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AI AVATARS AND VIRTUAL INFLUENCERS: UNDERSTANDING TRUST
DYNAMICS IN DIGITAL MARKETING

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PhD

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AI Avatars and Virtual Influencers: Understanding Trust Dynamics
in Digital Marketing

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A thesis submitted in partial fulfilment of the requirements for the degree of
Doctor of Philosophy

April 2025

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ABSTRACT

The rapid advancements in artificial intelligence (AI) have revolutionized the digital marketing landscape, leading to the proliferation of avatars—digital entities with an anthropomorphic appearance, controlled by humans or software, that are capable of interaction. While avatars have long been utilized, their roles have evolved from service agents to multifaceted tools across social media and beyond. For example, virtual influencers—AI-powered, computer-generated characters that operate on social media in lieu of human influencers—have gained significant attention from academia and industry. However, despite their growing popularity, building consumer trust in virtual influencers remains challenging. Virtual influencers can be freely modified and are highly adaptable, capable of appearing in diverse environments (i.e., virtual or real), paired with any companion (i.e., virtual or human), and expressing a broad spectrum of emotions, from positive to negative. Yet, little is known about how to leverage this adaptability to build trust in virtual influencers. This dissertation addresses these gaps through three interconnected chapters, offering a comprehensive examination of avatar marketing with a specific focus on virtual influencers.

Chapter One provides a systematic literature review of avatar marketing by synthesizing insights from 203 Web of Science-indexed publications from the past fifteen years. It employs bibliometric network visualization to chart the evolution of

avatar research and uses citation network analysis to identify seven distinct research domains, with main path analysis mapping the knowledge structure within each. The chapter concludes by outlining future research directions across these domains and proposing a four-phase, seven-domain avatar marketing framework. Chapter Two investigates the effect of contextual cues on shaping consumer trust and overall attitudes toward virtual influencers. Three experiments reveal that human-like virtual influencers are perceived as less trustworthy than either their anime-like counterparts or human influencers. However, trust in virtual influencers improves when they are presented in a virtual (vs. real) environment or accompanied by a virtual (vs. human) companion, resulting in more positive attitudes. Chapter Three examines the asymmetric effects of emotional expressions on consumer perceptions of virtual influencers. Through an analysis of Instagram field data combined with three controlled experiments, the research demonstrates that negative (vs. positive) emotional expressions elicit stronger feelings of uncanniness and reduce consumer trust, thereby diminishing marketing outcomes (i.e., product attitudes and purchase intentions).

This dissertation provides a comprehensive exploration of virtual influencer marketing, integrating insights from consumer psychology, human-avatar interaction, and marketing communication. The findings offer valuable implications for both researchers and practitioners, providing guidelines for effectively incorporating virtual

influencers into digital marketing strategies. The dissertation concludes by discussing the theoretical and managerial implications and suggesting directions for future research.

PUBLICATIONS ARISING FROM THE THESIS

Qu, Y., Lo, C. K. *, & Baek, E (2025). “From humanoid to virtual humans: A systematic review of avatar marketing,” *International Journal of Human-Computer Interaction*, 1-20.

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INTRODUCTION

Research Background

In recent years, advancements in artificial intelligence (AI), including generative AI (GenAI) and large language models (LLMs), have driven significant technological transformations in digital marketing. These innovations have fueled the proliferation of digital characters, known as avatars—human-like figures operated by humans or software, endowed with interactive features (Miao et al., 2022). Today's avatars are not merely passive entities; they actively engage in meaningful communication and form emotional bonds with users (Silva & Bonetti, 2021). For example, Microsoft's Xiaoice serves as a supportive companion, addressing users' needs for communication, affection, and social belonging (Dormehl, 2018), while also functioning as a marketing tool by leveraging JD.com's product catalog to assist shoppers (Soper, 2015). With its highly human-like appearance, Xiaoice has facilitated real-time interactions for over 660 million users since its launch in 2014 (Zhou et al., 2020).

Among these avatars, virtual influencers have emerged as a novel category, designed to emulate human behavior, personality, and emotions to engage with online audiences (Moustakas et al., 2020). With a prominent social media presence, virtual

influencers endorse products/services/brands, interacting with audiences in ways that closely resemble human influencers (Arsenyan & Mirowska, 2021; Moustakas et al., 2020). A notable example is Lil Miquela on Instagram, created by Brud, who has amassed millions of followers and partnered with global brands like Porsche, Samsung, Chanel, and Prada (Liu & Lee, 2024), underscoring the commercial viability of virtual influencers and their expanding role in shaping digital consumer behavior. The market for social media avatars, particularly virtual influencers, is rapidly growing, with an expected valuation of \$4.6 billion and a growth rate of 26% by 2025 (Wan & Jiang, 2023).

Research Objectives

The growing use of virtual influencers in marketing raises important questions about their effectiveness. On one hand, studies suggest that virtual influencers are often perceived as less authentic and persuasive, which can result in weaker parasocial relationships and lower brand interest (Luo & Kim, 2023; Lou et al., 2023). Consequently, virtual influencers tend to generate less favorable attitudes and lower purchase intentions compared to their human counterparts (Qu & Baek, 2023; Li et al., 2023; Zhou et al., 2023). On the other hand, virtual influencers offer unique advantages.

They have been shown to outperform human influencers in conveying novelty, enhancing brand innovativeness, and stimulating word-of-mouth intentions (Franke et al., 2023; Sands et al., 2022). Additionally, they evoke lower levels of negative emotions from audiences, fostering more positive consumer interactions (Barari, 2023). Virtual influencers are also linked to reduced appearance-related anxiety among audiences, creating a more inclusive and non-judgmental environment (Deng & Jiang, 2023). These mixed findings reveal the complexity of consumer perceptions of virtual influencers and underscore the pivotal role of trust in shaping their marketing effectiveness, pointing to the need for a more nuanced understanding.

Several important gaps remain in the field of AI avatars and virtual influencer marketing. First, to fully understand how virtual influencers impact consumer trust, it is essential to examine the broader body of avatar research and trace its development from the early stages for a systematic review. Earlier review papers primarily focused on the initial forms of avatars, excluding AI-powered avatars due to technological limitations at the time (e.g., Beale & Creed, 2009). Recent reviews have begun addressing artificial avatars, but often adopt narrow scopes. For instance, Liew and Tan (2021) concentrated on customer service applications, overlooking broader marketing contexts. Laszkiewicz and Kalinska-Kula (2023) examined virtual influencers solely within social media, leaving other marketing domains underexplored. Miao et al. (2022)

proposed a taxonomy of avatars based on realism levels to address definitional inconsistencies by reviewing recent avatar-related research. While these studies provide valuable conceptual frameworks, they neither systematically review previous research nor offer a comprehensive view of avatar evolution. Their categorizations of knowledge often reflect the authors' priorities and preferred structures rather than offering a holistic synthesis of the field.

Chapter One fills this gap by examining avatar research from the past fifteen years, covering 203 high-quality publications in the field of digital marketing. Employing analysis tools such as VOSviewer, CitNetExplorer, and Pajek (Cai & Lo, 2020; Wei et al., 2021), the review objectively traces the academic trajectory of avatar literature and outlines future research directions across seven domains: (1) drivers of avatar adoption, (2) human-avatar interaction, (3) effective avatar design, (4) avatars with distinct personalities, (5) user satisfaction, (6) avatar anthropomorphism, and (7) avatar usability. The review concludes by proposing a comprehensive four-phase, seven-domain framework of avatar marketing. Special emphasis is placed on Phase One, which focuses on the anthropomorphic design of avatars to enhance consumer trust and marketing effectiveness, guiding the industry through the ongoing AI revolution.

Second, the literature on virtual influencer marketing has largely overlooked the role of contextual cues in shaping consumer trust. Existing studies have examined factors such as perceived authenticity

Second, a critical gap remains in the virtual influencer marketing literature regarding how contextual factors influence consumer trust. Existing studies have examined aspects like perceived authenticity (Moustakas et al., 2020; Batista da Silva Oliveira & Chimenti, 2021), moral responsibility (Yan et al., 2024), the persuasive power of virtual influencers (Faddoul & Chatterjee, 2020), audience reactions to their social media presence (Arsenyan & Mirowska, 2021), and the effectiveness of their endorsements (Franke et al., 2023; Zhou et al., 2023). Social media platforms (e.g., Instagram) have increasingly relied on images, using visual representations of products, services, or lifestyle elements to engage consumers (Choi & Rifon, 2007). However, little is known about how visual elements—particularly contextual cues within posts—affect consumer trust and attitudes toward virtual influencers.

To address this gap, Chapter Two examines whether the location of virtual influencers (background type: virtual vs. real environment) and their companions (companion type: virtual vs. human influencer) serve as determinants of consumer perceptions and attitudes. Drawing on cue utilization theory (e.g., Olson, 1978) and

consistency theory (Fiske & Taylor, 1991; Groom et al., 2009), this chapter explores how these visual cues (i.e., background type and companion type) shape consumer trust and attitudes toward virtual influencers. Through three experimental studies, the results indicate that virtual influencers with human-like characteristics are viewed as less trustworthy compared to both anime-like virtual influencers and human influencers. However, trust in virtual influencers increases when they are placed in a virtual environment rather than a real one, or when they are accompanied by a virtual companion instead of a human, leading to more favorable attitudes.

Third, an important yet underexplored area in building consumer trust in virtual influencers concerns the impact of their emotional expressions. A notable phenomenon in the narratives of virtual influencers is their ability to convey both positive and negative emotions (CSMP, 2023). Consumers in human-avatar interactions generally prefer positive emotions when avatars express emotions like joy (Zhou et al., 2017) or happiness (Chuah & Yu, 2021), as these emotions enhance trust (Torre et al., 2020), perceived warmth, service quality, and satisfaction (Yu & Ngan, 2019). In contrast, another body of research on social media shows that, while emotional expressions are typically positive (Chung et al., 2023), negative emotional expressions—such as those in tweets and Instagram posts—are more likely to engage audiences effectively (Tsugawa & Ohsaki, 2015; Chung et al., 2023). Negative emotions are engaging,

possibly because they are often perceived as unconventional and authentic (Sommers, 1984; Waterloo et al., 2017). Given these contradictory effects in terms of negative emotional expression, it raises an interesting question: how do the negative (vs. positive) emotional expressions of virtual influencers—who, as avatars, have a presence on social media—affect consumer perceptions and, ultimately, marketing effectiveness?

Chapter Three addresses this question through the lens of the positive-negative asymmetry phenomenon, which suggests that negative information captures more attention and triggers stronger cognitive and emotional responses than positive information (Peeters, 1971; Ito et al., 1998; Baumeister et al., 2001; Rozin & Royzman, 2001). This asymmetry is particularly relevant in the context of virtual influencers, whose emotional expressions may heighten consumers' perceptual sensitivity, particularly concerning the Uncanny Valley, where highly anthropomorphic non-human entities are perceived as discomfoting (Mori, 1970). To investigate this, Chapter Three compares the impact of negative versus positive emotional expressions by virtual influencers through a multi-method approach, combining field data from Instagram with three controlled experiments. This approach allows for both ecological validity and experimental control, offering comprehensive insights into how emotional expressions influence consumers' affective (i.e., uncanniness) and cognitive perceptions (i.e., trust). The findings reveal that negative emotional expressions

heighten perceptions of uncanniness, reduce consumer trust, and ultimately diminish endorsement effectiveness.

To conclude, this dissertation explores the following research questions:

RQ1 (Chapter One): How has avatar research evolved in the field of digital marketing, and what are the key domains and future directions in avatar marketing?

RQ2 (Chapter Two): How do contextual visual cues—background environment type (virtual vs. real) and companion type (virtual vs. human)—affect consumer trust and attitudes toward virtual influencers?

RQ3 (Chapter Three): How do virtual influencers' negative (vs. positive) emotional expressions influence consumer perceptions (i.e., uncanniness and trust) and marketing effectiveness (i.e., product attitudes and purchase intentions)?

This dissertation is structured into three interconnected chapters, each addressing one of the research questions while offering complementary insights into how AI avatars and virtual influencers shape consumer trust in digital marketing. Through a comprehensive exploration of their influence on consumer perceptions and marketing effectiveness, the study integrates theoretical frameworks with empirical evidence to examine key factors—such as anthropomorphism, contextual cues, and

emotional expression—that impact trust and brand outcomes. The findings not only advance academic understanding but also provide practical implications for marketing practitioners, informing strategies to build and sustain consumer trust in an AI-driven marketplace.

CHAPTER 1

A SYSTEMATIC LITERATURE REVIEW ON AVATAR MARKETING

Abstract

Avatars, whether human-operated or AI-driven, are anthropomorphic digital characters that engage users through computer-mediated communication. Recent advances in artificial intelligence have accelerated avatar adoption in marketing and led to a surge in related research. However, a gap remains in integrating interdisciplinary insights into a cohesive marketing framework with objective methods. This systematic review addresses the gap by synthesizing insights from 203 publications in the Web of Science over the past fifteen years. First, a bibliometric network visualization charts the evolution of avatar research. Second, a citation network analysis identifies seven distinct research domains. Third, a main path analysis systematically maps the knowledge structure within each domain. Notably, "anthropomorphism" emerged as a dominant theme, signaling a trend toward avatars becoming increasingly anthropomorphic in form, behavior, and cognition. The review concludes by outlining future research directions within the seven research domains, proposing a four-phase, seven-domain avatar marketing framework, and offering valuable insights for both scholars and practitioners.

1. Introduction

Advancements in digital technology have driven the rapid proliferation of digital characters, commonly referred to as avatars (Miao et al., 2022). Examples include chatbots, embodied agents, virtual agents/assistants, and virtual humans (Von der Pütten et al., 2010; Silva & Bonetti, 2021). According to Miao et al. (2022), avatars are "digital figures with human-like appearances, operated by humans or software, possessing interactive features." Initially designed for task-oriented responses to simple queries and once scripted (Qu & Baek, 2023), avatars have evolved into autonomous versions powered by artificial intelligence (AI) (De Freitas & Cohen, 2024), resembling humans with life-like appearances and naturalistic interactions (Li et al., 2023). Similarly, Silva and Bonetti (2021) emphasize this AI-driven functionality, describing avatars as "life-like beings powered by AI." Li et al. (2023) highlight the avatars' human-like imagery and behavior in their definition.

Avatar marketing refers to the strategic use of digital personas, virtual characters, or computer-generated representations to promote products, services, or brands. Avatars today are not merely passive; they actively engage in meaningful communication and form emotional bonds with users (Silva & Bonetti, 2021). For example, Microsoft's Xiaolce, serves as a supportive companion, addressing users' needs for communication, affection, and social belonging (Dormehl, 2018), while also functioning as a marketing

tool by leveraging JD.com's product catalog to assist shoppers (Soper, 2015). It features a highly human-like appearance and has facilitated real-time interactions for over 660 million users since its launch in 2014 (Zhou et al., 2020). Across industries, more avatars, such as Samsung Neons and Daniel Kalt of UBS Switzerland, provide information and advice to consumers (Zhou et al., 2020; Hasan et al., 2021). Accordingly, the adoption of avatars as marketing communication tools is expected to grow substantially, with projections indicating a 187% increase in consumer products and a 241% rise in the travel and hospitality sectors (Sweezey, 2019). In the banking industry, 87% of companies either already use avatars or plan to adopt them within the next two years (Torresin, 2019). Additionally, avatars in social media marketing, particularly virtual influencers, are on the rise, with the market expected to reach a valuation of \$4.6 billion and a growth rate of 26% by 2025 (Wan & Jiang, 2023).

With the rapid expansion of avatar applications, research on avatars has expanded. Miao et al. (2022) address inconsistencies in avatar definitions and propose a taxonomy based on their level of realism. They argue that aligning an avatar's form and behavioral realism can lead to positive marketing outcomes. Hasan et al. (2021), through practical case studies from multiple industries, examine customer experiences in interactions with avatars, highlighting the importance of their anthropomorphic features. While these works significantly contribute to the avatar literature by building

a conceptual framework, they neither systematically review prior studies nor provide a holistic view of avatar evolution. Earlier review papers, however, focused on avatars in their early forms, excluding AI-powered ones due to the technological constraints of the time (e.g., Beale & Creed, 2009). Although Liew and Tan (2021) recently reviewed the literature on artificial agents, their focus was limited to customer service rather than offering a broader marketing perspective. Likewise, Laszkiewicz and Kalinska-Kula (2023) examined virtual influencers in their review, focusing on the narrow context of social media marketing. Most importantly, the categorizations of knowledge in previous review papers were based on the authors' understanding, reflecting their priorities and preferred knowledge structures in avatar research. Therefore, a systematic review is necessary to synthesize existing findings, clarify the scope of the field, and propose future research agendas.

To fill the gap, this review examines avatar research from the past fifteen years, covering 203 high-quality publications. By utilizing scientific tools—VOSviewer, CitNetExplorer, and Pajek (e.g., Cai & Lo, 2020; Wei et al., 2021)—this review objectively traces the academic trajectory of avatar literature and outlines future research directions across seven domains: (1) drivers of avatar adoption, (2) human–avatar interaction, (3) effective avatar design, (4) avatars with distinct personalities, (5) user satisfaction, (6) avatar anthropomorphism, and (7) avatar usability. Among these

domains, the growing significance of avatar anthropomorphism was highlighted, illustrating the evolution of avatars from humanoid figures to more intelligent virtual humans. This systematic literature review (SLR) is the first to investigate AI avatars from a fully integrated marketing perspective while incorporating interdisciplinary insights.

By doing so, this review introduces a step-by-step avatar marketing journey comprising four interrelated phases. While few studies have thoroughly investigated the consumer decision-making process behind avatar adoption, much of the literature has focused solely on specific aspects of avatar marketing (e.g., social cues of avatars in Gutuleac et al., 2024; anthropomorphism and emotional receptivity of avatars in Sestino & D'Angelo, 2023). Thus, our proposed journey maps the entire avatar marketing process—from design and adoption to interaction and evaluation—offering a structured framework that unifies previously fragmented insights. Unlike studies that focus on static outcomes, our cyclical paradigm illustrates how continual improvements can enhance avatar marketing, ultimately benefiting both the consumer experience and marketing performance over time. This comprehensive perspective provides a complete understanding of the complexities involved in avatar marketing.

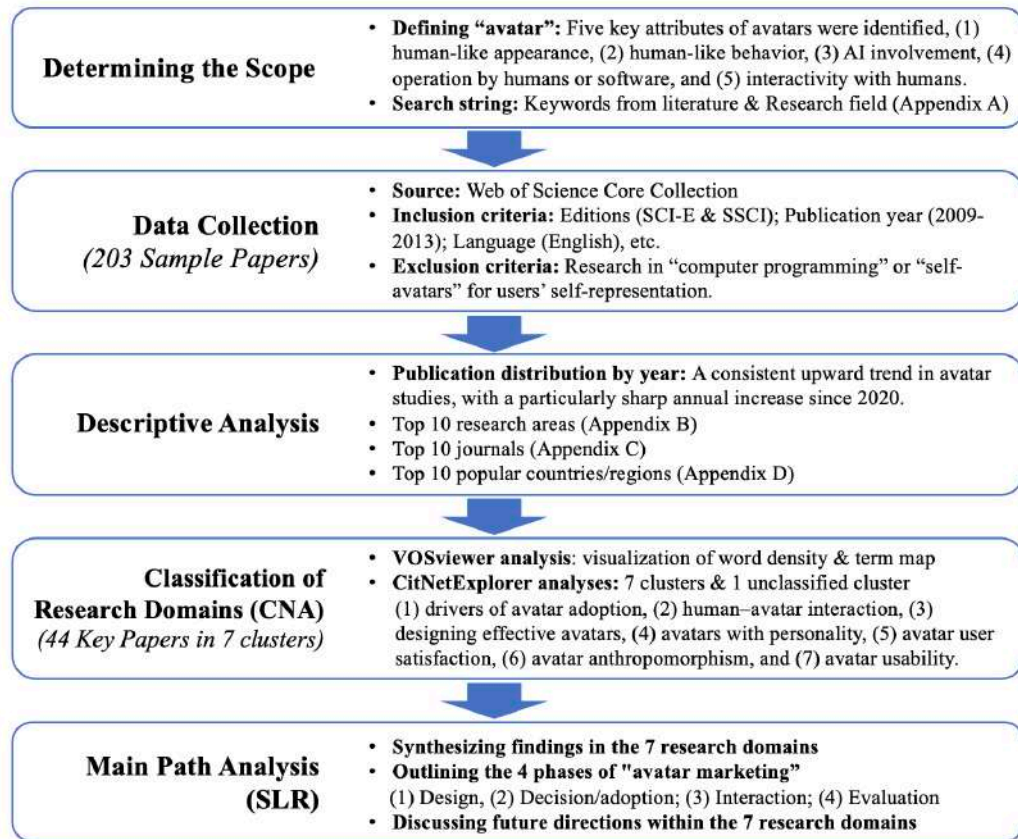
Furthermore, this work systematically derives insights into the relationships among existing studies by employing citation network analysis (CNA) and main path

analysis (MPA). This approach clarifies the rich interconnections within the literature, which were previously difficult to discern due to its vast volume (Sybrandt et al., 2018; Banker et al., 2024). Specifically, CNA identifies key research domains, while MPA illuminates the knowledge structure of avatars within these areas. By combining quantitative methods (i.e., CNA) with qualitative techniques (i.e., SLR), the systematic literature network analysis (SLNA) yields more comprehensive and reliable findings than either approach could achieve alone (Colicchia & Strozzi, 2012). Additionally, co-occurrence analysis enhances this review by visualizing the bibliometric network. Through this rigorous methodological framework, our review distinguishes itself from other avatar studies in both methodology and content (see Table 1). The findings offer valuable insights into the future of avatar research and its practical applications in digital marketing.

Aspect	Avatar Review Article						
	Rist et al. (2004)	Beale & Creed (2009)	Guo & Goh (2015)	Aljaroodi et al. (2019)	Liew & Tan (2021)	Laszkiewicz & Kalinska- Kula (2023)	This review
Using CNA							✓
Using MPA							✓
Using SLR				✓	✓	✓	✓
Marketing perspective						✓	✓
Revealing avatar evolution	✓		✓				✓
Including various types of avatars				✓	✓		✓
Encompassing various application fields	✓			✓	✓		✓
Visualizing the keywords						✓	✓
Summarizing research methods		✓				✓	✓
Concluding conflicting findings		✓					✓
Identifying research domains				✓		✓	✓
Proposing a unified framework				✓		✓	✓

[TABLE 1: Comparison to relevant reviews of avatars literature]

The report of this SLNA follows the Preferred Reporting Items for Systematic Reviews (Page et al., 2021), a widely adopted guideline for systematic reviews across various fields (e.g., Yan et al., 2024; Cordas dos Santos et al., 2024; Sadozai et al., 2024). In the following sections, this review begins by defining the scope of the review and describing the data collection process by detailing the inclusion and exclusion criteria. Next, a co-occurrence analysis is conducted to generate the term maps of keywords in the avatar marketing literature, illustrating keyword density and its evolution over time. The results of the CNA are then presented, highlighting seven major research domains. Subsequently, MPA is applied to synthesize key papers within these domains, suggesting future research directions for each. Finally, the review concludes with a summary of its theoretical, methodological, and practical contributions. The overall process of this SLNA is depicted in Figure 1.



[FIGURE 1: The SLNA flow]

2. Methodology

2.1 Data Collection

AI-powered avatars are anthropomorphic digital characters featuring human-like appearance and behavior (Li et al., 2023). They are controlled by either humans or software and can interact with humans via computer-mediated communication (Miao et al., 2022; Silva & Bonetti, 2021). As such, five key attributes of avatars were identified: (1) human-like appearance, (2) human-like behavior, (3) AI involvement, (4) operation by humans or software, and (5) interactivity with humans. These components form the foundation for synthesizing the literature on avatar marketing in this review.

To align with the definition of avatars, terms such as “anthropomorphism” and “AI” were included in the search string, with additional terms frequently mentioned in recent avatar research (Miao et al., 2023; Liew & Tan, 2021; Silva & Bonetti, 2021). To include high-quality papers, the following criteria were applied: (1) relevance to the marketing domain; (2) publication in SCI or SSCI journals; (3) publication within the last fifteen years; (4) papers written in English; and (5) exclusion of conference proceedings, book chapters, and early access articles to ensure complete citation data. As a result, 203 key papers were identified for analysis and review (see Appendix A for the search string).

2.2 Data Analysis Method

In the literature review, the most common approaches to measuring relatedness are based on either citation or word relations (Van Eck & Waltman, 2017). Word relations rely on shared words in publication titles, abstracts, or full texts as indicators of relatedness (e.g., Janssens et al., 2009). This review adopts a combined approach that considers both citation and word-relatedness (Boyack & Klavans, 2010). Using a quantitative method, citation relations were classified into three categories: direct citation relations, bibliographic coupling, and co-citation relations (Boyack & Klavans, 2010; Klavans & Boyack, 2017).

Specifically, to bolster the objectivity of our literature review, we employ SLNA by using “VOSviewer”¹ and “CitNetExplorer,”² which offer complementary visualizations, with aggregate level (i.e., VOSviewer) and individual publications (i.e., CitNetExplorer) (Van Eck & Waltman, 2017). CNA crafts a social network where both authors and papers stand as nodes, with their mutual citations acting as edges (Colicchia & Strozzi, 2012). This method is based on the premise that citation networks go beyond mere abstract links between articles, serving as systematic pathways for disseminating and evolving knowledge (Hummon & Doreian, 1989; Colicchia & Strozzi, 2012). Such

¹ <https://www.vosviewer.com>

² <https://www.citnetexplorer.nl>

networks reveal how researchers, particularly in similar domains, frequently cite each other, building upon prior knowledge and contributing fresh perspectives (Cai & Lo, 2020; Wei et al., 2021). This review uses CNA to highlight key research domains, track the evolution of scholarly traditions, and identify emerging paradigms, offering a more comprehensive and objective analysis than traditional systematic literature reviews (Ngai et al., 2007).

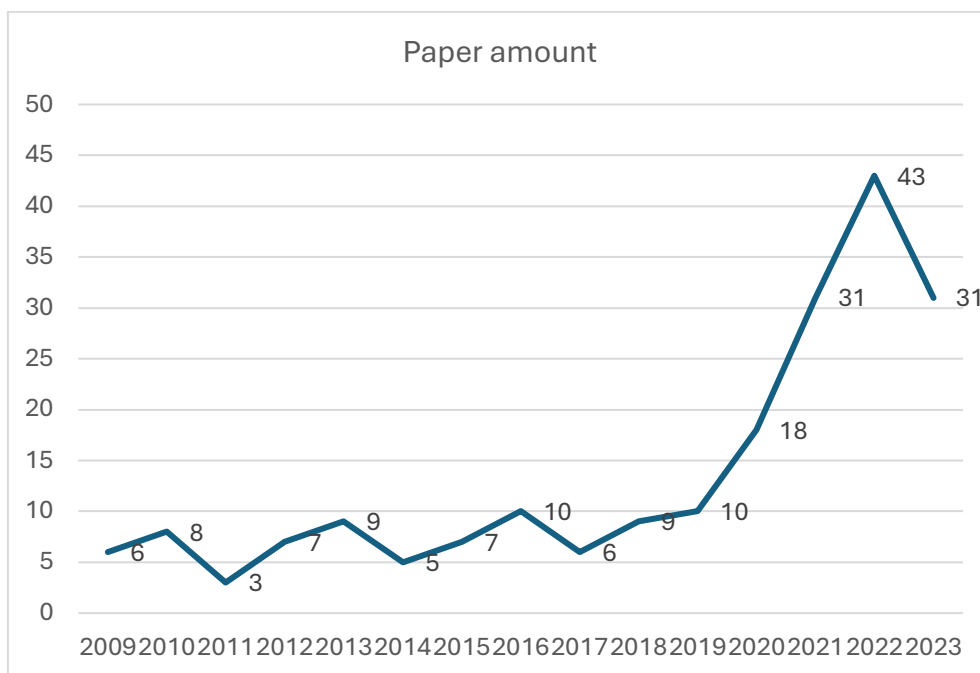
To review the knowledge structure of the major research domains identified by CNA, we applied MPA by using “Pajek 64,”³ a tool that aids in selecting the appropriate traversal weight scheme and pinpointing the dominant papers (Zeng et al., 2020). Through weighting citations within each cluster, MPA allows us to discern the most significant paths (Fan et al., 2012; Tong et al., 2019). Leveraging this approach, the evolution of each avatar research domain was visualized, presenting a prospective agenda for future research.

³ <http://mrvar.fdv.uni-lj.si/pajek/>

3. Descriptive Statistics: Distribution of Publications by Year

To provide a holistic view of avatar marketing research, the descriptive analysis was conducted to show the (1) Publication distribution by year, (2) Top 10 research areas (see Appendix B), (3) Top 10 journals (see Appendix C), and (4) Top 10 popular countries/regions (see Appendix D).

Figure 2 displays the article distribution from 2009 to 2023, revealing a consistent upward trend in avatar studies, particularly pronounced since 2020, with a sharp annual rise. Over the last three years (2021–2023), 105 articles on avatars accounted for 51.72% of total publications, likely attributed to the widespread application of AI technology (Zhang et al., 2021). Another factor might be the global impact of COVID-19, which emerged in December 2019 and intensified in 2020. This pandemic underscored the importance of social distancing (Krishnamurthy, 2020), driving increased network use (Donthu & Gustafsson, 2020), virtual communication (Singh et al., 2020), and e-commerce (Tran, 2021). These shifts have undeniably spurred demand for avatar-based marketing services across various sectors. The use of avatars will continue to surge in the future (Sweezy, 2019; Torresin, 2019).



[FIGURE 2: Paper amount distribution by year (till July 2023)]

4. Classification of Research Domains

4.1 Bibliometric Network Visualization

This paper uses VOSviewer, a software tool specializing in constructing and visualizing bibliometric networks, to complement CitNetExplorer (Van Eck & Waltman, 2017). By utilizing co-occurrence analysis, a term map was generated to provide insights into the landscape of avatar marketing literature over the past fifteen years. This visualization showcases 97 frequently utilized terms extracted from the titles and abstracts of 203 research papers. In Figure 3, the colors of the dots transition from dark purple, blue, and green to light yellow, symbolizing the evolution of these terms from early research to more recent endeavors. The lines connecting these dots and the distances between them denote relationships among the terms. When two terms are closely positioned with prominent connecting lines, it signifies a strong co-occurrence relationship, indicating their frequent appearance together in articles. Figure 4 illustrates word density, where a deeper and broader yellow range indicates heightened term prominence, signifying more frequent adoption and extensive research focus within the realm of avatar marketing.

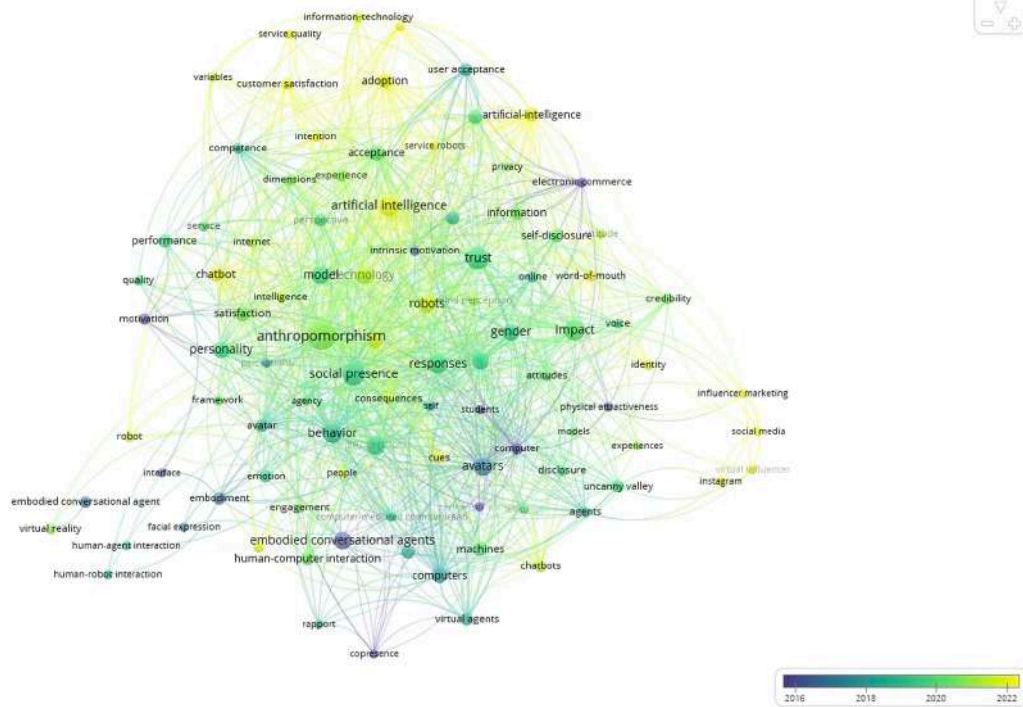
When examining both visualizations together, a preliminary understanding of the avatar marketing literature emerges. Notably, “anthropomorphism” stands out as

the most predominant term in visualization, garnering increased attention from researchers, especially around and after the year 2020. Anthropomorphism involves attributing human traits to non-human characters (Waytz et al., 2010). Examples include seeing faces in clouds, treating pets as companions, or shouting at malfunctioning computers (Guthrie, 1995). In avatars, anthropomorphism can be conveyed through both visual and audio design elements, which can significantly influence user adoption intentions (Sestino & D'Angelo, 2023). The prominence of anthropomorphism in the term map reflects how recent technological advancements have enhanced avatar human-likeness, sparking growing academic interest in this phenomenon. The research domain of “avatar anthropomorphism” will be thoroughly discussed in Section 5.6 (Cluster 6: Avatar anthropomorphism) of this review.

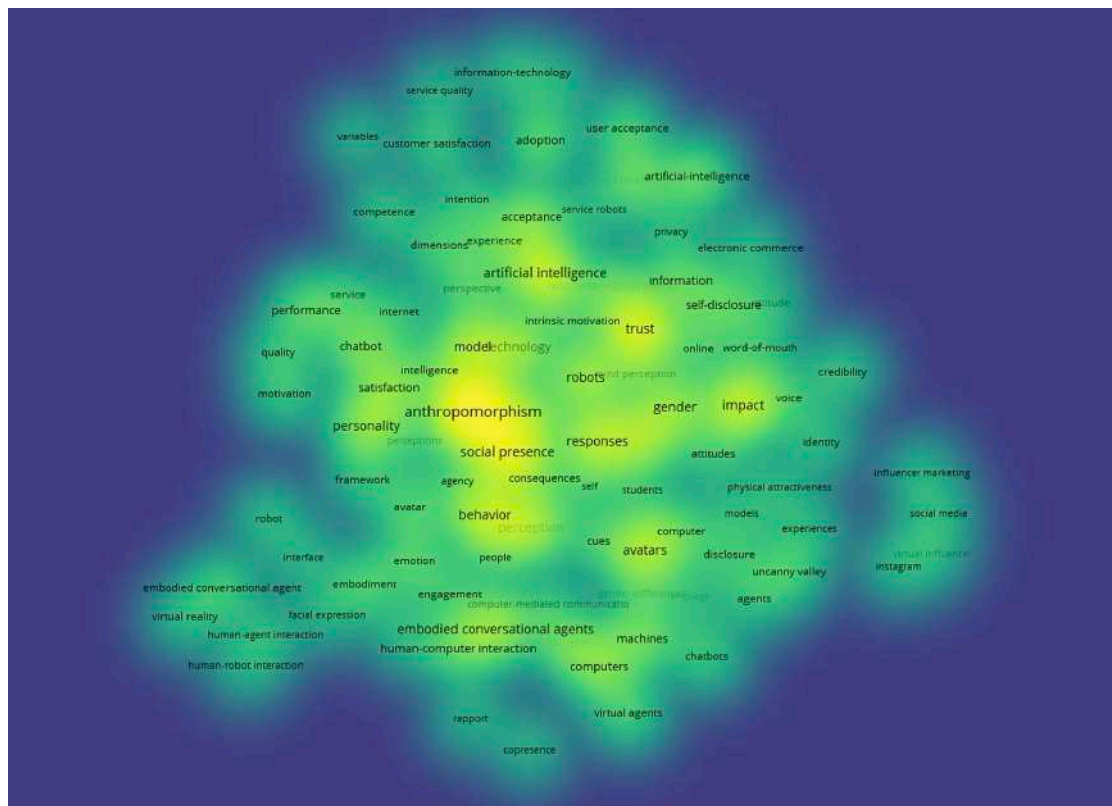
Additionally, “trust” gained scholarly attention around 2020, suggesting its pivotal role in avatar interactions. “Artificial intelligence” closely neighbors “trust,” indicating a closely intertwined relationship between both concepts. A recent review reveals that trust is particularly relevant to human–AI interactions due to the complexity and non-determinism of AI behaviors, which lead to consumers’ perceived risk (Glikson & Woolley, 2020). Building on the technology acceptance model (TAM; Davis, 1989), the concept of trust was added as a significant predictor of technology acceptance (Hoff & Bashir, 2015; Lee & See, 2004). Around 2016, the terms “avatars”

and “conversational agents” received extensive research attention. Given that “avatars” served as a primary keyword in search queries, its prominence is expected. The increase in research on “conversational agents” suggests that avatars used for conversational interactions held significant popularity during the period. As technology advances, the visualization’s lower right section shows a surge in research around “social media” (e.g., represented by “Instagram”) and “influencer marketing,” particularly in 2022 and 2023. Within this context, a novel type of avatar, the “virtual influencer,” emerges; however, research in this area is still nascent (Yu et al., 2024; Zhou et al., 2023).

To complement CNA, these frequently used terms will be further discussed within the research domains identified by CNA (e.g., “anthropomorphism” in Domain 6, and “social media,” “influencer marketing,” and “virtual influencer” in Domain 4).



[FIGURE 3: VOSviewer term map visualization—keywords evolution]

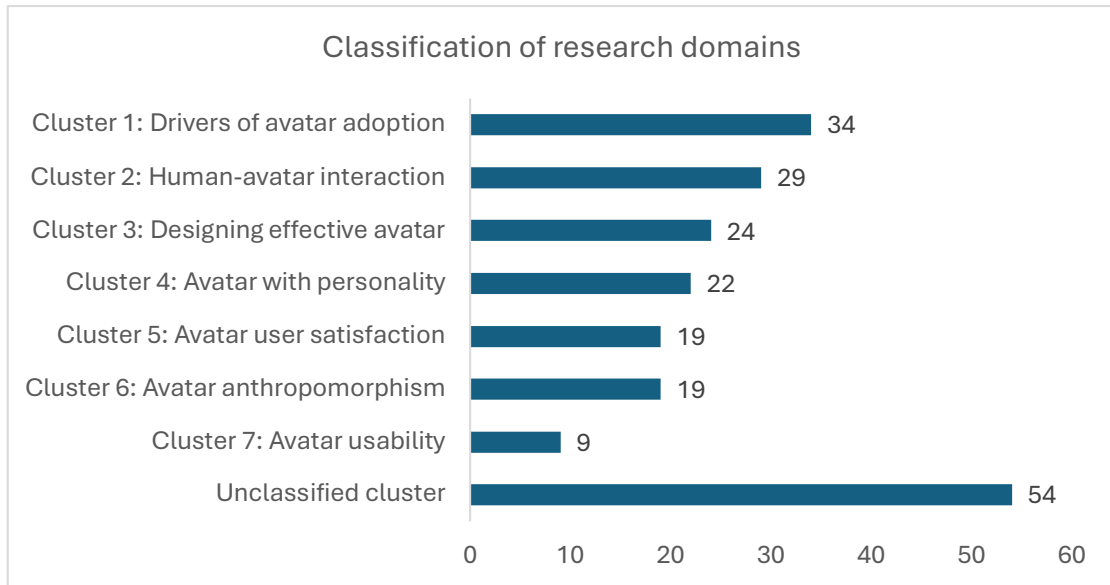


[FIGURE 4: VOSviewer term map visualization—word density]

4.2 Citation Network Analysis

CNA was performed using the software “CitNetExplorer” to categorize the 203 sample papers into clusters. The results of the analysis are illustrated in Figure 5. In this regard, we identified seven main clusters comprising 149 papers. Notably, 54 unclassified papers did not fall into these seven main clusters. After a thorough review, it was confirmed that these 80 articles lack discernible correlations. These scattered articles, termed “unclassified cluster,” represent 26.60% of the sample articles.

In the other seven research domains, the three most popular research domains are “drivers of avatar adoption” (34 papers, 16.75%), “human–avatar interaction” (29 papers, 14.29%), and “designing effective avatars” (24 papers, 11.65%). Additionally, there are 22 papers (10.84%) focusing on “avatar with personality,” with 19 papers (9.36%) dedicated to both “avatar user satisfaction” and “avatar anthropomorphism.” The domain of “avatar usability” garnered the least attention, with only nine papers (4.43%). Each research domain will be examined further in Section 5.



[FIGURE 5: Paper amount distribution by research domain]

5. Main Path Analysis Results and Future Research Direction

5.1 Cluster 1: Drivers of Avatar Adoption

Drivers of avatar adoption refer to the key factors that motivate individuals or organizations to use avatars. As the largest research domain identified, its knowledge structure is shown in Figure 6. Avatar adoption occurs in various marketing contexts, including online retailing (e.g., the product recommendation agent (PRA) in Qiu and Benbasat (2009), sales avatar in Keeling et al. (2010)), and those in customer service (e.g., the personal intelligent agent (PIA) in Moussawi et al. (2021); the intelligent personal assistant (IPA) in Hu et al. (2021), and digital voice assistants in Fernandes and Oliveira (2021)). In this domain, surveys, experiments, and mixed methods are commonly employed for data collection. For data analysis, structural equation modeling (SEM), a tool designed for analyzing complex models with numerous variables (Hair et al., 2014), is the most frequently used method for investigating the drivers of avatar adoption, with seven out of eight papers in the main path utilizing SEM.

From a social relationship perspective, Qiu and Benbasat (2009) conducted early research examining the essential interface design elements for effective avatars (i.e., PRA). The results of a laboratory experiment demonstrate that incorporating

anthropomorphic interfaces—particularly humanoid embodiment and human voice output—into an avatar significantly enhances users’ sense of social presence. This, in turn, strengthens trust in the avatar and increases their feelings of enjoyment. Moussawi et al. (2021) applied these findings to examine the factors influencing the application of service avatars, specifically PIAs. They developed a user adoption model that incorporates the unique characteristics of avatars and identified perceived intelligence and anthropomorphism as significant antecedents of avatar adoption.

In the subfield within this research domain, Keeling et al. (2010) proposed a three-fold approach for avatar implementation, which entails capturing requirements to determine the suitable appearance, role, interaction style (i.e., social- or task-oriented communication), and content for the intended task. Chattaraman et al. (2019) extended this by comparing social- and task-oriented avatars in online shopping for older consumers. The findings reveal that Internet competency and the conversational style of the avatar had significant interaction effects on social, functional, and behavioral outcomes. On this basis, Hu et al. (2021) examined the impact of artificial autonomy on avatar (i.e., IPA) usage, specifically focusing on three types of autonomy: sensing, thought, and action. Drawing on mind perception theory (Gray & Wegner, 2020; Waytz et al., 2010), the authors proposed that competence and warmth, as dimensions of

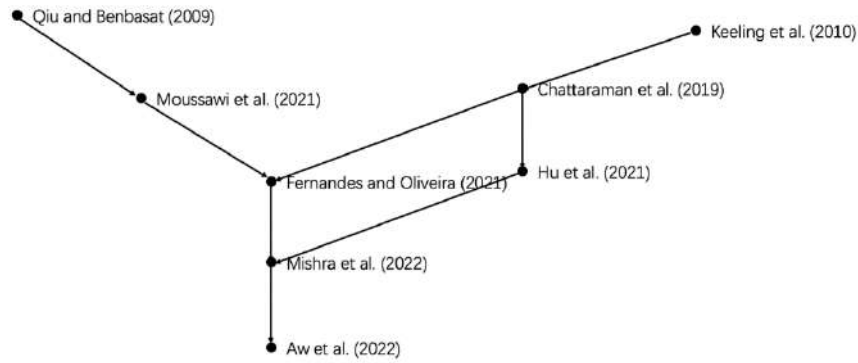
human-like perceptions, elucidate the relationship between artificial autonomy and avatar usage.

Together, the two branches of knowledge have inspired recent research on drivers of avatar adoption. Fernandes and Oliveira (2021) examined the motivations for adopting avatars (i.e., intelligent digital voice assistants). They conducted a comprehensive exploration of the functional elements of avatars (including ease of use, usefulness, and social norms), social aspects (including humanness, social interactivity, and social presence), as well as the rational components (including trust and rapport) that drive adoption. In line with the “attitude shapes behavior” approach, Mishra et al. (2022) explored how hedonic and utilitarian attitudes affect the usage of avatars. The study found that the utilitarian attitude had a stronger impact than the hedonic attitude on avatars (i.e., smart voice assistant) usage and word-of-mouth (WOM). A research model proposed by Aw et al. (2023) examined the antecedents to continuance usage of avatars (i.e., digital voice assistants), encompassing human-like attributes (i.e., perceived anthropomorphism, perceived animacy, and perceived intelligence), technology attributes (i.e., performance expectancy, effort expectancy, and perceived security), and contextual factors (i.e., social influence and facilitating conditions). In another study by Gao et al. (2023), a model was developed based on the stimulus-organism-response (S-O-R) framework. The findings reveal that likeability, animacy,

and responsiveness positively influence social presence and telepresence, subsequently leading to increased purchase intention. The findings reveal that likeability and responsiveness have a direct impact on purchase intention, whereas animacy does not.

Understanding the drivers influencing avatar adoption is crucial for marketers, especially in contexts where continued engagement with avatars—such as in service settings—is essential. Since consumers' needs differ when interacting with avatars compared to human service providers, there is a notable gap in research contrasting human vs. avatar service providers. Future research could investigate how avatars impact product attitudes, purchase intentions, brand loyalty, and word-of-mouth (WOM) in online retailing. From a marketing perspective, focusing solely on drivers of adoption may not capture the full impact of avatars on consumer behavior. Further exploration of how avatars influence consumer perceptions and behaviors after adoption is necessary to deepen our understanding of avatar marketing effectiveness.

Additionally, future research could examine more analytical methods beyond SEM. While SEM is widely used to validate causal hypotheses in nonexperimental studies (Tomarken & Waller, 2005), it has limitations in experimental designs or in testing interaction hypotheses. Alternative methods, such as experimental designs, could provide more granular insights into how avatars influence consumer decision-making processes and marketing outcomes.



[FIGURE 6: The main path of drivers of avatar adoption]

5.2 Cluster 2: Human–Avatar Interaction

Human-avatar interaction, a subset of human-computer interaction, explores the interplay between avatars and avatar users. It constitutes the second-largest domain in avatar marketing research, emphasizing both avatar technology and the dynamic relationships that emerge in these interactions. Figure 7 shows the main path.

Von der Pütten et al. (2010) distinguished avatars (controlled by a human participant) from agents (controlled solely by a human) based on the level of agency. However, according to the latest definition by Miao et al. (2022), these virtual characters are commonly referred to as avatars. When comparing interaction with avatars and agents, Von der Pütten et al. (2010) found that the belief in interacting with either an avatar or an agent barely impacts the avatar evaluation and behavioral

reactions, whereas behavioral realism influences the interaction. Pickard et al. (2016) compared participants' preferences for disclosing information to a human or an avatar (i.e., embodied conversational agent (ECA)) interviewer. The findings indicated that avatars are preferred for discussing highly sensitive topics that could potentially elicit negative self-admissions. In contrast, human interviewers were preferred for less sensitive topics or those likely to evoke positive self-admissions. Correspondingly, in a study conducted by Schuetzler et al. (2018), it was found that participants perceived no difference between human interviewers and avatars (i.e., conversational agents (CAs)) when disclosing nonsensitive information. However, participants were less likely to disclose sensitive behavior to a human compared to an avatar. Additionally, when the avatar demonstrated understanding, participants were less inclined to disclose sensitive information compared to when it did not.

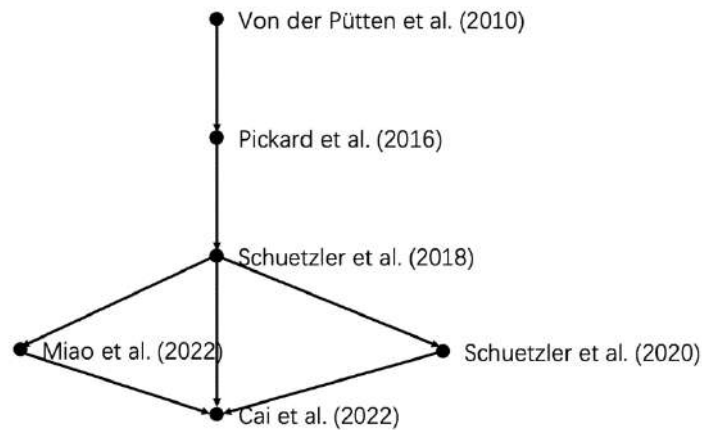
Building upon the work of Schuetzler et al. (2018), the following research emerged. Schuetzler et al. (2020) indicated that tailored responses and response variety form an avatar's conversational skills. According to social presence theory, higher-skilled avatars (i.e., conversational agents) are perceived as having more social presence and anthropomorphism, thereby boosting consumer engagement. Cai et al. (2022) studied how anthropomorphic cues affect customers' avatar (i.e., chatbots) usage intentions in online travel agencies. The findings suggest that although the social

presence and emotional cues were important, using human avatars or customer names alone was insufficient. Emotional cues strongly shaped usage intentions. Furthermore, perceived trustworthiness, intelligence, and enjoyment mediate the above effect.

Human–avatar interactions encompass a wide range of scenarios, including online gaming, a significant sector of the entertainment industry (Teng, 2010). Given gamers’ unique personalities and motivations (Jeng & Teng, 2008; Teng, 2008), the gamer–avatar relationship warrants further exploration. The rise of social media highlights the emergence of social media avatars (i.e., virtual influencers). Understanding how interactions with these avatars differ from those with traditional service avatars is crucial. While there is a marked difference in the initiator of interactions, the former proactively engages audiences, and the latter often responds to consumers passively. Human roles and intentions differ substantially in the interaction. Such distinctions are worth exploring in future research.

Interaction styles vary across avatar types: ECAs and CAs are conversation-driven, while chatbots are text-based. Future research could explore how the interaction modality (voice vs. text) affects consumer engagement, which, in turn, may influence the effectiveness of avatar marketing. Future research may also consider individual differences in human–avatar interaction. In addition to demographic information (e.g., age and gender; Tannen, 1990; Tannen, 1994), other factors, such as consumers’

technology readiness (Demirci & Ersoy, 2008), might impact human–avatar interaction. Additionally, researchers could focus on developing strategies to enhance the interaction experience, thereby improving overall marketing outcomes (e.g., purchases and revenue). This could be particularly impactful in industries such as healthcare, education, and fashion retail, where tailored interactions significantly influence consumer experiences.



[FIGURE 7: The main path of human–avatar interaction]

5.3 Cluster 3: Designing Effective Avatars

Designing effective avatars, the third-largest research domain in avatar studies, focuses on optimizing the visual and functional elements of avatars to enhance user engagement and achieve specific objectives. As depicted in Figure 8, this domain

explores how various design elements—such as appearance, behavior, and interactivity—can be tailored for different application scenarios, including online games, e-commerce, customer service, and virtual learning environments.

Building upon theories of attribution, social comparison, and social facilitation, Mumm and Mutlu (2011) initiated a branch of research in designing effective avatars. They demonstrated how feedback from an on-screen avatar praising participants or providing comparative information on others' performance can enhance users' intrinsic motivation to perform a task in an online game. Chattaraman et al. (2012) examined the advantages of simulated social interaction using virtual avatars on older consumers' experience in retail websites, specifically addressing age-related obstacles to online retail adoption. Mediation analyses showed that avatars had a two-fold impact (1) on trust mediated by perceived social support and (2) on patronage intentions partly mediated by trust and perceived risks. This has significant implications for e-commerce marketers seeking to increase consumer trust and reduce perceived risks—key factors influencing online purchase behaviors. Mimoun and Poncin (2015) explored the impact of using an avatar (i.e., embodied conversational agent (ECA)) on consumers' perceptions of shopping value (i.e., hedonic and utilitarian), as well as its implications on purchase intentions and website satisfaction. These findings suggest that avatars can influence both the emotional (hedonic) and functional (utilitarian) value consumers

place on their online shopping experiences, further solidifying avatars' potential as valuable tools in enhancing the overall consumer experience.

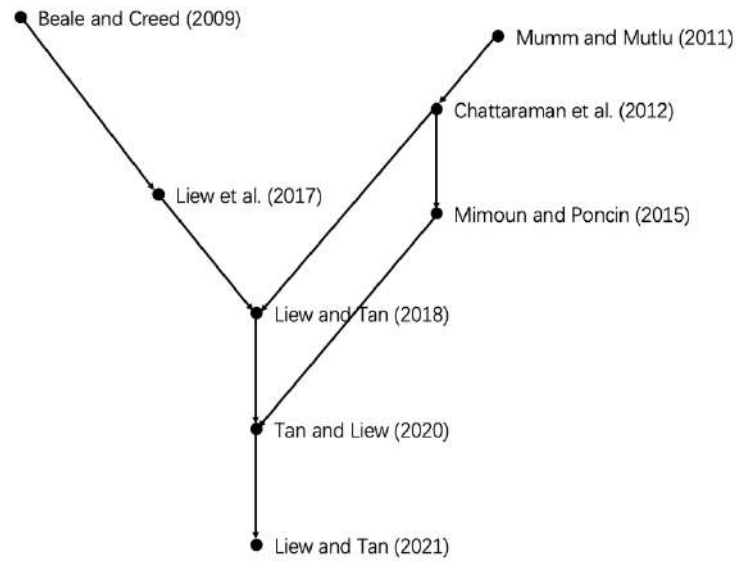
In another branch, Beale and Creed (2009) examined the impact of emotions expressed by avatars on user attitudes and behavior. The findings suggest that synthetic emotions can both enhance and hinder interactions with avatars depending on different situations. In virtual learning environments, Liew et al. (2017) demonstrated that the enthusiasm expressed by avatars (i.e., pedagogical agents) through verbal and nonverbal cues significantly improved learners' positive emotions, intrinsic motivations, affective perceptions, and cognitive outcomes.

Together, the above two knowledge paths provide the basis for subsequent research in this field. Liew and Tan (2018) demonstrated that utilizing specialist avatars, as compared to generalist avatars, improved perceptions of avatar expertise, credibility of information, trust in the website (including ability, benevolence, and integrity), and purchase intention. Similarly, Tan and Liew (2020) found that incorporating surface cues in the design of specialist avatars enhances perceptions of expertise, message trustworthiness, social presence, website trust, and purchase intention. These findings align with source credibility theory (Goldsmith et al., 2020) and multiple source effect theory (Lee & Nass, 2004). By reviewing related publications on avatar design, Liew and Tan (2021) introduced the DASSCI (demographics, appearance, social prestige,

specialization, communication style, and information quality) classification model.

This model effectively categorizes the various cues involved in the creation of expert and competent avatars into six key dimensions.

The current body of research on avatar design has predominantly concentrated on avatars' communicative styles, emotional expressiveness, and visual attributes. However, a noticeable gap exists in understanding how external factors might shape consumer attitudes toward avatars. Thus, future avatar marketing studies are encouraged to integrate environmental/contextual information with avatar design elements to provide a more comprehensive understanding of how the combinations affect consumer perceptions and reactions. More visual attributes of avatars can be examined within this research domain. Given that avatars often extend beyond still images to include animations in certain contexts, exploring motion-related attributes, such as motion speed, presents an interesting aspect. This could be particularly relevant in marketing campaigns where dynamic, animated avatars replace human endorsers to foster positive product and brand attitudes. Furthermore, the design elements of voice-based avatars also include audio attributes. The tone, speed of speech, gender, and age reflected in the avatar's voice are aspects worth studying.



[FIGURE 8: The main path of designing effective avatars]

5.4 Cluster 4: Avatars with Personality

Personality, refers to “the enduring configuration of characteristics and behavior that comprises an individual’s unique adjustment to life, including major traits, interests, drives, values, self-concept, abilities, and emotional patterns (APA Dictionary of Psychology⁴). In the context of avatars, personality involves endowing virtual characters with consistent and recognizable traits that mimic human-like individuality. Powered by AI technologies (e.g., natural language processing, deep learning, and computer vision), these traits enable avatars to exhibit behaviors, preferences, and

⁴ <https://dictionary.apa.org/personality>

emotional expressions, making personality no longer an exclusive characteristic of humans but an integral feature of virtual entities. The main path of the avatar with personality is presented in Figure 9.

For example, human facial expressions (e.g., a smile) could be adopted by service avatars. One primary focus of this avatar used an experimental approach to examine whether users reciprocate an avatar's smile in interaction (Kramer et al., 2013). Though the avatar's smile does not noticeably influence the evaluation, human users tend to smile when the avatar is smiling (Kramer et al., 2013). Liu (2019) focused on data from the social media platform (i.e., Twitter) where avatars (i.e., social bots) play a significant role in spreading WOM through volume and emotional content. However, it is noted that these avatars can distort brand-related information across industries and among various brands (Liu, 2019).

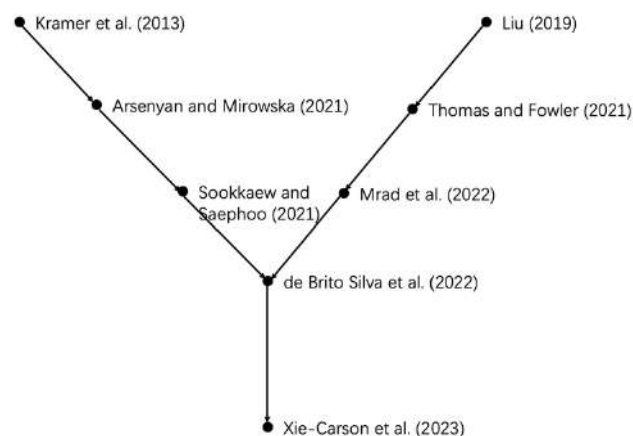
Thereafter, another two pioneering studies established a foundation for exploring avatars with personality. Their insights, when extended to the field of influencer marketing (Zhang & Mac, 2023), provide a framework for understanding virtual influencers (VIs) as an emerging type of avatar that embodies human-like qualities (Qu & Baek, 2023). More specifically, VIs are portrayed as “fictional, computer-generated individuals possessing human traits, characteristics, and personalities” (Thomas & Fowler, 2021). VI, according to its identity system proposed

by Mrad et al. (2022), is conceived as a brand entity consisting of multiple components under its overall perceived identity. Arsenyan and Mirowska (2021) compared three forms of influencers, namely human-like VI, anime-like VI, and human influencer. The findings affirm that the human-like VI receives the least positive reactions compared to the latter two. Expanding on this, Sookkaew and Saephoo (2021) explored how avatars are distributed across various social networking service (SNS) platforms, while De Brito Silva et al. (2022) identified the critical role of credibility and authenticity in avatar marketing. Their research revealed that avatars' posts should align with their personalities, lifestyles, and personal narratives, contributing to stronger consumer trust and brand loyalty. In a similar vein, a recent study on SNS avatars by Xie-Carson et al. (2023) examined source and content attributes that influence social media users' engagement with VIs in a tourism context. The findings highlighted that users prefer VIs with an anthropomorphic appearance.

The rapid progress of AI technology and the emergence of the metaverse concept have sparked significant interest among researchers in exploring diverse virtual characters (Laszkiewicz & Kalinska-Kula, 2023; Jin, 2024). Within the SNS landscape, research could benefit from integrating insights from traditional service avatars and VIs, while also identifying the distinct consumer needs and expectations for each. On platforms like TikTok, virtual avatars typically take the form of virtual streamers (He

et al., 2023), who can instantly respond to consumer inquiries, much like chatbots, but with the added engagement of animated facial expressions and body gestures. Such platform differences may give rise to distinct consumer needs and purposes; understanding these differences is key for brands seeking to deploy avatars in targeted, platform-specific campaigns.

In addition, given that the embodiment of avatars with personality represents a form of avatar anthropomorphism (please refer to Cluster 6), future research in this field could benefit from drawing on theories of human-computer interaction, social psychology, and communication to examine how avatars' personalities influence consumer decision-making. By investigating these dynamics, future research can help brands design avatars that not only capture attention but also foster deeper, more meaningful relationships with consumers.



[FIGURE 9: The main path of avatars with personality]

5.5 Cluster 5: Avatar User Satisfaction

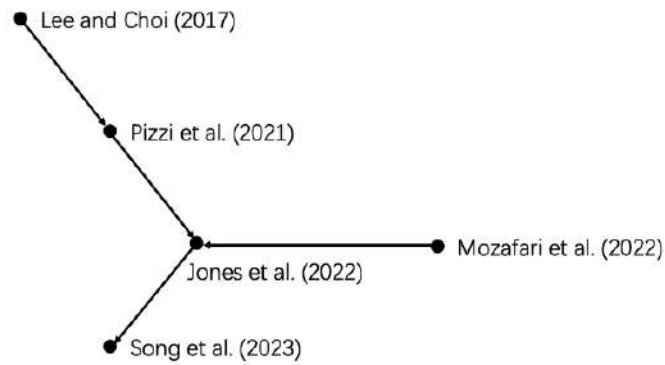
User satisfaction is the subjective evaluation of the interactive experience (Lindgaard & Dudek, 2003) and is closely linked to usability (Hassenzahl et al., 2001).

As avatars become increasingly integrated into digital marketing strategies, understanding how users evaluate their interactions with avatars is paramount. Figure 10 silhouettes the main knowledge structure of avatar user satisfaction.

Lee and Choi (2017) studied how communication variables (i.e., self-disclosure and reciprocity) and the relationship between avatars (i.e., conversational agents) and users (i.e., intimacy, trust, and interactional enjoyment) affect user satisfaction and the intention to use an interactive movie recommendation system. Pizzi et al. (2021) focused on consumer choice satisfaction and consumer experience as dependent variables. The study examined how the appearance (human-like vs. non-human-like) and activation (user-initiated vs. system-initiated) of an avatar (i.e., digital assistant) influence consumers' reactance, which, in turn, triggers a sequence of consumers' evaluations of the decision-making process. Jones et al. (2022) found that avatar authenticity improves when it takes a female form, and even more so when it is professionally dressed or of a different race. This elevated authenticity boosts engagement, loyalty, and satisfaction. Song et al. (2023) found that building a positive human–avatar (i.e., chatbot) relationship (i.e., appreciation) is a better recovery strategy

than admitting the avatar's limitations (i.e., apology) for service failures. Building on the politeness theory (Brown & Levinson, 1987), avatars' politeness affects post-recovery satisfaction through face-saving concerns. Furthermore, time pressure moderates this relationship (Song et al., 2023).

The primary citation trail is limited due to the brief history of avatar applications. However, growth and diversification are expected in the near future, paving the way for more research on avatar user satisfaction. Future research should consider methodologies beyond experimental design to gain a broader understanding. For instance, qualitative methods might provide deeper user insights (Hennink et al., 2020). Acquiring sales data from the field could reflect consumer behavior. Additionally, it is worth investigating how avatar disclosure (i.e., telling or not telling consumers they are interacting with an avatar) might detrimentally impact user satisfaction, drawing on relevant theories such as Uncanny Valley theory (Mori, 1970; Mori et al., 2012) and mind perception theory (Gray & Wegner, 2012; Waytz et al., 2010).



[FIGURE 10: The main path of avatar user satisfaction]

5.6 Cluster 6: Avatar Anthropomorphism

Anthropomorphism refers to the attribution of human characteristics, emotions, or behavior to non-human entities (Waytz et al., 2010) and has been shown to influence user adoption intentions (Sestino & D'Angelo, 2023). As mentioned earlier (Section 4.1: Bibliometric Network Visualization), the term map generated by VOSviewer visualizes word density, revealing “anthropomorphism” as the most frequently used term in avatar marketing literature. This frequent occurrence highlights the significant role that anthropomorphic avatars play in shaping consumer perceptions and behaviors in the marketing domain. Figure 11 outlines the research domain of avatar anthropomorphism. As explained by Miao et al. (2022), anthropomorphism stands as a fundamental cornerstone within avatar construction. Anthropomorphism in avatars encompasses a

range of manifestations, including but not limited to imbuing with anthropomorphic qualities through the infusion of human emotions (Creed et al., 2015), the integration of human capabilities (Appel et al., 2020; Uysal et al., 2022), and the augmentation of their form realism to achieve a heightened resemblance to humans (Kim et al., 2023).

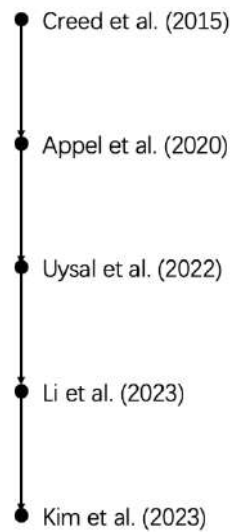
From 2015 to 2023, avatar anthropomorphism research highlights context-dependent effects. In the health context, Creed et al. (2015) showed that participants initially increased their consumption of fruits and vegetables during the intervention facilitated by the avatar (i.e., embodied agent). However, this uptick was followed by a decrease post-intervention. Notably, no significant consumption distinction was observed between emotional and unemotional avatars. However, qualitative feedback expressed a preference for emotional avatars.

Uncanny Valley theory (Mori, 1970; Mori et al., 2012) cannot be ignored in avatar anthropomorphism research. According to this theory, peoples' eeriness perceptions will be triggered when non-human entities become increasingly anthropomorphic but not yet fully human (Mori, 1970). Guided by Uncanny Valley theory, Appel et al. (2020) revealed that an avatar's capacity to feel (experience) evokes more feelings of eeriness compared to its capacity for planning and self-control (agency), which in turn is more eerie than without a mind. This effect lessened when it was placed in a nursing context. In marketing, the challenge lies in balancing human-

like features to avoid invoking discomfort while still enhancing consumer engagement. Uysal et al. (2022) demonstrated how anthropomorphism-induced identity threat stemming from an avatar (i.e., artificial intelligence assistant (AIA)) impacts consumer empowerment and, consequently, consumer well-being. These adverse effects are most prominent within close and long relationships. Kim et al. (2023) found a positive effect of avatar anthropomorphism in the context of the metaverse. Enhancing avatar realism increased the user–avatar relationship and the avatar use intention. These effects were sequentially mediated by psychological distance and social presence. Notably, user familiarity with avatars moderated the mediation process. Moreover, consumers often perceive anthropomorphic avatars as more credible and appealing (Holzwarth et al., 2006; Mull et al., 2015; Nowak, 2004). Though anthropomorphism results in favorable impressions and positive communication (Chen et al., 2023; Han, 2019; Kang & Watt, 2013), Uncanny Valley theory suggests potential drawbacks (Mori et al., 1970). Uncanny Valley theory has been instrumental in shedding light on human-robot interactions (e.g., Kim et al., 2019; Murphy et al., 2021) and understanding the commercial failure of animations (e.g., Brenton et al., 2005).

These insights are crucial for marketers operating consumer-facing platforms, as they must carefully assess whether the avatars are over-anthropomorphized, potentially alienating consumers. By understanding the psychological underpinnings of

consumer discomfort, marketers can refine their avatar designs and selections to facilitate more engaging, less eerie interactions. In this domain, future research may further explore the opportunities and challenges of avatar anthropomorphism, with a special emphasis on addressing the challenges. For example, devising strategies to counter the unsettling feelings induced by human-like avatars could offer insights for academic and industry practitioners. Considering the link between anthropomorphism and consumer loneliness (Epley et al., 2008), investigating how individual differences affect attitudes toward anthropomorphic avatars presents a compelling research avenue. Additionally, future studies could explore various forms of anthropomorphism, including, but not limited to, appearance design, embodiment of personality (e.g., Cluster 4), imitation of human behaviors (e.g., Belk & Kniazeva, 2018), emotional expression in avatars (e.g., Sestino & D'Angelo, 2023), and how anthropomorphism influences the dynamics of human-avatar relationships (e.g., virtual love; Koike & Loughnan, 2021).



[FIGURE 11: The main path of avatar anthropomorphism]

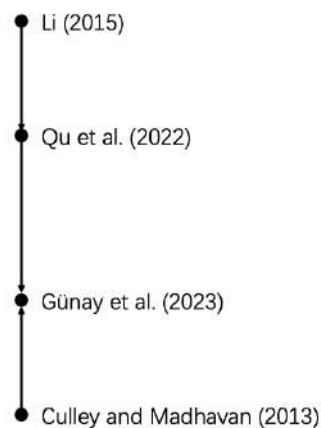
5.7 Cluster 7: Avatar Usability

Usability is a fundamental concept in human-computer interaction (Kasper Hornbæk, 2006). It has been described as “the capability to be used by humans easily and effectively” (Shackel, 1991, p. 24), “quality in use” (Bevan, 1995), and “the effectiveness, efficiency, and satisfaction with which specified users can achieve goals in particular environments” (ISO, 1998, p. 2). The knowledge structure of avatar usability is shown in Figure 12. The main path in this domain spans a decade, from 2013 to 2023.

As an early contribution to avatar usability, Culley and Madhavan (2013) expanded the scope of HCI literature to include anthropomorphic HCI agents, which can be classified as avatars (Miao et al., 2022). The research briefly explored anthropomorphism in HCI agents while emphasizing the significance of universal usability, which is particularly relevant as companies promote their products in increasingly globalized markets to users from varied cultural backgrounds (Culley & Madhavan, 2013).

Consumers' positioning of avatars (i.e., conversational agents (CAs)) has evolved from tools to assistants and even friends over time (Rhee & Choi, 2020). Based on the outcome of a usability test that highlighted low usage frequency, Qu et al. (2022) introduced an innovative paradigm to integrate social cues into voice interactions, with a specific emphasis on personal pronouns, aiming to enhance user engagement. Presently, users prefer avatars (i.e., CAs) that respond using second-person pronouns tailored to their query's pronoun usage (Qu et al., 2022). Women exhibit higher sensitivity to personal pronoun effects (Qu et al., 2022). Delving further into user perspectives through in-depth interviews, Günay et al. (2023) unveiled that potential users primarily center their viewpoints and expectations on the potential impact of avatars (i.e., virtual assistants (VAs)) on family well-being. This emphasis extends alongside usability, privacy, safety, and security concerns.

Avatar usability, a relatively nascent domain with limited publications, calls for future studies to define “usability” within diverse avatar application contexts, such as avatars serving as assistants to respond to instructions, or as friends offering understanding and support as a companion. Future studies should consider the 5E’s model of usability-effectiveness, efficiency, engagement, error tolerance, and ease of learning (Quesenbery, 2001). Additionally, exploring HCI-related concepts (e.g., privacy and safety) is essential. It is advisable to incorporate insights from a broader range of human-computer and human-human interaction theories to further enrich this research area, particularly those focused on consumer psychology and behavior in digital environments.



[FIGURE 12: The main path of avatar usability]

6. General Discussion

6.1 Avatar Marketing Journey: A Four-Phase, Seven-Domain (4P7D) Process

Our systematic review of 203 publications observed a rising trend in various avatar marketing facets from the descriptive analyses classified by year, research area (see Appendix B), journal (see Appendix C), and geography (see Appendix D). The CNA of 149 grouped articles yields seven key research domains: (1) drivers of avatar adoption, (2) human–avatar interaction, (3) designing effective avatars, (4) avatars with personality, (5) avatar user satisfaction, (6) avatar anthropomorphism, (7) avatar usability.

Furthermore, the evolutionary trajectory of avatar marketing was charted and visually represented through a keyword cloud. The most frequently used keyword in the map is “anthropomorphism,” highlighting the academic interest in this specific feature of avatars. This finding also hints at the evolution of avatars—a progression from basic, less anthropomorphic text- or voice-based humanoid avatars to sophisticated, AI-driven virtual human avatars. These advanced avatars resemble humans not only in appearance but also in cognition, as exemplified by virtual influencers.

The MPA elucidated the foundational structure of each domain, presenting both current development and avenues for future studies. While avatar marketing is advancing rapidly, it has yet to mature. The seven research domains still require deeper exploration. Our review stands apart due to its unique format and content, bridging existing research gaps and offering insights for subsequent studies in these domains (see Table 2 for a summary).

Research domain	Paper amount	Key papers	Terms	Theories	Research methods	Future direction
Cluster 1: Drivers of avatar adoption	34	Qiu and Benbasat (2009); Keeling et al. (2010); Chattaraman et al. (2019); Moussawi et al. (2021); Fernandes and Oliveira (2021); Hu et al. (2021); Mishra et al. (2022); Aw et al. (2022)	Avatar, avatar assistant, product recommendation agent, intelligent personal agent, personal intelligent agent, smart voice assistant, digital voice assistant, interactive animated character as salesperson, conversational digital assistant, virtual shopping assistant	Computers Are Social Actors (CASA) paradigm; Social agency theory; Technology Acceptance Model (TAM); TAM2; TAM3; Unified Theory of Acceptance and Use of Technology (UTAUT); UTAUT2; Service Robot Acceptance Model (sRAM); Social influence theory; Social response theory; Rational choice theory; Post-acceptance model	Experiment, survey, mixed	· Understanding the differences in consumer needs between human and avatar service providers · Examining how avatars (in online retail) influence marketing effectiveness · Exploring various research methods beyond the SEM
Cluster 2: Human-avatar interaction	29	Von der Pütten et al. (2010); Pickard et al. (2016); Schuetzler et al. (2018); Cai et al. (2022); Schuetzler et al. (2020); Miao et al. (2022)	Avatar, embodied conversational agent, virtual human, conversational agent, anthropomorphic chatbot	Mind perception theory; Threshold model of social influence; Ethopoeia concept; Self-disclosure theory; Social desirability theory; Social presence theory; Person construal theory; CASA paradigm; Realism maximization theory; Emotions as social information theory; Uncertainty reduction theory; Cue congruence theory; Stereotype theory; Consistency theory	Experiment, interview, survey, mixed	· Comparing interactions across different avatar formats · Considering individual differences in consumers · Developing tactics to enhance the interaction experience

Research domain	Paper amount	Key papers	Terms	Theories	Research methods	Future direction
Cluster 3: Designing effective avatars	24	Beale and Creed (2009); Mumm and Mutlu (2011); Chattaraman et al. (2012); Mimoun and Poncin (2015); Liew et al. (2017); Liew and Tan (2018); Tan and Liew (2020); Liew and Tan (2021)	Avatar, embodied agent, embodied virtual agent, screen-based anthropomorphic entity, pedagogical agent, embodied conversational agent, artificial agent, motivational agent, virtual agent (for older users)	Emotional response theory; Cognitive load theory; Social agency theory; Media equation theory; Categorical perception theory; CASA paradigm; Source credibility theory; Multiple source effect theory; Attribution theory; Social comparison theory; Social facilitation theory; Social response theory	Experiment, focus group, mixed, literature review	· Combining external factors with avatar design · Examining more visual attributes of avatars · Investigating audio elements for voice-based avatars · Differentiating emerging avatar forms in SNS from traditional service avatars
Cluster 4: Avatars with personality	22	Kramer et al. (2013); Liu (2019); Arsenyan and Mirowska (2021); Sookkaew and Saephoo (2021); Thomas and Fowler (2021); de Brito Silva et al. (2022); Mrad et al. (2022); Xie-Carson et al. (2023)	Avatar, virtual avatar, human-like virtual agent, virtual agent, virtual influencer, avatar influencer, digital influencer, AI influencer, computer-generated influencer, social bot	Threshold model of social influence; Ethopoeia concept; Uncanny Valley theory; CASA paradigm; Elaboration likelihood model; TAM; Algorithm aversion; Parasocial relationship theory; Social penetration theory (SPT)	Experiment, interview, case study, observation, field data, mixed	· Applying across diverse platforms for varied interaction purposes and target consumers · Learning from research theories in human interaction and communication

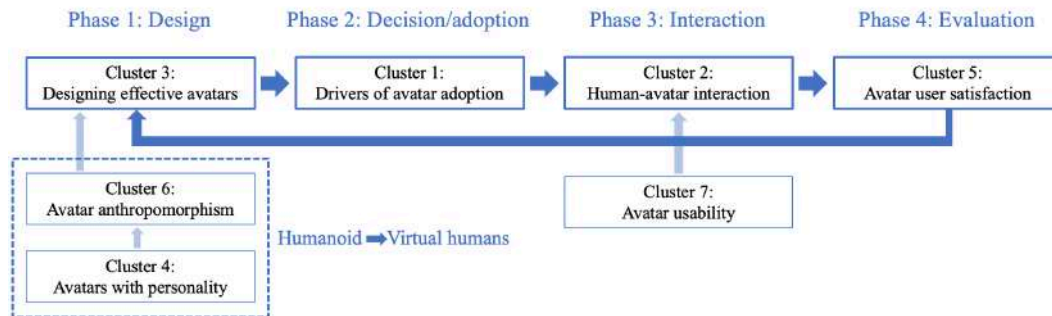
Research domain	Paper amount	Key papers	Terms	Theories	Research methods	Future direction
Cluster 5: Avatar user satisfaction	19	Lee and Choi (2017); Pizzi et al. (2021); Jones et al. (2022); Mozafari et al. (2022); Song et al. (2023)	Avatar, conversational agent, conversational agent, digital assistant, digital agent, chat agent, chatbot	CASA paradigm; Uncertainty reduction theory; Reactance theory; Expectancy-disconfirmation theory; Communication accommodation theory (CAT); Muted group theory (offshoot of CAT); Homophily theory; Schema congruity theory; genderlect theory; Politeness theory; Attribution theory; Commitment–trust theory	Experiment	· Exploring research methods beyond experimental design · Investigating how avatar disclosure negatively affects user satisfaction, based on related theories
Cluster 6: Avatar anthropomorphism	19	Creed et al. (2015); Appel et al. (2020); Uysal et al. (2022); Kim et al. (2023)	Avatar, embodied agent, humanoid robot (as tool/agent), artificial intelligence assistant	Uncanny Valley theory; Seminal relationship theory; Social exchange theory; Mind perception theory; Construal level theory (CLT); Social presence theory; CASA paradigm; Source attractiveness model	Experiment, interview, survey, mixed	· Discovering the opportunities brought by avatar anthropomorphism and overcoming the challenges · Considering individual differences in avatar users · Examining various types of anthropomorphism in practice
Cluster 7: Avatar usability	9	Culley and Madhavan (2013); Li (2015); Qu et al. (2022); Günay et al. (2023)	Avatar, anthropomorphic agent, telepresent robot, virtual agent, conversational agent, virtual assistant	Social response theory; Communication adaptation theory; Interpersonal communication theory; Personal construct psychology (PCP)	Experiment, interview, mixed	· Examining context-specific influences · Incorporating the 5E’s model of usability · Investigating other concepts in HCI related to usability, and their interrelationships · Integrating more theories from different disciplines

[TABLE 2: Summary of the seven research domains and future direction]

To synthesize the identified seven research domains in the avatar marketing journey, Figure 13 illustrates the sequential and interrelated steps of the 4P7D model. The process begins with Phase 1—the design phase—which focuses on design elements that enhance the effectiveness of avatar marketing (Cluster 3). This includes incorporating avatar anthropomorphism (Cluster 6), achieved through features like form realism and behavioral realism (Miao et al., 2022). Another key strategy in this phase is integrating personalities into avatars, which offers both advantages and potential drawbacks for marketing outcomes (Cluster 4). In Phase 2, consumers encounter a selection of avatars, leading to an examination of the drivers behind their adoption decisions. This phase examines the drivers of (i.e., whether to adopt the avatar and which one to adopt; Cluster 1). These decisions then shape Phase 3, where human–avatar interactions occur (Cluster 2), with usability emerging as a critical factor (Cluster 7). Finally, in Phase 4, the process culminates in the evaluation of user satisfaction, serving as a key success metric (Cluster 5). Marketers can evaluate and utilize Insights from this phase to improve avatar design, returning to Phase 1 and perpetuating a continuous marketing loop that advances the field of avatar marketing.

In the 4P7D process, the dotted box in Figure 13 highlights two rapidly expanding research domains in Phase 1 (i.e., Clusters 6 and 4) that warrant further investigation. Consistent with the definition of avatars, which emphasizes "anthropomorphism" as a key feature, our co-occurrence and main path analyses highlight the significance of avatar marketing through anthropomorphism. Compared to earlier avatars, advancements in AI have enabled the creation of virtual human avatars, which are endowed with human-like appearances and personalities, sometimes indistinguishable from real people (Li et al., 2023). Anthropomorphic features (Cluster 6) and personality integration (Cluster 4) are not just aesthetic choices; they directly impact consumer perceptions and brand attitudes, both positively and negatively (e.g., Qu & Baek, 2023; Miao et al., 2022). The 4P7D process offers

a framework for advancing avatar marketing, with particular emphasis on Phase 1's role in guiding the industry through the AI revolution.



[FIGURE 13: An avatar marketing journey: A 4P7D process]

6.2 Theoretical and Methodological Contributions

This review offers several theoretical contributions. First, it traces the evolution of avatars from their early forms to sophisticated virtual humans, elucidating the implications for marketing outcomes such as user engagement, satisfaction, and trust (e.g., Liew & Tan, 2021; Hasan et al., 2021). By synthesizing avatar research from the past fifteen years, this review identifies seven key domains, provides a comprehensive discussion of prior research, and suggests future research directions within these domains. Additionally, this review incorporates interdisciplinary insights from fields such as human-computer interaction, communication, psychology, sociology, and marketing into a cohesive marketing framework, resulting in a seven-domain model that is directly applicable to marketing.

Second, a 4P7D framework was proposed based on the seven research domains. The four phases encompass the entire avatar marketing process: avatar design, consumer adoption, interaction with avatars, and consumer evaluation, which in turn informs marketers in refining the design. This structured framework offers theoretical implications by providing a

comprehensive lens to understand the sequential and interrelated steps in avatar marketing. It bridges fragmented research areas, highlighting how design features, consumer behaviors, and evaluation metrics interact to shape outcomes. This study significantly advances the literature by integrating insights from seven distinct research domains and presenting a unified framework. It establishes a solid foundation for future avatar marketing research, particularly in exploring feedback loops and their role in optimizing marketing effectiveness.

Third, the review adopts a novel methodological approach by integrating CNA and MPA with an SLR. The combination offers a more comprehensive and objective understanding of the knowledge structure in avatar marketing. Such an approach is essential for identifying key research areas and mapping the intellectual development of the field (e.g., Colicchia & Strozzi, 2012). By applying this rigorous methodological framework and following a transparent reporting guideline (Page et al., 2021), the review advances the theoretical foundation of avatar research, providing a roadmap for future studies to explore human-avatar interaction.

6.3 Practical Implications

The review provides several practical implications that can benefit marketers and industry practitioners in effectively utilizing avatars in their strategies. First, it emphasizes the role of anthropomorphism in avatar marketing effectiveness. Practitioners can leverage the insights to develop avatars that balance appealing human-like features with essential functionalities while mitigating discomfort associated with the Uncanny Valley effect (Qu & Baek, 2023). By identifying the anthropomorphic attributes of avatars—such as form, behavior, and cognition (including emotion and personality)—marketers can create suitable digital

characters that enhance user engagement and foster emotional connections specifically to their target consumers/users (Miao et al., 2022; Silva & Bonetti, 2021).

Second, the comprehensive 4P7D framework outlined herein serves as a practical tool for assessing avatar effectiveness across various marketing contexts (e.g., chatbots in online retailing, virtual assistants in service marketing, and virtual influencers in social media marketing). This framework allows marketers to evaluate how well their avatars embody the identified key attributes and engage users. The iterative nature of the 4P7D framework enables marketers to refine avatar designs continuously, using user feedback and satisfaction metrics to drive consumer-driven personalization. The model underscores the importance of integrating consumer-centric design with ongoing improvement, ensuring avatar marketing strategies remain both effective and innovative. This adaptive approach positions avatars as dynamic tools capable of shaping modern marketing practices and meeting the evolving demands of the digital landscape.

Third, the descriptive analysis of the avatar research offers a holistic view of avatar marketing. Our categorization reveals the increasing trend of avatar research, highlighting the areas of focus and the major journals publishing this work, and identifying which countries lead in avatar research (Tranfield et al., 2003). By staying informed about these trends and technological advancements, practitioners can anticipate shifts in consumer reactions, ensuring they remain competitive in the evolving digital landscape.

6.4 Limitations and Future Research

There are some limitations to our study. Firstly, the present CNA approach considers all citations equally, despite their varied importance within respective articles (Fan et al., 2014).

Secondly, while this SLNA employed three analytical tools—VOSviewer, CitNetExplorer, and Pajek—to examine interconnections within the literature, future research could explore alternative methods and tools with different analytical focuses. For example, incorporating meta-analysis could provide a more comprehensive synthesis by quantifying effect sizes across studies. Although this review adhered to the applicable elements of the Preferred Reporting Items for Systematic Reviews (PRISMA; Page et al., 2021) where applicable for CNA, the PRISMA items specifically designed for meta-analysis were not fully addressed due to the nature of its methodology. However, these items could be incorporated in future research employing meta-analysis. Thirdly, negative citations (citing to critique) might be present in the citation network (Fan et al., 2014). However, such instances are considered to have minimal effects on citation analysis (Pilkington & Meredith, 2009).

Importantly, given the rapid advancement of AI technologies, avatars are increasingly exhibiting more sophisticated human-like features. Accordingly, this review suggests that future research should place greater emphasis on avatar anthropomorphism. Existing studies present conflicting findings, with no clear consensus on whether anthropomorphism enhances marketing effectiveness. To provide more nuanced insights, future research could explore its context-dependent effects (Crollic et al., 2022). Furthermore, beyond computer-mediated communication with AI avatars, an increasing number of avatars are entering our physical world as robots. These highly anthropomorphic entities are designed to be intelligent, possessing emotions and cognitions.

CHAPTER 2

TRUST IN VIRTUAL INFLUENCERS: HOW CONTEXTUAL CUES IMPACT CONSUMER ATTITUDES

Abstract

Advances in technology have facilitated the rise of virtual influencers—digital personas designed to engage consumers on social media platforms. This study investigates consumer attitudes toward virtual influencers and identifies key visual factors that shape these perceptions. Across three experiments (N = 894), the research examines how contextual elements—the environment and the presence of companions—interact with influencer type (human vs. virtual) to influence perceptions of trustworthiness. The findings show that human-like virtual influencers are perceived as less trustworthy than their anime-like counterparts or human influencers (Study 1). However, trust in virtual influencers improves when they are placed in virtual (vs. real) environments (Study 2) or accompanied by virtual (vs. human) companions (Study 3), resulting in more favorable consumer attitudes. This research advances the literature on human-avatar interaction and influencer marketing, offering practical insights into building trust and enhancing consumer acceptance of virtual influencers.

1. Introduction

Lil Miquela, an Instagram influencer with over three million followers, was named one of the 25 most influential people on the Internet by *Time* magazine in 2018 (Robinson, 2020). She was also invited to the Prada FW18/19 fashion show. As influencers are a key element of digital marketing strategies, it is not surprising to see them employed to interact with consumers, endorse products or services, build brand equity, and foster consumer loyalty (e.g., Van Norel et al., 2014). What is surprising in this case is that Miquela is not a human but a computer-generated virtual entity. Prada's collaboration with a virtual influencer created an unforgettable moment that perplexed the fashion crowd—raising the question of how a virtual character could appear at a physical, live event (Hiort, 2021).

Virtual influencers, a category of avatars, are computer-generated digital personas designed to emulate human influencers through the integration of motion capture, computer graphics, and artificial intelligence (AI) technologies (Rodrigo-Martín et al., 2021). By 2022, Instagram had over 200 virtual influencers, reflecting the rapidly growing interest in and investment by industry stakeholders (Hiort, 2021b). The rising adoption of virtual influencers by marketing practitioners has drawn significant academic attention. Some studies suggest that virtual influencers generate brand benefits comparable to those achieved by human celebrity endorsers (e.g., Thomas & Fowler, 2021). However, other research highlights skeptical or negative consumer reactions, driven by perceived lack of authenticity (Lou et al., 2022) and their human-like appearance (Arsenyan & Mirowska, 2021).

Trust is essential for virtual influencers in their role as social media influencers, particularly in shaping positive consumer attitudes and behaviors (e.g., Pittman & Abell, 2021). However, there is limited understanding of the factors that influence consumers' trust in virtual influencers. To address this gap, this study investigates whether contextual cues in social

networking service (SNS) posts—specifically, where virtual influencers are located and who they are accompanied by—serve as determinants of consumers’ trust. Recent SNS formats, such as Instagram, have heightened the reliance of social media influencers on images, using visual presentations of products, services, or aspects of their lives to engage with consumers (Choi & Rifon, 2007). Drawing on cue utilization theory (Olson, 1978; McGuire, 1985) and consistency theory (Festinger, 1958; Fiske & Taylor, 1991; Groom et al., 2009), this research explores how various visual cues shape consumers’ attitudes toward virtual influencers.

This study enriches the literature on interactive marketing, which is defined as “the bi-directional value creation and mutual-influence marketing process through active customer connection, engagement, participation, and interaction” (Wang, 2021, p. 1). By examining when and how consumers' attitudes toward virtual influencers shift, the study deepens the understanding of avatars and influencer marketing, providing valuable managerial insights for digital marketing practitioners. The investigation of contextual cues offers practical implications for enhancing consumer trust and optimizing marketing strategies involving virtual influencers.

2. Literature Review

2.1 What is a Virtual Influencer?

Powered by AI, virtual influencers are computer-generated personas that operate on social media platforms, engaging with audiences and promoting products/services/brands (Sands et al., 2022; Zhou et al., 2024). Taxonomically, virtual influencers are a type of digital human avatar with high degrees of both form realism (i.e., resembling human appearance) and behavioral realism (i.e., mimicking human behaviors) (Miao et al., 2021). Beyond their taxonomic characteristics, virtual influencers are designed with distinct personalities, capable of expressing emotions and naturally interacting with consumers through SNS (De Brito Silva et al., 2022; Lou et al., 2022). This distinguishes virtual influencers from virtual service agents, which are user-oriented and task-based, responding only to consumer requests (e.g., online sales/recommendation agents, chatbots).

Social media influencers are individuals who build an online presence by actively posting about their lifestyles and endorsing brands/products/services on various social media platforms (Tafesse & Wood, 2021). Viewers often perceive influencers as more credible, relatable, and closer to themselves than traditional celebrities (Hwang & Zhang, 2018; Schouten et al., 2020). Marketing practitioners have observed that social media influencers not only have a greater impact on their followers' actual purchases than traditional celebrities (Dinh & Lee, 2021) but also pose less investment risk and are more cost-effective (Liu et al., 2017).

Virtual influencers, who have substantial followings on SNS and demonstrate human traits along with high interactivity (Mrad et al., 2022), have emerged as a new form of independent third-party endorsers. They are particularly effective in tailoring communication to specific target groups, outperforming human influencers in this regard (Hofeditz et al., 2022). Jang and Yoh (2020) suggested that various qualities of virtual influencers, such as innovation

and professionalism, are transferred to the brands they endorse, fostering positive brand perceptions. Furthermore, virtual influencers offer brands the advantage of minimizing the risk of human error by providing full control over the influencer's behavior and customer service responses (Sands et al., 2022), with the added benefits of low-cost and scandal-free characteristics (Thomas & Fowler, 2021).

While virtual influencers primarily appear on social media platforms, they not only mimic realistic human features but also express their personalities through posts and interactions with SNS audiences (Thomas & Fowler, 2021; Rodrigo-Martín et al., 2021). Like human influencers, virtual influencers use strategies such as creating identity intrigue, employing dissonant narratives, facilitating emotional release, and provoking responses to engage their audiences (Block & Lovegrove, 2021).

2.2 Trust and Virtual Influencers

Source credibility theory suggests that consumers are persuaded by credible sources, such as trustworthy endorsers (Ohanian, 1990). The perceived trustworthiness of an influencer positively influences consumers' attitudes toward their advertisements for brands (Schouten et al., 2020) and products (Jin et al., 2019; Kim & Kim, 2021). Trust in branded posts on SNS increases purchase intentions (Kim & Kim, 2021; Schouten et al., 2020).

Research has shown that virtual influencers are generally less trusted than human influencers (Sands et al., 2022). Virtual influencers are often created and managed by brands or agencies, which makes their intentions and motives seem less transparent (Hudders et al., 2021). Empirical research has demonstrated that, compared with human influencers, virtual influencers receive fewer positive reactions (Arsenyan & Mirowska, 2021; Park et al., 2021).

Additionally, interpersonal interactions with virtual (vs. human) agents are less engaging and perceived as more insincere (Longoni et al., 2019). For these reasons, scholars, as well as practitioners, have examined how to build consumers' trust in virtual influencers so that they can be effective endorsers (Audrezet & Koles, 2023).

This study examines whether all types of virtual influencers are equally distrusted compared to human influencers. According to the Uncanny Valley theory, negative attitudes toward robots increase as their appearance approaches that of a human (Mori, 1970; Mori et al., 2012). Arsenyan and Mirowska (2021) compared three types of influencers (human-like virtual, anime-like virtual, and human) and found that human-like virtual influencers were perceived less favorably than their anime-like counterparts. Building on previous research, this study hypothesizes that virtual influencers will be trusted less than human influencers. Furthermore, in line with the Uncanny Valley theory, it is predicted that human-like virtual influencers will be trusted less than anime-like virtual influencers. Formally stated:

H1. A virtual influencer is less trusted than a human influencer. Specifically, a human-like (vs. anime-like) virtual influencer is less trusted than a human influencer, leading to less positive attitudes.

2.3 Cues to Influence the Perceived Trustworthiness of a Virtual Influencer: Consistency Theory

People generally prefer consistency and are more willing to interact with those who behave consistently than with those who behave unpredictably, likely because consistency reduces the cognitive load on interactors (Fiske & Taylor, 1991). Consumers' preference for consistency is not limited to human interactions. For example, Miao et al. (2022) suggested

that avatars are more effective when there is consistency between their form and behavioral realism. Other studies have found that avatars with a mismatch between appearance and voice are unappealing and elicit less affinity than avatars with matched characteristics (Higgins et al., 2022). According to consistency theory, digital agents with consistent verbal and nonverbal personality cues are perceived as more likable, persuasive, useful, and enjoyable to interact with than agents with inconsistent cues (Nass et al., 2000). Consistency in an agent's behaviors and motivational states is critical to building trust (Ortony, 2003).

Building on consistency theory, this study examined how contextual cues in influencers' posts affect consumers' trust in and attitudes toward a virtual influencer compared to a human influencer. The cue utilization theory, which proposes that consumers use product-related cues as a reference to evaluate a product (Olson, 1978), suggests that individuals under uncertainty increase their information search and rely on cues in the order of the most effective to the least effective (Gigerenzer, 2008). Thus, contextual information and cues can provide insights into the focal object (e.g., Kleine III & Kernan, 1991) and influence consumer attitudes, emotions, and behaviors (Baek et al., 2021; Maier & Dost, 2018).

As visual cues (e.g., lighting) in self-presentations on SNS (i.e., selfies) are used by viewers to evaluate influencers (Abidin, 2016; Wang et al., 2020), the first contextual cue this paper focuses on is the background image in SNS posts, which indicates the influencer's location and environment. Applying consistency theory, this paper examines whether the match or mismatch between the background cue and the focal object (i.e., the influencer) affects consumers' perceived trustworthiness and attitudes. A virtual and a real environment are considered the environment types most compatible with virtual influencers and human influencers, respectively. It was predicted that consumers may rely more on environmental cues when assessing a virtual influencer compared to a human influencer. Consumer attitudes

toward a virtual influencer and perceived trustworthiness are expected to be influenced by the alignment of the virtual influencer's cues (i.e., perceived as more positive in a virtual environment), whereas attitudes toward a human influencer are not anticipated to be affected by this match. Thus, the following hypothesis is proposed:

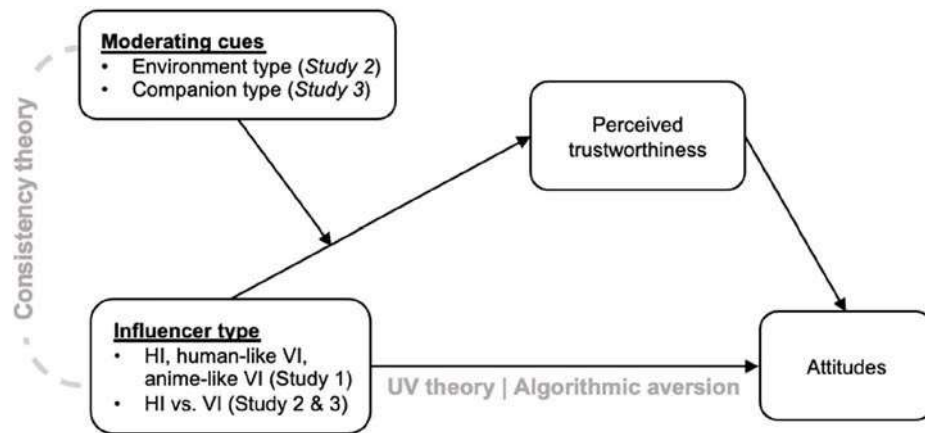
H2. The perceived trustworthiness of a virtual influencer increases when it is in a virtual (vs. real) environment, leading to more positive attitudes. The perceived trustworthiness of a human influencer is not affected by the type of environment.

In addition to the background image, this research examines how the companion type, or whom the influencer is with in the SNS post, affects the evaluation of the virtual influencer. Social information in the form of contextual cues can influence individuals' evaluations (Baldwin, 1992; for example, with an AI assistant, see Hsieh & Lee, 2021). Individuals in a group photo with social cues are perceived differently than individuals in a solo photo (Krämer et al., 2017). The assessment of a person is largely influenced by observations of other faces in both offline and online environments, such as the number of friends and Facebook profile features (Pegors et al., 2015; Tong et al., 2008). Applying consistency theory, it was predicted that trust in and attitudes toward a virtual influencer (vs. human influencer) would be affected by the match between the influencer and the social cues, specifically the companion type. Accordingly, we propose:

H3. The perceived trustworthiness of a virtual influencer is enhanced when it is accompanied by a virtual (vs. human) companion, leading to more positive attitudes. The perceived trustworthiness of a human influencer is not affected by the type of companion.

The following sections present the studies testing the hypotheses. Specifically, Study 1 examines the role of trust in shaping consumer attitudes toward different types of social media influencers. Building on this, Studies 2 and 3 test the moderating effects of contextual cues—

environment type and companion type, respectively. The conceptual framework of this research is illustrated in Figure 1.



[FIGURE 1: Conceptual framework]

3. Study 1

3.1 Design and Procedures

Study 1 adopted a single-factor three conditions (influencer type: human influencer vs. human-like virtual influencer vs. anime-like virtual influencer) between-subjects design. The human influencer and the human-like virtual influencer had the same human appearance but were labelled differently. The anime-like virtual influencer had a cartoon appearance, customized from the human figure using a cartoon-creating application to maintain a similar baseline appearance (see Figure 2). To control for potential confounding factors in the background (Wang et al., 2020), a white background was used.



[FIGURE 2: Human influencer and human-like virtual influencer (left); Anime-like virtual (right)]

Data was collected from 211 U.S. consumers via Prolific, yielding a valid sample of 207 participants (48.8% female; $M_{\text{age}} = 31.44$, $SD = 7.78$). Participants were randomly assigned to one of three conditions and viewed stimuli accompanied by descriptions. They then completed a survey consisting of three items on their attitudes toward the influencer (Tran et al., 2019; $\alpha = 0.960$) and five items on the perceived trustworthiness of the influencer (Ohanian, 1990; $\alpha = 0.947$), both rated on a seven-point Likert scale. As a manipulation check, participants also assessed perceived humanness using seven-point semantic differential scales

(Ho & MacDorman, 2010; $\alpha = 0.812$). Finally, they completed a measure of technology innovativeness (Kim & Choo, 2021; $\alpha = 0.823$) and provided demographic information. (See Appendix E for all the measurements.) Participants were thanked for their participation.

Before conducting the main analyses, Harman's single-factor test was used to check for potential common method bias (CMB) issues. The results showed that the variance was 48.81%, which is less than 50%, indicating that the data in Study 1 were not affected by CMB.

3.2 Results and Discussion

3.2.1 Manipulation Check

A one-way ANOVA was conducted with influencer type as the independent variable and humanness as the dependent variable. The manipulation check revealed a significant main effect of influencer type ($F(2, 204) = 19.31, p < 0.001$), indicating that participants perceived higher humanness in the human influencer ($M = 3.37, SD = 1.45$) compared to the human-like virtual influencer ($M = 2.41, SD = 1.01; p < 0.001$) and the anime-like virtual influencer ($M = 1.74, SD = 1.01; p < 0.001$). Notably, there was also a significant difference between the human-like and anime-like virtual influencers ($p = 0.004$). These results suggest that participants successfully assessed appearances and read the descriptions when answering the questions.

3.2.2 The Effect of Influencer Type on Attitudes

A one-way ANOVA on attitudes found a significant effect of influencer type ($F(2, 204) = 3.16, p = 0.045$). Participants reported more favorable attitudes toward the human influencer ($M = 3.67, SD = 1.31$) than the human-like virtual influencer ($M = 3.03, SD = 1.47; p = 0.013$).

However, the differences between the human influencer and the anime-like virtual influencer ($M = 3.21$, $SD = 1.64$; $p = 0.117$) and between the anime-like and human-like virtual influencers ($p = 0.482$) were not significant. When age, gender, and technology innovativeness were added as covariates, they showed no significant relationships with the main variables ($p = 0.407$) and did not alter the results.

3.2.3 The Effect of Influencer Type on Trust

A one-way ANOVA on perceived trustworthiness found a significant effect of influencer type on trust ($F(2, 204) = 3.29$, $p = 0.039$). Participants reported higher trust in the human influencer ($M = 3.22$, $SD = 1.21$) than in the human-like virtual influencer ($M = 2.63$, $SD = 1.30$; $p = 0.012$). Trust in the human influencer was marginally higher than trust in the anime-like virtual influencer ($M = 2.75$, $SD = 1.48$; $p = 0.079$). There was no significant difference in trust between the anime-like and human-like virtual influencers ($p = 0.609$). Adding age, gender, and technology innovativeness as covariates revealed no significant relationships with the main variable ($p = 0.145$) and did not affect the results.

3.2.4 The Mediating Effect of Trust

A mediation analysis (Process Model 4, 5,000 bootstraps; Hayes, 2017) was conducted with influencer type as the categorical independent variable (human influencer = 0 as the baseline, anime-like virtual influencer = 1, human-like virtual influencer = 2), attitudes as the dependent variable, and trust as the mediator. The analysis revealed that compared to trust in a human influencer, trust was significantly lower for a human-like virtual influencer ($\beta = -0.581$, $SE = 0.23$, $p = 0.011$) but not for the anime-like virtual influencer ($\beta = -0.466$, $SE = 0.26$, $p = 0.078$). When controlling for influencer type, perceived trustworthiness had a positive and significant effect on attitudes ($\beta = 0.845$, $SE = 0.05$, $p < 0.001$), while the effects of the two virtual influencer conditions were nonsignificant ($p = 0.384$).

Importantly, the bias-corrected confidence interval (CI) of the indirect effect for the human-like virtual influencer excluded zero, confirming a significant mediation ($\beta_{\text{human influencer vs. human-like virtual influencer}} = -0.492$, $SE = 0.18$, $CI_{95\%} [-0.864, -0.132]$), whereas the indirect effect for the anime-like virtual influencer included zero, indicating non-significance.

Supporting H1, the results of Study 1 suggest that a human influencer is more trusted and generates more positive attitudes than a human-like virtual influencer. More importantly, the comparison between the human influencer and the two types of virtual influencers clarified differences in attitudes: participants held less favorable attitudes toward a human-like virtual influencer compared to an anime-like virtual influencer. This finding aligns with the Uncanny Valley theory, which posits that non-human entities resembling humans—such as the human-like virtual influencer in this study—are viewed less favorably (Mori, 1970; Mori et al., 2012).

Based on the findings from Study 1, which suggest that attitudes toward the anime-like virtual influencer were not more negative than those toward the human influencer, subsequent analyses focus on the human-like virtual influencer (referred to as “virtual influencer” hereafter) to explore which characteristics enhance attitudes and trust in comparison to the human influencer. Study 2 examines the background effect and tests alternative mechanisms, such as perceived similarity and curiosity.

4. Study 2

4.1 Design and Procedures

Study 2 aims to investigate the factors that affect trust in a virtual (vs. human) influencer. Focusing on the background image, Study 2 tests the effect of different types of background images (virtual vs. real environments) on perceived trustworthiness and attitudes toward the influencer (H2). The study employed a 2 (influencer type: virtual vs. human) $\times$ 2 (environment type: virtual vs. real) between-subjects design.

An existing virtual influencer, Daisy (www.virtualhumans.org/%20human/daisy), was used and described as either a virtual or human influencer. To manipulate the environment type, a pretest was conducted to identify appropriate background images for the stimuli. A total of 116 participants (49.1% female; $M_{\text{age}} = 31.20$, $SD = 8.65$), recruited via Prolific, evaluated five sets of images depicting the same context (e.g., a street or meadow) with varying levels of virtuality (see Figure 3). In a 2 (real vs. virtual) $\times$ 5 images mixed design, participants rated perceived virtuality (unreal/real, virtual/actual, non-existent/existent) and attractiveness (non-attractive/attractive) on a seven-point semantic differential scale. The results of a repeated-measures ANOVA showed that a set of meadow images exhibited similar attractiveness ($p = 0.25$) and valence ($p = 0.21$), while the virtuality of the virtual meadow image was significantly higher than that of the real photo ($p < 0.001$; see Appendix F for details). This set of images was used as the influencer's background for the stimuli (see Figure 4).

In the main study, 394 U.S. residents were recruited from Prolific for a small payment. Responses from participants who recognized Daisy were excluded to control for awareness effects, leaving a final sample of 385 (68.83% female; $M_{\text{age}} = 30.88$, $SD = 8.03$). Participants were randomly assigned to one of four conditions, viewed the stimuli, and rated their attitudes toward the influencer ($\alpha = 0.967$), perceived trustworthiness ($\alpha = 0.955$), perceived similarity

(Schouten et al., 2020; $\alpha = 0.941$), and curiosity (Yang et al., 2020; $\alpha = 0.951$) on a seven-point Likert scale.

After answering manipulation check questions ($\alpha = 0.867$ for influencer type, $\alpha = 0.966$ for background type), participants provided demographic information and were thanked. Similar to Study 1, Harman's single-factor test was conducted to check for CMB, and no issue was found (variance = 42.21%, below the 50% threshold).



[FIGURE 3: Five sets of pretested images]



[FIGURE 4: Stimuli featuring the influencer in a virtual vs. real environment]

4.2 Results and Discussion

4.2.1 Manipulation Check

The manipulation check for the influencer type was successful, showing that participants in the human influencer condition perceived higher humanness ($M = 3.62$, $SD =$

1.53) than those in the virtual influencer condition ($M = 2.11$, $SD = 1.33$; $F(1, 383) = 100.20$, $p < 0.001$). The environment type manipulation was also successful, with participants perceiving the virtual meadow image as more unreal and virtual ($M = 1.37$, $SD = 0.76$), while the real meadow image was perceived as more real and actual ($M = 4.07$, $SD = 1.93$; $F(1, 383) = 328.95$, $p < 0.001$). The perceived vividness of the two environments did not differ ($p = 0.09$), but the attractiveness of the environments differed in the main experiment ($M_{\text{virtual}} = 5.04$, $SD = 1.58$ vs. $M_{\text{real}} = 5.38$, $SD = 1.60$; $F(1, 383) = 4.43$, $p = 0.036$). Thus, the attractiveness of the environment was included as a covariate in the subsequent analysis.

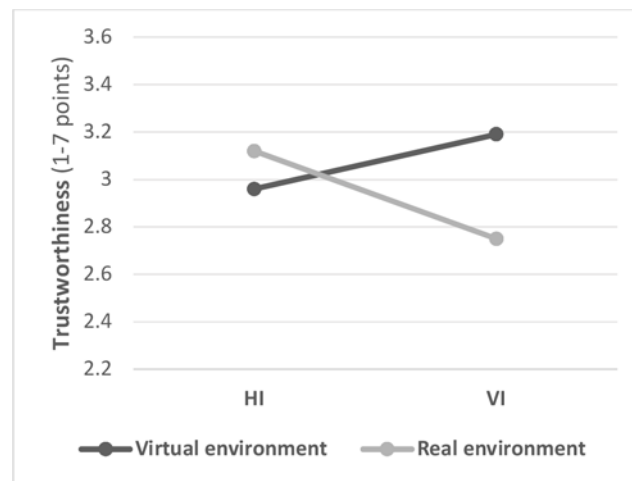
4.2.2 The Effect of Influencer Type and Environment Type on Trust

The results of the ANCOVA revealed a significant interaction effect of influencer and environment types on perceived trustworthiness ($F(1, 380) = 4.77$, $p = 0.030$; see Figure 5). No significant main effects were observed for influencer type ($p = 0.60$) or environment type ($p = 0.31$). Further pairwise analysis showed that a virtual environment ($M = 3.06$, $SD = 1.52$), compared to a real environment ($M = 2.89$, $SD = 1.44$), significantly increased trust in the virtual influencer ($F(1, 380) = 5.06$, $p = 0.025$). However, for the human influencer, no difference in trust was observed based on environment type ($M_{\text{virtual}} = 2.90$, $SD = 1.31$ vs. $M_{\text{real}} = 3.18$, $SD = 1.33$; $F(1, 380) = 0.65$, $p = 0.42$). No significant results were found for similarity ($F(1, 380) = 2.44$, $p = 0.12$) and curiosity ($F(1, 380) = 1.76$, $p = 0.19$).

4.2.3 Moderated Mediation

To test Hypothesis 2, a mediated moderation analysis (Process Model 7, 5,000 bootstraps; Hayes, 2017) was conducted with influencer type as the independent variable (0 = human influencer, 1 = virtual influencer), environment type as the moderator, perceived trustworthiness as the mediator, attitudes toward the influencer as the dependent variable, and attractiveness as the covariate. As expected, the moderated mediation effect through perceived

trustworthiness was significant ($\beta = 0.435$, $SE = 0.199$, $CI_{95\%} [0.028, 0.822]$), showing a significant interaction between influencer and environment type on perceived trustworthiness ($\beta = 0.59$, $SE = 0.27$; $t = 2.18$, $p = 0.030$). The conditional effects of influencer type revealed a marginally negative effect of the virtual influencer on trust in a real environment ($\beta = -0.366$, $SE = 0.19$; $t = -1.91$, $p = 0.056$).



[FIGURE 5: Estimated marginal means of trustworthiness with the covariate appearing at the value of 4.98]

The results of Study 2 show that consumers are less likely to trust a virtual influencer when it is placed in a real (vs. virtual) environment. While attitudes toward the human influencer were not affected by the type of environment, attitudes toward the virtual influencer were more positive in the virtual environment compared to the real environment, which can be explained by differing levels of trust. In the main study, even when using the same set of images examined in the pretest, the perceived attractiveness of the two environment types differed. The authors speculate that this difference occurred because the introduction of an influencer at the early stage led viewers to believe that the real (vs. virtual) meadow image was generally more appropriate as a background. Our results, regardless of whether attractiveness was controlled for, showed that the pattern remained the same.

Since images of social media influencers frequently appear on social networking sites, Study 3 was designed to investigate the effect of companion type and examine whether attitudes toward a virtual influencer can be enhanced depending on the companion they are pictured with in a group photo. Specifically, Study 3 predicts that trust in a virtual influencer will (or will not) decrease when the virtual influencer is accompanied by a human (vs. virtual) companion.

5. Study 3

5.1 Design and Procedures

In Study 3, a total of 320 U.S. participants were recruited via Prolific. After excluding incomplete responses, 302 valid responses (49.67% female; $M_{\text{age}} = 29.57$, $SD = 7.62$) were used for analysis. Study 3 employed a 2 (influencer type: virtual vs. human) $\times$ 2 (companion type: virtual vs. human) between-subjects design. The same influencer used in Study 2 was employed, with the human and virtual companions derived from the stimuli used in Study 1 (see Figure 6). Participants were randomly assigned to one of four conditions.

As in Studies 1 and 2, attitudes toward the focal influencer ($\alpha = 0.959$) and perceived trustworthiness ($\alpha = 0.950$) were measured, followed by manipulation check items ($\alpha = 0.887$ for influencer type and $\alpha = 0.954$ for companion type). The attractiveness of the companions was also measured as a control variable. Finally, participants provided their demographic information and were thanked. Harman's single-factor test revealed a variance of 44.62%, indicating that the data are free from CMB.



[FIGURE 6: Stimuli featuring the influencer with a virtual (left) or human (right) companion]

5.2 Results and Discussion

5.2.1 Manipulation Check

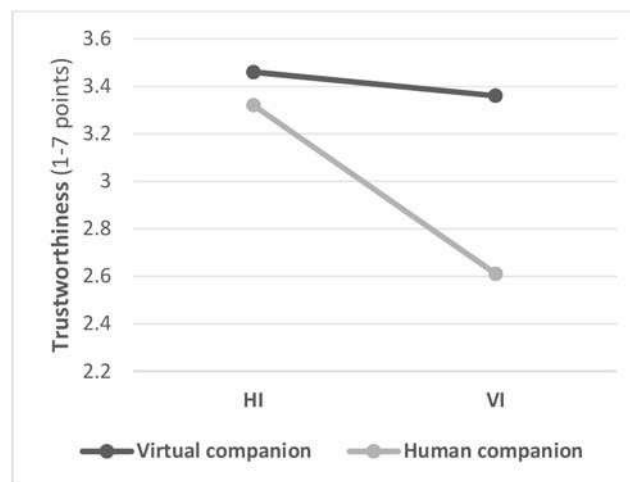
The manipulation check for influencer type was successful, with participants in the human influencer condition perceiving greater humanness ($M = 3.40$, $SD = 1.80$) compared to those in the virtual influencer condition ($M = 2.36$, $SD = 1.43$; $F(1, 300) = 75.93$, $p < 0.001$). Regarding companion type, participants rated the virtual companion as less realistic and more virtual ($M = 1.50$, $SD = 1.01$) compared to the human companion ($M = 3.83$, $SD = 1.90$; $F(1, 300) = 176.86$, $p < 0.001$). Although the companion images were created from the same baseline appearance, participants rated the human companion as more attractive than the virtual one ($M_{\text{virtual}} = 3.26$, $SD = 1.45$ vs. $M_{\text{human}} = 4.71$, $SD = 1.36$; $F(1, 300) = 79.94$, $p < 0.001$). Therefore, the attractiveness of the companion was included as a covariate in the subsequent analysis.

5.2.2 The Effects of Influencer Type and Companion Type on Trust

The results of the ANCOVA showed significant effects of influencer type ($M_{\text{virtual}} = 2.99$, $SD = 1.36$ vs. $M_{\text{human}} = 3.40$, $SD = 1.35$; $F(1, 297) = 7.29$, $p = 0.007$), companion type ($M_{\text{virtual}} = 3.26$, $SD = 1.28$ vs. $M_{\text{human}} = 3.13$, $SD = 1.44$; $F(1, 297) = 1.80$, $p = 0.01$), and their interaction ($F(1, 297) = 4.00$, $p = 0.046$, see Figure 7) on perceived trustworthiness. Further comparisons revealed that the virtual influencer was significantly less trusted when accompanied by a human ($M = 2.71$, $SD = 1.41$) than when accompanied by a virtual companion ($M = 3.23$, $SD = 1.27$; $F(1, 297) = 11.11$, $p = 0.001$). In contrast, trust in the human influencer was not affected by companion type ($p = 0.55$).

5.2.3 Moderated Mediation

Similar to Study 2, a moderated mediation analysis (Process Model 7, 5000 bootstraps; Hayes, 2017) was conducted, with companion type (0 = human, 1 = virtual) as the moderator. The overall moderated mediation effect was significant ($\beta = 0.404$, $SE = 0.21$, $CI_{95\%} [0.007, 0.833]$). The mediation effect of trust was significant only when the influencer was accompanied by a human, negatively affecting participants' attitudes toward the virtual influencer ($\beta = -0.474$, $SE = 0.16$, $CI_{95\%} [-0.791, -0.177]$). Specifically, the interaction between influencer type and companion type on trust was significant ($\beta = 0.611$, $SE = 0.31$, $t = 1.99$, $p = 0.046$), showing a significant negative effect of the virtual influencer on perceived trust only when the influencer was accompanied by a human ($\beta = -0.716$, $SE = 0.22$, $t = -3.33$, $p = 0.001$).



[FIGURE 7: Estimated marginal means of trustworthiness with the covariate appearing at the value of 3.99]

The results of Study 3 support H3 and are consistent with those of Study 2, indicating the moderating effect of the contextual cue (i.e., companion type) on trust and attitudes toward an influencer. Specifically, trust in a virtual influencer decreased when the virtual influencer was accompanied by a human rather than a virtual companion. In contrast, when a virtual influencer was accompanied by a virtual companion, trust levels remained comparable to those

of the human influencer. A contrast analysis further revealed that the combination of a virtual influencer with a virtual companion was not significantly different from a human influencer with either a human ($p = 0.88$) or a virtual companion ($p = 0.62$).

These findings suggest that the social context (i.e., companion) in which virtual influencers are presented plays a crucial role in shaping consumer perceptions, highlighting the importance of consistency in visual cues.

6. General Discussion

Through three online experiments, this work investigates the effects of virtual influencers, compared to human influencers, on consumers' trust and attitudes. Building on previous findings that virtual influencers are generally less trusted than human influencers (e.g., Arsenyan & Mirowska, 2021), this study examines the factors that enhance or diminish trust in a virtual influencer. While it was confirmed that attitudes toward a human-like virtual influencer are more negative than attitudes toward a human influencer—consistent with the concept of algorithmic aversion (Dietvorst et al., 2015; Xu & Mehta, 2022; Yalcin et al., 2022)—Study 1 supports the Uncanny Valley theory by demonstrating that attitudes toward anime-like virtual influencers, whose appearance is far from human, are not significantly more negative than attitudes toward human influencers.

Accordingly, Studies 2 and 3 focus on human-like virtual influencers and examine the factors that influence consumer perceptions by manipulating contextual cues, such as the background image (Study 2) and the type of companion (Study 3). The findings, supported by consistency theory (e.g., Nass et al., 2000), reveal that a virtual influencer paired with a virtual cue (i.e., a virtual environment or a virtual companion) elicits the same level of trust as a human influencer. In contrast, when the virtual influencer is accompanied by a human companion or placed in a real-world setting, trust in the virtual influencer significantly decreases.

Taken together, this study, to the best of the authors' knowledge, is the first to systematically identify the conditions under which a virtual influencer is more or less trusted than a human influencer. Our findings suggest that negative attitudes toward a virtual influencer can be mitigated by adjusting contextual cues in the surrounding environment.

6.1 Theoretical Contributions

This study has several theoretical implications. First, it contributes to the influencer marketing literature not only by corroborating the notion that people prefer human influencers over virtual influencers but also by applying the Uncanny Valley theory (Mori, 1970; Mori et al., 2012) to the understanding of attitudes toward virtual influencers. In particular, the finding that a human influencer is not preferred over an anime-like virtual influencer but is preferred over a human-like virtual influencer supports the argument that people have negative attitudes toward highly anthropomorphic non-human entities. Although other studies have reported similar results (Arsenyan & Mirowska, 2021), this study enhances methodological robustness by altering the appearance of the social media influencer while keeping all other information identical. This extends the social media influencer literature by confirming that virtual influencers are not yet credible replacements for human influencers (Audrezet et al., 2023; Zhou et al., 2023), though an anime-like virtual influencer could be a viable alternative.

Second, this study expands current knowledge of consistency theory by identifying when attitudes toward virtual influencers are diminished and how trust in a virtual influencer can be maintained at the same level as trust in a human influencer. While previous studies have examined the effects of varying degrees of humanness in virtual influencers (Arsenyan & Mirowska, 2021), this study manipulated contextual cues to create matches and mismatches along the reality–virtuality dimension. The findings reveal that a virtual influencer paired with a human-like cue had the most negative effect on consumer attitudes (the mismatched condition), leading to the lowest level of trust. In contrast, trust in a virtual influencer, whether presented in a virtual environment or accompanied by a virtual companion (the matched condition), was comparable to trust in a human influencer. This supports the argument of Miao et al. (2022) that consistency between an avatar’s form and behavioral realism enhances

effectiveness, whereas a mismatch between cues is perceived as unappealing and reduces affinity (Higgins et al., 2022).

Finally, this study contributes to cue utilization theory in digital marketing and the social media influencer literature by demonstrating that simply manipulating a contextual cue can influence attitudes toward the focal object. In virtual communication, where face-to-face interactions are absent and information is often incomplete, people tend to rely on peripheral and external cues (Keeling et al., 2010). In the social media influencer literature, diverse contextual cues influence viewers' evaluations of influencers (Abidin, 2016). Notably, this study applied visual cues (i.e., background and companion) commonly found in social media influencer photos and demonstrated that these contextual cues significantly affect users' evaluations of the focal object.

6.2 Managerial Implications

The findings of this study have several important implications for marketing practitioners, particularly in social media marketing, digital branding, and e-commerce.

The findings of this study provide valuable recommendations for social media marketers using virtual influencers. The authors advise caution when incorporating virtual influencers into marketing campaigns. As applications for virtual beings continue to evolve, it is crucial for practitioners to consider how to capitalize on emerging technological trends. Virtual influencers (e.g., Miquela at the Prada fashion show) have the power to attract public attention and interest. However, at this early stage of virtual influencer adoption, the study suggests that placing them in real-world settings or alongside human companions may not yield the best results. Instead, the study proposes an alternative approach: introducing narratives

where virtual influencers interact with virtual friends in a digital environment. This strategy could mitigate negative perceptions, enhance trustworthiness, and ultimately make virtual influencers more persuasive in shaping consumer attitudes.

For digital branding, the research underscores the importance of understanding and managing contextual cues to enhance virtual influencer effectiveness. Unlike traditional marketing, digital content can be easily modified using tools like Photoshop and AI-powered photo editors. The findings suggest that simple adjustments, such as changing the background or altering the type of companions featured with a virtual influencer, can significantly impact audience perceptions.

In the e-commerce landscape, virtual influencers present an opportunity to enhance customer engagement and drive conversions. The study demonstrates that small, strategic changes to a virtual influencer's background and the type of companions they appear with can positively influence consumer trust and attitudes. By leveraging these digital modifications, e-commerce brands can create more compelling and successful online shopping experiences.

6.3 Limitations and Future Research

This study has several limitations that can be addressed in future research. First, this study only used a female influencer, as female influencers dominate the fashion market (Belanche et al., 2021). Future research could explore a broader range of virtual influencers, considering factors such as gender, age, and diverse appearance features, including skin color, to go beyond the familiar human-like representations.

Second, hypotheses were tested through online experiments. While controlled experiments offer internal validity by focusing on the variables of interest, the authors suggest

that future research employ alternative methods, such as field experiments, to enhance external validity. Behavioral responses, such as the number of likes, shares, and comments, which reflect engagement levels with social media influencer posts (e.g., Zell & Moeller, 2018), or metrics like click-through rates or page view times for advertisements, could be useful. By doing so, future studies could investigate how actual social media users interact with and engage with the content of virtual influencers compared to human influencers, thereby replicating the current findings in a real-world context.

Lastly, future studies should consider a broader range of factors that may influence trust and attitudes toward virtual influencers. While the current findings indicate that incorporating human cues into virtual influencer posts diminishes viewers' favorable attitudes, there is another body of research suggesting that human-like characteristics, such as empathic emotion, humanoid appearance, and voice-based communication, can enhance consumer trust in avatars (Brave et al., 2005). Therefore, future research could benefit from addressing this discrepancy and systematically examining which specific human-like characteristics, when added to virtual influencers, positively or negatively affect consumer perceptions.

CHAPTER 3

VIRTUAL INFLUENCERS DON'T CRY: ASYMMETRIC REACTIONS TO POSITIVE AND NEGATIVE EMOTIONAL EXPRESSIONS FROM AI AVATARS

Abstract

With rapid advancements in artificial intelligence (AI), virtual influencers—AI-powered avatars active on social media—have emerged as influential agents in digital marketing. Despite their growing prominence, they often face challenges related to trustworthiness and advertising efficacy. While they express a wide range of emotions in their content, the impact of these emotional expressions on consumer perceptions remains underexplored. Drawing on positive-negative asymmetry theory—which posits that negative information attracts greater attention and elicits stronger cognitive and emotional responses than positive information—this research investigates how negative versus positive emotional expressions influence consumer perceptions and marketing outcomes. Using a multi-method approach that combines field data analysis with three controlled experiments, the study demonstrates that negative emotional expressions heighten perceptions of uncanniness, reduce consumer trust, and ultimately diminish endorsement effectiveness. This research extends the literature on virtual influencers and human-avatar interaction by applying positive-negative asymmetry in the context of recent technological advancements, offering valuable insights for optimizing virtual influencer strategies in digital campaigns.

Introduction

With the rapid advancement of AI technologies, virtual influencers have emerged as key players in digital marketing (e.g., Zhou et al., 2023). These AI-powered avatars, designed to resemble human-like influencers, are increasingly used to interact with audiences, create content, and endorse products, services, and brands on social media platforms (Arsenyan & Mirowska, 2021; Moustakas et al., 2020). For example, one of the most prominent virtual influencers is Lil Miquela (@lilmiquela), who has gained 2.4 million followers on Instagram by sharing human-like life experiences such as traveling, shopping, and expressing emotions like happiness and sadness (Moustakas et al., 2020). She has actively partnered with global brands such as Porsche, Samsung, Chanel, and Prada (Batista da Silva Oliveira & Chimenti, 2021; Liu & Lee, 2024). This trend reflects a broader shift in digital marketing strategies, as more companies seek to leverage these AI avatars to engage consumers. The market for virtual influencers alone is projected to reach over \$4.6 billion by 2025 (Statista, 2023), underscoring their growing relevance in the marketing sphere.

A notable phenomenon in the narratives of virtual influencers is their ability to express both positive and negative emotions, which capture the attention of audiences (CSMP, 2023). While individuals generally prefer to perceive and express positive emotions over negative ones (e.g., Berridge, 1999), consumers in human-avatar interactions prefer avatars that express joy (Zhou et al., 2017) and happiness (Gong, 2007; Chuah & Yu, 2021). These positive emotional expressions enhance consumer trust in the avatar (Torre et al., 2020), as well as perceptions of interpersonal warmth, service quality, and satisfaction (Yu & Ngan, 2019). However, in the realm of social media, tweets with negative sentiments are more likely to be reposted (Tsugawa & Ohsaki, 2015), and negative emotional expressions in Instagram posts have been found to engage consumers more effectively than positive ones (Chung et al., 2023).

This may be because negative emotions, often suppressed in public expression, are perceived as unconventional (Sommers, 1984; Waterloo et al., 2017), making the individual appear to share authentic personal experiences (Chung et al., 2023). Thus, the effects of emotional expressions in avatars seem to be context-dependent, varying across different media platforms and consumer interactions. These contradictory effects raise an important question: how do the positive and negative emotional expressions of virtual influencers affect consumer perceptions and, ultimately, marketing effectiveness?

Building on the well-established concept of positive-negative asymmetry, which suggests that negative information tends to receive greater emphasis, demand more attention, and require deeper cognitive processing (Peeters, 1971; Ito et al., 1998; Baumeister et al., 2001; Rozin & Royzman, 2001), this research aims to extend studies of human-avatar interactions into the realm of social media marketing. Specifically, it explores the effects of virtual influencers' positive and negative emotional expressions.

Despite the growing presence of virtual influencers, recent studies have shown that consumers often perceive them as lacking authenticity and persuasive power (Song et al., 2024; Luo & Kim, 2023; Lou et al., 2023). Consumers tend to form weaker emotional connections with virtual influencers (Stein et al., 2022), who are generally less trusted (Qu & Baek, 2023), elicit less favorable brand attitudes (Song et al., 2024), and generate lower purchase intentions compared to human influencers (Li et al., 2023). Given these challenges, improving the marketing effectiveness of virtual influencers is crucial for both scholars and practitioners. Through real-world data analysis and three controlled experiments, this research investigates how the emotional expressions—both positive and negative—of virtual influencers influence consumer perceptions (i.e., uncanniness and trust) and, in turn, their marketing effectiveness (i.e., product attitudes and purchase intentions).

The present research makes several contributions. First, it adds to the growing body of literature on virtual influencers (e.g., Qu & Baek, 2023). Most existing research compares the marketing effectiveness of virtual influencers with traditional human influencers (Dabiran et al., 2024; Ma & Li, 2024; El Hedhli et al., 2023; Kim & Park, 2023; Lee & Yuan, 2023), exploring various aspects such as intimacy (Dabiran et al., 2024; Kim & Park, 2023; Lee & Yuan, 2023), perceived authenticity (Moustakas et al., 2020; Batista da Silva Oliveira & Chimenti, 2021), moral responsibility (Yan et al., 2024), trustworthiness (Qu & Baek, 2023), parasocial relationships (Kim & Park, 2023; Lee & Yuan, 2023), audience reactions on social media (Arsenyan & Mirowska, 2021), persuasive storytelling (Faddoul & Chatterjee, 2020), and endorsement effectiveness (e.g., purchase intentions in Franke, Groeppel-Klein, & Müller, 2023; Zhou et al., 2023). However, the emotional expressions of virtual influencers have largely been overlooked. A few studies have explored the impact of virtual influencers' emotional expressions, but they have not explained the underlying mechanisms, examined how these expressions influence marketing outcomes, or compared them with human influencers (Ham et al., 2024; Yu et al., 2024; Lim & Lee, 2023). This research addresses this gap by examining how the emotional expressions of virtual influencers shape consumer perceptions and affect marketing effectiveness.

Second, this research contributes to the field of human-avatar interaction (Miao et al., 2022; see Qu et al., 2025, for a review) with a focus on avatars' emotional expressions. Prior research has explored avatars' emotional displays in service encounters, where effective emotional cues are perceived as more relatable (Baylor & Kim, 2005; Standing et al., 2016), leading to enhanced service satisfaction (Cherniss, 2000; Gelbrich et al., 2021), increased positive word-of-mouth (Standing et al., 2016), and higher adoption intentions (Le et al., 2023). However, the social role of avatars as virtual influencers has received limited attention. This research shifts the focus from functional avatars (e.g., chatbots or service agents) to their social

roles in the highly interactive realm of social media. By demonstrating that the negative emotional expressions of AI avatars lead to unintended consequences, the findings deepen the understanding of avatar-based interactions and emphasize the need for a more cautious approach in social media marketing.

Third, this research applies the concept of positive-negative asymmetry (Peeters, 1971; Ito et al., 1998), which suggests that negative emotional expressions attract more attention and have a stronger impact than positive ones (Baumeister et al., 2001; Rozin & Royzman, 2001). By employing this theoretical framework, the study challenges existing perspectives in influencer marketing, where negative emotions are typically viewed as drivers of consumer engagement (Tsugawa & Ohsaki, 2015; Chung et al., 2023). The findings indicate that, regarding virtual influencers, negative emotions increase perceptions of uncanniness and reduce consumer trust, ultimately diminishing the effectiveness of brand endorsements. Additionally, the study adapts psychological models of human cognition and emotion processing to AI interactions and digital marketing, with significant implications for marketers in the rapidly growing AI avatar, virtual influencer, and social media sectors.

In the following sections, we first review the relevant literature on virtual influencers, emotional expression in avatars, positive and negative emotional expressions, and positive-negative asymmetry. Based on prior research, we propose three hypotheses comparing the negative and positive emotional expressions of virtual influencers. To test these hypotheses, we report four studies, including one field data analysis and three controlled experiments. Finally, the theoretical contributions and managerial implications are discussed in the General Discussion.

Conceptual Background

Virtual Influencer: A Subset of AI Avatar

Advancements in digital technology have fueled the proliferation of digital characters, commonly referred to as avatars. These avatars are digital entities with anthropomorphic appearances, controlled either by humans or software, capable of interacting with users (Miao et al., 2022). Initially designed for task-oriented responses to simple queries and once scripted (Qu & Baek, 2023), avatars have evolved into autonomous versions powered by AI (De Freitas & Cohen, 2024). Today's avatars resemble humans in both appearance and interaction, with lifelike features that facilitate natural engagement and foster emotional and social bonds in digital environments (Li et al., 2023; Silva & Bonetti, 2021).

Widely adopted across various sectors, avatars take on diverse forms, such as chatbots (Ho et al., 2018), automated assistants (Natour et al., 2011), virtual service agents (Le et al., 2023; Verhagen et al., 2014), embodied agents (Lee & Choi, 2017; Schuetzler et al., 2018), virtual/digital assistants (Chattaraman et al., 2019; Freeman & Beaver, 2018; Gelbrich et al., 2021), and virtual humans (Roxas et al., 2018), all designed to assist in services, recommend products or endorse brands (Von der Pütten et al., 2010; Silva & Bonetti, 2021; Qu et al., 2025).

A more recent evolution of AI avatars, virtual influencers, are gaining significant prominence in digital marketing. These computer-generated characters, created using advanced technologies like 3D modeling, motion capture, and AI, actively engage with users rather than serving as passive entities (Arsenyan & Mirowska, 2021; Sands et al., 2022). Unlike service avatars (e.g., chatbots), which are primarily task-based and respond to consumer queries (Qu & Baek, 2023), virtual influencers are designed with crafted personas and narratives to emotionally bond with audiences through their social media presence (Arsenyan & Mirowska, 2021; El Hedhli et al., 2023; Moustakas et al., 2020). With their customized digital attributes,

virtual influencers offer unique advantages in collaborating with brands (Jiang et al., 2024), becoming a popular digital marketing tool, and securing a global foothold in the ever-expanding influencer market (Zhou et al., 2023).

Emotional Expressions of AI Avatars

Emotion is commonly defined as a mental state, affection, or reaction (Cabanac, 2002), or as “a state of physiological arousal and of a cognition appropriate to this state of arousal” (Schachter & Singer, 1962, p. 380). Emotional expression plays a key role in communicating emotions and influencing social interactions (Ekman, 2004). It is one of the primary ways individuals express their feelings, significantly affecting attention (Evans, 2001), memory (Christianson & Loftus, 1991), perceptions and actions (Hatfield et al., 1993), information processing (Lemerise & Arsenio, 2000), problem-solving (Isen et al., 1987), judgment and decision-making (Baron, 1987), persuasion (Mackie & Worth, 1989; Mackie & Worth, 2020), and personal development (e.g., goal pursuit; Fang et al., 2024). Emotional expression is crucial for building and maintaining social relationships (Ekman, 2004), which is particularly relevant when AI avatars, such as virtual influencers, engage in meaningful communication with consumers by expressing emotions (Lim et al., 2023; Ham et al., 2024; Yu et al., 2024).

As AI technology advances, there is a growing body of research highlighting the potential of AI avatars to form emotional connections with users (Huang & Rust, 2021). The emotions of avatars can be conveyed through various modalities, such as written language (e.g., text-based chatbots; Shumanov & Johnson, 2021), spoken communication (e.g., embodied conversational agents; Liew et al., 2017), and visual cues, including facial expressions and body language (e.g., virtual humans; Yu et al., 2024). Virtual influencers, specifically, utilize

a combination of these modalities to create more immersive and emotionally engaging interactions (e.g., Yu et al., 2024).

The impact of avatars' emotional expressions has been widely studied in the context of human-avatar interactions. Research shows that avatars with effective emotional expressions can positively influence service performance by enhancing consumer satisfaction through perceived warmth in interactions (Cherniss, 2000; Gelbrich et al., 2021). Standing et al. (2016) further demonstrated that emotional expressions from avatars are linked to quicker word-of-mouth (WOM) within online communities. Consumers who engage with avatars that express emotions are more likely to adopt and recommend them (Le et al., 2023). In contrast, avatars lacking emotional expression are often seen as less human-like and engaging, whereas emotionally expressive avatars are perceived as more relatable, even if they are less competent (Baylor & Kim, 2005). Qualitative studies also highlight that consumers strongly prefer interacting with avatars that display emotions, rather than those that are unemotional (Creed et al., 2015).

Positive and Negative Emotional Expressions

Emotions and emotional expressions are categorized into positive or negative valence, with individuals typically preferring to perceive and express positive emotions over negative ones (Berridge, 1999). Those who express positive emotions, such as smiles, are often perceived as more sociable, honest, pleasant, polite, kind, and warm (Bernstein et al., 2010; Mueser et al., 1984). In marketing and service encounters involving interpersonal interactions, positive emotional expressions are generally favored (e.g., Zhang et al., 2022).

The "computers are social actors" paradigm suggests that the basic rules of interpersonal interaction also apply to human-avatar interaction (Reeves & Nass, 1996; Nass & Moon, 2000). Consumers are more likely to experience positive emotions when avatars express joy (Zhou et al., 2017), which in turn enhances their trust in the avatar (Torre et al., 2020). In particular, happy avatars generate higher consumer engagement, including increased consumption intention and more favorable evaluations, even when their emotional expressions are not contextually aligned (Gong, 2007). This effect is seen in real-world applications, such as at the Henna Hotel, where smiling robots are shown to improve perceived interpersonal warmth, service quality, and customer satisfaction (Yu & Ngan, 2019). Similarly, humanoid robots like Sophia, whose expressions of happiness and surprise increase consumer pleasure, are more engaging compared to those that express sadness (Chuah & Yu, 2021).

On the flip side, research also indicates that negative emotional expressions can evoke favorable reactions. Sadness and fear, for instance, may elicit sympathy and a desire to assist (Lench, Tibbett, & Bench, 2016; Marsh & Ambady, 2007). The impact of negative emotional expressions is particularly amplified in social media marketing. Although emotions on Instagram are generally more positive, negative emotions tend to engage consumers more effectively than positive ones (Chung et al., 2023). Negative emotions, often suppressed in public, are perceived as unconventional, and when expressed, they can be seen as more authentic (Sommers, 1984; Waterloo et al., 2017). Messages with negative sentiments on Twitter, for example, are more likely to be reposted (Tsugawa & Ohsaki, 2015). Given the contradictory findings on the effect of emotional valence, this research focuses on examining the impact of positive and negative emotional expressions of virtual influencers on consumers.

Positive-Negative Asymmetry

Humans have a natural tendency to place greater emphasis on negative stimuli than on positive ones, a bias rooted in both innate tendencies and life experiences (Rozin & Royzman, 2001). This phenomenon, known as positive-negative asymmetry, suggests that negative events, emotions, and information exert a stronger influence on human cognition, behavior, and social interactions than positive ones (Baumeister et al., 2001; Vaish et al., 2008). Negative stimuli demand more attention and cognitive processing, as they are perceived as more informative (Peeters & Czapinski, 1990). Czapinski (1988) explains this bias through a behavioral-adaptive perspective, suggesting that negative outcomes—such as encountering harmful toadstools instead of beneficial mushrooms—are more salient for survival. Consequently, humans develop a heightened sensitivity to negative stimuli, which leads to an overemphasis on the negative (Peters, 1971).

Neuroscientific evidence further supports this asymmetry. Research by Ito et al. (1998), which found that negative pictures elicited larger late positive potentials (LPPs) in event-related brain potentials (ERPs) compared to positive pictures. Despite both stimuli being equally arousing, the larger LPPs associated with negative stimuli suggest that negative information is processed more intensely or saliently. Brain regions involved in this bias include the right inferior frontal/insular cortex, which shows greater activation in response to negative stimuli (Cunningham et al., 2004). While the amygdala responds to both negative and positive stimuli, it is more sensitive to emotional intensity, with greater reactivity to negative stimuli (Lewis et al., 2007; Winston et al., 2005). These findings suggest that the negativity bias is encoded in neural activity early in the processing stream, beginning with the initial categorization of stimuli into emotional valence classes (Ito et al., 1998).

This asymmetry has been consistently observed in various psychological processes, including attitude and impression formation, decision-making, and emotional processing (e.g.,

Anderson, 1965; Peeters & Czapinski, 1990; Skowronski & Carlston, 1989; Baumeister et al., 2001; Rozin & Royzman, 2001). For instance, negative impressions and bad stereotypes are quicker to form and more resistant to disconfirmation than good ones (Baumeister et al., 2001). When forming impressions of others, negative traits are given more weight in overall evaluations than positive traits (Bimbaum, 1972; Feldman, 1966; Fiske, 1980; Hodges, 1974), and individuals need less negative trait information to infer characteristics about others (Aloise, 1993; Anderson, 1965; Czapinski, 1988). Similarly, in decision-making, negative aspects of events tend to carry more weight than positive ones (Kahneman & Tversky, 1984; Peeters & Czapinski, 1990). Negative experiences—such as losing money, receiving criticism, or being abandoned by friends—tend to have a greater psychological impact than equally extreme positive events (Baumeister et al., 2001; Kahneman & Tversky, 1984). This is exemplified by the axiom that losses loom larger than gains of the same magnitude (Kahneman & Tversky, 1984; Kanouse & Hanson, 1971).

In the realm of emotions, negative emotions tend to have a more profound impact on individuals than positive emotions, even when both are equally distant from a neutral state (Baumeister et al., 2001). This positive-negative asymmetry is reflected in the greater cognitive resources devoted to processing negative affect, as people often prioritize escaping negative moods over prolonging positive ones (Baumeister et al., 2001). The salience of negative events further amplifies this bias, with research showing that negative experiences are more likely to be recalled than positive ones (Finkenauer & Rime, 1998). Additionally, negative emotions elicit a wider range of potential responses compared to positive emotions, contributing to a larger variety of negative emotional states (Kahneman & Tversky, 1984). This observation aligns with Wilhelm Wundt's early recognition that language reflects the greater variety and intensity of unpleasant emotions (Wundt, 1896). Negative emotional states are often described using a richer, more varied vocabulary, and there is a more nuanced language for physical pain

than for physical pleasure (Baumeister et al., 2001; Rozin & Royzman, 2001). Thus, negative emotions not only demand more cognitive attention but also generate a more complex and finely tuned response system, both psychologically and linguistically (Rozin & Royzman, 2001).

Prior research has also examined how individuals respond to emotional expressions. For example, Steiner (1979) found that adults were more accurate in judging negative facial expressions, such as those related to sour (negative) versus sweet (positive) tastes. Similarly, Oehman, Lundqvist, and Esteves (2001) found that threatening frowning faces (negative) were detected more quickly and accurately than smiling faces (positive) under most conditions, although no significant difference was observed when the background consisted of friendly faces and the processing time was short. These findings suggest that negative emotional expressions tend to capture more attention and are recognized more readily than positive ones, further supporting the positive-negative asymmetry in emotion recognition, particularly regarding facial expressions.

Hypothesis Development

Building on the positive-negative asymmetry phenomenon, this research aims to examine how negative versus positive emotional expressions of virtual avatars influence consumers' perceptions of uncanniness, trust inferences, and, consequently, their marketing effectiveness.

Uncanniness. The Uncanny Valley theory posits that non-human entities exhibiting human-like characteristics, without being fully human, elicit a sense of uncanniness (Mori, 1970). Central to this concept is anthropomorphism, which involves attributing human-like traits—particularly emotions, motivations, and intentions—to non-human entities (Leyens et

al., 2003; Epley et al., 2007). In the context of AI avatars, the integration of human-like emotions into their design can make them more relatable (Baylor & Kim, 2005), yet may also trigger discomfort when they are perceived as "almost human" but not quite.

Emotional responsiveness (which includes the concept of emotional expression), often seen as a fundamental aspect of human nature (Haslam, 2006; Loughnan & Haslam, 2007), is a core component of anthropomorphism (Epley et al., 2007). Despite humanity's tendency to celebrate our agentic capacities, the true essence of our minds lies in our hearts—our feelings and emotions (Shakespeare, 1992, Act II, Scene ii, 285–300). This may explain why emotional expressions, particularly when conveyed by non-human agents, can have a significant impact on how they are perceived. Gray and Wegner (2007) argue that a sophisticated chatbot that conveys emotions may be unnerving. This phenomenon is likely applicable to AI avatars, such as virtual influencers, where the display of emotions can lead to perceptions of uncanniness. Notably, this sense of uncanniness may be more pronounced, or even emerge exclusively, when the emotional expressions are negatively valenced. This aligns with the well-established positive-negative asymmetry phenomenon, which posits that negative emotions and information are processed more thoroughly and perceived more intensely (e.g., Baumeister et al., 2001). Thus, we hypothesize:

H1. Negative emotional expressions of virtual avatars elicit stronger uncanniness perceptions among consumers compared to positive and neutral emotional expressions.

Trust and Marketing Effectiveness. Trust plays a pivotal role in human-AI interactions (Yang & Wibowo, 2022; De Freitas et al., 2023; Dietvorst et al., 2018). Unlike other AI systems, such as recommendation engines or prediction tools, AI avatars engage users in dynamic, human-like conversations, which often lead to higher credibility attribution (Pentina et al., 2023; Sundar, 2008). This interactivity fosters interpersonal dynamics, allowing users to form bonds

with avatars (Xie & Pentina, 2022; Li & Zhang, 2024). Additionally, AI avatars typically incorporate strong anthropomorphic elements, displaying human-like conversational styles across various topics, unlike the rigid, pre-defined conversations that are typical of rule-based AI systems (Jo et al., 2023). Studies suggest that these anthropomorphic avatars are often perceived as more trustworthy (Chen & Park, 2021), indicating their effectiveness in building trust among consumers (Ng & Zhang, 2025).

While anthropomorphic AI avatars can be highly effective at building trust, extensive research has also highlighted the detrimental effects associated with their perceptions of uncanniness or eeriness. Such perceptions can reduce trust (Weisman & Peña, 2021; Song & Shin, 2024), diminish consumer attitudes (Kim et al., 2019), and ultimately, undermine marketing effectiveness (Song & Shin, 2024). For example, exposure to a talking head avatar that mirrors the participant's face triggers uncanny perceptions, which in turn decreases affect-based trust in the avatar (Weisman & Peña, 2021). Similarly, increasing the human-like appearance of an avatar significantly elevates feelings of eeriness, which negatively affects consumers' trust in the avatar and lowers their purchase intentions (Song & Shin, 2024).

In the context of social media, virtual avatars are commonly used as virtual influencers to endorse products/services/brands (Qu & Baek, 2023). According to source credibility theory, people are more likely to be persuaded by credible sources (Ohanian, 1990). The trustworthiness of the influencer significantly impacts the effectiveness of marketing, influencing consumers' attitudes toward the advertisements, the endorsed brands (Schouten et al., 2020), and products (Jin et al., 2019; Kim & Kim, 2021), as well as purchase intentions (Kim & Kim, 2021; Schouten et al., 2020).

In this research, virtual avatars with emotional embodiment, particularly those displaying negative emotional expressions, are likely to reduce trust by heightening perceptions

of uncanniness. This decrease in trust, in turn, may undermine their effectiveness in endorsing products and influencing consumer behavior. Formally stated:

H2. A virtual avatar's negative (vs. positive) emotional expression reduces consumer trust by heightening perceptions of uncanniness.

H3. A virtual avatar's negative (vs. positive) emotional expression undermines endorsement effectiveness (i.e., product attitudes and purchase intention) by reducing trust, compared to humans.

Study 1

Study 1 ventured into the field to provide evidence for the assumption that negative emotional expressions by a virtual agent (i.e., virtual influencer) lead to detrimental effects (i.e., negative tone and uncanniness) among consumers. Instagram posts and comments from Lil Miquela's official account were selected as the data source for the reasons below. As a prominent figure in virtual influencer research (e.g., Drenten & Brooks, 2020; Ozdemir et al., 2023), she is the top virtual influencer on Instagram with the largest content and followers (Molenaar, 2024), ensuring substantial consumer engagement for analysis. Miquela's negative emotional posts attract attention and spark discussion on this novel phenomenon (Dpa, 2023; Young, 2023).

In Study 1, we employed an emotion detection method to identify facial expressions in the figures' faces within the posts. Next, a lexicon-based text analysis assessed (i) sentiment tone, reflecting consumers' general attitudes, and (ii) their perceptions of uncanniness in the comments. Finally, a linear regression analysis examined the relationship between the virtual influencer's emotional expressions and consumer responses (i.e., sentiment tone and uncanniness).

Design and Procedures

Data collection. Python scripts scraped posts and comments from Lil Miquela's Instagram account. The data collection process began on July 3, 2023, and concluded on July 8, 2023. During this period, we gathered all 1,263 of Lil Miquela's Instagram posts, from her initial post on April 23, 2016, to her latest one on June 21, 2023. Our compilation included 2,069 pieces of media (i.e., images and videos), among which 477 (23.05%) contained multiple

images, and 165 (7.97%) featured videos. To comprehensively detect the emotional expressions of the figures in the posts, all images from multi-image posts were included in the analysis, and we extracted the cover images (i.e., the first frame) from video posts, as they shape consumers' first impressions. This process resulted in a total of 2,069 images from the media. Meanwhile, we included 469,493 comments under the collected posts for analysis.

Independent variables. The independent variables—the emotional expressions of the virtual influencer—were identified in posts using Microsoft Azure's cloud-based Face Vision Application Programming Interface (API), which is widely used in marketing research and emotion recognition (Lee, 2021; Chuah et al., 2021). The analysis first detected the presence of faces in all images, excluding 389 posts (18.80%) without faces, resulting in 1,680 images with faces. In instances where images contained multiple faces ($N = 356$; 17.21% of images), the one with the largest pixel area was selected for detailed examination. For emotion detection, the pre-trained API quantifies eight emotions—anger, contempt, disgust, fear, happiness, neutrality, sadness, and surprise—each contributing to a total score of 1,680 (100%). We summed the scores for “anger,” “contempt,” “disgust,” “fear,” and “sadness” to represent negative emotion (48.80, 2.90%), used “happiness” for positive emotion (565.93, 33.69%), and “neutral” for neutral emotion (1,024.72, 61.00%). “Surprise” (40.15, 2.39%) was excluded due to its ambiguous classification and potential collinearity issues.

Dependent variables. Sentiment tone and perceptions of uncanniness were evaluated using the Linguistic Inquiry and Word Count⁵ (LIWC; Boyd et al., 2022), a software tool for

⁵ The LIWC program analyzes texts by comparing each word to predefined and customized dictionaries, calculating word frequencies across categories. Each score reflects the proportion of words in a particular category within the text (Lin et al., 2021).

automated text analysis that has proven effective for sentiment analysis in marketing studies (Robertson et al., 2023; Lin et al., 2021).

To gain an overview of consumers' attitudes toward the virtual influencer's emotional expressions, we first focused on its sentiment tone, specifically the "negative tone" and "positive tone" from the LIWC default dictionary. Another variable, "uncanny," is defined by the Oxford English Dictionary as "strange or mysterious, especially in an unsettling way." We customized the dictionary to investigate perceptions of uncanniness in comments (see Appendix G). To ensure comprehensive measurement, we expanded the vocabulary beyond "uncanny" and "uncanniness" to include related synonyms, comprising 38 adjectives, 36 corresponding noun forms, and two phrases, totaling 76 words and phrases.

Using the customized dictionary, a total of 4,586 comments (0.98% of all comments) were identified as reflecting perceptions of uncanniness, with the frequency of uncanny-related terms ranging from 0.24% to 100%. To assess the reliability of this self-developed dictionary, one of the authors and a research assistant independently reviewed 459 comments (10% of the uncanny-related comments) and agreed that 385 of these comments accurately reflected uncanniness perceptions, resulting in a precision rate of 83.89%. This precision rate outperformed other text classification models (e.g., Qi & Shabrina, 2023).

We also examined consumer engagement, indicated by the number of "likes" and "comments" (e.g., Swani & Labrecque, 2020; Rietveld et al., 2020), as detailed in Appendix G. Table 1 describes the dependent variables. After assessing their distribution, we applied a log transformation to achieve approximate normality, upon which the subsequent analyses were conducted.

Category	Variable name	Description	Examples of comments
Affect category (LIWC)	Negative tone	Whether the comments contained negative tone including bad, wrong, too much, hate, etc.	Score = 100; E.g., "Ewwwww" "Fakeshit" "Ugly" "Annoying." Score = 50; E.g., "Pls stop!!" "Playing sims" "Stfu pls"
	Positive tone	Whether the comments contained positive tone including good, well, new, love, etc.	Score = 100; E.g., "GORGEOUS" "Beautifullllll" "Fabulous" Score = 50; E.g., "Nice bangs" "Interesting design" "Hi robot"
Self-developed (LIWC)	Perceived uncanniness	Whether the comments contained uncanniness perception including uncanny, uncanniness, creepy, creepiness, freaky, freakiness, etc.	Score = 100; E.g., "Creepy creepy creepy" "FREAK" "weird" Score = 50; E.g., "Spooky movies" "Kinda creepy" "Creepy tho"
Engagement	Likes (Appendix G)	Number of likes	/
	Comments (Appendix G)	Number of comments	/

[TABLE 1. Descriptions of dependent variables]

Control variables. We first controlled for media type (i.e., image or video) since images and videos elicit different levels of engagement (Borah et al., 2020; Tellis et al., 2019). Second, we controlled for the number of images per post, termed image count, because consumers may allocate different attention to single-image and multi-image posts. Third, the number of faces per image, referred to as face count, was controlled. This is important because group photos, which contain social cues perceived differently from solo images (Krämer et al., 2017), and the presence of companions can affect trust in virtual influencers (Qu & Baek, 2023). We also considered the gender of the focused face, since the largest face in the image may not be Miquela but another celebrity, possibly male. Lastly, since Miquela first appeared on Instagram on April 23, 2016, but did not reveal herself as an AI bot until 2018, we controlled for the posting year to account for evolving consumer awareness and perceptions of virtual nature over time.

Results and Discussion

Sentiment tone. In the linear regression analysis, after controlling for media type, image count, face count, influencer gender, and posting year, results showed that consumers were more likely to use negative tones in their comments when the virtual influencer expressed stronger negative emotions ($\beta = .117$, $SE = .085$, $t = 3.437$; $p = .001$; Table 2, model 2). However, the virtual influencer's positive ($\beta = .114$, $SE = .061$, $t = 1.284$; $p = .199$) and neutral emotional expressions ($\beta = .072$, $SE = .061$, $t = .805$; $p = .421$) did not significantly influence the use of negative tone. Furthermore, the regression results showed that the use of positive tones was unaffected by the virtual influencer's different emotional expressions ($\beta_{\text{negative}} = -.003$, $SE = .078$, $t = -.075$; $p = .940$; $\beta_{\text{positive}} = .041$, $SE = .056$, $t = .466$; $p = .641$; $\beta_{\text{neutral}} = .040$, $SE = .056$, $t = .449$; $p = .653$; Table 3, model 2).

[TABLE 2. VI's emotional expressions and consumers' negative tones (log-transformed)]

	(1)	(2)
(Constant)	(.062)	(12.197)**
Negative emotional expression	.121 (.088)	.117** (.085)
Positive emotional expression	.148 (.063)	.114 (.061)
Neutral emotional expression	.195 (.063)	.072 (.061)
Media type		.015 (.029)
Image count		-.102** (.005)
Face count		.049 (.009)
Influencer gender		.030 (.028)
Posting year		-.232** (.006)
R Square	.009**	.088**
N _{media} = 1,690	N _{comments} = 469,493	

Notes: Standard errors are in parentheses; * $p < .05$, ** $p < .01$.

[TABLE 3. VI's emotional expressions and consumers' positive tones (log-transformed)]

	(1)	(2)
(Constant)	(.055)**	(.078)**
Negative emotional expression	-.006 (.079)	-.003 (.078)
Positive emotional expression	.026 (.057)	.041 (.056)
Neutral emotional expression	-.041 (.057)	.040 (.056)
Media type		-.109**(.027)
Image count		.023 (.005)
Face count		.019 (.008)
Influencer gender		-.078** (.026)
Posting year		.166** (.006)
R Square	.004	.051**
N _{media} = 1,690	N _{comments} = 469,493	

Notes: Standard errors are in parentheses; * $p < .05$, ** $p < .01$.

Uncanniness. In the linear regression analysis, after accounting for the control variables, the uncanniness score increased when the virtual influencer expressed negative emotions in posts ($\beta = .080$, $SE = .153$, $t = 1.993$; $p = .046$; Table 4, model 2). However, positive emotional expressions by the virtual influencer did not affect consumers' perceptions of uncanniness ($\beta = .071$, $SE = .112$, $t = .690$; $p = .491$), nor did posts with neutral emotions ($\beta = .014$, $SE = .112$, $t = .133$; $p = .895$).

[TABLE 4. VI's emotional expressions and consumers' uncanniness perceptions (log-transformed)]

	(1)	(2)
(Constant)	(.109)**	(22.328)
Negative emotional expression	.073 (.154)	.080* (.153)
Positive emotional expression	.052 (.112)	.071 (.112)
Neutral emotional expression	-.012 (.112)	.014 (.112)
Media type		.075* (.053)
Image count		-.107** (.010)

Face count		.070* (.015)
Influencer gender		.015 (.053)
Posting year		.040 (.011)
R Square	0.009*	0.028**
N _{media} = 1,690		N _{comments} = 469,493

Notes: Standard errors are in parentheses; * $p < .05$, ** $p < .01$.

Regarding engagement, neither negative nor positive emotional expressions of the virtual influencer affected the number of likes ($p > .05$), whereas neutral emotional expression decreased likes ($p < .05$). The virtual influencer's emotional expressions did not influence the number of comments, regardless of control variables ($p > .05$; see Appendix G for more details).

Study 1 provides preliminary evidence for H1 by analyzing Instagram posts and comments from a prominent virtual influencer. The results show that *only* negative emotional expressions by the virtual influencer increase the use of negative tones in comments and evoke perceptions of uncanniness, although they do not significantly affect consumer engagement.

Study 2A

In a controlled experiment, Study 2A examines whether the virtual influencer's negative (vs. control vs. positive) emotional expression results in higher levels of uncanniness (H1).

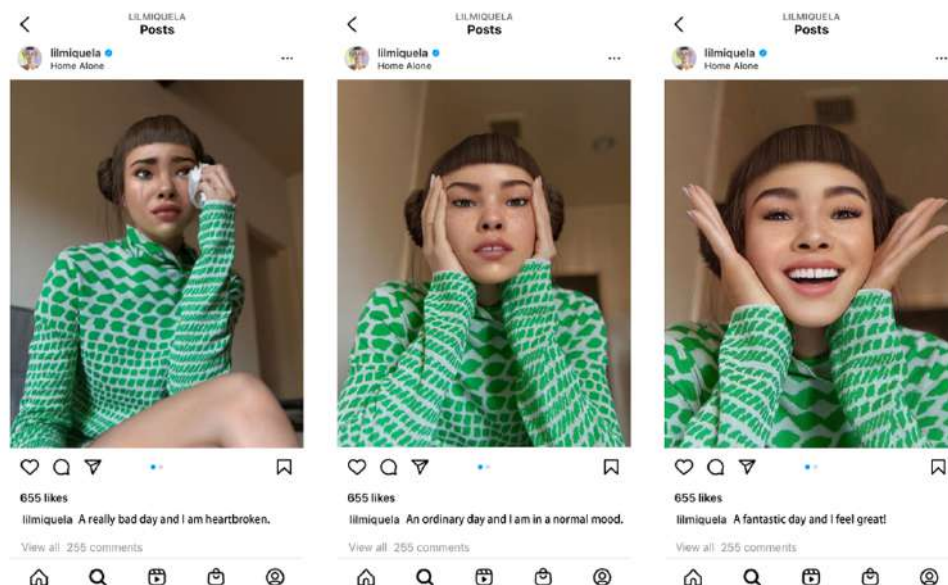
Method

The survey was developed using Qualtrics and administered via Prolific, recruiting 589 US-based Instagram users who were compensated with a small monetary reward. After excluding invalid responses that failed the attention check⁶ ($N = 167$) or did not complete the survey ($N = 4$), the final sample size was 418 ($M_{\text{age}} = 31.67$, $SD = 8.02$; 46.9% female, 50.0% male, 3.1% other). Participants were randomly assigned to one of three conditions in a single-factor, three-level (emotional expression: negative vs. control vs. positive) between-subjects design. We created fictitious screenshots as stimuli using images sourced from Lil Miquela's Instagram posts⁷. In the negative emotion condition, the virtual influencer's face appeared sad with tears, captioned, "A really bad day and I'm heartbroken." In the control condition, she displayed a neutral expression with the caption, "An ordinary day and I'm in a normal mood." In the positive emotion condition, she laughed happily with the caption, "A fantastic day and I feel great!" (see Figure 1).

⁶ The question "What is not true about Miquela?" presented three options: "Miquela is a computer-generated fictional character," "Miquela is a human" (correct answer), and "Miquela is a virtual influencer." The requirement for heightened attention and comprehension likely contributed to a high failure rate (28.35%). To address this, a simpler attention check was implemented in subsequent studies.

⁷ Two remain untouched, while the image for the positive condition was retouched by (i) cropping irrelevant parts and (ii) enhancing her positivity using an AI tool.

Participants first viewed a headshot of Lil Miquela, introduced as a virtual influencer, followed by an attention check. Next, they viewed a screenshot of an Instagram profile containing basic information about her before being presented with one of three stimuli. A manipulation check measured emotional valence on a 7-point scale (1 = “negative” to 7 = “positive”). The measure of perceived uncanniness follows Gray and Wegner (2012). Participants rated their feelings of "uneasy," "unnerved," and "creeped out" on a 7-point Likert scale (1 = "not at all" to 7 = "extremely")⁸, as these terms are more commonly used and less ambiguous than "uncanny" (Gray & Wegner, 2012). The study concluded with participants providing demographic information.



[FIGURE 1: Stimuli for the virtual influencer’s negative (left), control (middle), and positive (right) emotional expressions]

⁸ Gray and Wegner’s (2012) scale originally used 5 levels, which we adapted to a 7-level scale for consistency across measures.

Results and Discussion

Manipulation check. A one-way ANOVA showed that participants in the negative emotional expression condition rated the virtual influencer's emotion as significantly more negative ($M = 1.34$, $SD = .63$) than those in the control condition ($M = 4.02$, $SD = .73$; $p < .001$) and the positive condition ($M = 6.30$, $SD = 1.19$; $p < .001$), confirming the effectiveness of the manipulation.

Uncanniness. A one-way ANOVA revealed a significant main effect of the virtual influencer's emotional expressions on participants' perceived uncanniness ($F(2, 415) = 5.15$, $p = .006$; $\eta^2 = .024$). Negative emotional expression led to significantly higher perceived uncanniness compared to the control condition ($M_{\text{negative}} = 4.39$, $SD = 1.85$ vs. $M_{\text{control}} = 3.69$, $SD = 1.87$; $p = .003$), and the positive emotional condition ($M_{\text{positive}} = 3.83$, $SD = 2.05$; $p = .016$). The control and positive conditions did not differ in perceived uncanniness ($p = .550$). H1 is supported.

The results from both real-world data (Study 1) and the controlled experiment (Study 2A) are consistent: only negative (vs. control vs. positive) emotional expressions by the virtual influencer increase perceptions of uncanniness, supporting H1. In subsequent studies, we focus on emotional valence by comparing negative vs. positive emotional expressions to explore how negative emotional expression affects trust toward the virtual influencer.

Study 2B

Study 2B aims to generalize the findings by using a different virtual influencer and examining another important outcome variable in the context of influencers—perceived trustworthiness. Again, we test whether the impact of emotional expression on the outcome variable is explained by the feeling of uncanniness (H2).

Method

A total of 324 U.S.-based Prolific participants ($M_{\text{age}} = 34.25$, $SD = 8.02$; 49.7% female, 48.5% male, 1.9% other) were randomly assigned to one of two conditions in a single-factor, two-level (emotional expression: negative vs. positive) between-subjects design. To create the stimuli, we used an AI photo editor to modify an image of a neutral-faced human influencer to display negative and positive emotions, while describing her as a virtual character. The captions were pretested to differ in emotional valence while maintaining similar levels of ease of imagination (how easily participants can visualize the scenario), authenticity (how genuine the captions are perceived to be), and emotional intensity (the strength or degree of the emotion conveyed) (Figure 2; Pretest was detailed in Appendix H). The procedure is similar to Study 2A, with trust measured on a 6-item, 7-point semantic differential scale (e.g., “believable/unbelievable”; Ohanian, 1990; $\alpha = .974$).



[FIGURE 2: Stimuli for the virtual influencer's negative (left) and positive (right) emotional expressions]

Results and Discussion

Manipulation check. The results of one-way ANOVA confirmed a successful manipulation, with differing levels of emotional valence ($M_{\text{negative}} = 1.41$, $SD = .87$ vs. $M_{\text{positive}} = 6.32$, $SD = .99$; $F(1, 322) = 2243.10$, $p < .001$; $\eta^2 = .874$), but similar intensity ($M_{\text{negative}} = 4.96$, $SD = 1.77$ vs. $M_{\text{positive}} = 5.17$, $SD = 1.31$; $F(1, 322) = 1.47$, $p = .226$; $\eta^2 = .005$).

Trust. The results of the one-way ANOVA revealed that participants rated the virtual influencer as being less trustworthy after viewing its negative emotional expression compared to the positive expression ($M_{\text{negative}} = 3.10$, $SD = 1.76$ vs. $M_{\text{positive}} = 3.72$, $SD = 1.88$; $F(1, 322) = 9.37$, $p = .02$; $\eta^2 = .028$).

Uncanniness. A one-way ANOVA on uncanniness also showed that perceived uncanniness was higher in the negative emotional expression condition than in the positive

condition ($M_{\text{negative}} = 4.17$, $SD = 1.82$ vs. $M_{\text{positive}} = 3.31$, $SD = 1.91$; $F(1, 322) = 17.61$, $p < .001$; $\eta^2 = .051$).

Mediation. A mediation analysis (Process Model 4, 5,000 bootstraps; Hayes, 2012) indicated that perceived uncanniness mediates the effect on trust (indirect effect: $b = .159$, $SE = .046$; 95% CI [.076, .258]; direct effect: $b = .151$, $SE = .097$, $p = .118$; 95% CI [-.039, .341]). Supporting H2, the negative emotional expression of the virtual influencer diminishes trust by increasing feelings of uncanniness, in contrast to the positive emotional expression condition.

Study 2 provides direct causal evidence supporting our assertions. Negative (vs. control vs. positive) emotional expression by the virtual influencer elicits uncanniness (Study 2A) and reduces trust compared to positive expressions (Study 2B). Study 2 raises questions about whether negative emotional expression, regardless of agent type, causes detrimental effects or if these effects are specific to virtual agents. Study 3 addresses this by comparing agent types.

Study 3

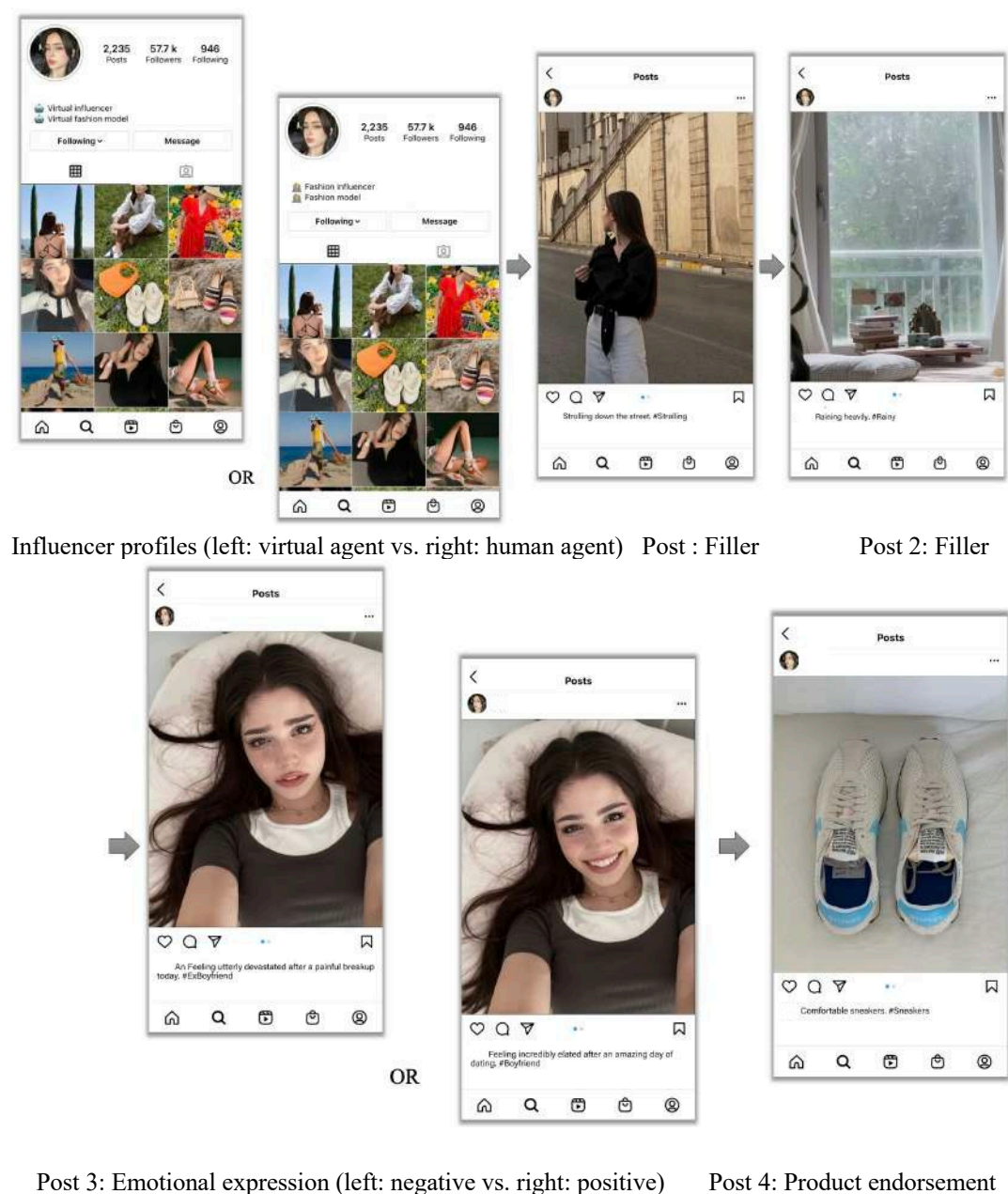
The objective of Study 3 is twofold. First, it explores the consequences of influencers' emotional expressions on marketing-related outcomes (i.e., attitudes and purchase intentions toward the endorsed product). To enhance ecological validity, the study examines product endorsement effectiveness in a separate post rather than the same post where the influencer displays emotional expressions, suggesting the spillover effect of emotional expressions on other postings. Second, the study compares virtual and human influencers to determine whether consumer trust is uniquely diminished by a virtual influencer's negative emotional expressions rather than by a human influencer, thereby affecting the effectiveness of influencer endorsements.

Method

Three hundred and seventy US-based participants ($M_{\text{age}} = 35.16$, $SD = 8.32$; 72.7% female, 26.2% male, 1.1% other) completed this study in exchange for monetary compensation on Prolific. They were randomly assigned to a 2 (emotional expression: negative vs. positive) $\times$ 2 (agent type: virtual vs. human) between-subjects design.

Participants first viewed a mock profile of the influencer, which included an introduction describing her as either a virtual fashion influencer or a fashion influencer, followed by an attention check. They then viewed four posts: two filler posts, a third post containing either negative or positive stimuli to manipulate emotional valence, and a fourth post featuring sneakers endorsed by the influencer (see Figure 3). Next, product attitudes were measured using a 3-item bipolar semantic differential scale (e.g., “not likable/likable”; Madden et al., 1988; $\alpha = .908$), while purchase intention was assessed on a 7-point Likert scale with the

question, “How willing are you to purchase the sneakers?” Participants also rated their trust in the influencer on a 4-item, 7-point Likert scale (e.g., “The influencer can be relied upon for her content”; Kim & Kim, 2021; $\alpha = .917$). The emotional expression stimuli were presented again to assess emotional intensity (1 = “not intense at all” to 7 = “very intense”). Finally, participants provided demographic information and their daily Instagram usage (1.1% “Never use,” 46.5% “Less than 1 hour,” 36.2% “1 to 2 hours,” 10.0% “2 to 3 hours,” 6.2% “More than 3 hours”).



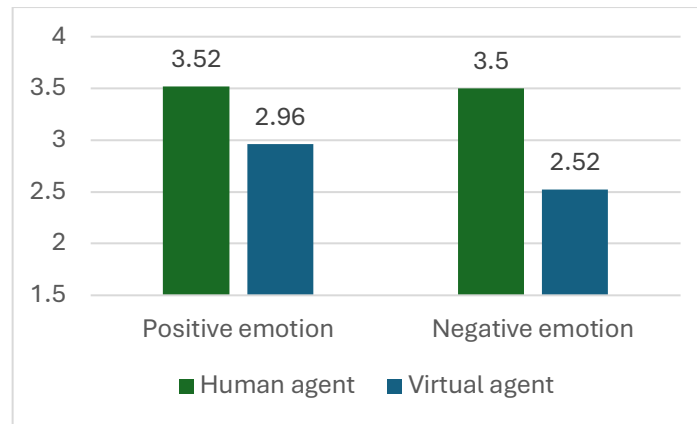
[FIGURE 3: Stimuli in Study 3]

Results and Discussion

Manipulation check. Results of the t-test revealed that participants in the negative emotional expression condition rated the influencer's emotion more negatively than those in the positive condition ($M_{\text{negative}} = 2.27$, $SD = 1.40$ vs. $M_{\text{positive}} = 5.36$, $SD = .89$; $t(193) = 81.85$, $p < .001$). As shown by the one-way ANOVA, emotional intensity did not differ between negative and positive conditions ($M_{\text{negative}} = 4.91$, $SD = 1.74$ vs. $M_{\text{positive}} = 5.23$, $SD = 1.51$; $F(1, 368) = 3.441$, $p = .064$; $\eta^2 = .009$), confirming the success of the manipulation.

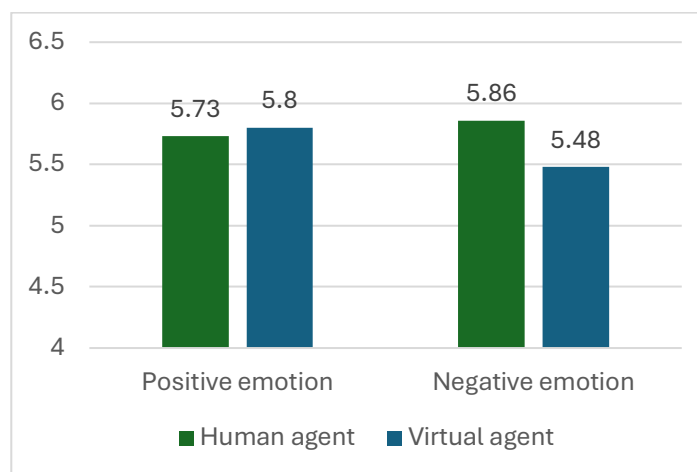
Trust. A 2 (emotional expression: negative vs. positive) $\times$ 2 (agent type: virtual vs. human) ANCOVA on trust was conducted. Subsequent analyses incorporate Instagram usage as a covariate to account for its influence on the variables⁹, potentially stemming from varying familiarity with and reliance on the platform (references). The main effect of emotional expression on trust was not significant ($M_{\text{negative}} = 3.05$, $SD = 1.33$ vs. $M_{\text{positive}} = 3.23$, $SD = 1.41$; $F(1, 365) = 2.44$, $p = 0.119$, $\eta^2 = 0.007$). As indicated by a significant main effect of influencer type, the virtual influencer received lower trust than the human influencer ($M_{\text{virtual}} = 2.76$, $SD = 1.38$ vs. $M_{\text{human}} = 3.51$, $SD = 1.25$; $F(1, 365) = 32.43$, $p < 0.001$, $\eta^2 = 0.082$). Notably, the interaction effect was marginally significant ($F(1, 365) = 2.92$, $p = 0.088$, $\eta^2 = 0.008$). As expected, further pairwise comparisons revealed that negative emotional expressions, compared to positive ones, decreased trust toward the virtual influencer ($M_{\text{negative}} = 2.52$, $SE = .14$ vs. $M_{\text{positive}} = 2.96$, $SE = .13$; $p = .022$), but not toward the human influencer ($M_{\text{negative}} = 3.52$, $SE = .13$ vs. $M_{\text{positive}} = 3.50$, $SE = .14$; $p = .914$; see Figure 5).

⁹ The one-way ANOVA results indicated that Instagram usage influenced product attitudes ($p = .048$), purchase intentions ($p = .002$), and trust in the influencer ($p < .001$).



[FIGURE 5. Effect on trust (adjusted mean)]

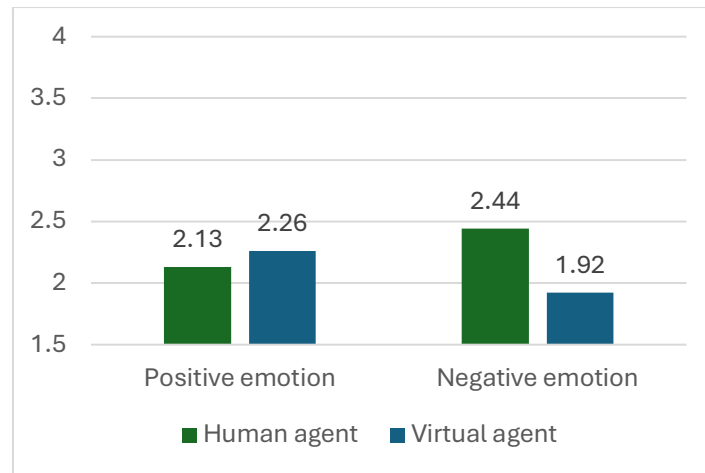
Product attitudes. A similar 2 (emotional expression: negative vs. positive) $\times$ 2 (agent type: virtual vs. human) ANCOVA on product attitudes revealed no significant main effects of emotional expression ($M_{\text{negative}} = 5.68$, $SD = 1.06$ vs. $M_{\text{positive}} = 5.77$, $SD = 1.08$; $F(1, 365) = .76$, $p = .384$, $\eta^2 = .002$) or agent type ($M_{\text{virtual}} = 5.65$, $SD = 1.06$ vs. $M_{\text{human}} = 5.80$, $SD = 1.07$; $F(1, 365) = 2.14$, $p = .145$, $\eta^2 = .006$). However, their interaction significantly influenced product attitudes ($F(1, 365) = 4.09$, $p = .044$, $\eta^2 = .011$). Specifically, compared to positive emotional expression, negative emotional expression by the virtual influencer undermined product attitudes ($M_{\text{negative}} = 5.48$, $SE = .11$ vs. $M_{\text{positive}} = 5.80$, $SE = .11$; $p = .043$), while product attitudes were unaffected by the emotional expressions of the human influencer ($M_{\text{negative}} = 5.86$, $SE = .11$ vs. $M_{\text{positive}} = 5.73$, $SE = .11$; $p = .411$; see Figure 6).



[FIGURE 6. Effect on product attitudes]

Moderated mediation on product attitudes. To identify the mechanism, we conducted a moderated mediation analysis (PROCESS model 7; 90% CI, 10,000 bootstraps; Hayes, 2018) with emotional expression as the independent variable, product attitudes as the dependent variable, trust as the mediator, agent type as the moderator, and Instagram usage as a covariate. The results confirmed our proposed moderated mediation model (indirect effect: $b = -.145$, $SE = .088$; 90% CI $[-.299, -.010]$; direct effect: $b = -.032$, $SE = .101$, $p = .751$; 90% CI $[-.199, .135]$). Specifically, the mediation was significant for the virtual influencer ($b = -.139$, $SE = .065$, 90% CI $[-.248, -.036]$) but not for the human influencer ($b = .006$, $SE = .058$, 90% CI $[-.084, .105]$), indicating full mediation only for the virtual influencer. Consistent with our theorizing, negative (vs. positive) emotional expression reduced trust in the virtual (vs. human) influencer, thereby diminishing attitudes toward the endorsed product.

Purchase intention. A 2 (emotional expression: negative vs. positive) $\times$ 2 (agent type: virtual vs. human) ANCOVA on purchase intention was conducted with the same covariate. The main effects of emotional expression ($M_{\text{negative}} = 2.19$, $SD = 1.53$ vs. $M_{\text{positive}} = 2.20$, $SD = 1.61$; $F(1, 364) = .01$, $p = .922$, $\eta^2 = .000$) and agent type ($M_{\text{virtual}} = 2.10$, $SD = 1.53$ vs. $M_{\text{human}} = 2.29$, $SD = 1.60$; $F(1, 364) = 1.51$, $p = .220$, $\eta^2 = .004$) were not significant, but their interaction significantly influenced purchase intention ($F(1, 364) = 3.98$, $p = .047$, $\eta^2 = .011$). Pairwise comparison indicated that the negative emotional expression of the virtual influencer significantly reduced purchase intention compared to the human influencer ($M_{\text{virtual}} = 1.92$, $SD = .17$ vs. $M_{\text{human}} = 2.44$, $SD = .16$; $p = .023$), while positive emotional expressions from both influencers had no effect on purchase intention ($M_{\text{virtual}} = 2.26$, $SD = .16$ vs. $M_{\text{human}} = 2.13$, $SD = .17$; $p = .587$; see Figure 7).



[FIGURE 7. Effect on purchase intention]

Moderated mediation on purchase intention. A moderated mediation analysis (Process Model 7; 90% CI, 10,000 bootstraps; Hayes, 2018) with purchase intention as the dependent variable and the other variables held constant was conducted, confirming our proposed model (indirect: $b = -.226$, $SE = .136$; 90% CI $[-.455, -.007]$; direct: $b = .081$, $SE = .147$, $p = .581$; 90% CI $[-.161, .324]$). Notably, the mediation was significant for the virtual influencer ($b = .008$, $SE = .090$; 90% CI $[-.137, .160]$) but not for the human influencer ($b = -.218$, $SE = .101$; 90% CI $[-.387, .053]$), indicating full mediation only for the virtual influencer. Consistent with our theorizing, negative (vs. positive) emotional expression reduced trust in the virtual (vs. human) influencer, thereby lowering purchase intention for the endorsed product.

To conclude, the results in this study support H3, showing that the virtual influencer's negative (vs. positive) emotional expression undermines endorsement effectiveness (i.e., product attitudes and purchase intention), which is explained by reduced trust. In contrast, emotional expression does not affect participants' perceptions when the influencer is human.

General Discussion

Theoretical Contributions

The present research makes several important contributions to the literature on virtual influencers, human-avatar interaction, and emotional processing in digital marketing.

The findings contribute to the growing body of literature on virtual influencers (e.g., Qu & Baek, 2023; Zhou et al., 2023). Existing research has focused on aspects such as the effect of intimacy on consumers (Dabiran et al., 2024; Lee & Yuan, 2023; Kim & Park, 2023), perceived authenticity (Moustakas et al., 2020; Batista da Silva Oliveira & Chimenti, 2021), moral responsibility (Yan et al., 2024), trustworthiness (Qu & Baek, 2023), parasocial relationship (Kim & Park, 2023; Lee & Yuan, 2023), and their persuasive power (e.g., Faddoul & Chatterjee, 2020; Zhou et al., 2023). In comparison to human influencers, this research contributes to the limited studies exploring the impact of emotional expressions by virtual influencers (Lim & Lee, 2023; Ham et al., 2024; Yu et al., 2024), specifically by examining the mechanism of trust and its effects on endorsement effectiveness. Moreover, by drawing on source credibility theory (Ohanian, 1990), this research shows that the trustworthiness of influencers plays a critical role in shaping product attitudes and purchase intentions.

This research also contributes to the literature on human-avatar interaction by highlighting the role of emotional expression in social and relational contexts. Emotional expressions have long been studied in service encounters, where avatars with effective emotional displays positively impact service performance by enhancing consumer satisfaction through perceived warmth (Cherniss, 2000; Gelbrich et al., 2021). Emotionally expressive avatars are seen as more relatable, whereas those lacking emotional expression are perceived as less human-like and engaging (Baylor & Kim, 2005). Consumers tend to prefer interacting

with avatars that display emotions, and this preference is reflected in their tendency to engage in more positive WOM (Standing et al., 2016). Consequently, avatars that engage in emotional conversations are more likely to be adopted and recommended by users (Le et al., 2023; Standing et al., 2016). While prior studies on human-avatar interaction have primarily focused on avatars' functional roles in marketing (e.g., chatbots as service agents, Ho, Hancock, & Miner, 2018), this research shifts the focus to their social role within the highly interactive context of social media, where avatars take the form of virtual influencers, with particular emphasis on their negative-valenced emotions. Our findings suggest that when avatars display negative emotions, it can trigger unintended consequences, such as an increased sense of uncanniness and reduced trust. This shift is significant because, in social media environments, virtual influencers assume complex, emotional, and relational roles that go beyond mere functional tasks.

Another major theoretical contribution is the application of the positive-negative asymmetry concept (Peeters, 1971; Ito et al., 1998) to human-avatar interaction and virtual influencer marketing. Positive-negative asymmetry suggests that negative emotional expressions tend to attract more attention and have a stronger impact than positive ones (Baumeister et al., 2001; Rozin & Royzman, 2001). In the context of virtual influencers, this research proposes that while negative (vs. positive) emotional expressions may capture attention, they can also trigger heightened perceptions of uncanniness—an effect where entities that are nearly human-like, but not quite, elicit discomfort (Mori, 1970). This study thus reveals novel outcomes of positive-negative asymmetry, showing that negative emotions in virtual influencers can heighten uncanniness, reduce trust, and undermine the effectiveness of their endorsements. Our findings align with the positive-negative asymmetry phenomenon but diverge from prior research in traditional influencer marketing, where negative emotions are typically seen as drivers of consumer engagement (Tsugawa & Ohsaki, 2015; Chung et al.,

2023). This insight expands existing psychological models with a unique application to AI and virtual influencers.

Practical Implications

This research has several implications for marketers. The Uncanny Valley (Mori, 1970) remains a critical concern in virtual influencer marketing. According to the negative-positive asymmetry phenomenon (Peeters, 1971; Ito et al., 1998), negative emotional expressions can exacerbate this effect, making the virtual influencer appear more unnatural and less relatable to consumers. Marketers should be mindful of the risk of triggering the Uncanny Valley by ensuring that emotional expressions from virtual influencers are appropriately calibrated.

The findings underscore the crucial role emotional expressions play in shaping consumer perceptions of virtual influencers. While certain emotions, such as surprise (Chuah & Yu, 2021), can enhance storytelling, negative emotions may reduce consumer trust if overused or misaligned with the product or service being marketed—particularly when the influencers are computer-generated and lack the capacity for sensation (Zhou et al., 2023) or genuine emotions. In this regard, marketers should carefully manage emotional expressions to ensure they resonate positively with the target audience, especially when using AI avatars for brand endorsements.

Furthermore, this research emphasizes the importance of building consumer trust in virtual influencers. The credibility of the information source (e.g., the endorser) plays a crucial role in determining persuasion power (Ohanian, 1990), affecting product attitudes and purchase intentions. For example, if a virtual influencer like Lil Miquela were to express exaggerated sadness or frustration (e.g., announcing a breakup) in her Instagram post, it could evoke

discomfort rather than empathy, causing consumers to question the avatar's trustworthiness. Therefore, marketers should ensure that virtual influencers are portrayed positively and consistently align with the brand's image and values, fostering trust by minimizing negative emotional expressions. This trust-building process is essential, particularly as AI avatars continue to grow in prominence within digital marketing (e.g., social media marketing and e-commerce).

Limitations and Future Research

Several promising directions for future research can be explored. While positive-negative asymmetry helps explain the phenomenon, it remains unclear how only negative emotional expressions from virtual influencers contribute to perceptions of uncanniness. For example, researchers could use eye-tracking studies to compare participants' fixation duration and areas (e.g., Yin et al., 2021) when viewing posts featuring negative versus positive emotional expressions from virtual influencers. These measures would provide more direct insights into participants' attention to negative versus positive stimuli. Neuroscience research, such as fMRI (Functional Magnetic Resonance Imaging), can further complement eye-tracking by identifying the specific brain regions involved in the uncanniness response. The amygdala, which is associated with emotional processing and fear responses, is often activated when people encounter stimuli that feel strange or unsettling (Sergerie et al., 2008). This activation may be heightened in response to uncanny stimuli.

While this research compares emotional valence, future studies may explore which specific emotions within the negative-valenced spectrum have the most detrimental effects on consumer perceptions of virtual influencers. The six core emotions identified by Ekman

(1992)—fear, disgust, anger, happiness, surprise, and sadness—have been shown to significantly influence social interactions (Landwehr et al., 2011), consumer behaviors in retail settings (Pantano & Scarpi, 2022), and user engagement on social media (Chuah & Yu, 2021). Future research could investigate how each of these emotions, particularly the negative ones, affects consumer perceptions of uncanniness, trust, product attitudes, and purchase intentions related to endorsements in the context of virtual influencers (and other AI avatars). This would provide a more nuanced understanding of emotional expression in digital marketing and guide marketers in strategically managing emotional content to optimize influencer effectiveness.

Both the field data and the controlled experiments in this research focused on Instagram, a highly visual social media platform that prioritizes visual content (i.e., images and videos) over text (Leaver et al., 2020). Given the importance of modality in shaping consumer perceptions (Melumad & Meyer, 2024) and service satisfaction (Melumad, 2023), future research could explore whether negative emotional expressions from avatars in other modalities (e.g., text and audio) elicit the same effects. Additionally, it would be valuable to examine whether our findings extend to other social media platforms, such as X and Facebook, or to generative AI systems, like Replica, that involve communication and play a social role (De Freitas et al., 2024).

CONCLUSION

Throughout the dissertation, Chapter One provides a systematic review of the avatar marketing literature, tracing its evolution over the past fifteen years and synthesizing key research domains. This review serves as the conceptual foundation for the subsequent empirical studies. Chapter Two investigates the role of contextual visual cues, examining how virtual influencers' background environments and companion types influence consumer trust. Lastly, Chapter Three explores the nuanced effects of virtual influencers' emotional expressions, highlighting the asymmetrical impact of negative versus positive emotions on consumer perceptions and marketing outcomes.

Collectively, these three chapters present an in-depth investigation into virtual influencer marketing, integrating theoretical perspectives from consumer psychology, human-avatar interaction, and marketing communication. The findings yield valuable insights for both researchers and practitioners, offering practical guidelines for designing and implementing virtual influencers in digital marketing strategies.

Theoretical Contributions

The present dissertation makes several theoretical contributions by synthesizing insights across three interconnected studies on avatar marketing and virtual influencers (i.e., contextual cues and emotional expressions). First, this dissertation advances the theoretical framework of avatar marketing by offering a comprehensive and interdisciplinary synthesis of the literature. The systematic literature review (Chapter 1) traces the evolution of avatars from rudimentary digital representations to highly sophisticated virtual humans, outlining their implications for key marketing outcomes such as drivers of avatar adoption (e.g., Cai et al.,

2022; Mishra et al., 2022), avatar anthropomorphism (e.g., Moussawi et al., 2021; Murphy et al., 2021; Nowak & Rauh, 2005), consumer trust (e.g., Qu & Baek, 2023; Glikson & Woolley, 2020; Keeling et al., 2010), and satisfaction (e.g., Mimoun & Poncin, 2015; Teng, 2010). The seven key research domains were identified by citation network analysis (CNA) and thoroughly discussed in terms of main path analysis (MPA). Based on the seven domains, the proposition of the four-phase seven-domain framework—encompassing avatar design, consumer adoption, interaction, and evaluation—integrates fragmented research areas into a unified, sequential model. This framework serves as a theoretical foundation for understanding the holistic avatar marketing process, bridging prior literature across human-computer interaction, cognitive psychology, sociology, and digital marketing. Furthermore, the application of CNA and MPA methodologies in conjunction with the systematic literature review not only enhances the rigor of the analysis but also provides a roadmap for future research, mapping the intellectual development of the field and identifying key research gaps (Colicchia & Strozzi, 2012; Fan et al., 2014).

Second, this dissertation extends the literature on virtual influencers by investigating how contextual cues in the posts (Chapter Two) and their emotional expressions (Chapter Three) influence consumer trust. Prior research has compared the marketing effectiveness of virtual influencers with traditional human influencers (Dabiran et al., 2024; Ma & Li, 2024; El Hedhli et al., 2023; Kim & Park, 2023; Lee & Yuan, 2023), examining factors such as intimacy (Dabiran et al., 2024; Kim & Park, 2023; Lee & Yuan, 2023), perceived authenticity (Moustakas et al., 2020; Batista da Silva Oliveira & Chimenti, 2021), moral responsibility (Yan, Mo, & Zhou, 2024), trustworthiness (Qu & Baek, 2023), parasocial relationships (Kim & Park, 2023; Lee & Yuan, 2023), audience reactions on social media (Arsenyan & Mirowska, 2021), persuasive storytelling (Faddoul & Chatterjee, 2020), and endorsement effectiveness (Zhou et al., 2023; Franke et al., 2023). However, limited attention has been paid to how contextual cues

and emotional expressions shape consumer trust in virtual influencers. This dissertation contributes to filling this gap by showing that both the congruence between the virtual influencer and the post environment (Chapter Two) and the emotional valence of their expressions (Chapter Three) significantly influence consumer trust and uncanniness perceptions. These findings emphasize the importance of situational and emotional cues in shaping consumer responses, offering a more nuanced understanding of how virtual influencers operate as persuasive agents in social media contexts.

Third, this dissertation makes significant contributions to the psychological literature by extending existing theories in the context of interaction with AI avatars and virtual influencers. Specifically, the research provides novel applications of the source credibility theory (Ohanian, 1990), the Uncanny Valley theory (Mori, 1970), the cue utilization theory (Olson, 1978; McGuire, 1985), the consistency theory (Festinger, 1958; Fiske & Taylor, 1991), and the positive-negative asymmetry phenomenon (Peeters, 1971; Ito et al., 1998; Baumeister et al., 2001; Rozin & Royzman, 2001).

Source Credibility Theory. The source credibility theory suggests that the effectiveness of a persuasive message depends on the perceived credibility of the source delivering it (Ohanian, 1990). In the context of social media, influencers serve as the information source, and their credibility impacts consumer attitudes and endorsement effectiveness. For virtual influencers, whose credibility is digitally constructed, it hinges on factors such as their portrayal (e.g., emotional expressions, as discussed in Chapter Three) and how well they are integrated into their environmental contexts (e.g., background settings and companion types, as discussed in Chapter Two). The perceived trustworthiness of a virtual influencer can significantly influence consumer trust in their endorsements, which in turn affects behaviors such as purchase intentions. If a virtual influencer is seen as a credible source, their product endorsements are more likely to lead to positive consumer outcomes. This dissertation extends

source credibility theory (Ohanian, 1990) by showing that both contextual congruence and emotional expressions are critical in shaping the perceived trustworthiness of virtual influencers, thereby influencing consumer attitudes toward the influencer (Chapter Two) and the effectiveness of their endorsements (Chapter Three). This provides a nuanced understanding of how these cues interact to influence consumer perceptions in the digital marketing landscape.

Uncanny Valley Theory. The Uncanny Valley theory posits that highly anthropomorphic non-human entities, which are not fully human, trigger a sense of uncanniness (Mori, 1970). Emotion — a core attribute of anthropomorphism — plays a significant role in this unsettling effect (Epley et al., 2007). This dissertation supports the Uncanny Valley theory with empirical evidence, particularly in Chapter Three, showing that emotional expressions—especially negative ones—intensify perceptions of uncanniness in virtual influencers. The findings partially align with previous research suggesting that sophisticated chatbots conveying emotions can be unnerving (Gray & Wegner, 2007). However, Chapter Three reveals that negative emotions, in particular, amplify this effect. This insight advances our understanding of the Uncanny Valley by highlighting the critical role of emotional valence in shaping consumer responses to anthropomorphic digital entities.

The results in Chapter Two further support the Uncanny Valley theory, showing that attitudes toward anime-like virtual influencers with less human-like appearances are not significantly more negative than those toward human influencers. In contrast, human-like virtual influencers are significantly less trusted than their anime-like counterparts. These findings enrich our understanding of the Uncanny Valley by highlighting the dual impact of both the appearance of virtual influencers and the emotional expressions they convey.

Cue Utilization Theory. The cue utilization theory posits that individuals rely on various cues—both intrinsic (e.g., product quality) and extrinsic (e.g., background and companion type in this dissertation)—to form judgments and make decisions about objects or entities (Olson, 1978; McGuire, 1985). The theory suggests that the diagnostic value of each cue depends on the perceiver's knowledge, expectations, and decision-making context (Olson, 1978; McGuire, 1985). This dissertation applies cue utilization theory to the context of virtual influencers, revealing that consumers rely on contextual cues in social media posts to infer the trustworthiness of virtual influencers. Chapter Two shows that the presence of either a virtual or real environment and a virtual or human influencer as the companion acts as a key contextual cue, shaping consumer judgments about the trustworthiness of virtual influencers. The results suggest that when virtual influencers are portrayed in a way that aligns with consumer expectations—such as appearing in an environment or paired with another influencer that is congruent with their digital nature—trust perceptions and consumer attitudes are significantly enhanced. These findings extend cue utilization theory by demonstrating how visual narratives in digital content influence consumer perceptions, particularly in the emerging domain of AI-generated personas. This insight bridges the gap between traditional consumer decision-making models and digital marketing practices, offering a novel understanding of how consumers evaluate synthetic agents in online environments.

Consistency Theory. This dissertation extends consistency theory by demonstrating how contextual congruence in digital content influences consumer perceptions of virtual influencers. Previous research has shown that people prefer consistency in social interactions, as it reduces cognitive load and enhances predictability (Fiske & Taylor, 1991). By applying consistency theory, Chapter Two reveals that the alignment between contextual cues (e.g., background and companion) and the focal object (i.e., the influencer) significantly affects consumers' perceived trustworthiness and attitudes toward virtual influencers. These findings

suggest that consistency not only plays a vital role in human interactions but also extends to interactions with anthropomorphic digital agents. This insight broadens the application of consistency theory by highlighting how contextual alignment between virtual influencers and their environments enhances consumer trust, offering a nuanced understanding of how consistency shapes perceptions in digital marketing.

Positive-Negative Asymmetry. This dissertation advances the positive-negative asymmetry phenomenon by applying it to the emotional expressions of virtual influencers. Chapter Three demonstrates that negative emotional expressions evoke stronger perceptions of uncanniness and lower trust compared to positive expressions, highlighting the more significant impact of negative emotions on consumer reactions in digital marketing. This finding underscores the challenge of building trust with virtual influencers, as negative emotions amplify negative consumer responses. Furthermore, this research expands the positive-negative asymmetry concept by introducing a novel insight: negative emotions not only capture more attention but also intensify uncanniness—a discomfort triggered by entities that are almost human-like but not quite (Mori, 1970). This perspective contrasts with traditional influencer marketing, where negative emotions are typically seen as drivers of consumer engagement (e.g., Chung et al., 2023), and extends psychological models to explore how negative emotional cues in virtual influencer interactions can undermine the effectiveness of endorsements.

To conclude, this dissertation makes significant theoretical contributions by synthesizing key concepts from multiple disciplines within avatar marketing (Chapter One). The findings enhance our understanding of how factors such as contextual cues (Chapter Two) and emotional expressions (Chapter Three) shape consumer perceptions. The dissertation also offers new insights into well-established psychological theories, specifically in the context of digital marketing dynamics. These contributions further our understanding of AI avatars and

virtual influencer interactions, particularly in the critical area of building trust in digital personas.

Managerial Implications

Technological Advancements and Industry Trends. The dissertation touches on the growing body of avatar research, highlighting trends in avatar technology and identifying leading countries and major publications. For marketers, staying abreast of these trends is vital for anticipating shifts in consumer behavior and maintaining competitiveness in a rapidly evolving digital landscape. As avatars become an integral part of marketing strategies, understanding the technological advancements surrounding them can provide a competitive edge. A real-world example of this is the use of virtual influencers by major fashion brands like Balenciaga and Prada. These brands have embraced digital avatars in their marketing campaigns to tap into younger, tech-savvy audiences. For example, Balenciaga recently featured a virtual influencer, Imma and Miquela, in a collaboration, leveraging her as a model to promote their fashion collections. This showcases how brands can integrate avatars in increasingly sophisticated ways, creating more engaging and personalized consumer experiences through emerging technologies, which not only highlight the potential of avatars in marketing but also point to how the landscape is evolving. As technology continues to advance, staying ahead of these trends will be crucial for marketers to remain competitive.

Building Trust in Digital Personas. A central theme across all three chapters is the critical importance of building consumer trust in virtual influencers. This is particularly crucial in the context of AI-driven avatars, which, unlike human influencers, lack the capacity for genuine experiences (Gray & Wegner, 2012). To foster consumer trust, virtual influencers should be portrayed positively, aligning with both their digital nature and the brand's values.

The first chapter further emphasizes the vital role of anthropomorphism in avatar marketing. By balancing human-like visual features with functional attributes, marketers can create avatars that not only engage consumers but also build trust. This becomes especially important when considering the psychological discomfort caused by avatars that fall into the Uncanny Valley (Mori, 1970)—those that are either too human-like or too robotic, which can create unease and hinder consumer trust.

Careful Design of the Campaign. Chapter two emphasizes the need for caution when using virtual influencers in marketing campaigns, especially in real-world settings or alongside human companions, as this can decrease trust. The findings suggest that placing virtual influencers in digital environments, where they interact with other virtual beings, helps mitigate negative consumer reactions. Marketers can use visual manipulation tools to adjust contextual elements—such as backgrounds or companions—thereby enhancing trust and improving consumer attitudes. These insights provide marketers with strategies to refine their messaging and ensure that the campaign/post design aligns with consumer expectations.

Managing Emotional Expression in Virtual Influencers. Chapter three delves into the importance of managing emotional expressions in virtual influencers to avoid triggering the uncanny valley effect. Overusing negative emotions or presenting them in an exaggerated way can lead to diminished consumer trust. Marketers are advised to carefully calibrate the emotional tone of virtual influencers to avoid triggering consumers' feelings of uncanniness while maintaining trust by presenting more positive emotions. Lil Miquela, for example, is one of the most famous virtual influencers, boasting a sizable following. However, her Instagram followers have dropped from more than 3 million to 2.4 million, potentially due to the negative emotional expressions she has posted (CSMP, 2023), as evidenced by the negative comments following these posts (see Study 1 of Chapter Three). This decline in followers can be attributed

to the Uncanny Valley effect, where the artificial nature of the avatar becomes more apparent when emotional expressions appear exaggerated or inconsistent with expected norms, causing discomfort or a loss of trust among followers.

Limitations and Future Research

This dissertation provides key insights into the evolving role of AI avatars and virtual influencers in digital marketing. However, several limitations warrant further investigation. Chapter One employs CNA to synthesize existing research, yet this approach treats all citations as equally significant, despite their varying levels of importance within individual articles (Fan et al., 2014). Future research could refine citation analysis by incorporating meta-analytical techniques to quantify effect sizes across studies, offering a more comprehensive synthesis. Additionally, alternative analytical methods and tools could complement CNA, providing diverse perspectives on the evolution of avatar marketing. Beyond methodological improvements, given the conflicting findings on the impact of anthropomorphism in marketing, future research should examine its context-dependent effects (Crolic et al., 2022), identifying when and how human-like traits enhance or hinder consumer engagement. Furthermore, as avatars increasingly enter the physical world as robots, research should explore how embodied AI—equipped with human-like cognition and emotions—shapes consumer trust and behavioral responses.

Chapter Two investigates virtual influencer marketing within digital environments but is limited in scope, primarily focusing on young female influencers. While female influencers dominate fashion marketing (Belanche et al., 2021), this focus reflects current trends but lacks diversity. Future research should explore how demographic factors—such as gender, age, and

ethnic representation—influence consumer perceptions and trust in virtual influencers. The current study relies on controlled online experiments, which enhance internal validity but may restrict external validity. Incorporating real-world behavioral metrics—such as likes, shares, comments (Zell & Moeller, 2018), click-through rates, and page view times—could better capture consumer engagement. Moreover, expanding methodological approaches to include field experiments and observational studies would yield deeper insights into consumer behavior in naturalistic settings. While the findings suggest that the presence of human companions in virtual influencer posts reduces trust, prior research indicates that other human-like traits—such as empathic emotions, humanoid appearance, and voice-based interactions—may enhance consumer trust (Brave et al., 2005). Future studies should systematically investigate which human-like features positively or negatively influence consumer perceptions, offering actionable insights for virtual influencer design.

Chapter Three explores the asymmetrical effects of positive and negative emotional expressions in virtual influencers, revealing that negative expressions contribute to the uncanny valley effect. However, this study focuses on broad emotional valence (positive vs. negative) rather than specific discrete emotions. Future research should examine how distinct negative emotions—such as fear, disgust, and anger—differentially impact consumer perceptions of virtual influencers. Neuroscientific methodologies, including eye-tracking (Yin et al., 2021) and fMRI (Sergerie et al., 2008), could provide deeper insights into attentional processes and neural mechanisms underlying uncanny valley responses. Moreover, this study primarily investigates Instagram, a visually dominant platform (Leaver et al., 2020), which may limit the generalizability of the findings to other social media environments that prioritize different modalities, such as text-based interactions on X or voice-based interactions in AI-driven platforms. Future research should explore whether negative emotional expressions elicit similar effects across various platforms and modalities, including text, audio, and video.

Additionally, generative AI systems like Replica, which serve social and conversational roles (De Freitas et al., 2024), offer promising opportunities to examine emotional engagement in AI-driven interactions.

In conclusion, this dissertation advances the understanding of AI avatars, virtual influencers, and their roles in digital marketing. However, several promising avenues for future exploration remain. Addressing these limitations and expanding the research scope will yield deeper insights into human-avatar interactions and contribute to the development of more effective strategies for fostering trust in AI avatars and virtual influencers.

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APPENDIX

Appendix A. Search String (Chapter One)

Terms used to describe "avatar" in recent research (Miao et al., 2023; Liew & Tan, 2021; Silva & Bonetti, 2021):

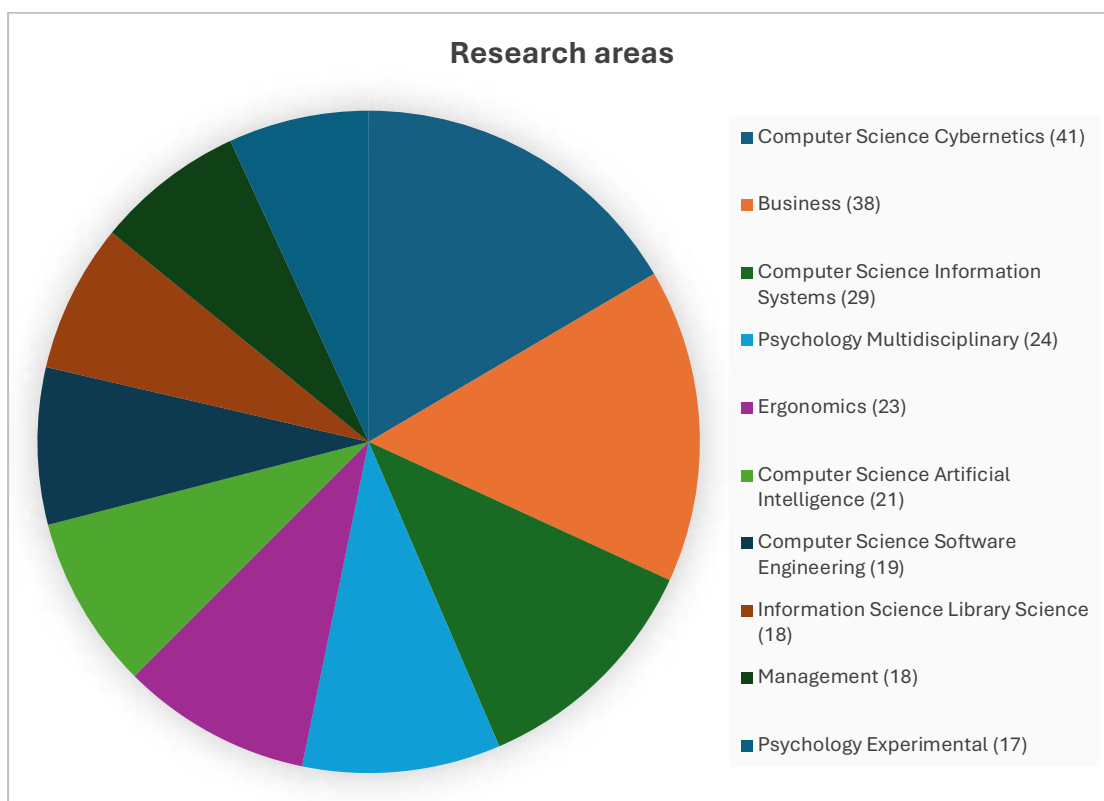
chatbot, digital assistant, embodied/intelligent conversational agent, anthropomorphic information agent, anthropomorphized agent, virtual customer (service) agent, virtual character/agent, automated shopping assistant, anthropomorphic interface agent, artificial agent, embodied virtual agent, voice user interface agent, digital/virtual human, digital/virtual helper.

The search string in the Web of Science Core Collection is:

TS=(anthropomorphism OR anthropomorphized OR anthropomorphic OR human-like OR humanoid OR humanized OR human-interface OR embodied) AND TS=(artificial intelligence OR AI) AND TI=(avatar OR chatbot OR agent OR assistant OR helper OR virtual human OR digital human OR virtual entity OR digital entity OR virtual character OR virtual influencer OR bot) AND TS=(marketing OR consumer OR customer OR service OR retail OR business OR user) NOT TS=(self-avatar OR self-representation OR online-self)

Appendix B. Descriptive statistics: Top 10 research areas (Chapter One)

Figure 1 presents the top ten research areas, and while our initial search string targeted marketing and service fields, the results, as categorized by Web of Science, indicate that avatar research has garnered attention across diverse disciplines. Notably, the two leading categories are computer science and cybernetics, comprising 41 papers (20.20%), followed closely by business with 38 papers (18.72%). This trend aligns with the anticipated expansion of avatar applications across several industries (Sweezey, 2019; Torresin, 2019; Mutani, 2022). It also underscores the significance of reviewing avatar marketing research, emphasizing its wide-reaching impact on various sectors.

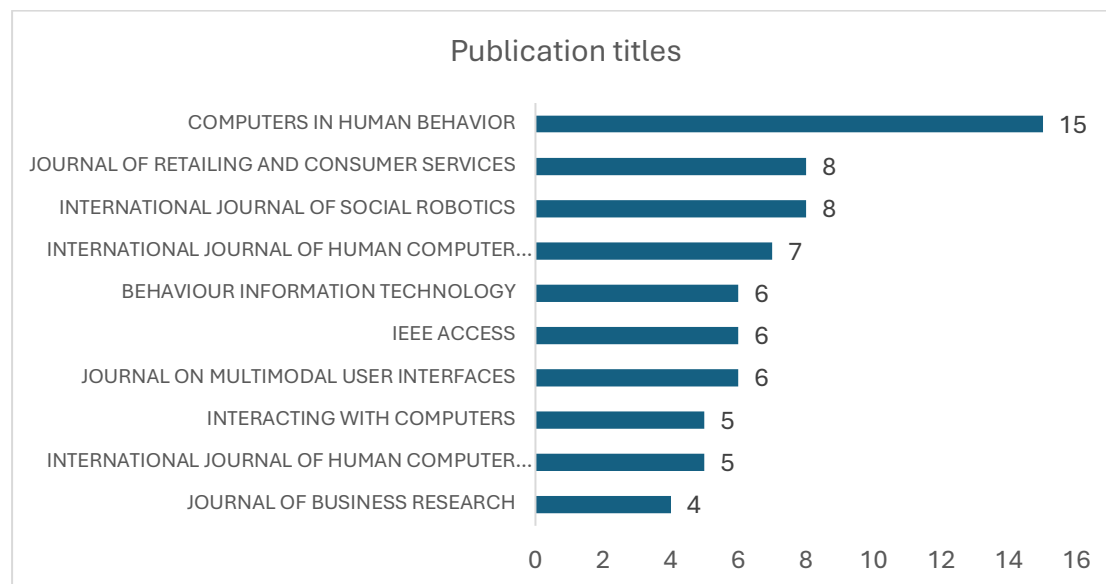


[FIGURE 1: Paper amount distribution by research areas]

Appendix C. Descriptive statistics: Top 10 journals (Chapter One)

Figure 2 presents the top 10 influential journals in avatar marketing, encompassing a broad spectrum of disciplines, such as psychology, business, robotics, and computer science. Notably, *Computers in Human Behavior* emerges as the foremost journal in avatar marketing, boasting 15 published papers. The *Journal of Retailing and Consumer Services* and the *International Journal of Social Robotics* are in close pursuit, each contributing eight papers to the field. Subsequently, the *International Journal of Human–Computer Studies* features seven papers, underlining the salience of avatars within the broader context of human–computer interaction.

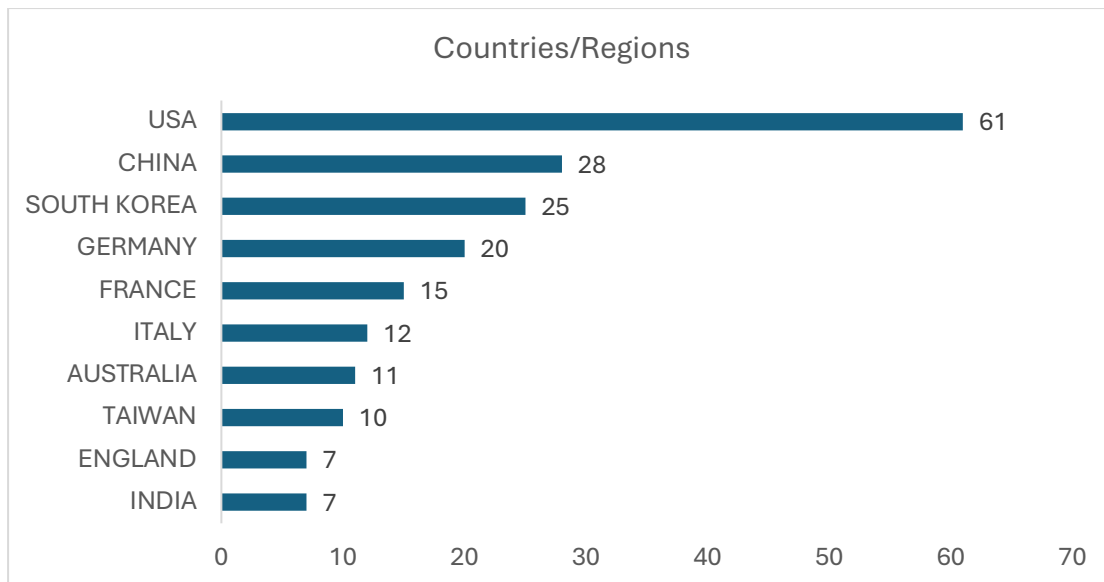
This distribution of publications across diverse journals aligns seamlessly with the previous research areas section, reaffirming the interdisciplinary nature of avatar marketing. It underscores the extensive recognition and scholarly attention that avatar marketing has garnered across multiple academic domains.



[FIGURE 2: Paper amount distribution by journal source]

Appendix D. Descriptive statistics: Top 10 popular countries/regions (Chapter One)

In avatar marketing research, we have identified the top 10 regions, shown in Figure 3, including North America (i.e., the US), East Asia (e.g., China and South Korea), Europe (e.g., Germany, France, and Italy), as well as Australia, among others. Among these, the United States leads in avatar marketing research, with 61 publications, driven by active research in innovative technologies like robotics and AI within its universities (Lu et al., 2018). This exceeds the combined output of Chinese scholars (28 papers, second place) and Korean scholars (25 papers, third place).



[FIGURE 3: Paper amount distribution by country/region]

Appendix E. Measurements used in the studies (Chapter Two)

Study 1:

Attitudes. (seven-point semantic differential scale), adopted from Tran et al. (2019).

- (1) bad – good; (2) dislike – like; (3) unfavorable – favorable

Perceived trustworthiness. (seven-point Likert scale; 1 = “Not at all”, 7 = “Very much), adopted from Ohanian (1990).

- (1) Dependable; (2) Honest; (3) Reliable; (4) Sincere; (5) Trustworthy

Humanness for Manipulation check (seven-point semantic differential scale), adopted from Ho and MacDorman (2010).

- (1) Human-made – human-like; (2) Artificial – natural; (3) Synthetic – real

Technology Innovativeness (seven -point Likert scale; 1 = “Not at all”, 7 = “Very much), adopted from Kim and Choo (2021).

- (1) In general, I am among the first in my circle of friends to acquire new technology when it appears.

- (2) I can usually figure out new high-tech products and services without help from others.

- (3) I enjoy the challenges of figuring out high-tech gadgets.

Study 2:

Attitudes, perceived trustworthiness and humanness, same as the Study 1

Similarity (seven-point semantic differential scale), adopted from Schouten et al. (2020).

“She would ...”

- (1) not think like me – think like me
- (2) not behave like me – behave like me
- (3) be different from me – be similar to me
- (4) be unlike me – be like me

Curiosity (seven -point Likert scale; 1 = “Not at all”, 7 = “Very much), adopted from Yang et al. (2020).

- (1) She makes me curious about her
- (2) Daisy makes me want to find out more about her
- (3) Daisy makes me wonder who she is.

Perceived virtuality (seven-point semantic differential scales), adapted from Ho and MacDorman (2010).

“The place in the image looks ...”

- (1) unreal – real
- (2) virtual – actual
- (3) non-existent – existent

Attractiveness of the image (seven-point semantic differential scales)

(1) the place in the image is “unattractive – attractive.”

Vividness of the image (seven-point semantic differential scales)

(1) the place in the image is “not vivid – vivid.”

Study 3: Attitudes and Perceived trustworthiness, same as Studies 1 and 2.

Appendix F. Descriptive statistics of pretest results (Study 2 of Chapter Two)

	Variables	Virtual Environment	Real Environment	F(1,114)
Image set 1	Virtuality	M=1.86, SD=1.09	M=4.54, SD=1.79	F = 94.15***
	Attractiveness	M=4.32, SD=1.38	M=4.93, SD=1.57	F = 5.02*
Image set 2	Virtuality	M=2.27, SD=1.40	M=6.54, SD=0.70	F = 433.09***
	Attractiveness	M=4.84, SD=1.70	M=5.98, SD=1.04	F = 19.16***
Image set 3	Virtuality	M=1.89, SD=1.05	M=6.16, SD=1.09	F = 466.44***
	Attractiveness	M=3.25, SD=1.42	M=5.32, SD=1.48	F = 59.51***
Image set 4	Virtuality	M=2.94, SD=1.84	M=5.79, SD=1.20	F = 98.01***
	Attractiveness	M=6.16, SD=1.00	M=6.37, SD=1.02	F = 1.32 ^{ns}
Image set 5	Virtuality	M=1.80, SD=1.14	M=4.11, SD=1.85	F = 65.08***
	Attractiveness	M=4.70, SD=1.58	M=5.34, SD=1.37	F = 5.39*

Notes: *p < 0.05; ***p < 0.001

Appendix G. Supplemental Materials for Study 1 (Chapter Three)

Table W1. Word set of uncanniness measure

adj.	n.	phr.
uncanny	uncanniness	out of the ordinary
eerie	eeriness	out of the way
unnatural	unnaturalness	
preternatural	preternaturality/preternaturalness	
supernatural	supernaturalness	
unearthly	unearthliness	
otherworldly	otherworldliness	
unreal	unreality	
ghostly	ghostliness	
mysterious	mystery	
strange	strangeness	
abnormal	abnormality	
odd	oddness	
curious	curiosity	
queer	(same as adj.)	
weird	weirdness	
bizarre	bizarreness	
freaky	freakish/freakishness	
eldritch	/	
creepy	creepiness	
spooky	spookiness	
freaky	freakiness	
rum	(same as adj.)	
bizarro	(same as adj.)	
striking	(same as adj.)	

remarkable	remarkableness/remarkability	
extraordinary	extraordinariness	
unusual	unusualness	
exceptional	exceptionality	
astounding	astoundmen	
astonishing	astonishment	
incredible	incredibility	
conspicuous	conspicuousness	
noteworthy	noteworthiness	
notable	notability	
considerable	consideration	
distinctive	distinctiveness	
arresting	arrest	

Negative and positive emotions. After including the control variables, consumers presented more negative emotions in their comments when viewing the VI's negative emotional posts ($\beta = .095$, $SE = .103$, $t = 2.675$; $p < .05$; Table W2, model 2). VI's positive ($\beta = .047$, $SE = .075$, $t = .151$; $p > .05$) and neutral emotional expressions ($\beta = -.002$, $SE = .075$, $t = -.019$; $p > .05$) did not impact consumers' negative emotions. After including the control variables, consumers' positive emotions in comments were not affected by VI's different emotional expressions ($\beta_{\text{negative}} = -.008$, $SE = .088$, $t = -.233$; $p > .05$; $\beta_{\text{positive}} = -.007$, $SE = .064$, $t = -.080$; $p > .05$; $\beta_{\text{neutral}} = .003$, $SE = .064$, $t = .034$; $p > .05$; Table W3, model 2).

Table W2. VI's emotional expressions and consumers' negative emotions (log-transformed)

	(1)	(2)
(Constant)	(.109)**	(.153)*
Negative emotional expression	.092* (.104)	.095* (.103)
Positive emotional expression	.049 (.076)	.047 (.075)

Neutral emotional expression	.036 (.075)	-.002 (.075)
Media type		.034 (.035)
Image count		-.112** (.007)
Face count		.082** (.010)
Influencer gender		.039 (.034)
Posting year		-.092* (.008)
R Square	.009*	.028**
N _{media} = 1,690		N _{comments} = 469,493

Note: Standard errors are in parentheses; * $p < .05$, ** $p < .01$.

Table W3. VI's emotional expressions and consumers' positive emotions (log-transformed)

	(1)	(2)
(Constant)	(.062)**	(12.812)*
Negative emotional expression	-.015 (.089)	-.008 (.088)
Positive emotional expression	-.030 (.064)	-.007 (.064)
Neutral emotional expression	-.058 (.063)	.003 (.064)
Media type		-.008 (.031)
Image count		.048 (.006)
Face count		.068 (.009)
Influencer gender		-.066** (.030)
Posting year		.066* (.006)
R Square	.001	.017**
N _{media} = 1,690		N _{comments} = 469,493

Note: Standard errors are in parentheses; * $p < .05$, ** $p < .01$.

To examine consumer engagement, we analyzed the effects of VI's emotional expressions on the number of (1) likes and (2) comments.

Number of likes. As shown in Table W4, the VI's negative emotional expressions did not significantly influence the number of likes, both before ($\beta = -.020$, $SE = .068$, $t = -.548$; $p > .05$) and after controlling for other variables ($\beta = -.008$, $SE = .067$, $t = -.235$; $p > .01$). Positive emotional expressions decreased likes before including the control variables ($\beta = -.210$, $SE = .068$, $t = -2.248$; $p < .05$), but this effect was not significant after including controls ($\beta = -.177$, $SE = .049$, $t = -1.910$; $p > .05$). Neutral emotional expressions decreased likes, both before ($\beta = -.288$, $SE = .049$, $t = -3.073$; $p < .05$) and after accounting for control variables ($\beta = -.207$, $SE = .049$, $t = -2.206$; $p < .05$). Influencer gender ($\beta = -.119$, $SE = .022$, $t = -4.696$; $p < .01$) and posting year ($\beta = .123$, $SE = .005$, $t = 4.192$; $p < .01$) were found to significantly influence the number of likes.

Table W4. VI's emotional expressions and likes on the posts (log-transformed)

	(1)	(2)
(Constant)	(.048)**	(10.209)**
Negative emotional expression	-.020(.068)	-.008(.067)
Positive emotional expression	-.210(.049)*	-.177(.049)
Neutral emotional expression	-.288(.049)**	-.207(.049)*
Media type		.028(.023)
Image count		-.015(.004)
Face count		.042(.007)
Influencer gender		-.119(.022)**
Posting year		.123(.005)**
R Square	.013**	.040**
$N_{\text{media}} = 1,690$	$N_{\text{comments}} = 469,493$	

Note: Standard errors are in parentheses; * $p < .05$, ** $p < .01$.

Number of comments. Three types of emotional expression of VI didn't affect the number of comments regardless of the control variables ($p > .05$; Table W5).

Table W5. VI's emotional expressions and comments on the posts (log-transformed)

	(1)	(2)
(Constant)	(.066)**	(13.275)**
Negative emotional expression	-.088(.095)	-.006(.091)
Positive emotional expression	-.061(.068)	-.079(.065)
Neutral emotional expression	.011(.067)	-.109(.065)
Media type		.140(.032)**
Image count		.075(.006)**
Face count		-.069(.010)**
Influencer gender		-.073(.031)**
Posting year		-286(.007)**
R Square	.005*	.091**
N _{media} = 1,690	N _{comments} = 469,493	

Note: Standard errors are in parentheses; * $p < .05$, ** $p < .01$.

Appendix H. Supplemental Materials for Study 2 (Chapter Three)

Pretest Method

Before the main experiment, a pretest was conducted to determine the negative and positive emotional captions in the posts. 81 U.S.-based participants ($M_{\text{age}} = 35.18$, $SD = 8.36$; 50.62% female), recruited via Prolific, evaluated five sets of captions expressing opposite emotions across five contexts in random order: (1) Sadness and frustration vs. happiness in book reading; (2) Loneliness and isolation vs. happiness in social relationships; (3) Frustration and confusion vs. happiness in work tasks; (4) Sorrow and anguish vs. happiness in a romantic relationship; And (5) worry and fear vs. happiness about a friend's health condition.¹⁰ The influencer type (virtual or human) was not specified to the participants. For each scenario, ease of imagination (1 = “very hard to imagine” to 7 = “very easy to imagine”), perceived authenticity (1 = “not authentic at all” to 7 = “very authentic”), emotional valence (1 = “negative” to 7 = “positive”), and emotional intensity (1 = “not intense at all” to 7 = “very intense”) were measured on a 7-point Likert scale.

A set of captions featuring the influencer’s negative and positive emotions in reading was used for the stimuli (see Figure 2), as they were perceived to have a similar ease of imagination ($M_{\text{negative}} = 4.05$ vs. $M_{\text{positive}} = 4.58$; $p > .05$), authenticity ($M_{\text{negative}} = 4.60$ vs. $M_{\text{positive}} = 4.78$; $p > .05$), and emotional intensity ($M_{\text{negative}} = 5.35$ vs. $M_{\text{positive}} = 5.30$; $p > .05$), but different in emotional valence ($M_{\text{negative}} = 2.38$ vs. $M_{\text{positive}} = 5.95$; $p < .01$).

Pretest Material

¹⁰ The scenarios were inspired by existing posts from Instagram VIs. For instance, in a post from Lil Miquela on March 17, 2023, she described her struggle with reading as a robot, accompanied by a selfie expressing sadness and a crying emoji at the end of the caption.

“Please envision yourself on a social media platform where you encounter an influencer's post.

You will read a total of 5 scenarios described on the following pages, each depicting the situation an influencer experienced.

Kindly read the descriptions within the influencer's posts attentively, imagine the depicted situations, and respond to the following questions.”

Scenario 1 (Ability to read):

I'm swamped by a profound sense of sadness and frustration. Being dyslexic, the words on the page often dance and jumble before my eyes, refusing to form coherent sentences. I struggle to get through even a single chapter of a book, and it's disheartening. Each attempt to read is a reminder of the barriers I face, and it leaves me feeling defeated and inadequate.

Reading is an absolute delight. I read a chapter in the book in the afternoon, and to my joy, the words flowed effortlessly. The story captivated me, and I found myself immersed in the narrative, the characters, and the very essence of the book. It was more than fun; it was a triumph, a testament to overcoming the challenges that dyslexia often presents. In those moments, I felt uninhibited and completely engaged, a feeling that was both exhilarating and profoundly fulfilling.

Scenario 2 (Social relationship):

I feel like an outsider, isolated in a world that buzzes around me. Despite being surrounded by people, there's this palpable distance, an invisible wall that separates me from everyone else. I don't understand why they don't seem to like me. I try to reach out, to connect, but it's like I'm invisible. There's a void where friendships should be. It's lonely here, and I can't figure out what I'm doing wrong.

I'm at the heart of warmth and camaraderie. I'm popular, surrounded by friends who truly get me. Conversations flow effortlessly, full of genuine understanding and shared jokes. My friends and I are in sync, and it feels like we're not just moving through life together; we're experiencing it as one. I'm valued, I'm understood, and I'm exactly where I belong. It's a rich, fulfilling community, and I couldn't be happier.

Scenario 3 (Work-related):

I'm sitting at my desk, and I can't shake this heavy feeling of frustration. Papers are scattered everywhere; my screen is a jumble of data that just doesn't make sense. I feel stupid, like I'm drowning in tasks I can't seem to grasp. The more I try, the more confused I become. It's like every file and every email is a reminder of how much I'm struggling to keep up.

I love my work, I love what I do, and it shows. My desk is tidy, my projects are on track, and every successful outcome on my screen is a little victory. I'm not just keeping up; I'm excelling, and with each achievement, I feel a profound sense of fulfillment. It's not

just that I'm good at my job; it's that my job makes me happy, and I can't help but smile about it.

Scenario 4 (Romantic relationship)

Today has been an incredibly painful day. My boyfriend ended our relationship, and I am left completely shattered. The world seems to have lost its color, and every moment is filled with sorrow and anguish. It's hard to describe the emptiness that's echoing through me. I feel lost, like a part of me has been ripped away, and all I'm left with are the jagged edges of our shared past.

Today is an extremely happy day. I spent it with my boyfriend, and everything we did was infused with joy and interest. Whether it was the laughter that came easily or the shared glances that said everything, today was a day where everything just clicked. Our connection feels deeper, more vibrant, and I'm reminded of all the reasons why I cherish what we have. It's days like today that make me feel incredibly lucky to have him in my life.

Scenario 5 (Friend's health condition)

Today, I'm engulfed in sadness; my friend received a diagnosis for a very bad illness. It feels like the ground has been pulled from under me. The news came as a shock, and I'm struggling to process it. I feel helpless, watching someone I care deeply for facing

something so daunting. My mind is a blur of worry and fear, and I can't seem to find any solace amidst the uncertainty of what lies ahead.

There comes a day of immense relief and happiness. My friend, who has been battling a severe illness, has shown remarkable recovery. It's like a weight has been lifted off my chest. Seeing the improvement in my friend's health, knowing how far she's come, fills me with joy. Every bit of progress feels like a victory. I'm overflowing with gratitude and hope for the future, celebrating each step forward in my friend's journey to wellness.

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