven Zusammenhang zu den Internalen Quellenmonitoringleistungen steht. Dieses Ergebnis ist etwas überraschend, da erwartet wurde, dass (die höchsten) Zusammenhänge zu den Quellenmonitoringleistungen bestehen sollten, die die gleiche Wahrnehmungsquelle betreffen. Das sind die externalen Quellen in den Realitätsmonitoringbedingungen und in der Externalen Quellenmonitoringbedingung. Dies ist offenbar nicht der Fall, sondern es besteht ein spezifischer Zusammenhang zu internalen Quellenmonitoringleistungen. Eine mögliche Erklärung ist, dass die reine Information, dass die Personenquelle eine verbale Beschreibung abgibt, offenbar nicht ausreichend bzw. hilfreich ist, um die beiden externalen Quellen in der Externalen Quellenmonitoringbedingung und die internale und die externale Quellen in den Realitätsmonitoringquellen voneinander zu unterscheiden und häufiger richtig zuzuordnen. Diese Information scheint dennoch bei der Abgrenzung der publiklen und der privaten Quelle in der Internalen Quellenmonitoringbedingung hilfreich zu sein und geht mit einer höheren Anzahl richtiger Quellenzuordnungen einher.

Da *soziale Variablen* innerhalb und außerhalb der Familie einen ersten Hinweis liefern können, welche sozialen Faktoren vorteilhaft sind für frühe Quellenmonitoringleistungen habe ich ebenfalls in Experiment 2 überprüft, ob ausgewählte soziale Variablen in bedeutsamen Zusammenhängen zu den vier erfassten Quellenmonitoringleistungen stehen. In Experiment 2 habe ich daher überprüft, ob die erhobenen 4 Quellenmonitoringleistungen in einem positiven Zusammenhang stehen mit den soziale Markervariablen innerhalb und außerhalb der Familie Anzahl der Stunden, die das Kind mit der Mutter (pro Tag), dem Vater (pro Tag) oder einer anderen vertrauten Person (pro Woche) verbringt und den wöchentlichen Kontakten des Kindes zu Gleichaltrigen, zu jüngeren und zu älteren Kindern, Anzahl der Besuche pro Woche, die die Eltern mit dem Kind tätigen, Anzahl der Besuche, die die Eltern zu Hause bekommen pro Woche, Anzahl und Art der Kurse, die das Kind regelmäßig besucht und die Dauer des Kindergarten- und Grippenbesuches. Dabei habe ich angenommen, dass mit zunehmender Häufigkeit auch die korrekte Angabe von Personenquellen steigen sollte und die Kinder mit vielen Kontakten geübter in den richtigen Quellenzuordnungen sein sollten.

Experiment 2 zeigte, dass die Anzahl der Stunden, die das Kind in der Woche mit Gleichaltrigen verbringt in positivem Zusammenhang mit Realitätsmonitoringleistungen in der vertrauten Bedingung und Externalen Quellenmonitoringleistungen steht. Darüber hinaus steht die Anzahl der Dauer des Kindergartenbesuchs in positivem Zusammenhang mit den Realitätsmonitoringsleistungen in der unvertrauten Bedingung. Allerdings zeigte Experiment 2 ebenfalls, dass die übrigen sozialen Variablen in keinem bedeutsamen Zusammenhang zu den drei Hauptarten des Quellenmonitorings stehen. Es ist dabei ebenfalls möglich, dass die verwendeten Markervariablen zu ungenau sind, um die vermuteten Zusammenhänge aufzuzeigen. In anschließenden Forschungsarbeiten ist es daher sinnvoll, konkretere soziale Variablen zu verwenden und zu überprüfen, ob sie relevant sind für frühe Quellenmonitoringleistungen.

Mein zweites Experiment ergab somit, dass die Vertrautheit mit der Personenquelle eine günstige Bedingung für die Kinder aller Altersgruppen ist, dass multiple Quellenzuordnungen möglich sind ab der Mitte des dritten Lebensjahres und dass die interne Quellenmonitoringinstruktion optimiert werden kann für die älteren aber nicht für die jüngeren Dreijährigen. Ebenfalls zeigten sich einzelne Beziehungen zwischen den ausgewählten verbalen Fähigkeiten, Theory-of-Mind-Fähigkeiten und den einbezogenen Quellenmonitoringarten, allerdings bestand keine Beziehung zwischen den Inhibitionsleistungen und den überprüften Quellenmonitoringleistungen.

Fazit

Mit meinen beiden Experimenten war es somit möglich, günstige Bedingungen für frühe Quellenmonitoringleistungen zu identifizieren und aufzuzeigen, dass spezifische Arbeitsgedächtnisleistungen, Sprachverständnisleistungen, Sprachproduktionsleistungen, Theory-of-Mind-Fähigkeiten und soziale Variablen innerhalb und außerhalb des familiären Kontextes bedeutsam sind für frühe Quellenmonitoringleistungen.

Meine beiden Experimente erweitern somit unsere derzeitigen Kenntnisse über die Frage, wie jüngere Kinder zwischen den verschiedenen Quellen in ihren Erinnerungen unterscheiden, indem sie aufzeigen, wann frühe Quellenmonitoringleistungen möglich sind, welche Charakteristiken bereits verwendet werden, wie Quellenmonitoringleistungen verbessert werden können und welche kognitiven, sozial-kognitiven und sozialen Variablen relevant für frühes Quellenmonitoring sind.

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Abbreviations

AUS	Australia
CD	Compact Disk
cf.	confer
DPS	Discrimination Proportion Score
EEG	Electroencephalogram
e.g.	exempli gratia, for example
ERP	Event-Related Potential
ESM	External Source Monitoring
et al.	et alii, and others
fMRI	functional Magnetic Resonance Imaging
i.e.	id est, that is
ISM	Internal Source Monitoring
GER	Germany
LTM	Long-Term Memory
M	arithmetical Mean
Min.	Minute(s)
N, n	Sample size
p	Probability
RM	Reality Monitoring
sec	Seconds
SEM	Standard Error of Measurement
USA	United States of America

Appendix

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