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Should your brand hire virtual influencers? How realism and gender presentation shape trust and purchase intentions☆

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ABSTRACT

Virtual influencers (VIs), a natural progression in the AI gold rush in marketing, are becoming increasingly humanlike thanks to the advancements in generative-AI and natural language processing (NLP). This study (N = 710), guided by an integrated framework combining the Technology Acceptance Model (TAM), Parasocial Relationships (PSR), and Extended Privacy Calculus Model (EPCM), explores how perceived realism (form and behavioral) of VIs influences consumers' trust, brand attitudes, and purchase intentions, with gender presentation moderating these effects. Findings reveal that form (visual) realism boosts perceived usefulness, while behavioral (communication) realism enhances perceived ease-of-use. These functional affordances, along with social factors (presence, cognition, enjoyment), influence trust in VIs. Privacy concerns negatively shape trust, which, in turn, impacts purchase intentions through brand attitudes. These effects are stronger for male VIs. Findings support the PSR-based perspective, highlighting that consumers treat VIs as social actors and apply human social norms in brand-specific interactions.

1. Introduction

"You know what? Now we can just create videos on our own. Who needs the human beings?" This bold statement from ByteDance, TikTok's parent company, captures a pivotal shift in digital branding: the rise of virtual influencers (VIs) (Katz, 2025). As generative-AI, end-to-end human animation, and spatial computing converge, VIs are transforming influencer marketing.

VIs, computer-generated personas designed by humans or AI to mimic humans, create content and engage with followers, like human influencers (HIs) (Sands et al. 2020). Their rising popularity calls for systematic investigation of their impact on consumer decisions (Sun and Tang, 2024). As brands increasingly deploy VIs to persuade consumers, understanding the communication dynamics between VIs and followers becomes essential (Ma and Li, 2024).

Some VIs are so lifelike that consumers mistake them for humans (Zhang, 2024). For instance, Aitana Lopez (@fit_aitana) openly discloses her synthetic origin, yet many followers believe she is human. However, not all VIs are this convincing. VIs that are perceived realistic, but not human-like risk triggering the '*uncanny valley*' effect, causing discomfort (Arsenyan and Mirowska, 2021; Mrad et al., 2024). Their persuasive impact hinges on perceived realism: form realism (how humanlike they look) (Nowak and Fox, 2018) and behavioral realism (how humanlike they act) (Guadagno et al., 2007). These dimensions enhance consumer evaluations (Willemsen et al., 2025), especially in saturated digital environments where consumers seek novel forms of engagement (Diwanji et al., 2025; Mo and Wang, 2025).

Ethical concerns emerge as realism blurs the line between authentic and synthetic (Kietzmann et al., 2021). This raises important questions about disclosure, authenticity, and potential consumer deception, especially when VIs are not clearly identified as artificial. Beyond individual ad responses, VIs may also reshape broader consumer perceptions and social norms surrounding identity, parasocial bonds, and influence. As with deepfakes (Kietzmann et al., 2021), VIs can enhance personalization and engagement, yet may also invite manipulation and erode credibility. These tensions underscore the urgency of examining realism and gender in shaping consumer responses.

Gender presentation is particularly salient in VI contexts. HI research shows influencers strategically perform gender through visual and verbal cues to meet audience expectations (Lee and Yuan, 2023; Hudders and DeJans, 2022). This performative aspect of gender (Butler, 1990), positions VI gender not as a fixed attribute but as a stylized repetition of

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acts, embodied through appearance and communication. For VIs, whose identities are entirely digitally-constructed, this perspective becomes salient. Gender presentation, operationalized through visible and linguistic markers, serves as the primary means through which they connect with audiences. Consumers interpret these cues when evaluating VI authenticity, credibility, and persuasion.

This study integrates three theories to examine how VIs shape purchase intentions. The Technology Acceptance Model (TAM) explains how VI features influence perceived usefulness and acceptance (Feng et al., 2024). Parasocial Relationship (PSR) theory addresses emotional and cognitive connections with VIs (Lim and Lee, 2023). The Extended Privacy Calculus Model (EPCM) accounts for privacy risks in engaging with VIs (Trifiro, 2023). Appendix 1a summarizes recent studies applying these frameworks to influencer contexts. While TAM research explores AI influencer attributes, it often overlooks trust and privacy. PSR studies focus on parasocial interaction but rarely integrate realism or privacy factors. EPCM work addresses privacy mainly in human influencers or e-services, not VIs. This study uniquely integrates these perspectives to examine how perceived realism and gender influence trust, privacy concerns, and purchase intentions, addressing key gaps in understanding consumer responses to VIs in sustainability marketing.

The present study addresses these research questions: RQ1. How does VI realism influence consumer acceptance? RQ2. How do perceptions of VI social attributes shape trust, brand attitudes, and purchase intentions? RQ3. How does VI gender influence these outcomes?

2. Theoretical background

2.1. VIs and perceived realism

Influencer marketing is rapidly evolving amid automation, AI integration, and growing transparency calls concerning HIs (Influencer Marketing Hub-IHB, 2025). Research shows 73% of marketers believe influencer marketing can be largely automated, and 66 % report better performance from AI-driven campaigns. The VI market is projected to exceed USD111 billion by 2033 (Garner Insights, 2025). VIs are now brand ambassadors (Anaelle, 2025), digital public servants (Katz, 2024), celebrity replicas engaging fans (Sherman, 2023), and even, participants in fake political endorsements (Suciu, 2024).

With ever-growing digital content consumption, especially among Gen-Z (Kholkina et al., 2025), VIs offer brands scalable, creative, and low-risk alternatives to HIs (Byun and Ahn, 2023). They enhance efficiency, engagement, and emotional connection (Kim and Wang, 2024) while delivering personalized brand experiences through novel formats (Looi and Kahlor, 2024). Brands increasingly prefer VIs over traditional celebrity or HI campaigns (Molenaar, 2025; Mueller, 2025). For instance, malls (e.g., @countrysidemallfl) employ social commerce VIs like Cindy to boost engagement by promoting current trends, deals, and events (Mueller, 2025).

While promising, VIs' potential as brand endorsers is still emerging. They engage consumers through AI-enhanced aesthetics and social interactions, elements vital for authentic engagement (Kim and Baek, 2024), but their impact on decision-making remains underexplored (Lou et al., 2023). Their acceptance is not universally accepted. Systematic reviews indicate that consumers find HIs as more authentic, trustworthy, and similar (perceived homophily) than VIs (Byun and Ahn, 2023). They view VIs as out-group, dehumanized agents (Dabiran et al., 2024), but those with stronger anthropomorphic traits (perceived realism) exert greater influence through credibility and competence (Ma and Li, 2024; Zourrig et al., 2025).

VI realism encompasses anthropomorphic traits such as personalities, backstories, and communication styles making them relatable (Kim et al., 2024a). Realism can be categorized into: form realism (FR) and behavioral realism (BR) (Willemsen et al., 2025). FR refers to VIs' visual features, while BR pertains to actions and interactions with consumers. High realism enhances VI persuasiveness and engagement (Kim et al., 2024a), yet overly humanlike VIs risk triggering *'uncanny valley'* effects that provoke discomfort and distrust (Mrad et al., 2024). Thus, balancing FR and BR is essential to build trust while mitigating negative reactions. These dimensions of realism also influence parasocial relationships (PSR), which provide a valuable framework for understanding how VI characteristics drive consumer attitudes and influence.

2.2. Parasocial relationships with synthetic agents

PSR refers to one-sided but psychologically meaningful connections audiences form with media figures (Horton and Wohl, 1956). Traditionally applied to TV personalities, PSR has since been extended to social media influencers and, more recently, synthetic agents such as VIs (Mrad et al., 2024; Yuan and Lou, 2020). Across contexts, PSR enhances perceived authenticity, trust, and persuasion (Farivar et al., 2023; Stein et al., 2022).

This extension is supported by the Computers Are Social Actors (CASA) framework, which holds that people instinctively apply social rules to media agents with humanlike traits (Nass and Moon, 2000). For VIs, FR (e.g., visual believability) and BR (e.g., expressive communication) serve as key triggers of PSR (Willemsen et al., 2025). Studies show higher FR and BR elicit stronger PSR, which in turn enhances message effectiveness and brand evaluations (Shah et al., 2025; Dabiran et al., 2024).

Yet, for VIs, PSR remains contingent on realism. When realism exceeds cognitive thresholds for believability, 'uncanny valley' effects may emerge, disrupting the illusion of intimacy (Mrad et al., 2024). Still, studies find when PSR is successfully activated, it significantly enhances persuasion, ad recall, and willingness to pay (Farivar et al., 2023; Dabiran et al., 2024). Thus, PSR offers a critical lens for understanding how consumers psychologically relate to synthetic endorsers, and how these evaluations interact with perceived functionality and and risk, as explored in this study.

2.3. Technology acceptance of VIs

Findings regarding VIs' acceptance remain mixed, with some studies showing their persuasive potential (Lou et al., 2023; Wang et al., 2025), while others reporting lower credibility and brand attitudes than HIs (Muniz et al., 2024; Sands et al., 2022). This underscores the need for a comprehensive framework to explain consumer responses to VIs.

TAM provides a foundational lens to explain how users adopt new technologies based on two core beliefs: perceived ease of use (PE) and perceived usefulness (PU) (Davis et al., 1989). Originally developed in organizational settings, TAM has since been widely applied across domains, including mobile services (Kim and Garrison, 2009), AI agents (Ma et al., 2024), e-commerce (Sohn and Kwon, 2020), and more recently, influencer marketing (Kim and Chan-Olmsted, 2022; Nash, 2024).

TAM helps explain how consumers evaluate these synthetic agents as brand endorsers. FR and BR, VIs' visual realism and interactive expressiveness, can shape PE (e.g., ease of engaging with VI content) and PU (e.g., effectiveness of VIs as brand endorsers) respectively. Higher levels of realism signal advanced design and credibility, enhancing PU, while intuitive interaction patterns support PE (Willemsen et al., 2025; Franke et al., 2023).

However, their artificiality introduces complications not captured in traditional TAM applications. Studies show perceived novelty increases engagement (Kim et al., 2024a), but lack of homophily reduces trust and message effectiveness (Song et al., 2024). To account for such complexities, scholars have suggested to explore relational and emotional factors. Kembau et al. (2025) showed that beyond PE and PU, social influence significantly shaped attitudes toward VIs. Similarly, Kim et al. (2025) identified enjoyment and trust as critical drivers of acceptance.

These psychological bonds with VIs, while essential for fostering trust and engagement, exist alongside privacy concerns inherent in

digital interactions. Consumers' willingness to engage with VIs hinges not only on realism and social connection but also on how they negotiate trust and privacy. This interplay is well-captured by the Extended Privacy Calculus Model (EPCM), which complements PSR and TAM perspectives by addressing the trade-offs consumers make in social media environments.

2.4. VIs and the 'privacy paradox'

Consumers' relationship with technology is often constrained by privacy concerns (PC), which shape behaviors across contexts, including online shopping (McKee et al., 2024), virtual assistants (Leschanowsky et al., 2024), social media (Dienlin and Metzger, 2016), and mobile services (Sah and Jun 2024). This tension creates a 'privacy paradox,' where users weigh the benefits of engagement against privacy risks, influencing their technology adoption (Inman and Nikolova, 2017; Davlembayeva et al., 2025).

Early research emphasized the tension between disclosure and vulnerability (Petronio, 2002), which later evolved into the Privacy Calculus Model, the idea that users weigh perceived benefits against privacy risks when deciding to engage online (Dinev and Hart, 2006). This model has since been extended into EPCM, theorizing that technology adoption depends on consumer evaluation of trust versus PC (Dinev and Hart, 2006). Trust mitigates privacy fears, promoting positive attitudes and purchase intentions (Ju and Wang, 2024; VandenAbeele et al., 2024). For influencers, emotional connections can reduce perceived privacy risk, strengthening acceptance.

EPCM has proven effective across diverse domains. In e-commerce, perceived trust and privacy assurance increase purchase intentions (Dinev and Hart, 2006). In mobile services, it explains selective disclosure based on perceived utility versus surveillance risks (Sah and Jun, 2024). In social media contexts, privacy concerns shape engagement, often leading to privacy fatigue or selective avoidance (Leschanowsky et al., 2024). Recent applications also include AI agents and voice assistants, where users calibrate trust based on anthropomorphism, transparency, and data use (Ju and Wang, 2024).

Applied to VIs, EPCM provides a useful lens to understand consumer acceptance. VIs present a novel hybrid: visually anthropomorphic yet functionally artificial. Some studies suggest consumers perceive VIs as less privacy-invasive due to their lack of emotional sentience or personal data harvesting (Kim et al., 2024b). However, high BR and immersive presence may reverse this dynamic by increasing social presence, potentially triggering discomfort or privacy vigilance. This paradox, where a VI is humanlike enough to trigger engagement but artificial enough to feel safe, makes EPCM especially relevant.

Together, these frameworks provide a multidimensional lens to understand consumer acceptance of VIs as brand endorsers. TAM helps account for how consumers evaluate VI functionality and relevance, it does not explain relational or affective engagement. PSR captures the emotional bonds and perceived authenticity, but lacks mechanisms to account for privacy-related risk. EPCM addresses these limitations by integrating trust and privacy calculus into the evaluation of digital interactions. An important but often overlooked factor shaping these responses is gender presentation. Like HIs, gender cues in VIs can shape perceived realism, relatability, and trustworthiness (Hudders and DeJans, 2022).

2.5. VI gender presentation

Parasocial processes are central to how individuals engage with media figures (Liebers and Schramm, 2019), including interactions with cartoon or animated characters (Ramasubramanian and Kornfield, 2012), digital avatars (Jin, 2012), or chatbots (Diwanji et al., 2025). These responses are shaped by attributes of message sender and receiver (Liebers and Schramm, 2019; Stein et al., 2022). For VIs, gender presentation functions as a salient anthropomorphic cue that can influence PSR formation.

In influencer marketing, gender cues affect perceived warmth, competence, and authenticity. Female influencers are often viewed as more empathetic or relational, while male influencers are perceived as more authoritative or objective (Hudders and DeJans, 2022). These perceptions influence downward brand outcomes. When gender presentation aligns with social gender norms (Diwanji et al., 2025), influencer endorsements tend to elicit more favorable evaluations (Filieri et al., 2023). Gender presentation interacts with technology perceptions. Venkatesh and Morris (2000) found that male endorsers tend to enhance PU, while female endorsers increase PE and subjective norms. These findings are consistent with gender-based differences in advertising (Fischer and Arnold, 1994; Sreen et al., 2018).

Because VIs are digitally-constructed, their gender cues can be deliberately designed to enhance perceived realism or identity alignment. Homophily, similarity in gender identity, fosters stronger PSR, ultimately boosting attitudes and intentions (Melnychuk et al., 2024). Gender presentation also intersects with perceptions of trust and privacy: more realistic or relational gender cues may strengthen emotional engagement, while also heightening privacy concerns or trust dynamics. In this study, we explore how gender presentation, alongside functional attributes, shapes consumer responses to VI-driven brand messages.

3. Conceptual development

3.1. Effectiveness of VI realism and functional attributes

FR and BR, the visual and interactive humanlikeness of VIs, play a significant role in shaping user perceptions of functional attributes (PU and PE) of these agents (Willemsen et al., 2025). High realism fosters more immersive and believable user experiences (Kim et al., 2024a; Cheung et al., 2024), enhancing engagement and intentions. Consequently, the alignment of FR and BR with followers' real-life expectations and experiences with HIs can significantly influence PE and PU. VIs with higher FR possess more anthropomorphic traits, making them appear humanlike, whereas those with lesser FR look unrealistic (cartoonlike). Higher BR means VIs would showcase lifelike communication and interaction styles, whereas lower BR means that their messages appear robotic (such as AI-generated). Realistic behavior increases perceived ease of interaction (VonderPutten et al., 2010), and FR enhances PU (Ham et al., 2023). The synergy between FR and BR supports a more seamless, believable experience (Guadagno et al., 2007), thereby strengthening functional perceptions critical to VI effectiveness. Therefore.

H1. Higher form realism will positively influence perceived usefulness of VI content.

H2. Higher behavioral realism will positively influence perceived ease-of-use of VIs.

Additionally, prior research demonstrates that PE positively affects PU (Al-Adwan, 2024; Cao et al., 2024). When consumers perceive it easy to interact with VIs, it may enhance their perceptions of the usefulness of their content, aligning with TAM (Ma et al., 2024). Therefore.

H3. Perceived ease-of-use will have a positive influence on perceived usefulness of VI content.

Moreover, functional attributes positively influence trust (TRST) and brand attitudes (Venkatesh et al., 2012; Wirtz et al., 2018). Consistent with TAM, PU and PE enhance attitudes toward the brand (ATB), consumers' overall brand evaluations (Ajzen and Fishbein, 1980; Hassanein and Head, 2005), and also build TRST (Ye et al., 2019). Trust and attitudes serve as second-order constructs linking functional attributes to behavioral intentions (Saad, 2023). Therefore.

H4a-b. Perceived usefulness of VI content will positively influence trust and brand attitudes.

H5a-b. Perceived ease-of-use of VIs will positively influence trust and brand attitudes.

3.2. Perceived enjoyment in VI interactions

Perceived enjoyment (PEnjoy), the degree to which human-computer interactions are intrinsically pleasurable beyond functional utility (Davis et al., 1989), plays a key role in technology adoption (Venkatesh et al., 2012). As an intrinsic motivator, PEnjoy often exerts stronger effects on intentions than extrinsic drivers like PU (Fong et al., 2018), while also fostering TRST (Ogonowski et al., 2014). This is particularly relevant for VIs, as users engage with social media to satisfy hedonic needs, including enjoyment (Shao, 2024). Interacting with VIs can elicit PEnjoy, which in turn strengthens ATB (Wang et al., 2024; Pizzi and Scarpi, 2020). Therefore.

H6a-b. Perceived enjoyment of VI content will positively influence trust and brand attitudes.

3.3. Social motivators in VI interactions

Consumers often perceive anthropomorphic technologies as social actors (Nass and Moon, 2000), especially when avatars mimic human traits, as VIs do (Li, 2015). AI-enhanced VIs exhibit FR and BR, enabling real-time interaction (Kim and Quan, 2024) and evoking social presence (SP), the perception of another social being during interaction (Short et al., 1976). For VIs, SP also refers to the degree to which technology makes users feel the presence of another social being (vanDoorn et al., 2017). Higher SP has been linked to greater TRST and ATB (Hassanein and Head, 2005; Ye et al., 2019). VIs' high FR and BR may amplify SP, fostering stronger TRST and ATB. Therefore.

H7a-b. Social presence will positively influence trust and brand attitudes.

Social cognition (SC), how people process social information, shapes responses in both human and digital interactions (Fiske and Macrae, 2012; Caic et al., 2019). Consumers form social inferences even during service bot interactions (Wirtz et al., 2018), and SC underpins perceptions of virtual agents (van Doorn et al. 2017). As VIs increasingly possess FR and BR that are typically reserved for human interactions (Nass and Moon, 2000), consumers tend to perceive them as sociable (Cho et al., 2010). However, when they lack the humanlike attributes, it may adversely impact consumer perceive SC (Davenport et al., 2020). With the rapid advancements in the large language models (LLMs), consumer-VI interactions are becoming more humanlike. Higher FR and BR can enhance TRST and attitudes (Caic et al., 2019). Therefore.

H8a-b. Social cognition will positively influence on trust and brand attitudes.

3.4. Privacy concerns in VI interactions

Consistent with EPCM, consumers view VIs differently from humans in terms of trust and privacy (Kim et al., 2024b). For virtual agents, privacy concerns (PC), fears of unauthorized access and disclosure of personal data (Han and Yang, 2018), negatively affect TRST (Zhou, 2011) and ATB (Chang et al., 2017). Prior work confirms PC influences both TRST and ATB in virtual agent contexts (McLean and Osei-Frimpong 2019), suggesting similar effects may emerge with VIs. Therefore.

H9a-b. Privacy concerns of VIs will negatively influence on trust and brand attitudes.

3.5. VIs and brand-specific outcomes

Attitudes, consumers' evaluations of brands shaped by messaging like ads or endorsements, are important antecedents of purchase intentions (Ajzen and Fishbein, 1980). Consistent with TAM, user technology evaluation influences usage intentions (McLean et al., 2020), with functional attributes, SP, and TRST significantly shaping attitudes (Venkatesh et al., 2012; Ye et al., 2020). In human-computer interactions, TRST is a critical predictor of ATB and PI (McLean et al., 2020), especially for emerging technologies like VIs, where trust reflects perceived dependability (Rheu et al., 2021). Studies confirm TRST influences ATB and PI in virtual agent contexts (Jang et al., 2023; Yu et al., 2025). Therefore, we predict TRST and ATB will positively influence PI (see Fig. 1).

H10. Trust toward VI will positively influence on brand attitudes.

H11a-b. Trust and brand attitudes will positively influence on purchase intentions.

3.6. Moderating role of gender presentation

Gender—a set of (in this case, binary) characteristics that distinguishes females from males (Verma 2021)—shapes how TRST and ATB influence PI (Fischer and Arnold, 1994; Sreen et al., 2018). Men and women differ in technology evaluations, affecting their trust, attitudes, and intentions (Venkatesh and Morris, 2000). In advertising, gender cues like visual appearance and verbal cues elicit varied consumer responses (Leyda, 2016). Muller et al. (2022) found that human gender norms extend to virtual agents, with male agents seen as more objective and female agents as more sympathetic. In influencer marketing, alignment with followers' gender identities enhances ATB and PI (Hudders and DeJans, 2022). Thus, we predict that gender presentation moderates the effects of TRST and ATB on PI, with stronger effects for male VIs (Gumparthi and Srivastava, 2024).

H12a-b. Gender presentation will moderate the effects of trust and brand attitudes on purchase intentions, such as the effects will be stronger for male than female VIs.

4. Method

We tested the hypotheses using a 2 (FR: high/low) × 2 (BR: high/low) × 2 (Gender: female/male) between-subjects design.

4.1. Participants

A-priori power analysis using *G*Power* indicated a minimum sample size of 180 participants (power [1–β] = .90, effect size $f = .38$, $\alpha = .05$). Aligned with earlier research, to enhance statistical power and capture diverse consumer perspectives, we recruited participants aged 18 to 50 through purposive sampling on Amazon Mechanical Turk (MTurk), a platform widely recognized for its diverse, non-student adult samples in behavioral research (Berry et al., 2022; Sharma et al., 2025). The sampling strategy sought demographic heterogeneity in gender, age, and ethnicity, consistent with the study's focus on digital engagement with VIs. We initially recruited 730 participants. After applying attention checks and removing incomplete or inconsistent responses, 710 valid cases were retained for analysis. Of the participants, 51 % were female ($n = 362$) and 48 % were male ($n = 333$). The average age was 34 years ($SD = 11.27$). Regarding ethnicity, 36 % were White ($n = 255$), 23 % were Black ($n = 163$), 11 % were Hispanic/Latino(a) ($n = 73$), 10 % were Asian ($n = 71$). Participants reported spending approximately 5 h daily on social media.

4.2. Measurements

The items and scales used in this study were adapted from prior research. For the functional attributes, four items based on Venkatesh et al. (2012) were used to measure PE (e.g., "Interacting with the VI is

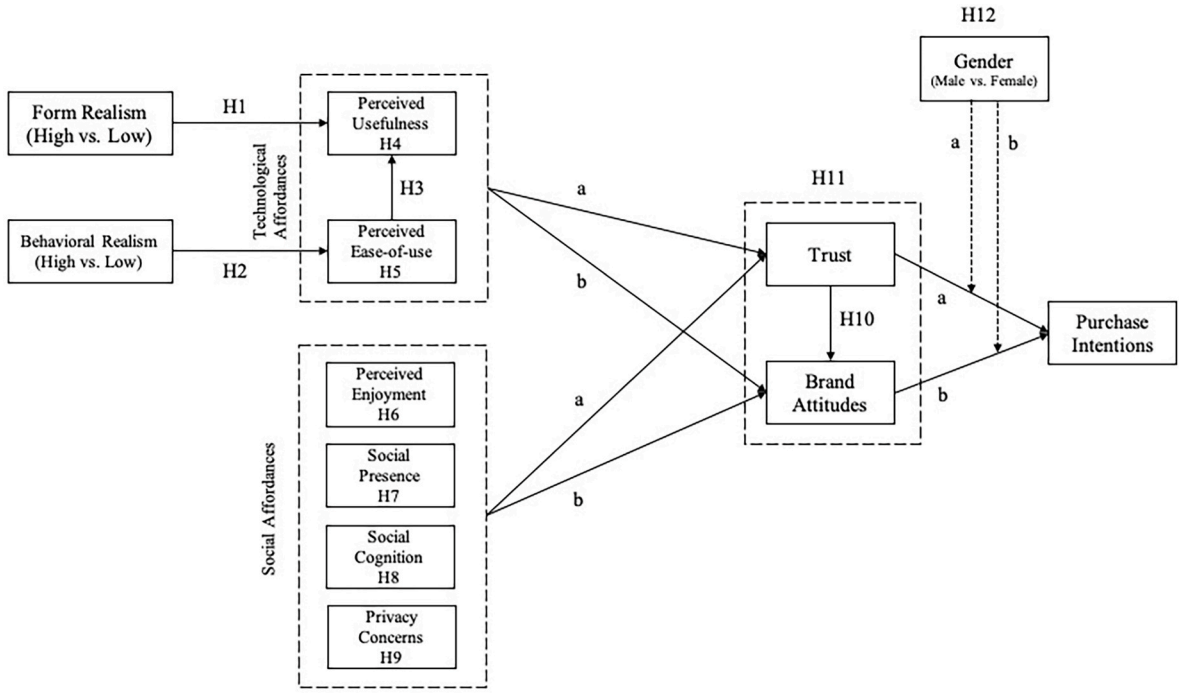

Fig. 1. Conceptual framework.

easy for me"; Cronbach's $\alpha = .88$), and four items were used for PU (e.g., "VI provides good quality information about the brand"; Cronbach's $\alpha = .88$). Five items measured SP (McLean and Osei-Frimpong 2019) (e.g., "When interacting with the VI, I feel a sense of sociability"; Cronbach's $\alpha = .95$). Six items assessed SC (Fiske et al. 2007) (e.g., "I think the VI is intelligent"; Cronbach's $\alpha = .85$). PEnjoy was measured with four items (Ye et al., 2019) (e.g., "I had fun interacting with the VI"; Cronbach's $\alpha = .90$).

TRST was assessed using four (Ye et al., 2019) (e.g., "I believe what the VI tells me about the brand"; Cronbach's $\alpha = .88$). PC was measured with four items (McLean and Osei-Frimpong 2019) (e.g., "I have concerns about the confidentiality of my interactions with the VI"; Cronbach's $\alpha = .86$). For the dependent variables, three items measured ATB (Bhutada et al., 2016) (e.g., "I generally have a positive feeling about the brand endorsed by the VI"; Cronbach's $\alpha = .95$), and three items assessed PI (Spears and Singh, 2004) (e.g., "It is likely that I will purchase the product endorsed by the VI"; Cronbach's $\alpha = .94$). All scales used a 7-point Likert style scale, ranging from strongly disagree (1) to strongly agree (7), and all items exceeded the Cronbach's α value threshold of .60, indicating reliability (Malhotra et al., 2010). We controlled for prior exposure to VIs, average daily social media use, product involvement, and demographics (age, gender, ethnicity) to rule out alternative explanations. Previous exposure was assessed by a two-item seven-point scale, ranging from not very much (1) to very much (7) (Lee et al., 2025). None of the control variables had a significant effect on the dependent variables or ($ps > .05$).

4.3. Stimuli

The stimuli featured Instagram VI posts with variations in FR (low/high), BR (low/high), and gender presentation (female/male). To inform the design of these posts, real Instagram VIs (e.g., LilMiquela, Noonnouri, KoffiGram, Plusticboy) were analyzed for their visual and communication attributes. Eight fictitious Instagram VI accounts were created, each using a gender-neutral profile name to avoid similarities to real VIs. The low FR visuals featured 2D cartoon-like images, while the high FR VIs appeared humanlike. Appendix 2a shows examples of VI profiles and post texts. Influencers were created using MetaHuman Creator, a generative-AI-powered tool that creates humanlike digital avatars. It also allows adding facial expressions and animations to make pictures look more realistic. Cartoonlike influencers were designed using Avatoon. To ensure that influencers appeared realistic and believable, we consulted with two graphic design experts and an influencer marketing manager, gathering feedback on the design choices and ensuring the VIs met industry standards for visual authenticity and communication.

For the BR conditions, we manipulated the communication styles and traits of the VIs. In the high BR condition, the influencers used natural and interactive language to mimic the human conversational style. Conversely, the low BR condition featured robotic, AI-generated text that lacked interactivity and was less engaging. To ensure that post text was appropriate for each condition, we consulted with two professional copywriters who provided feedback and adjustments to the language, ensuring consistency with the desired levels of realism in communication.

Gender presentation was operationalized through distinct visual and linguistic cues reflecting conventional masculine and feminine traits commonly employed by VIs in the industry. Visual features included hairstyle, clothing style, and facial characteristics, while communication styles varied in tone and language consistent with gender norms. While recognizing gender as a performative and socially constructed phenomenon (Butler, 1990), our binary framing aimed to isolate the effects of gender cues as commonly encoded and decoded in influencer marketing. Participants' recognition of gender presentation was empirically confirmed via manipulation checks, which demonstrated consistent decoding of the intended gender cues across experimental conditions. This approach aligns with extant empirical work that emphasizes visual and behavioral signals as primary markers of gender in digital contexts (Alvarez et al., 2021; Suh et al., 2023).

VIs were presented as male or female, with their visuals matching the chosen gender in both humanlike and cartoonlike conditions. Post text was tailored to suit male and female influencers, using communication styles typical for each gender. To control for prior experiences and brand familiarity, we used a fictitious brand. This ensured that participants had no preconceived notions or biases about the brand, allowing us to isolate the effects of the VIs without external influences from real-world brand

associations (Callow and Schiffman, 2002).

To determine the product category, a pre-test was conducted with a sample of 72 participants recruited from MTurk. They were presented with different hedonic (e.g., headphones, console) and utilitarian (e.g., smartphone, backpack, power bank) product categories. Participants' responses were recorded using Mittal's (1995) four-item, seven-point purchase decision scale, including "I would not care at all (1)-I would care a great deal (7)," "Not at all important (1)-Extremely important (7), " "Not at all concerned (1)-Very much concerned (7)," and "All very similar (1)-All very different (7)" (Cronbach's $\alpha = .82$). Headphones were selected as the final product to be used in the stimuli. Consistent with prior research (Hassanein and Head, 2005), headphones represent a broad gender appeal product category, thus minimizing the risk of gender-product congruence (e.g., feminine-coded products like skincare or masculine-coded products like power tools). This allowed observed effects to reflect the VI manipulations rather than product-gender associations.

4.4. Procedure

After the IRB approval, participants were recruited via MTurk. Upon consent, they were randomly assigned to one of experimental conditions on Qualtrics. They were asked to review three distinct VI posts about a fictitious brand. After reviewing the posts, participants completed the questions related to the dependent variables and provided demographic information. The study took 15 min to complete.

5. Results

A pilot test was conducted with 80 participants ($N = 80$) to assess the effectiveness of the VI realism and gender manipulations in influencing consumer trust, attitudes, and intentions. To evaluate the impact of the realism and gender manipulations, a univariate analysis of covariance (ANCOVA) was performed twice. The results indicated that both levels of FR and BR as well as the two gender types were successfully induced.

5.1. Manipulation checks

Regarding FR manipulation, the Chi-square test revealed that in the high FR condition, 92.18% of participants correctly perceived the VI as more 'humanlike', and 96% of participants correctly identified the VI as more 'cartoonlike ($X^2 = 361.01$, $df = 1$, $p = .001$; Cramer's $V = .98$, $p = .001$). Regarding BR manipulation, results revealed that in the high BR condition, 86.12 % of participants correctly perceived the VI's post text as natural and humanlike, whereas in the low BR condition, 82.88% of participants correctly identified the post text as robotic ($X^2 = 357.53$, $df = 1$, $p = .001$; Cramer's $V = .98$, $p = .001$). Regarding gender manipulation, results of the chi-square test revealed that in the male VI condition, 99% of participants correctly identified the VI gender as male, whereas in the female VI condition, 98.40% of participants correctly indicated the VI gender ($X^2 = 362.02$, $df = 1$, $p = .001$; Cramer's $V = .99$, $p = .001$).

5.2. Common method bias tests

To address potential common method bias, Harman's single-factor test was employed using the "psych" package in *R*, conducting an exploratory factor analysis on all variables. Results revealed that the first factor accounted for only 40% of the variance, which falls below the 50 precent threshold (Fuller et al., 2016). Furthermore, to enhance the robustness of the assessment, a full collinearity test was executed (Kock and Lynn, 2012). Results showed that the Variance Inflation Factors (VIF) for the latent variables in the model ranged between 1.122 and 1.234. This indicates that our model is free from common method bias, as evidenced by VIF values below the 3.3 threshold, signifying the absence of common method bias.

5.3. Test of hypotheses

The proposed hypotheses and the conceptual model were tested using SEM with maximum likelihood estimation and robust standard errors in MPlus (Version 8.11). A Chi-square test of independence was performed for the measurement model, yielding a significant result, $X^2(21, N = 710) = 2753.20$, $p = .145$. Chi-square tests assess perfect fit and factors such as sample size and model complexity can influence results (Brown, 2015). Additional fit statistics for the initial measurement model included: *RMSEA* = .048 [*CI*: .023 - .052], *SRMR* = .072, *TLI* = .94, and *CFI* = .95. Overall, good structural model fit was established. Control variables were included in the analyses. None had significant effects or changed the pattern of results ($ps > .05$).

Results revealed that higher FR positively influenced PU, ($\beta = .256$, $p = .001$), thus, supporting H1. Further, higher BR positively impacted PE, ($\beta = .187$, $p = .001$), thus, supporting H2. As predicted, PE positively influenced PU, ($\beta = .180$, $p = .001$), hence, supporting H3. Further, PU had a positive influence on TRST (H4a), ($\beta = .384$, $p = .001$), and ATB (H4b), ($\beta = .237$, $p = .001$), thus, supporting H4. Similarly, PE positively impacted TRST (H5a), ($\beta = .091$, $p = .008$), and ATB (H5b), ($\beta = .074$, $p = .004$), supporting H5. Results showed that PEnjoy positively impacted TRST(H6a), ($\beta = .090$, $p = .003$), and ATB (H6b), ($\beta = .219$, $p = .001$), supporting H6. SP had a positive influence on TRST (H7a), ($\beta = .104$, $p = .001$), and ATB (H7b), ($\beta = .101$, $p = .001$), supporting H7. SC also positively influenced TRST (H8a), ($\beta = .218$, $p = .001$), and ATB (H8b), ($\beta = .270$, $p = .001$), supporting H8. PC negatively influenced TRST (H9a), ($\beta = -.065$, $p = .029$), and ATB (H9b), ($\beta = -.057$, $p = .007$). Hence, H9 was supported. H10 was also supported as TRST positively influenced ATB ($\beta = .256$, $p = .001$). Further, TRST did not have a direct influence on PI (H11a), ($\beta = .070$, $p = .204$), but ATB positively impacted PI (H11b), ($\beta = .512$, $p = .001$). Thus. H11 was partially supported. See Table 1.

To test the moderating role of gender, we examined the interaction effects of gender (1 = male; 0 = female) with TRST and ATB in the model. The interaction between gender and TRST was statistically significant ($\beta = .058$, $p = .032$), indicating that gender significantly moderates the effects of TRST on PI. Specifically, the relationship between

Table 1
SEM path analysis.

Hypotheses	Relationships	Standardized regression weight	*p*-value	Supported?
H1	FR → PU	.256	.001	Yes
H2	BR → PE	.187	.001	Yes
H3	PE → PU	.18	.001	Yes
H4a	PU → TRST	.384	.001	Yes
H4b	PU → ATB	.237	.001	Yes
H5a	PE → TRST	.091	.008	Yes
H5b	PE → ATB	.074	.004	Yes
H6a	PEnjoy → TRST	.09	.003	Yes
H6b	PEnjoy → ATB	.219	.001	Yes
H7a	SP → TRST	.104	.001	Yes
H7b	SP → ATB	.101	.001	Yes
H8a	SC → TRST	.218	.001	Yes
H8b	SC → ATB	.27	.001	Yes
H9a	PC → TRST	−.065	.029	Yes
H9b	PC → ATB	−.057	.007	Yes
H10	TRST → ATB	.256	.001	Yes
H11a	TRST → PI	.07	.204	No
H11b	ATB → PI	.512	.001	Yes
H12a	Gender mod. TRST → PI	.058	.032	Yes
H12b	Gender mod. ATB → PI	.047	.048	Yes

Abbreviation: SEM=Structural equation modelling; FR=Form realism; BR=Behavioral realism; PU=Perceived usefulness; PE=Perceived ease-of-use; TRST = Trust; ATB=Attitude toward the brand; PEnjoy = Perceived enjoyment; SP=Social presence; SC=Social cognition; PC=Privacy concerns; PI=Purchase intentions; mod. = Moderator.

TRST and PI was stronger for male VIs compared to female VIs. Similarly, the interaction term between gender and ATB was marginally significant ($\beta = .047$, $p = .048$). ATB had a stronger influence on PI for male VIs than for female VIs. Although the interactions were significant, the direct effect of gender on PI was not statistically significant ($\beta = .051$, $p = .08$), implying that gender alone did not significantly predict PI without considering its interaction with other variables (TRST and ATB). Overall, H12 was supported.

6. Discussion

Despite advances in generative AI and social media that have made VIs more humanlike and visible, little is known about how perceived realism (FR, BR) and gender cues shape brand decisions. This study addresses that gap, showing that TRST, ATB, and PI are influenced by perceived realism and gender—consistent with prior findings (Gumparthi and Srivastava, 2024; Kim et al., 2024a).

H1 confirms that higher FR enhances PU, while H2 shows that higher BR improves PE. These findings point to a dual-pathway mechanism: FR drives cognitive evaluations by enhancing VI content utility, whereas BR enhances affective engagement through naturalistic communication, extending prior research treating realism as a unidimensional construct (e.g., Kim et al., 2024a). Unlike studies that emphasize only aesthetic appeal or entertainment (Grewe et al., 2021), findings disentangle the unique functional and experiential roles of FR and BR in shaping VI evaluations. This distinction contributes to a more granular understanding of how realism support different psychological outcomes in human–VI interactions (Cheung et al., 2024).

H3 shows that PE positively influences PU, supporting findings by Al-Adwan (2024) and Ma et al. (2024) that enjoyable digital interactions heighten users' functional value perceptions. A seamless and realistic user experience fosters greater perceived utility (Strojny et al., 2020). H4 and H5 results further demonstrate that functional attributes significantly enhance TRST and ATB, consistent with Venkatesh et al. (2012) and Ye et al. (2019). H6 reveals that PE positively influences TRST and ATB, reinforcing prior evidence that enjoyable interactions shape favorable evaluations of both technology and its endorsers (McLean and Osei-Frimpong 2019). Users who derive hedonic value from VI interactions are more likely to trust the agent and the brand it promotes (Wang et al., 2024; Fong et al., 2018). By demonstrating the parallel roles of both functional and experiential attributes in fostering trust and attitudes, this study contributes to a more integrated understanding of VI value perceptions, an area underexplored in existing literature.

H7-H8 further underscore the trust-building potential of SP and SC. Perceived social cues and presence significantly shape consumers' emotional bonds with VIs and, by extension, the brands they endorse (Pfaller et al., 2021). When VIs are viewed as social beings (Nass and Moon, 2000), users feel closer to them, enhancing TRST and ATB (Ye et al., 2019). As generative-AI technologies improve the perceived realism of social presence, they may help overcome the 'uncanny valley' effect, thereby increasing trust in such interactions (Caic et al., 2019). By modeling both SP and SC as distinct social mechanisms, findings extend prior work by clarifying how these dimensions uniquely contribute to trust formation in VI contexts.

H9 results confirm that PC negatively impacts TRST and ATB, consistent with prior findings (McLean and Osei-Frimpong 2019; Sun et al. 2024). PC can dampen trust and attitudes, even in otherwise engaging interactions. These results align with reviews highlighting the adverse effects of PC on consumer–technology trust (Leschanowsky et al., 2024). Importantly, findings extend EPCM by showing that privacy perceptions vary with VI anthropomorphism, thereby influencing users' evaluative responses (Kim et al., 2024b).

The interesting finding (H10) is that that TRST significantly boosts ATB but has no direct effect on PI, diverging from prior work (Venkatesh et al., 2012). This suggests that trust primarily shapes cognitive evaluations (ATB), with its effect on behavior mediated through attitudes (H11). Findings resonate with research showing trust enhances VI perceptions that influence downstream brand evaluations and purchase behaviors (Yu et al., 2025; Jang et al., 2023), refining understanding of trust's indirect path to action. By delineating this indirect pathway, our study offers a novel contribution: while VI trust is essential, it operates primarily through attitude formation rather than direct behavioral influence.

H12 demonstrates that VI gender moderates the effects of TRST and ATB on PI, consistent with prior work on gender norms and endorsement outcomes (Hudders and DeJans, 2022; Sreen et al., 2018). Aligning with Müller et al. (2022), gendered expectations surrounding HIs appear to transfer to VIs. PSR and social role theory suggest that users ascribe role-consistent traits to VIs—e.g., decisiveness to males and warmth to females—shaping trust and brand responses (Grewe et al., 2021; Gupta et al., 2009). Male VIs, perceived as more agentic, evoke greater trust and brand attitudes. Conversely, female VIs, while seen as approachable, may not elicit equivalent trust (Strojny et al., 2020). Findings contribute uniquely to the literature by demonstrating that VI gender presentation activates similar cognitive mechanisms as in HIs, influencing downstream brand outcomes. Strategically, brands should calibrate VI gender presentation based on context and audience expectations.

Collectively, findings offer answers to our guiding research questions. First, form and behavioral realism significantly shape VI acceptance, supporting RQ1 and highlighting the importance of perceptual cues in driving usefulness and ease of use. Second, perceptions of VI attributes, including enjoyment, social presence, cognition, and privacy concerns, meaningfully influence trust, brand attitudes, and purchase intentions (RQ2). Third, gender moderates these effects, with male VIs yielding stronger downstream responses, addressing RQ3.

Together, these findings integrate TAM, PSR, and EPCM to offer a unified model of VI endorsement effects, extending prior work that typically isolates visual realism, social cues, or privacy concerns. Unlike earlier findings that position trust as a direct predictor of behavioral intention (Venkatesh et al., 2012), our results show that trust shapes brand attitudes but not intentions, suggesting that VI-based trust may be more affective. Unlike prior work that often treats realism or gender presentation as isolated cues (Grewe et al., 2021; Hudders and DeJans, 2022), results show how gender moderates realism–response links, revealing asymmetries in how users attribute credibility and warmth to male versus female VIs. These insights extend the literature by uncovering boundary conditions of perceived realism, hedonic utility, and gender presentation in shaping VI endorsement outcomes.

These results also raise important ethical considerations. As VIs become increasingly humanlike, concerns around deception and parasocial manipulation grow (Kietzmann et al., 2021; Mrad et al., 2024). Findings suggest that realism boosts trust and persuasion, but may also blur the line between real and synthetic, leading to unintended emotional attachments. This raises ethical questions about transparency and disclosure in VI use (Mouritzen et al., 2024). To preserve consumer trust, brands should disclose VI artificiality clearly, especially in contexts involving high involvement or social impact, where misrecognition could compromise user autonomy.

Beyond marketing outcomes, the formation of parasocial bonds with fully synthetic entities like VIs raises profound societal questions. As VIs become more persuasive, consumers may develop attachments that challenge traditional notions of social interaction and raise ethical concerns about manipulation and autonomy. Findings highlight the need for responsible design and transparent disclosure to safeguard consumer well-being as synthetic agents become pervasive in everyday life (Diwanji et al., 2024).

6.1. Theoretical contributions

This study offers several theoretical contributions by integrating TAM, PSR, and EPCM to advance understanding of consumer–VI

interactions in brand contexts. First, TAM helps explain how functional and technological attributes of VIs shape brand-specific responses. TAM posits that PU and PE are critical determinants of technology adoption (Davis et al., 1989). By applying TAM to VI context (Kim and Garrison, 2009; Ma et al., 2024), this study addresses recent calls to investigate VI adoption (Vinoi et al., 2025; Wang et al., 2025). Findings show that consumers perceive functional benefits of VI interactions as important in forming brand-specific decisions. They expand prior findings on virtual agent adoption (Wirtz et al., 2018) and human-virtual agent interactions (vanDoorn et al., 2017) by empirically linking VI technological affordances, specifically FR and BR, to trust, brand attitudes, and purchase intentions. This underscores how VIs differ from other technologies by requiring alignment with both technical features and brand communication demands (Yang et al., 2023). Importantly, we integrate social motivators—PE, SP, and SC—expanding TAM to encompass hedonic and social drivers critical to VI adoption, thus responding to recent calls for deeper inquiry into the social dimensions of technology acceptance (Stein et al., 2022; Vinoi et al., 2025).

Second, consistent with PSR, our findings demonstrate that consumer responses to VIs are shaped by social and relational dynamics, where VIs with greater anthropomorphic traits foster emotional connections akin to human media figures (Lim and Lee, 2023; McLean and Osei-Frimpong 2019). Aligned with the CASA framework, which posits that people apply social scripts to computers and digital agents, our results show that SP, SC, and PEnjoy function as distinct antecedents of VI trust (vanDoorn et al., 2017), revealing a novel PSR-based pathway for consumer–brand relationships mediated through synthetic agents (Caic et al., 2019). This extends existing PSR scholarship by situating VIs at the intersection of technology and mediated sociality, emphasizing the importance of social, not just functional, affordances in VI research.

Importantly, findings add nuance to current conversations on parasocial manipulation and ethical boundaries in synthetic media (Wiederhold, 2025). While PSR frameworks traditionally examine media attachment, this study shows how realism and anthropomorphism can blur the line between authentic and artificial presence, amplifying the risk of deceptive perceptions, especially when VI humanness is not clearly disclosed. These results support growing concerns about the manipulative potential of synthetic agents (Kietzmann et al., 2021) and highlight the need to theorize disclosure as an ethical boundary condition within PSR. Future research may explore how explicit signaling of a VI's artificiality moderates trust, relational bonds, and consumer decision-making, particularly in high-stakes or vulnerable contexts.

Third, findings account for consumers' privacy concerns when interacting with VIs, and reveal that PC negative shape attitudes, consistent with EPCM (Trifiro, 2023). We demonstrate that PC negatively affect trust and attitudes, reinforcing EPCM's premise that users weigh trust against privacy risks when adopting technologies (Dinev and Hart, 2006; Ju and Wang, 2024). These results reinforce the value of transparency and responsible data practices in mitigating PC and enabling sustainable engagement with VI-endorsed content (Chahal and Mahajan, 2024).

Fourth, findings reveal that gender presentation significantly influences the effects of trust and attitudes on intentions. This study contributes to literature showing that consumers apply offline social norms about gender to online interactions, including with non-human entities like VIs (Muller et al., 2022). Grounded in gender performance theory, gender presentation in VIs is not merely visual, it is communicative and stylized. These results suggest that gendered cues shape consumer perceptions of VI authenticity, trustworthiness, and persuasion. As brands anthropomorphize VIs, they must consider how gendered traits are performed, perceived, and decoded by users. Misalignment may inadvertently trigger dissonance or reduce campaign effectiveness. Overall, this integrated framework demonstrates how functional, relational, ethical, and identity-based dimensions jointly shape consumer responses to VI-driven brand endorsements.

6.2. Practical implications

Findings offer targeted guidance for brands and marketers aiming to leverage VIs to build consumer trust, enhance brand attitudes, and drive purchase intentions. Our results reveal form realism enhances perceived usefulness, while behavioral realism boosts enjoyment—two distinct antecedents of trust. Brands should therefore avoid one-dimensional VI designs and optimize both visual and behavioral realism tailored to audience expectations, mitigating eeriness and maximizing engagement (Yang et al., 2023).

Marketers should strategically align VI gender presentation with nuanced consumer expectations and segment demographics. Matching gender presentation with the target segment can strengthen the influence of trust and brand attitudes on purchase intentions. Marketers must also account for consumer expectations from VIs, such that for those with high anthropomorphic expectations, VI-driven brand interactions should facilitate realistic and natural interactions, and provide hedonic value, yet effectively address consumers' privacy concerns. Conversely, when expectations are low, a low realism avatar focused on meeting basic needs, such as offering one-way brand information, may be more effective.

These insights are reflected in practice. For instance, VIs like Lilmiquela, shown wearing real brand fashion accessories, and attending real events such as the Milan Fashion Week generated significant attention among consumers. brands like Vega have used more stylized VIs, such as bodybyralph, to deliver one-way product information, achieving strong follower response. Findings show gender-sensitive and expectation-informed VI strategies can optimize brand impact, enabling marketers to balance visual appeal, interactional depth, and audience alignment to drive consumer response.

To cultivate trust, brands should leverage advanced NLP-powered VIs capable of nuanced, real-time dialogue that fosters parasocial bonds—a mechanism shown here to deepen purchase intent. However, findings emphasize that privacy concerns significantly inhibit trust formation in VI contexts, making transparent AI disclosure and consumer control over data indispensable for sustained engagement. Employing digital analytics to track evolving attitudes toward authenticity and privacy enables proactive adaptation of VI strategies.

As VIs increasingly blur the line between reality and digital fabrication, our data underline the imperative of transparent disclosure about their AI origins to maintain consumer trust and prevent deception (Hermann, 2022). Additionally, embracing diverse anthropomorphic and gender representations broadens appeal, promoting inclusivity and enhancing brand resonance across market segments.

6.3. Limitations and future directions

It is important to acknowledge limitations. First, this study is cross-sectional in nature, representing a snapshot in time. Future research can longitudinally examine these effects to understand changes over time (Mathai, 2024). Second, this study used static images as VI posts, incapable of portraying dynamic FR and BR. Future studies can use videos and animations to enrich the stimuli forms. Third, the sample, although very large and diverse, ensuring generalizability of findings, was only collected from the United States. Therefore, future research could include participants from diverse cultures to examine the cross-cultural effects on consumer-VI interactions.

Fourth, while utilization of MTurk has been proven more effective than student samples, the demographics of MTurk participants may not fully represent the broader population (Follmer et al., 2017). Future studies can seek to recruit participants from diverse demographic and cultural backgrounds to enhance representativeness, and therefore, external validity. Lastly, the application of VIs across different product categories and industries warrants further exploration. Specifically, future studies could examine how VI effectiveness varies in gender-coded categories, where product–influencer congruence may

amplify or diminish consumer responses. Further, emerging scholarship highlights how VIs often reproduce stereotypical gender norms, with only a few adopting non-binary or gender-ambiguous identities (Shin and Lee, 2023). While some VIs challenge traditional gender scripts, the dominant industry trend is shaped by entrenched beauty standards. Miyake (2023) argues VIs evoke complex reactions linked gender norms and digital embodiment. Gender is increasingly understood as fluid and performative (Butler, 1990). Future research should incorporate gender performativity to explore how consumers interpret and respond to non-binary, fluid, or ambiguous gender presentations by VIs.

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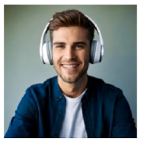
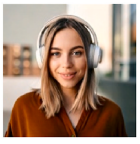
Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1a. Summary of Prior Research Using TAM, PSR, and EPCM Theories

Authors	Theory Used	Main Findings	How This Study Differs
Feng et al. (2024)	TAM	Identified key VI attributes predicting acceptance	Focuses on attribute development; does not examine parasocial trust, privacy calculus, or VI gender effects as in our integrated study
Lou et al. (2023)	TAM	VIs impact brand image and awareness but fail to drive purchase due to weak authenticity	Emphasizes authenticity and engagement; lacks analysis of trust mediation and privacy concerns central to our research
Muniz et al. (2024)	TAM	Disclosure of VI's nonhuman nature reduces brand trust; cultural effects observed	Focuses narrowly on disclosure effects on trust; does not address BR or gender moderation present in our work
Shah et al. (2025)	PSR	FR and BR increase engagement and parasocial relationships, moderated by content authenticity	Examines digital human avatars resembling VIs but does not incorporate privacy calculus or gender presentation as in our study
Stein et al. (2022)	PSR	Parasocial interactions with VIs comparable to humans; mental human-likeness mediates effects	Compares PSR with HIs vs. VIs; does not explore trust, privacy concerns, or technology acceptance
Lim and Lee (2023)	PSR	Disclosure of VI origin and emotional narratives influence credibility through parasocial interaction	Focuses on emotional narratives and origin disclosure; lacks investigation of FR and BR or gender effects analyzed in our study
VandenAbeele et al. (2024)	EPCM	Privacy concerns are downplayed due to cognitive biases	Explores HI privacy concerns; does not address VI privacy perceptions or their impact on trust and purchase
Ju and Wang (2024)	EPCM	Trust reduces privacy risks and enhances perceived benefits, influencing intentions	Applies privacy calculus in e-service settings; does not study VI context, which our research addresses
Trifiro (2023)	EPCM	Influencers balance public sharing and privacy through boundary regulation	Focuses on HI privacy management; does not analyze consumer privacy concerns in VIs

Appendix 2a. . Examples of VI posts

			
(Profile Image) Post text: Obsessed with these new LumaSound wireless headphones! Seriously, the sound quality is next level and they're so comfy for all-day wear. Whether I'm working, chilling, or jamming out, these babies never disappoint. Perfect for on-the-go! Highly recommend if you're looking to upgrade your sound game! #LumaSound #SoundOn	(Profile Image) Post text: Obsessed with these new LumaSound wireless headphones! Seriously, the sound quality is next level and they're so comfy for all-day wear. Whether I'm working, chilling, or jamming out, these babies never disappoint. Perfect for on-the-go! Highly recommend if you're looking to upgrade your sound game! #LumaSound #SoundOn	(Profile Image) Post text: Introducing LumaSound wireless headphones. Enhanced auditory output. Maximum comfort for prolonged usage. Seamless performance with consistent sound quality. Stability: high. Recommended for audio enhancement and efficiency optimization. #LumaSound #Headphones	(Profile Image) Post text: Introducing LumaSound wireless headphones. Enhanced auditory output. Maximum comfort for prolonged usage. Seamless performance with consistent sound quality. Stability: high. Recommended for audio enhancement and efficiency optimization. #LumaSound #Headphones
Example 1: VI with high form and behavioral realism (male)	Example 2: VI with high form and behavioral realism (female)	Example 3: VI with low form and behavioral realism (male)	Example 4: VI with low form and behavioral realism (female)

Data availability

Data will be made available on request.

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