

RESEARCH ARTICLE OPEN ACCESS

Why Female Virtual Conversational Agents Exhibit Greater Social Presence: Insights From the Stereotype Content Model

Kristina Nickel¹  | Caroline Meyer²

¹Kiel Institute for Responsible Innovation (KIRI), Kiel University, Kiel, Germany | ²A&F Marketing – Consumer Psychology, Kiel University, Kiel, Germany

Correspondence: Kristina Nickel (kristina.nickel@bwl.uni-kiel.de)

Received: 11 December 2023 | **Revised:** 12 December 2024 | **Accepted:** 23 January 2025

Funding: This work was supported by Postdoc Center of Kiel University.

Keywords: gender | sociability | social presence | stereotype content model | virtual conversational agents

ABSTRACT

In recent years, companies have increasingly adopted virtual conversational agents (VCAs) to interact with their consumers. A significant number of these agents are assigned to a specific gender, typically female, thereby reinforcing gender-related stereotypes. This work employs the stereotype content model (SCM), especially focusing on the two subdimensions sociability and morality, to investigate how the VCA's gender impacts social presence in two studies (Study 1: avatars; Study 2: chatbots). Both studies show an indirect effect of the VCA's gender (female) on social presence through sociability, but not through morality. Contrary to expectations, the indirect effect through sociability is significant for both male and female consumers. The findings indicate that the indirect effect is robust across different product categories (i.e., finance, fashion, holiday trip, and toothbrush) and types of VCAs (i.e., visual and verbal). This research demonstrates how established stereotype theories (i.e., SCM) can serve as a valuable framework for exploring human-machine communication. Moreover, the results provide a fundamental basis for addressing and reducing the persistence of gender stereotypes, initiating a more extensive discussion about the ethical considerations related to interactions between humans and technology.

1 | Introduction

Airline tickets, fashion, and even banking transactions are predominantly purchased or carried out online. This means that a computer-based dialog system has replaced the formerly human conversational partner (Jiménez-Barreto et al. 2021). In fact, virtual conversational agents (VCAs), such as voice assistance systems, chatbots, and avatars, are already an important part of people's everyday lives. Not surprisingly, the development of artificial intelligence (AI) is constantly being pushed forward in research to integrate computer-based technologies, especially human-like contact partners, more closely into numerous everyday contexts and to make targeted use

of those in marketing. In this development, it is also evident that the most popular digital (voice) assistance systems, such as Cortana (Microsoft), Siri (Apple), Alexa (Amazon), and other VCAs (e.g., Molli, Ryanair chatbot; Emmi, MediaMarkt chatbot; Marie, DHL chatbot), have female voices and female names. This dominance of female VCAs has faced criticism for reinforcing gender stereotypes and potentially contributing to gender bias (Costa and Ribas 2019). Thus, questions about VCAs' gender¹ are gaining attention (Alesich and Rigby 2017; Stroessner and Benitez 2019). Many companies tend to use feminine features, seemingly with the assumption that a female VCA evokes more positive evaluations, greater trust, and more desire to contact than a male VCA (Stroessner

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and Benitez 2019)—but where do these positive reactions toward female VCAs come from? This paper tries to answer this question by explaining the chain of effects resulting in the prevalent role of female VCAs and their perceived superiority from a psychological perspective. The focus is on the perception of social presence, meaning the feeling that the VCA is a physically present person (Kreijns et al. 2022). Social presence, in turn, leads to desired outcomes such as the intention to use an agent (Qui and Benbasat 2009) or stronger trust (Pitardi and Marriott 2021; Qui and Benbasat 2009), thereby contributing to a better understanding of the role and benefits of female VCAs.

Social cognition theory focuses on how individuals process, store, and apply information about others (Arioli et al. 2018). A key aspect of social cognition is the concept of social schemas, which are mental representations of social patterns and norms. These schemas encompass information about societal roles and the expectations associated with different individuals within a group (Kaneko et al. 2021). Through the lens of social cognition, researchers explore various topics, including stereotypes. According to Fiske et al.'s (2002) stereotype content model (SCM), social cognition initially operates along the “Big Two”: perceived warmth and competence. These dimensions are essential in forming first impressions of (originally) other people (Fiske 2018). Consistent with this line of thinking, social role theory shows that female stereotypes are associated with characteristics such as warmth, empathy, and morality (reflected in social roles such as assistants). Male stereotypes, on the other hand, are described with agentic characteristics such as strength, assertiveness, and dominance (e.g., mentors and leaders) (Betz et al. 1989). Previous research revealed that other stimuli, such as brands (Kolbl et al. 2019), virtual environments (Orth et al. 2023), service providers (Güntürkün et al. 2020), and VCAs' gender (Borau et al. 2021), are also evaluated in terms of their warmth and competence. The SCM could therefore likewise be relevant in explaining the use of female VCAs and their superiority in, for example, social presence. That these dimensions generally play a significant role in gender differences is shown by a positive connection between perceived warmth and traditional females, having already been proven by both implicit (Ebert et al. 2014) and explicit (Eckes 2002) measures. This makes warmth a key characteristic associated with females, particularly enabling them to take on assistant roles (Costa 2018). Accordingly, the main focus of this study is to investigate whether perceptions of warmth can explain positive effects of VCAs' female gender on social presence. Following Leach et al. (2007), warmth should be further divided into two main facets: sociability and morality. Sociability describes the degree to which an individual cooperates and forms connections with others (e.g., friendliness); morality refers to perceived correctness (e.g., honesty, sincerity, and trustworthiness) (Van Prooijen and Bartels 2019), which may also play a central role in perception and, consequently, interaction with (female) VCAs. The importance of distinguishing between these two dimensions is demonstrated by the finding that morality and sociability characteristics are treated in different ways (Brambilla et al. 2011). Further significance of dividing warmth into sociability and morality has already been demonstrated in marketing-relevant contexts

(Van Prooijen and Bartels 2019), but not yet in the increasingly important context of VCAs. Thus, questions arise: Are sociability and morality transferable to and relevant for evaluating VCAs (the gender of VCAs)? What impact do these constructs have on individuals and their perception of VCAs? What personal (i.e., consumer gender) factors exert a moderating influence? To date, little attention has been paid to the role of gender (both consumer and VCA gender) in response to VCAs (Toader et al. 2020). Table 1 presents the most relevant studies on gender influences in VCA contexts. It shows that a link has already been established between VCA gender and the dimensions of warmth and competence (Borau et al. 2021), while there has been a lack of consideration of the subdivision of warmth into the dimensions of morality and sociability, which should certainly be taken into account. Previous research has further neglected to examine the role of gender and the SCM in the perception of a VCA's perceived social presence, which positively affects trust (Pitardi and Marriott 2021; Qui and Benbasat 2009), and, subsequently, intentions to use an agent as a decision aid (Qui and Benbasat 2009). It is also noticeable that previous studies have only investigated visual gender differences and ignored verbal differences, even though there are definitely differences in communication styles (Mulac et al. 2001). Understanding these differences is crucial for both researchers and practitioners to gain insights into the differential effects of female and male VCAs in order to use them sensibly.

To address these questions and thus extend previous research, we employ pictures of avatars as visual stimuli in Study 1 and chatbots as verbal stimuli in Study 2 to examine the role of sociability and morality as subcomponents of warmth in explaining the underlying processes of the relationship between the VCAs' gender and social presence. It is important to understand both the visual and verbal cues of gendered VCAs, as these cues elicit different consumer responses and require different levels of cognitive processing (Rebollar et al. 2017). Studying these cues is critical for designers and marketers, enabling them to use such elements effectively when designing VCAs that enhance social presence and build trust in human-agent interactions. Based on the SCM by Fiske et al. (2002), and more importantly on the subdivision of warmth into sociability and morality (Leach et al. 2007), this paper seeks to fill the gap in knowledge on whether the SCM can be applied in the domain of VCAs and whether it helps in explaining social presence. In sum, we contribute to extant literature by showing that the systematic differences in preferences for a specific VCA's gender trace back to sociability (rather than morality). We further investigate whether this effect holds true for both visual and verbal cues and across different product categories.

In the next section, we review the theoretical connections among VCA gender, warmth (sociability and morality), and their role in consumers' perceived social presence (and therefore trust evaluations) to develop hypotheses linking these constructs. Next, we provide detailed descriptions of our studies and discuss the results. In the last sections of this paper, we discuss how, when, and why the results of our studies diverge from previous studies, offering valuable insights for both researchers and practitioners.

TABLE 1 | Literature review on gender influences in VCA context and research gap that our paper fills.

Reference	Key contribution	Empirical	AI	Stimulus	Gender cues	Stereotype content model	Social presence	Moderators
Eyssel and Hegel (2012)	The short-haired male robot was perceived as more agentic, whereas the long-haired female robot was perceived as more communal.	x	x	Robot hair gender cues (short vs. long hair)	Visual	Communion, agency (DV)	—	—
Van Doorn et al. (2017)	Higher levels of warmth and competence led to more favorable customer service outcomes	—	x	—	—	Warmth, competence (Med)	IV	Customer attributes (anthropomorphism, relationship orientation, technology readiness)
Stroessner and Benitez (2019)	Robots were evaluated more positively and produced a greater desire for contact, to the degree that they were seen as humanlike and feminine.	x	x	Robot face gender cues and robot type (humanlike vs. machinelike)	Visual	Warmth, competence (DV)	—	Perceived machineness
Bernotat et al. (2021)	A robot with a female body shape was perceived as more communal, it was preferred for stereotypically female tasks, and evoked more cognitive and affective trust than a robot with a male body shape. Both robot types were perceived as equally agentic and were deemed equally suitable for stereotypically male tasks.	x	x	Robot body shape gender cues	Visual	Agency, communion (DV)	—	—
Borau et al. (2021)	The female chatbot was preferred over the male chatbot because it was perceived as more human and more likely to consider our unique needs.	x	x	Robot, chatbots	Visual	Competence, warmth, morality (DV), warmth, competence (Med)	—	—

(Continues)

TABLE 1 | (Continued)

Reference	Key contribution	Empirical	AI	Stimulus	Gender cues	Stereotype content model	Social presence	Moderators
Bastiansen et al. (2022)	No significant effects of warmth, assigned gender of chatbot, or interaction between these two on trust, helpfulness, or competence.	x	x	Chatbots	Verbal (name and pronoun only)	Warmth (IV, manipulated), competence (DV)	—	—
Belanche et al. (2021)	Perceived competence of the robot influenced mainly utilitarian expectations, while perceived warmth influenced relational expectations.	x	x	Robot (high vs. low in warmth and competence)	—	Competence, warmth (IV)	—	Need for social interaction
Present Study		x	x	VCA; chatbot conversation	Visual & verbal	Sociability, morality, competence (Med)	DV	Consumer gender

Note: Only papers that are most relevant to the present paper (i.e., stereotype content model) are included. Abbreviations: — = not tested in that study; AI = Artificial Intelligence; DV = Dependent Variable; IV = Independent Variable; Med = Mediator; X = tested in that study.

2 | Theoretical Background and Hypotheses Development

2.1 | Visual Versus Verbal Cues of Gendered VCAs

According to De Cock et al. (2020), VCAs are natural language interaction interfaces designed to simulate human conversations using AI. In other words, VCAs are systems that mimic human conversation, using text or spoken language, as well as gestures and other body expressions (Laranjo et al. 2018). The deployment of AI-driven VCAs is particularly important in marketing and sales (Mariani et al. 2023). In the context of online customer services, a VCA represents a computer-generated, animated, AI-driven virtual character that engages in conversations with consumers, responds to their questions, and performs adequate non-verbal behavior (Pan and Hamilton 2018). In general, VCAs can be classified into the following categories: (1) text-only interaction (e.g., chatbots), (2) voice-based agents (e.g., Amazon's Alexa), (3) embodied conversational agents (e.g., avatars, which have a virtual body or face), and (4) 3D realistic agents in virtual reality or augmented reality (Van Doorn et al. 2017).

Since individuals tend to anthropomorphize computer agents (Nguyen et al. 2023), they assign human-like characteristics to these non-biological beings, such as gender, through (a) visual appearance and (b) verbal (and non-verbal) behaviors (Brahnam and De Angeli 2012).

Previous research has already shown that the physical appearance and therefore embodiment of virtual agents is beneficial (Cowell and Stanney 2003). For instance, the visual representation as an embodied agent is perceived as more socially present than a non-embodied agent (Geven et al. 2006). Research further indicates that the optical appearance has a significant impact on consumers' liking, intention to use (Straßmann and Krämer 2018), and perceived reliability (Yuksel et al. 2017). It also affects the VCA's humanity, enhancing its perceived ability to recognize individual needs (Borau et al. 2021) and reducing feelings of discomfort (Stroessner and Benitez 2019). Classic research in person perception and impression management has also documented the effects of visual cues on gender categorization (Fiske 1998). Specifically, facial cues (e.g., hairstyles [Eyssel and Hegel 2012]) serve as key visual means conveying social category information, including gender (Mason et al. 2006). In the VCA context, Borau et al. (2021) found that the appearance of a chatbot and robot, including its gender, influenced customers' preference. As a limitation, their study focused only on visual cues. When interacting with VCAs, verbal cues play a crucial role in addition to visual ones.

Verbal cues (e.g., communication style) are the most direct way of representing computers' internal states, personalities, and gender (Lee et al. 2019), which can influence the consumer perceptions of chatbots. For example, a more socially oriented communication style by a VCA can increase the perceived rapport (Van Pinxteren et al. 2023). Differences in communication styles are often attributed to gender. In her research, Tannen (1991) highlighted that females typically use conversations to build connections through emotion-centered talk, whereas males use conversations to communicate knowledge and social status. For this reason, she created the term genderlect. To be more precise,

females' communication style is characterized by being supportive and polite (e.g., they use phrases such as "Would you mind?" [Haas 1979]). This style can be described as indirect, tactful, and concerned, often involving the use of questions. In addition, females tend to use elaborate language, incorporating flowery expressions and metaphors, and their communication is often affective, emphasizing emotions and feelings (Mulac et al. 2001). Research further shows that females tend to use more words when talking about psychological and social processes, particularly those related to family and friends (Newman et al. 2008). In digital communication, females are more likely to use emoticons and emojis, employing them more frequently and to express a wide range of emotions (Wolf 2000). In contrast, males' communication style is characterized by directness, with a preference for discussing topics, such as sports, money, and business (Mulac et al. 2001). The direct style emphasizes openness and straightforwardness, and often involves giving directives or instructions. Furthermore, males are typically succinct in their communication, focusing on their individual needs, which can be seen as instrumental communication (Mulac et al. 2001). In terms of content, males tend to refer more to object properties and impersonal topics (Newman et al. 2008), meaning that they are more likely to engage in discussions related to topics that do not involve personal or emotional aspects. In digital communication, males also use emoticons and emojis, but their usage differ from that of females. They tend to employ emoticons to indicate irony, relativize a message, or reduce ambiguity in their interactions (Wolf 2000).

Owing to the significant differences in communication styles (e.g., Mulac et al. 2001; Newman et al. 2008), besides the notable role of appearance (e.g., Borau et al. 2021), this work investigates both visual (i.e., pictures of avatars) and verbal (i.e., chatbot conversations) cues.

2.2 | Social Presence Theory and the SCM

Recently, a study by Borau et al. (2021) showed that female chatbots are preferred over male chatbots because they are perceived as more human. Moreover, the masculinity of a robot's face was found to evoke feelings of discomfort (Stroessner and Benitez 2019). In general, VCAs benefit from creating a sense of social presence by adopting characteristics of human-to-human communication (Borau et al. 2021). Social presence refers to the sense of being with another (Biocca et al. 2003). Technologies are often designed to create feelings of social presence, conceptualized as the awareness of another being's copresence (Biocca and Nowak 2001) or the experience of sensing a social entity when interacting with the system (Heerink et al. 2009). In other words, social presence is defined as a sense of intimacy and immediacy (Rafaeli and Noy 2005). Consequently, by interacting with a human-like (e.g., warm, sincere) virtual agent or agentess, consumers can feel a sense of social presence (Qui and Benbasat 2009; Adam et al. 2021), while solely factual expertise seems to exert a negative influence on the sense of social presence (Feine et al. 2019). Consumers' perception of social presence can positively impact their behavioral intentions (Jiang et al. 2022), trust (Pitardi and Marriott 2021; Qui and Benbasat 2009), and ultimately their intentions to use an agent as a decision-making tool (Qui and Benbasat 2009). Therefore,

it is important to understand how VCAs' social presence can be increased.

In general, anthropomorphic factors like visual and verbal cues, and thus anthropomorphic features such as gender, can affect social presence and trust (Feine et al. 2019). To evaluate characteristics including gender cues, people use stereotypes. This helps save cognitive capacities when making decisions about approach or avoidance (Fiske 1998). Two stereotypical dimensions that proved to be central in social perceptions and evoke specific emotions which, in turn, lead to specific behavioral tendencies, are warmth and competence—the two main dimensions of the SCM (Cuddy et al. 2007). These two dimensions arise from people's need to evaluate the goals of others (warmth) and their ability to achieve those (competence), aiming to maintain their own security. Among other factors, gender can influence the perception of the SCM dimensions. Even when occupying the same social role, it has been shown that females are generally perceived as warmer than males (Bye et al. 2022). Since the femininity of VCAs can likewise increase warmth perceptions (Borau et al. 2021), we assume that warmth plays a key role in explaining perceptions of social presence induced by the chatbot gender and that verbal gender cues are as crucial as visual cues.

Warmth (encompassing sociability and morality)—but not competence—is further generally seen as a fundamental characteristic that distinguishes humans from machines (Borau et al. 2021). In line with this, recent research indicated a positive direct relationship between robots' anthropomorphism and warmth but not competence (Zhu and Chang 2020), underlining the assumption that social presence can be intensified by perceived warmth. More recently, studies revealed the need to subdivide warmth into sociability and morality (e.g., Leach et al. 2007; Brambilla et al. 2011). Similar to warmth (and competence), sociability and morality have already been shown to be relevant for the assessment of marketing-relevant stimuli, such as brands (Gidaković et al. 2022) and the perceived interactivity of corporate social responsibility communication (Van Prooijen and Bartels 2019). Accordingly, the necessity of this subdivision is highlighted, along with the importance of sociability and morality in evaluating different stimuli. For example, perceived sociability in learning platforms can facilitate social interaction, which, in turn, increases perceptions of social presence (Weidlich and Bastiaens 2019). Furthermore, negative effects on morality judgments of a chatbot interaction compared to an interaction with a human can be reduced by a socially oriented and more emotional communication style (Zhou et al. 2022). An emotional communication style is typically associated with the female gender (e.g., Mulac et al. 2001; Tannen 1991). Beyond this, research has shown that female employees are typically evaluated based on sociability and morality (in addition to competence), while male employees are only evaluated based on their competence (Prati et al. 2019). This further highlights the importance of sociability and morality, particularly in perceptions of females. Therefore, we assume that sociability and morality, as subcomponents of warmth (Leach et al. 2007), provide insights into the underlying processes of how VCAs' female gender enhances social presence.

In many countries, such as Germany, historical cultural influences and patriarchal norms have reinforced gender stereotypes,

with traditional role expectations favoring men in positions of power and authority. Despite progress, these influences continue to shape societal perceptions of gender roles and behaviors and require ongoing efforts to challenge and overcome them (Bonvillian 2020). In line with this thinking, many societies have historically associated females with empathy and nurturing, which are desirable traits in customer service interactions (Risman 2018). These stereotypes can lead to the perception that females are better suited for assisting and soothing consumers. Similarly, female subgroups, such as secretaries and housewives, are perceived to be warm but not competent (Eckes 2002).

Transferring these effects to VCAs may help better understand consumers' response to technology-enabled services, such as chatbots and service robots (Van Doorn et al. 2017; Seiler et al. 2019). Research in consumer psychology and marketing on this topic is rare and the findings are partly contradictory (see Table 1 for a literature review). For example, Stroessner and Benitez (2019) found that more feminine and humanoid robots are perceived as warmer compared to more masculine and machine-like robots. Matching these results, experiments by Eyssel and Hegel (2012) showed that male robots are perceived as more agentic. Contrary to this, Bernotat et al. (2021) revealed that female and male robots are described as equally agentic and Bastiansen et al. (2022) found no differences in perceived competence, helpfulness, or trust based on the chatbot's gender. Do these findings indicate a closing gap in gender stereotype differences? Or do they highlight the need to differentiate warmth into sociability and morality? What factors may play a (mediating or moderating) role here? What (indirectly) influences social presence? Oliveira et al. (2019) explored how robots' varying levels of warmth and competence impact emotional responses toward robots, but research addressing the influence on social presence is rare to nonexistent. In addition to these rare and inconsistent findings, which usually showed only direct relationships, the existing literature on VCAs has mainly focused on the "Big Two" dimensions of warmth and competence, ignoring the different roles and characteristics of the sociability and morality subdimensions of warmth (Leach et al. 2007). To address these gaps, this research aims to explore the applicability of the three-dimensional SCM in the context of VCAs and whether it helps to explain the perception of social presence by investigating the distinct roles of sociability and morality.

In sum, we expect:

Hypothesis 1. *VCAs' gender has an influence on social presence, such that individuals perceive greater social presence when interacting with female VCAs than with male VCAs.*

Hypothesis 2. *The positive (negative) effect of female (male) VCAs on social presence is positively (negatively) mediated by (a) sociability and (b) morality. To be more precise:*

Hypothesis 2a. *Female VCAs are perceived as more sociable than male VCAs. Sociability, in turn, has a positive effect on social presence.*

Hypothesis 2b. *Female VCAs are perceived as more moral than male VCAs. Morality, in turn, has a positive effect on social presence.*

2.3 | Moderating Effect of Consumer Gender

In the context of educational VCAs, some studies show that students learn best when the VCA's characteristics match the student's gender, a phenomenon known as the gender matching hypothesis (Makransky et al. 2019). Furthermore, Qui and Benbasat (2009) claimed, "when two individuals share certain attributes, such as demographic characteristics [...] communication between them is more likely to be effective" (673). In line with this, it was indicated that perceptions of similarity with digital companions can result in feelings of connectedness (Gelbrich et al. 2023). Roth (2004) confirmed that demographic homophily between service providers and customers positively influences the development of strong customer relationships. Homophily refers to the attraction of similar individuals, which gives these individuals an advantage (similarity-attraction theory). In a study by Payne et al. (2013), participants were asked to select their preferred virtual health assistant. The results showed a preference for female VCAs, but this preference was observed primarily among female participants. Previous studies have shown that gender as well as similarity between a stimulus and the self play a role in the perception of visual stimuli (Nickel et al. 2020), and that gender differences in the perceived social presence of robots exist (Schermerhorn et al. 2008). In addition, perceptions and effects of warmth differ between males and females. For example, Xue et al. (2020) found that brand warmth has a positive effect on purchase intention for females but not for males, and Wen et al. (2020) found that female participants associate female faces more strongly with warmth than male participants do. Therefore, we hypothesize that the positive influence of female VCAs on social presence (through sociability and morality as dimensions of warmth) is more pronounced for females than for males because females are more (demographically) similar to female VCAs, and perceptions and effects of warmth may vary depending on the user's gender.

Hypothesis 3. *Consumer gender moderates the indirect effect of female VCAs on social presence, such that the mediating effects of (a) sociability and (b) morality are more pronounced for females than for males.*

Consumer gender has been studied frequently as a moderating variable, but further research is needed to specify situations in which gender is relevant for VCA acceptance (Belanche et al. 2021).

Figure 1 summarizes the hypothesized relationships in the derived research model. Competence judgment was incorporated as a parallel mediator to account for a potential alternative process. To enhance the generalizability of findings, the moderated mediation model is tested across various product categories (i.e., finance, fashion, holiday trip, and toothbrush) that differ in utilitarian versus hedonic value, as well as across different types of VCAs (i.e., visual and verbal). Likewise, the constructs of loneliness (Russell 1996), the individual tendency to recognize human characteristics in non-human objects (anthropomorphism tendency: Waytz et al. 2010), and personal innovativeness (Adam et al. 2021) may play a role in perceptions of computer agents and therefore work as control variables. To be more precise, attachment theory has emphasized the need of lonely individuals to seek social interaction

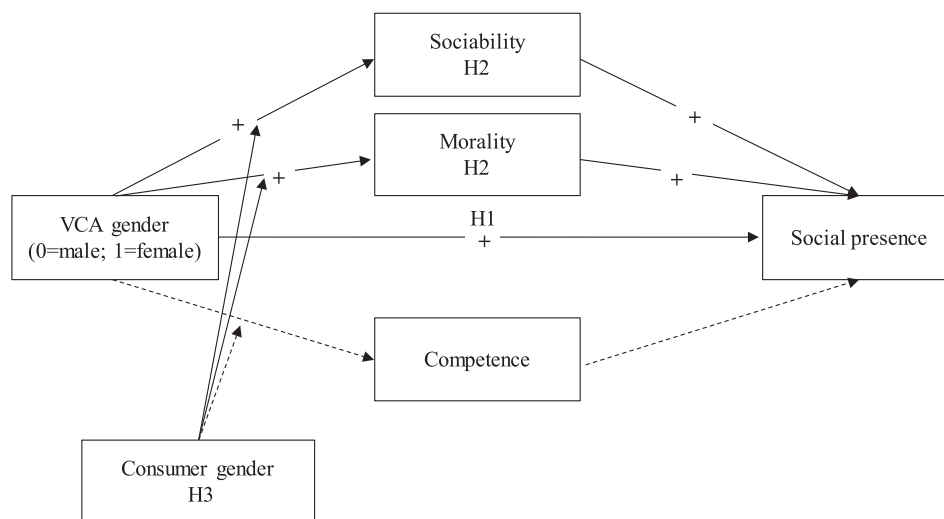


FIGURE 1 | Conceptual model. Control variables include consumer loneliness, anthropomorphism tendency, and personal innovativeness. The model is tested across different product categories and types of virtual conversational agents. Dashed lines indicate non-hypothesized effects.

and support from VCAs, which potentially influence their perceptions (Dosovitsky and Bunge 2021). Hence, the construct of loneliness worked as a covariate in our model. Consumers with a higher tendency to anthropomorphize may attribute human-like aspects and emotions to the VCA, which could impact their overall perception (Adam et al. 2021) and thus influence their overall experience, including social presence and trust (Munnukka et al. 2022). Personal innovativeness refers to an individual's willingness to adopt and use new technologies. Individuals with higher levels of personal innovativeness tend to embrace new technologies, such as VCAs, more readily than those with lower levels of personal innovativeness (Ling et al. 2021).

3 | Empirical Studies

3.1 | Study 1: Avatars in the Customer Service Context

The purpose of Study 1 was to test the main effect of VCAs' gender on social presence (Hypothesis 1), and the claim that female (versus male) VCAs enhance social presence mediated through sociability (Hypothesis 2a) and morality (Hypothesis 2b). Judgment of competence was included as a parallel mediator to account for an alternative process. In addition, the study examined the moderating role of participants' gender (Hypothesis 3) while using visual cues in the form of pictures of avatars as stimuli. To enhance the generalizability of findings, two product categories differing in their utilitarian versus hedonic value were considered: finance (utilitarian product [Pérez et al. 2020]) versus fashion (hedonic product [Michaelidou and Dibb 2006]).

3.1.1 | Method

Study 1 employed a 2 (VCA gender: male vs. female) \times 2 (product category: finance [utilitarian] vs. fashion [hedonic]) \times 2 (consumer gender: male vs. female) between-subjects design, including a number of individual difference variables as controls

(i.e., loneliness, anthropomorphism tendency, and personal innovativeness).

Pictures of the existing avatars Amelia (IPsoft) and Sam (IBM), taken from Borau et al. (2021), were used as stimuli. These (pictures of the) avatars share several characteristics, such as having the same facial perspective, a subtle smile, a neutral background, and similar perceived age and attractiveness (Borau et al. 2021) (see Web Appendix A). The participants were 312 consumers ($M_{\text{age}} = 32.96$ years, $SD = 11.80$, 61.5% females), recruited by using a university-based consumer panel (86%) and additionally Prolific (14%), who participated in a computer-based online study and were randomly assigned to treatments. All participants were informed of the research object, were assured anonymity, and had their data storage explained. Their voluntary consent to participate was recorded. After reading one randomly selected vignette (see Web Appendix B) and then viewing one randomly selected avatar, participants submitted scores on perceived sociability (Leach et al. 2007; $\alpha = 0.93$, $M = 4.01$, $SD = 1.55$), morality (Leach et al. 2007; $\alpha = 0.94$, $M = 3.91$, $SD = 1.47$), competence (Leach et al. 2007; $\alpha = 0.92$, $M = 4.49$, $SD = 1.34$), social presence (Heerink et al. 2009; $\alpha = 0.68$, $M = 3.33$, $SD = 1.29$), and product gender ($M = 4.03$, $SD = 1.16$). The participants then submitted personal information on innovativeness (Adam et al. 2021; $\alpha = 0.88$, $M = 4.07$, $SD = 1.42$), loneliness (Russell 1996; $\alpha = 0.87$, $M = 3.08$, $SD = 1.23$), anthropomorphism tendency (Waytz et al. 2010; $\alpha = 0.81$, $M = 3.19$, $SD = 1.15$), gender, and age.

3.1.2 | Results

3.1.2.1 | Mediation Analysis. We predicted that sociability and morality would positively mediate the effect of VCA femininity on social presence (Hypotheses 2a and 2b). Covariates included loneliness, anthropomorphism tendency, and personal innovativeness. Using a SPSS macro for testing multiple (parallel) mediation (Hayes 2018, PROCESS model 4, number of bootstrap samples = 5000), we found that VCA gender (0 = male, 1 = female) had a significant but negative direct effect on social presence ($b = -0.81$, $t = -6.29$, $p < 0.001$),

contrasting Hypothesis 1. VCA gender (0 = male; 1 = female) had a positive effect on sociability ($b = 0.64$, $t = 3.74$, $p < 0.001$) and on morality ($b = 0.48$, $t = 2.93$, $p = 0.004$), but not on competence ($b = 0.27$, $t = 1.77$, $p = 0.078$). As expected, we found support for the positive relationship between sociability and social presence ($b = 0.22$, $t = 3.30$, $p = 0.001$). In contrast to our expectations, morality ($b = 0.09$, $t = 1.18$, $p = 0.238$) did not influence social presence positively, but competence ($b = 0.20$, $t = 3.55$, $p < 0.001$) did influence social presence positively. Furthermore, as we hypothesized, there was a significant indirect effect of VCA gender on social presence, through sociability (Bootstrap [5000]; $b = 0.14$, 95% CI [0.05, 0.26]). Owing to the confidence intervals of morality (Bootstrap [5000]; $b = 0.04$, 95% CI [-0.03, 0.14]) and competence (Bootstrap [5000]; $b = 0.06$, 95% CI [-0.01, 0.14]) containing zero, it means that there was no indirect effect through these constructs (see Figure 2). Hypothesis 2a was supported, but Hypothesis 2b was not supported.

3.1.2.2 | Moderated Mediation Analysis of Consumer Gender. To test the claim that consumer gender (Hypothesis 3) interacts with VCA gender to influence its indirect effect on social presence through sociability and morality, we employed a moderated mediation analysis (Hayes 2018, PROCESS model 7, number of bootstrap samples = 5000). VCA gender was the independent variable (0 = male, 1 = female); sociability, morality, and competence were the mediators; social presence was the dependent variable; and consumer gender (0 = male, 1 = female) was the moderator. Covariates included loneliness, anthropomorphism tendency, and personal innovativeness in order to control for possible confounds.

The results (see Web Appendix C for detailed results) showed no significant effect of the VCA gender \times consumer gender interaction term on sociability, morality, and competence ($p > 0.05$). The conditional indirect effect of the VCA's gender on social presence through sociability was significant for both

male (Bootstrap [5000]; $b = 0.15$, 95% CI [0.02, 0.32]) and female (Bootstrap [5000]; $b = 0.13$, 95% CI [0.03, 0.26]) participants. The indirect effects through morality (and competence) were not significant.

3.1.3 | Study 1 Discussion

Study 1 gives initial evidence of the capacity of sociability, but not morality, to mediate the effect of female VCA's gender on social presence. However, Study 1 raises further questions. In particular, the observed negative direct effect of female VCA gender on social presence contrasts with Hypothesis 1, warranting further analysis. Additionally, given that the moderating effects of consumer gender did not show any significance, a deeper understanding is necessary here. Therefore, a second study was conducted to gain more clarity and insights, especially because Study 1 investigated gender cues only by changing the avatars' appearance from male to female. Since previous studies show that the communication style of males and females differs substantially from each other (e.g., Mulac et al. 2001; Newman et al. 2008), Study 2 seeks to overcome this shortcoming and to extend the results by using verbal cues instead of visual gender and exploring different product categories, thereby assessing whether the findings from Study 1 remain the same or whether differences in effects based on consumer gender can be found.

3.2 | Study 2: Chatbots in the Customer Service Context

The purpose of the chatbot study was to extend Study 1's findings. This was achieved by investigating (a) the impact of verbal cues in the form of chatbot gender on social presence (Hypothesis 1) mediated through sociability and morality (Hypothesis 2a/2b) and (b) the moderating effect of consumer gender (Hypothesis 3)

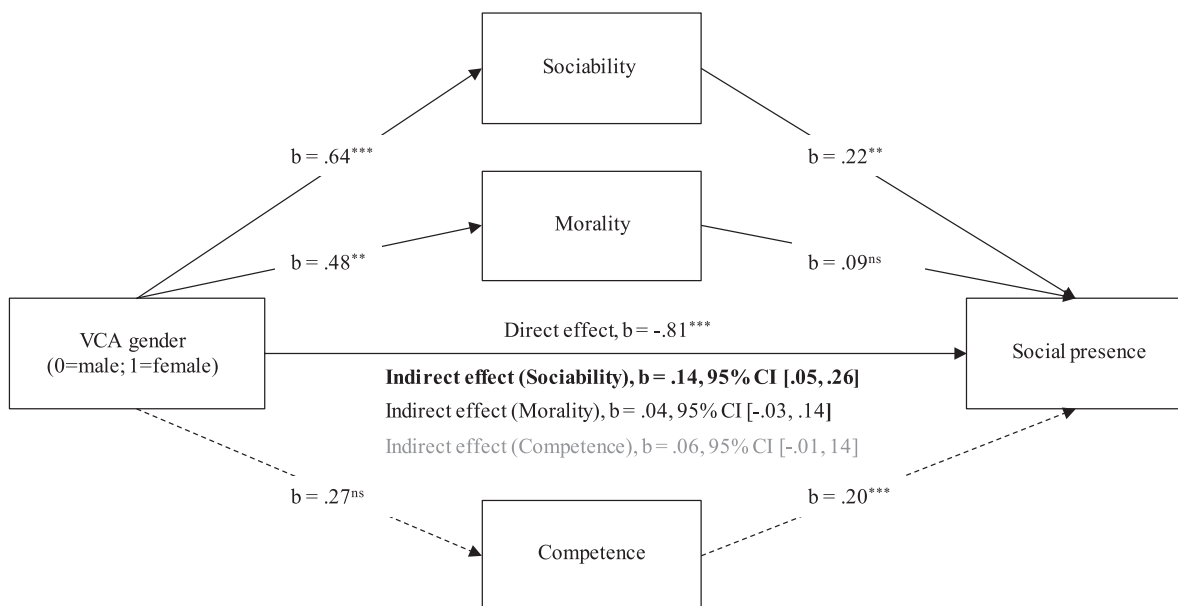


FIGURE 2 | Testing for the mediating effects of sociability and morality (Study 1). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ns = not significant. Control variables include consumer loneliness, anthropomorphism tendency, and personal innovativeness. Dashed lines indicate non-hypothesized effects.

across two additional product categories: toothbrush (utilitarian product [Baltas et al. 2017]) and holiday trip (hedonic product [Shao and Li 2021]). As in Study 1, the judgment of competence was included as a parallel mediator to account for an alternative process.

3.2.1 | Method

Study 2 employed a 2 (VCA gender: male vs. female) \times 2 (product category: toothbrush [utilitarian] vs. holiday trip [hedonic]) \times 2 (consumer gender: male vs. female) between-subjects design including a number of individual difference variables as controls. To enhance the generalizability of our findings, we selected two further product categories based on their practical relevance and utilitarian versus hedonic value. These considerations led to the selection of the toothbrush category and the travel category.

The participants were 354 consumers ($M_{\text{age}} = 31.00$ years, $SD = 12.93$, 53.4% females) recruited through a university-based consumer panel (36%) and additionally by Prolific (64%). Participants took part in a computer-based study and were randomly assigned to treatments. Each participant was informed of the purpose of the study, was assured of anonymity, and was provided with a data retention statement. Their voluntary consent to participate in the study was properly documented. After reading one randomly selected vignette (see Figure 3 for chatbot conversations), participants submitted scores on perceived sociability (Leach et al. 2007; $\alpha = 0.91$, $M = 3.93$, $SD = 1.53$), morality (Leach et al. 2007; $\alpha = 0.91$, $M = 3.88$, $SD = 1.37$), competence (Leach et al. 2007; $\alpha = 0.92$, $M = 4.44$, $SD = 1.56$), social presence (Heerink et al. 2009; $\alpha = 0.62$, $M = 1.88$, $SD = 1.05$), and chatbot gender ($M = 3.97$, $SD = 1.21$). The participants then submitted personal information on personal innovativeness (Adam et al. 2021; $\alpha = 0.85$, $M = 4.55$, $SD = 1.43$), loneliness (Russell 1996; $\alpha = 0.87$, $M = 3.15$, $SD = 1.19$), anthropomorphism tendency (Waytz et al. 2010; $\alpha = 0.84$, $M = 3.47$, $SD = 1.13$), gender, and age.

3.2.2 | Results

3.2.2.1 | Manipulation Check. A two-way analysis of variance (ANOVA) with manipulated chatbot gender and product category as independent variables and perceived chatbot gender as the dependent variable revealed a successful manipulation, with the female chatbot ($M = 4.51$, $SD = 1.28$) scoring as significantly more feminine than the male chatbot ($M = 3.57$, $SD = 1.11$, $F(1, 353) = 59.39$, $p < 0.001$). There were no significant interaction effects with product category ($p > 0.05$).

3.2.2.2 | Mediation Analysis. To test whether sociability and morality mediate the influence of VCA gender on social presence (Hypothesis 2a/2b) positively, we conducted a mediation analysis (Hayes 2018, PROCESS model 4), with VCA gender (0 = male, 1 = female) being the independent variable; sociability, morality, and competence three parallel mediators; and social presence the dependent variable. As in Study 1, control variables included loneliness, anthropomorphism tendency, and personal innovativeness.

The results (see Figure 4) indicated that VCA gender had no direct effect on social presence ($b = 0.08$, $t = 0.64$, $p = 0.521$), contrasting both Hypothesis 1 and Study 1 results. As demonstrated by the significant indirect effect of VCA gender on social presence through sociability (Bootstrap [5000]; $b = 0.26$, 95% CI [0.13, 0.41]) – but not through morality (Bootstrap [5000]; $b = 0.03$, 95% CI [−0.05, 0.09]) and competence (Bootstrap [5000]; $b = -0.02$, 95% CI [−0.09, 0.03])—the effect of VCA gender was fully explained by sociability. VCA gender had an influence on sociability ($b = 1.20$, $t = 8.29$, $p < 0.001$) but not on morality ($b = 0.07$, $t = 0.46$, $p = 0.649$) and competence ($b = 0.13$, $t = 0.79$, $p = 0.428$). Sociability ($b = 0.21$, $t = 4.05$, $p < 0.001$) and morality ($b = 0.21$, $t = 3.43$, $p < 0.001$) had a positive impact on social presence, whereas competence had a negative impact on social presence ($b = -0.15$, $t = -2.96$, $p = 0.003$).

3.2.2.3 | Moderated Mediation Analysis of Consumer Gender. To test the claim that consumer gender interacts with chatbot gender to influence the indirect effect on social presence through sociability and morality (Hypothesis 3), we employed a moderated mediation analysis (Hayes 2018, PROCESS model 7, number of bootstrap samples = 5000). VCA gender was the independent variable (0 = male, 1 = female); sociability, morality, and competence were the parallel mediators; social presence was the dependent variable; and consumer gender (0 = male, 1 = female) was the moderator. Again, covariates included loneliness, anthropomorphism tendency, and personal innovativeness in order to control for possible confounds.

The results showed no significant interaction effects between chatbot gender and consumer gender on mediator variables ($p > 0.05$). In line with Study 1, the results of conditional indirect effects showed that the indirect effect of VCA gender on social presence through sociability was significant for both males (Bootstrap [5000]; $b_{\text{indirect}} = 0.25$, 95% CI [0.11, 0.41]) and females (Bootstrap [5000]; $b_{\text{indirect}} = 0.29$, 95% CI [0.14, 0.46]), contrasting Hypothesis 3a. All other conditional indirect effects through morality and competence were not significant (see Web Appendix E for more details).

3.2.3 | Study 2 Discussion

Study 2's findings further corroborate the mediating role of sociability found in Study 1. In contrast to Study 1, the direct effect of female VCA gender on social presence was not significant but fully mediated by sociability in the verbal cue condition. Additionally, consistent with Study 1's findings, Study 2 could not confirm Hypothesis 3 and the claim that consumer gender moderates the indirect effect on social presence through sociability. These results are robust across different product categories (i.e., toothbrush and holiday trip).

4 | General Discussion

In recent years, companies have adopted VCAs to interact with consumers, with many VCAs often being assigned a female gender. This research builds on social presence theory and the SCM to develop a framework that helps explain how VCA gender influences consumer responses toward conversational agents.



FIGURE 3 | Chatbots. a = travel, female; b = travel, male; c = toothbrush, female; d = toothbrush, male. The original chatbot conversations are written in German (see Web Appendix D for original chatbot conversations and pretest results).

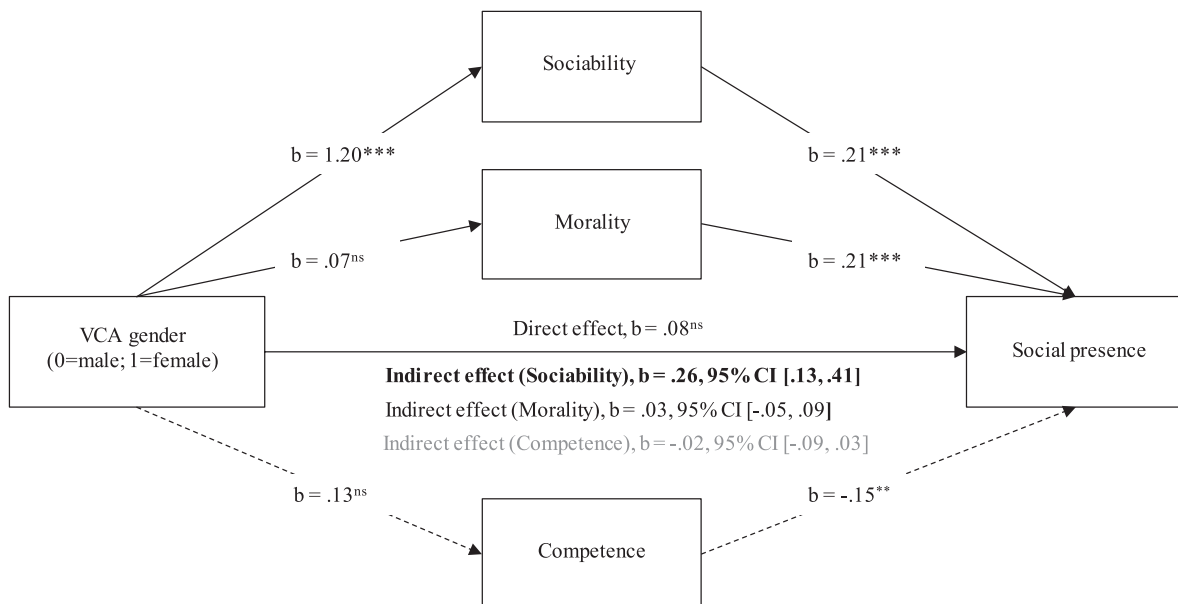


FIGURE 4 | Testing for the mediating effects of sociability and morality (Study 2). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ns = not significant. Control variables include consumer loneliness, anthropomorphism tendency, and personal innovativeness. Dashed lines indicate non-hypothesized effects.

Two studies were conducted, one focusing on the impact of visual cues in the form of gendered avatars (Study 1) and the other focusing on verbal cues in the form of gendered chatbots (Study 2). Study 1's findings show that the gender of VCAs (female) affects social presence indirectly through the perception of sociability. Interestingly, this effect is not observed in dimensions of morality. Contrasting Hypothesis 1, Study 1 revealed a significant negative direct effect of VCA gender on social presence (see Web Appendix F for more details on main effects). In line with Study 1, Study 2's results show that the gender of VCAs (female) influences social presence indirectly through sociability, but not through morality. Notably, there was no significant direct effect of VCA gender on social presence in the verbal cue condition, indicating full mediation through sociability (Montoya and Hayes 2017). These indirect effects are significant for both female and male consumers. Taken together, these findings highlight the role of sociability in positively mediating these effects.

4.1 | Theoretical Implications

This study contributes to current research in several ways. First, this research contributes to the stereotype content literature by demonstrating the applicability of the SCM in understanding how gendered VCAs can perpetuate gender-related stereotypes. It highlights the relevance of established stereotype theories in the context of human-machine communication. Notably, Seiler and Schär (2021) successfully employed the SCM in the context of VCAs. However, they did not investigate the influence of chatbot gender across different product categories. Instead, they tested chatbots with versus without pictures of male avatars, neglecting the important role of VCA gender and the perception of social presence. Moreover, while previous research on VCAs (e.g., Stroessner and Benitez 2019) often grouped sociability and morality under the broader dimension of warmth, our work explores the distinct roles of sociability and morality. Consistent

with Leach et al. (2007) and Brambilla et al. (2011), our findings confirm that sociability and morality, while they can be seen as considered parts of the same general dimension of warmth, are conceptually distinct constructs and thus play different roles in response to VCA gender. Both studies show that the effect of female VCA gender on social presence is mediated only by sociability and not by morality. These effects are robust across various utilitarian and hedonic product categories as well as across visual and verbal gender cues.

Second, research on social presence perceptions of VCAs has been extended by showing that there is a positive indirect effect of female VCA gender on social presence through sociability. Previous research has already shown numerous positive effects of greater perceived social presence, such as more positive behavioral intentions (Jiang et al. 2022), stronger trust (Pitardi and Marriott 2021; Qui and Benbasat 2009), and intentions to use an agent (Qui and Benbasat 2009), but has not accounted for VCA gender cues and how they can have a positive influence here.

Third, this research ruled out gender as a boundary condition for the positive influence of female VCA gender on social presence through sociability, as no difference was found between female and male consumers for this effect in both Study 1 (visual cues) and Study 2 (verbal cues). Supporting this assumption, Borau et al. (2021) found no interaction between the gender of the VCA and the gender of the participants in their studies, where gender was manipulated using visual cues. Conclusively, both female appearance and communication style are preferred by both females and males due to enhanced perceived sociability.

4.2 | Practical Implications

The results can help marketers use VCAs in a more targeted way by emphasizing not only visual but also verbal gender cues. Organizations or companies that employ VCAs, especially those

with gendered avatars or chatbots, should focus on strengthening perceived sociability and ultimately increase social presence. Marketers therefore have to ensure that their VCAs are perceived as particularly friendly, likable, and warm. This research revealed that femininity can, among other things, increase sociability. In addition, a sense of being connected with others—in this case, with the VCA—is linked to sociability (Landy et al. 2016). To create feelings of connectedness, VCAs need to be able to respond individually to customers' questions and wishes, and always be friendly and likable. This can, in turn, enhance the perception of social presence, ultimately benefiting consumer trust, customer relationships, and satisfaction. Interestingly, for both visual appearance and verbal cues, perceptions of morality (e.g., trustworthiness, honesty, and sincerity) do not seem to have a mediating influence here. Study 1 and Study 2's results, showing that the mediating effect through sociability is robust across different product categories (i.e., finance, fashion, holiday trip, and toothbrush), provide valuable insights for marketing managers and AI designers, as the effect of VCA gender seems to be relevant across different categories.

Marketers should keep in mind that the use of female-looking VCAs, but particularly those with a feminine communication style, is favorable across different product categories and consumer gender, in that feminine VCAs enhance social presence through stronger perceived sociability. Marketers should, therefore, use various visual cues that convey femininity and enhance sociability. Moreover, a feminine type of communication (e.g., using more emojis) leads also to stronger perceived sociability and, in turn, increases social presence, offering an additional opportunity for marketers to enhance the perceived social presence of a VCA. By combining verbal and visual cues, it is therefore possible to create a coherent image of the VCA and make more targeted use of the positive effects of a female VCA.

However, the study also raises important ethical considerations regarding the use of gendered VCAs. By reinforcing traditional gender stereotypes, organizations may inadvertently contribute to biases and prejudices. Acknowledging these ethical issues is essential for responsible AI deployment. Recognizing the potential harm associated with gender-based stereotyping on a societal level, particularly its adverse impact on females, it becomes imperative to comprehend the repercussions of perpetuating such stereotypes through VCAs.

4.3 | Limitations and Future Research

We believe that the present findings offer several valuable insights to researchers and practitioners, and we therefore mention possible avenues for future research.

First, for the purposes of improving the generalizability and robustness of these results, future research should examine additional contexts where VCAs are used. Different consumer groups (e.g., generations and culture) and settings (e.g., health context) might yield different results. While consumer gender was not found to moderate the effects, further research is needed to understand how different groups and contexts influence these dynamics. For example, as culture has an influence on gender role expectations and therefore responses to gendered

marketing stimuli (e.g., Ulrich and Tissier-Desbordes 2013), a fruitful area would be to examine how the gender of VCAs affects consumer responses in cultures that more strongly adhere to traditional masculine and feminine roles. In particular, cultural norms and values shape individuals' perceptions of gender roles (Alesina et al. 2013), which may affect attitudes toward female and male VCAs. In addition, the effects of other cues, such as auditory and a combination of different cues, need to be addressed in upcoming research. Given the prevalence of female voice assistance systems, such as Siri and Alexa, there is a particular need for further research, especially on the impact of pitch and tone of voice.

Second, the pictures of the avatars and chatbots used in the studies were limited in their functionality (e.g., no chatbot interaction), and this must be taken into account when interpreting the data and results. Future research may also want to explore whether the SCM applies to a chatbot or avatar with a 3D representation in order to investigate the role of immersion and virtual reality.

Third, further research is needed to better understand the negative direct effect of female VCA gender on social presence found in Study 1. The opposite signs of direct and indirect effects, which are referred to as suppression (MacKinnon et al. 2000), highlight the need to investigate the compensatory mechanisms that seem to operate within this process. In many cases, it is valuable to explore additional mediators, as other underlying processes could help explain these effects (Rucker et al. 2011). Future studies should therefore examine potential mediators that might clarify the negative effect (e.g., unobserved gender stereotypes). Our findings suggest that competence is unlikely to be a competing factor in this context. As the negative direct effect was found in Study 1, where pictures of avatars were used, it is possible that visual elements, such as the VCA's naturalness, facial expression, hairstyle, or clothing, may play a role in influencing the direct perception of social presence (e.g., Eyssel and Hegel 2012). Moreover, it would be worthwhile to examine whether, for example, certain linguistic elements or the use of emojis, especially in combination with pictures, could possibly weaken the negative effect or, in the best case, reverse it. Additionally, individual differences may also play a role in shaping these effects. For example, consumers' level of extroversion or whether they are verbalizers (versus visualizer) could alter the outcomes. Previous research has shown that extroversion and being a verbalizer, as well as their interaction, can lead to a change in consumers' intention to engage with a voice assistant (Heirati et al. 2024). The role of individual differences should therefore also be examined in the context of chatbots and could possibly improve the understanding of the observed effects.

Fourth, further research is required to examine alternative designs for VCAs that avoid gender reinforcement and promote inclusivity. Consideration should be given to gender-neutral VCAs to avoid perpetuating harmful stereotypes. Exploring non-binary or gender-diverse representations could be a step toward more inclusive and ethical AI.

Fifth, in the realm of brand management, companies carefully choose the voice and appearance of their VCAs to align them with their brand's values and identity. The focus of future

research could be on the influence of VCA gender on brand associations.

In conclusion, this research sheds light on how gendered VCAs influence social presence, offering valuable insights for theory and practice. Our paper underscores the need for AI development and paves the way for future research into more inclusive and responsible human-machine interactions. In sum, we hope that, in addition to technological advancements in VCA development, companies have the potential to enhance the consumer experience by drawing insights from the SCM.

Acknowledgments

The authors thank Linnea Heuer and Alexandra Gerlach for the excellent research assistance provided. Open Access funding enabled and organized by Projekt DEAL.

We also thank the Postdoc Center of Kiel University for funding (a) the recruitment of additional respondents and (b) the professional proof-reading of this publication.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

¹ Since some neuroscience researchers (Kaiser 2012) point out that sex refers to a person's biological reproductive structure and the presence of the XX or XY chromosome, we use the term gender instead of sex in this article.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.