A study on the relationship between virtual idols and fans from a parasocial interaction perspective: a three-dimensional framework of cognition, emotion, and behavior

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Abstract. Drawing on Parasocial Interaction (PSI) theory, this study examines the relational mechanisms between virtual idols and fans across cognitive, emotional, and behavioral dimensions. The findings reveal that, empowered by digital technologies, interactions between virtual idols and fans exhibit characteristics that transcend the traditional one-way model. On the cognitive level, anthropomorphic design strategies and fan co-creation blur the boundaries between the virtual and the real, as fans engage in "demediation" and perceive virtual idols as credible "digital life forms." On the emotional level, virtual idols provide a form of "simulated reciprocity" that is both minimizing social risk while maximizing emotional reward, effectively fulfilling users' needs for companionship and belonging—particularly among socially anxious groups—while also carrying potential risks of heightened "media dependency" and intensified feelings of real-world loneliness. On the behavioral level, fans build an active "participatory culture" through consumption, engagement, and secondary creation. Yet, under the joint influence of capital and subcultural dynamics, these behaviors also show tendencies toward "consumer alienation" and "group polarization." This study demonstrates that parasocial interactions in the context of virtual idols have evolved into a deeply involved and socially influential composite practice, thereby extending the explanatory scope of PSI theory in the age of artificial intelligence. The paper concludes with recommendations for future research directions and the cultivation of a healthy fan culture.

Keywords: virtual idols, parasocial interaction, media dependency, fan studies

1. Introduction

With the rapid development of the internet and artificial intelligence technologies, virtual idols have emerged as a new cultural phenomenon, quickly rising to prominence and gradually permeating popular entertainment and youth culture. Virtual idols are defined as "digitally created personas, constructed through technologies such as computer graphics and speech synthesis, that perform in virtual or real-world settings." Through highly anthropomorphized and interactive operational models, they attract significant attention and participation from young audiences. Survey data indicate that 92.3% of virtual idol enthusiasts are between the ages of 19 and 30, underscoring the group's substantial influence among younger generations.

The rise of social media has provided a crucial platform for the dissemination and interaction of virtual idols. By posting updates, hosting livestreams, and other activities, virtual idols engage with users across multiple dimensions, while users, in turn, participate through likes, comments, tips, and live chat messages. Advances in artificial intelligence further enhance the affective capacities of virtual idols, enabling them to recognize, express, and respond to user emotions, even serving as "emotional outlets" or "confessionals" for users' self-expression. Such deep-level emotional interaction not only provides users with psychological companionship and satisfaction but also fosters sustained emotional attachment and behavioral engagement.

Nevertheless, the relationship between virtual idols and users remains fundamentally asymmetrical, grounded in media technologies. It combines the emotional warmth of interpersonal communication with the virtual attributes of human-computer interaction, making it difficult to explain fully through traditional theories of social or emotional exchange. Against this backdrop, parasocial interaction theory offers a suitable framework for understanding the one-sided emotional bonds between users and media figures. Originally developed to describe viewers' attachments to television personalities, PSI theory has gained renewed relevance with the rise of virtual idols, expanding both its application contexts and research value. Therefore, this study, guided by PSI theory, systematically explores the cognitive, emotional, and behavioral dimensions of fan-virtual idol

relationships, with the aim of providing theoretical insights into the psychological mechanisms and sociocultural implications underlying the virtual idol phenomenon.

2. Literature review

2.1. The connotation and evolution of Parasocial Interaction Theory

Parasocial Interaction (PSI) theory was first proposed by Horton and Wohl [1] to describe the one-sided, virtual yet emotionally authentic relationships established between media users and media figures. The theory posits that audiences, through mediated encounters, construct pseudo-intimate relationships with performers or hosts, rooted in the audience's subjective psychological perception of media symbols. With advances in neurocognitive science, researchers have further uncovered the psychophysiological mechanisms underpinning parasocial relationships. Hatfield et al. [2] advanced the theory of emotional contagion, which holds that humans achieve emotional synchrony through the unconscious imitation of media figures' overt behaviors (such as facial expressions and gestures). This provides a mechanistic explanation for emotional bonding in parasocial interactions.

As media forms evolved, the subjects of parasocial interaction expanded from real individuals to fictional characters, animated figures, virtual idols, and social robots. Zhang and Fang [3] noted that interaction rules in electronic media share a degree of universality with real-world social interaction, but parasocial interactions transcend spatiotemporal and physical boundaries, enabling users to form emotional attachments with virtual entities. In recent years, scholars such as Lombard have advanced the paradigm of "media as social actors," emphasizing that anthropomorphic design and user mindlessness are the key mechanisms that facilitate parasocial interaction [4, 5].

2.2. Developmental stages of Parasocial Interaction Theory

The development of PSI theory can be broadly divided into three stages.

2.2.1. Stage One (1950s-1980s): initial formulation and television studies

In the context of television's widespread adoption, early research focused on the parasocial relationships between viewers and news anchors or television characters. Rubin and Perse [6] conceptualized PSI as an extension of the human attachment instinct, highlighting its similarities to interpersonal communication in emotional attraction, relational persistence, and behavioral prediction.

2.2.2. Stage Two (1990s-2010s): expansion in the internet and new media era

With the rise of the internet and social media, research extended to online celebrities, video bloggers, and opinion leaders in virtual communities. Ballantine [7] found that even "lurkers" in online communities formed parasocial relationships by observing and identifying with active participants. Lee and Watkins [8], through their study of YouTube vloggers and fans, confirmed the influence of parasocial interactions on consumer behavior.

2.2.3. Stage Three (2010s-present): the emergence of artificial intelligence and virtual agents

In the age of intelligent media, PSI research has expanded to artificial intelligence entities such as social robots, virtual idols, and voice assistants. Han et al. [9] demonstrated that users' parasocial interactions with social robots (e.g., Microsoft Xiaoice) have formed systematic patterns across cognitive, emotional, and behavioral dimensions. Virtual idols such as Hatsune Miku and Luo Tianyi have become significant emotional companions for Generation Z, with fans engaging deeply through tipping, live-chat "bullet comments," and secondary creations, thereby forming strong parasocial bonds.

2.3 Current research on Parasocial Interaction Theory

Current PSI research is marked by multidimensional and interdisciplinary approaches, primarily focusing on the following aspects.

2.3.1. Psychological dimensions and measurement tools

Scholars commonly conceptualize PSI along three dimensions—cognitive, emotional, and behavioral [10]. The cognitive dimension encompasses users' trust, identification, and perceptions of anthropomorphism toward media figures; the emotional dimension includes affective responses such as liking, longing, and empathy; and the behavioral dimension is reflected in observable acts such as following, consuming, and imitating. Han et al. [9], in their study of Microsoft Xiaoice users, employed a three-dimensional scale and confirmed its reliability and validity.

2.3.2. The double-edged effects of PSI

Most studies suggest that parasocial interaction can alleviate loneliness and provide emotional support [11]. However, excessive reliance on virtual interactions may also lead to diminished real-world social skills and heightened loneliness [12]. Han et al. [9] proposed the "masking effect of media dependency," arguing that while PSI directly alleviates loneliness, it indirectly exacerbates it via increased media dependence, yielding an overall negative effect.

2.3.3. New trends in virtual idol research

As an emerging research subject, virtual idols have garnered wide academic interest. Fans engage through livestreaming, bullet comments, and virtual gifts, fostering high-intensity emotional involvement and a sense of community belonging. Ma and Ge [13] pointed out that bullet comments serve as a form of parasocial expression with functions of emotional release and identity affirmation. Moreover, issues related to the commercialization, cultural impact, and ethical dimensions of virtual idols have increasingly become research hotspots.

Current scholarship reflects two dominant paradigms: the deficiency paradigm, which views parasocial interaction as a compensatory mechanism for insufficient real-world social ties, and the global-use paradigm, which emphasizes PSI as a universal psychological phenomenon independent of real-world social satisfaction [14]. In the study of virtual idols, both paradigms coexist, highlighting the complexity of user motivations.

3. Parasocial Interaction at the cognitive level

At the cognitive level, parasocial interaction is primarily reflected in users' perceptions of the authenticity, credibility, attractiveness, and sense of identification with media figures. The emergence of virtual idols has restructured the core logic of PSI, exhibiting new features under the dual impetus of technological empowerment and cultural integration.

Virtual idols transcend the traditional one-way mode of parasocial interaction, as fans directly participate in shaping the idols' personas through technological tools. For example, through secondary creations such as fan art, videos, or scripts, fans project their personal traits and ideals onto virtual idols, forming a "fan cultivation" model [15]. This process shifts PSI from "media production" toward collaborative co-creation, strengthening fans' cognitive identification and sense of belonging, and transforming them from mere audiences into "star-makers" and even "owners." eanwhile, anthropomorphic technologies—such as motion capture, AI-based voice synthesis, and real-time rendering—blur the boundary between the virtual and the real by endowing virtual idols with human-like behaviors (e.g., subtle facial expressions, real-time interactive responses). These techniques create a face-to-face, immersive experience. Such hyperreal encounters encourage fans cognitively to "demediate" the virtual idol, disregarding its technological mediation and perceiving it instead as an independent "digital life form." This cognitive shift lays the groundwork for deeper emotional bonds and sustained behavioral engagement.

4. Parasocial Interaction at the emotional level

Traditional PSI theory emphasizes audiences' ne-sided emotional attachment to media figures [1], typically manifested as affection, trust, and feelings of companionship. In the case of virtual idols, however, emotional bonding acquires new characteristics of heightened realism, interactivity, and substitutability.

Fans' motional investment is not purely one-directional; rather, it is grounded in technologically simulated "pseudo-reciprocity." Through livestream interactions, AI-based conversations, or personalized festival greetings, virtual idols provide emotional feedback that allows fans to feel "seen" and "responded to," thereby intensifying affective attachment. More importantly, virtual idols construct a form of "low-risk sociality," where users are free from the awkwardness, rejection, or social obligations common in real interactions. As "scandal-free perfect idols" [16], their technologically designed bodies circumvent real-world risks, offering socially anxious groups a safe object for emotional projection and strongly fulfilling their needs for belonging and identification.

Against the backdrop of rising global depression rates and increasingly fraught real-world social environments, virtual idols-equipped with anthropomorphic designs and empathetic interaction technologies (e.g., emotion recognition, 24/7 companionship)-have evolved from functional interaction tools into emotional support systems. They provide older users with relief from loneliness and offer younger audiences a confidential outlet for emotional disclosure. Yet, these highly realistic emotional connections also harbor risks. As Han et al. [9] argue in their "masking effect of media dependency," the deeper fans engage in PSI with virtual idols, the more likely they are to develop strong media dependency. When significant emotional needs are anchored in virtual relationships, users may withdraw from real-world interactions, ultimately intensifying feelings of loneliness [12]. Virtual idols thus become an "emotional substitute meal": they offer immediate comfort but may simultaneously erode individuals' motivation to cultivate real relationships, creating a paradox of "the more dependent, the lonelier."

5. Parasocial Interaction at the behavioral level

The behavioral dimension represents the external manifestation of cognitive perceptions and emotional attachments in PSI. Among fans of virtual idols, it is expressed through highly engaged practices of consumption, participation, and creation, which together constitute a dynamic ecosystem of "participatory culture." Fans are no longer passive consumers but also co-creators and prosumers [17]. However, this creative system is also susceptible to manipulation by commercial capital and the irrationality of group dynamics, producing a complex interplay of creativity and alienation [18].

Specifically, consumption behaviors serve as the most direct ritualized expressions of emotional commitment, such as purchasing merchandise, tipping, or subscribing to memberships. Yet, through slogans like "true love is proven by consumption," capital commodifies and quantifies emotion, transforming consumption into a tool for hierarchical stratification and fan identity certification. As a result, some fans fall into patterns of irrational spending, becoming "prisoners" of symbolic worship [18].

Participatory behaviors include highly organized forms of collective collaboration, such as recording, editing, translating, and promoting idol-related content, forming a structure of "organization without formal organization" [17]. While these practices enhance fans' sense of achievement and belonging, the insularity of such fan communities fosters "information cocoons" and group polarization. Individuals may become swept up in collective consciousness, lose independent judgment, and even contribute to online aggression [18].

In sum, fan behaviors in the virtual idol context embody both agency, cultural creativity, and group belonging [17, 19]. Yet, they also reveal the ambivalence of a participatory culture caught between empowerment and alienation.

6. Conclusion

Grounded in parasocial interaction theory, this study systematically examined the mechanisms of interaction between virtual idols and fans across cognitive, emotional, and behavioral dimensions. The findings reveal that virtual idols are not cold digital symbols, but rather "digital life forms" that carry fans' emotional projections and meaning-making practices.

At the cognitive level, hyperreal experiences enabled by technology, combined with fans' deep co-creative participation, lead to the "demediation" of virtual idols, which are increasingly perceived as credible and authentic social partners. At the emotional level, virtual idols provide "low-risk, high-reward" emotional support. Through simulated reciprocity and sustained companionship, they meet the needs for belonging and identification among contemporary youth—especially those experiencing social anxiety—while simultaneously posing risks of media dependency and exacerbated real-world loneliness. At the behavioral level, fans' practices of consumption, participation, and creation collectively build a vibrant "participatory culture" ecosystem, characterized by high initiative and creativity, yet also marked by trends of "consumer alienation," "group polarization," and "symbolic fetishism."

Parasocial interaction in the virtual idol context has thus evolved from a one-way, imagined intimacy into a bidirectional, deeply engaging, and socially consequential form of composite practice. It encompasses both the deficiency paradigm and the global-use paradigm: serving as compensation for deficits in real-world social interaction, while simultaneously constituting a universal cultural practice.

Future research could incorporate more diverse theoretical frameworks. For example, neuroscientific approaches such as Electroencephalography (EEG) could be used to investigate brain activation patterns and neural mechanisms during user-virtual idol interactions. Longitudinal studies could also illuminate the long-term effects of virtual interactions on users' real lives and mental health. From a practical standpoint, platforms and content producers should implement anti-addiction mechanisms and promote a healthy, rational fan culture. Meanwhile, society should pay greater attention to the emotional needs of young people by enriching offline social and cultural activities, thereby fostering real-life belonging and meaning, and guiding virtual interactions to complement rather than substitute reality.

Ultimately, virtual idols are both products of technological advancement and cultural innovation, and mirrors reflecting the emotional structures and spiritual worlds of contemporary youth. Understanding their operating mechanisms and social impacts is crucial for building an ecosystem that supports the healthy development of human emotions in the digital future.

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