



Parasocial interactions with real and virtual influencers: The role of perceived similarity and human-likeness

new media & society
2024, Vol. 26(6) 3433–3453
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DOI: 10.1177/14614448221102900
journals.sagepub.com/home/nms



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Abstract

Digitally created online celebrities (so-called virtual influencers) have appeared on various social media and video streaming platforms. While the scientific community has recently started to take an interest in this new phenomenon, it still remains mostly unclear how online audiences engage with—and relate to—these artificial digital creations. To address the identified research gap, we conducted a preregistered experiment ($N = 179$), comparing viewers' parasocial interactions (PSIs) with either a human or a virtual influencer. Based on natural stimuli, we find that viewers' parasocial response does not differ significantly between the two groups. However, by focusing on several theoretically relevant mediator variables, we uncover two opposing effects at play: While a significant direct effect signifies stronger PSIs with the virtual influencer, participants also attribute this persona with less mental human-likeness and similarity to themselves—which ultimately suppresses the observed advantage. Potential explanations for our results are discussed.

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Keywords

Influencer, parasocial interaction, social media, Twitch, video streaming

Introduction

Social media and video streaming services (such as Instagram, YouTube, or Twitch) have made it possible for everyday users to achieve great fame from the comfort of their own home—if they manage to amass a large number of followers and, by these means, turn into so-called *influencers*. However, considering that this new kind of stardom is now within the hypothetical reach of millions of people, becoming an influencer has also turned into a highly competitive enterprise (Duffy, 2017). In order to stand out from the numerous accounts that compete for viewers' attention, digital media users have to conceive of ever-new features, topics, and visuals to make their content seem worthwhile to prospective audiences.

A rather creative new phenomenon in this regard has emerged in the form of *virtual influencers*—social media celebrities that appear partially or fully artificial in nature (e.g. as digitally rendered 3D characters), while presenting the same type of content as real human influencers. Due to their rapidly increasing popularity, virtual influencers have also caught the attention of the scientific community, resulting in a first few exploratory studies (e.g. Arsenyan and Mirowska, 2021; Moustakas et al., 2020; Park et al., 2021; Shin and Lee, 2020). At the same time, we note that many fundamental aspects of users' engagement with this specific type of digital entity remain entirely unexplored. To contribute to the identified research gap, the current project focuses on one of the most central constructs of media psychology: *Parasocial interactions* (PSI), which may be understood as a complex set of cognitive, emotional, and behavioral responses to media characters (e.g. Schramm and Hartmann, 2008). Looking specifically at the context of video streaming, we conduct an online experiment that compares viewers' parasocial reactions toward a human and a virtual influencer of high comparability. Furthermore, we investigate potential mediators behind viewers' parasocial response, including perceived similarity and wishful identification, as well as different attributions of human-likeness to the respective online celebrities.

The virtual influencer phenomenon

As more and more virtual influencers appear on popular online platforms, it becomes increasingly difficult to define them in terms of a common set of attributes. To offer a rather broad definition, virtual influencers may be described as artificial media personas that are created by single programmers or whole media agencies, who often decide to remain anonymous. As digitally designed characters, they are typically characterized by a computer-generated face, which may either be connected to a digital body or superimposed on a real human body. Whereas some virtual influencers are portrayed as supermodels or performance artists, others strive for a “regular people” aesthetic (Kádeková and Holienčinová, 2018). In a similar vein, they may vary strongly in terms of their visual finesse, ranging from cartoon- or anime-like characters to those achieving astonishing levels of photorealism (Arsenyan and Mirowska, 2021).

Apart from their visual appearance, virtual influencers can also be differentiated depending on the content they present. Matching the thematic emphasis of different media platforms (e.g. Pelletier et al., 2020), virtual influencers on Instagram or Facebook are typically involved in the promotion of fashion items, domestic products, or brands, whereas those found on streaming platforms such as YouTube or Twitch (so-called *VTubers*) typically focus more on entertainment. This may also result in different content modalities, as the respective channels might put a stronger focus on either still images or whole videos. Of course, it should be noted that even within the same platform, virtual influencers show noteworthy variance as to how they maintain their user profiles. While scientific research into these differences is still sparse, a look at the currently most popular virtual influencer accounts on Instagram clearly supports this notion (Molenaar, 2021). Although the two virtual Instagram celebrities with the highest number of followers at the time of this writing—@magazineluiza (5.6 million followers) and @lilmiquela (3.1 million followers)—share multiple similarities (e.g. a focus on fashion-related content, frequent portrayals next to real models), the former is much more invested in professional brand communication than the latter, who also posts daily-life or comedic content. Even more so, other famous virtual influencers completely abstain from depicting real humans whatsoever (e.g. @anymalu_real; 0.5 million followers), or present highly stylized and artistic content (e.g. @noonouri; 0.4 million followers).

As many virtual influencer accounts keep it purposefully ambiguous who is responsible for the uploaded content, researchers have started to discuss the ontological nature of this new type of digital entity (Robinson, 2020; Shin and Lee, 2020)—that is, whether they may be regarded as *virtual avatars* (i.e. graphical representations of real people) or *virtual agents* (i.e. autonomous digital entities). Indeed, industry experts have reported that even today, artificial intelligence technology already plays a crucial role in the world of virtual influencers (e.g. Teh, 2021). While current technical restrictions may limit the actual autonomy of the resulting creations, ever-new innovations by technology companies make it seem likely that the percentage of computer-generated content in virtual influencer accounts will only increase in the future.

Then again, it should be noted that a few prominent virtual influencers are also quite forthcoming about the identity of the people managing the provided content. This holds especially true in the context of video streaming—a domain in which the conveyed personality, humor, and credibility of an influencer is evidently much more important than their physical appearance (e.g. Sakib et al., 2020; Zhao et al., 2021). Indeed, as video streamers are foremost perceived as entertainers, their success rises and falls with a likable live performance and authentic audience engagement (King and de la Hera, 2020; Kreissl et al., 2021). In consequence, influencers on YouTube or Twitch may want to emphasize the “human element” much more than those on other, more appearance-based social media—as hiding one’s true identity might actually diminish viewers’ positive impression in this context.

PSIs as a core concept of (social) media engagement

As a matter of fact, the idea that different behaviors by media protagonists will evoke more or less intense audience reactions has a rich history in the field of media psychology.

One of the most central contributions in this regard is the notion of *parasocial interactions* (PSIs), which may be defined as individuals' one-sided situational reactions toward characters depicted in mass media. In their initial conceptualization, PSIs were mostly considered as the result of basic perceptual illusions (Horton and Wohl, 1956). Yet, in recent years, scholars' understanding of the concept has evolved notably and now encompasses a variety of cognitive (e.g. thinking about the character's behavior), affective (e.g. feeling empathic toward the character), and conative (e.g. laughing about something the character said) elements (Dibble et al., 2016; Schramm and Hartmann, 2008). Once audience members repeatedly engage in PSIs with the same media character, they will further form so-called *parasocial relationships* (PSRs)—bonds that span across multiple reception situations and may, to some degree, resemble real-life instances of friendship or even romance (e.g. Tukachinsky and Stever, 2019).

While both described phenomena have originally been developed in the context of traditional mass media, they are believed to hold particular relevance for people's interactions with celebrities in the online context as well (Breves et al., 2021). After all, platforms such as Instagram, TikTok, or Twitch are often used by influencers to self-disclose personal information, facilitate high levels of immediacy, and offer impressive substitutes for social interaction—all of which have been shown to predict intense parasocial responses (Kim and Song, 2016; Tukachinsky and Stever, 2019). In addition, research has demonstrated that individuals typically perceive online influencers as more similar to themselves than traditional celebrities (e.g. Schouten et al., 2020), another factor that may foster particularly strong PSIs and PSRs.

Turning toward a topic of ongoing academic debate, some authors have raised the question whether influencer–audience contact may even be described as parasocial in the first place (e.g. Kowert and Daniel, 2021; Lou, 2022), considering that social media users can comment on an influencer's content and hope that, with some luck, they might get noticed or even receive a response (Wulf et al., 2021). However, literature has established that more often than not, users' messages to influencers go unnoticed amid the vast online audience, so that this kind of interaction should still be understood as mostly unilateral and not be equated to regular social encounters (e.g. Bond, 2016; Giles, 2002). Along the same lines, it has been argued that the apparent reciprocity of sending messages to online influencers is actually more reminiscent of writing fan letters to celebrities (Breves et al., 2021)—even if the resulting PSIs might indeed turn out slightly stronger than in the context of traditional media (Kowert and Daniel, 2021).

As underscored by their frequent use in media psychological research (e.g. Liebers and Schramm, 2019), parasocial processes are considered a fundamental part of people's media experience, not least because they crucially affect numerous other processes as well. Vorderer et al. (2004), for example, view PSIs and PSRs as a central prerequisite for media enjoyment and state that both phenomena foster individuals' subsequent engagement with the respective content (as viewers may want to “stay in contact” with a liked character). In order to explain the positive connection between PSI and media enjoyment, other researchers have argued that engaging in PSI satisfies a basic human desire, namely, the need for connectedness, as media users become part of a mediated social group (Green et al., 2004). Furthermore, parasocial phenomena have been linked to higher levels of suspense and arousal, presumably in consequence

of the sympathy felt toward the media character (Hartmann et al., 2008). In line with this proposition, several studies in the context of videogame streaming showed that (para-)social aspects associated with the platform Twitch strongly predicted users' self-reported enjoyment, as well as their fan commitment to specific streaming channels (Wulf et al., 2020).

Examining PSIs with virtual influencers

Faced with the strong impact of PSIs on the media reception process, scientists and media producers alike have tried to identify factors that may be associated with more intense parasocial responses by audience members. By these means, several distinct characteristics, both on the side of the media user (e.g. genre preference; Liebers and Straub, 2020) and the media character (e.g. how viewers are addressed; Wulf et al., 2021), have been revealed as important antecedents of PSI intensity and valence. Moreover, taking on an evolutionary perspective, (para-)social responses are believed to be automatically elicited by cues associated with human characteristics, such as a human face (Giles, 2002). Regarding the subject of the current study, we believe that this notion holds particular importance. While it has been shown that media users can also experience PSIs with artificial entities—such as cartoon and anime characters (e.g. Ramasubramanian and Kornfield, 2012), virtual avatars (Jin, 2010), or even bodiless chatbots (e.g. Youn and Jin, 2021)—viewers usually report much stronger parasocial responses toward human than toward animated media personas (Bond and Calvert, 2014; Giles, 2002). Along these lines, a recent study by Sheldon et al. (2021) revealed that digitally created movie protagonists elicited significantly weaker PSIs than human characters, further emphasizing the impact of a persona's ontological nature on viewer engagement.

At the same time, audiences' parasocial response toward virtual influencers might not only be impaired by their artificial appearance (i.e. reduced *visual human-likeness* cues), but also due to viewers' impression of an artificial intelligence or non-human mind behind them—that is, lower attributions of *mental human-likeness*. After all, literature from the field of human–computer interaction strongly indicates that the visual and mental properties of a digital creation are often considered separately during their evaluation, evoking distinct effects (e.g. Ferrari et al., 2016; Stein et al., 2020a; Yin et al., 2021). Even more so, it has been shown that—despite the impressive feats accomplished by contemporary AI—entities such as robots or digitally created agents are still perceived to be inferior to real people (e.g. Broadbent et al., 2013; Haslam et al., 2008), both in terms of agency (i.e. the ability to think and plan) and experience (i.e. the ability to feel). In turn, these reduced attributions of mental prowess seem to affect how people approach the respective entities (e.g. Waytz et al., 2010; Yam et al., 2021), for instance, resulting in less empathy and adapted moral expectations.

It may be pointed out that in practice, these effects might subside to some degree once audiences become aware of a human person orchestrating the actions of the digital influencer (i.e. perceiving it as an avatar; for example, Fox et al., 2015; Stein and Ohler, 2017). However, since most current virtual influencer channels go to great lengths to conceal the involvement of real people—or even claim a lack thereof—we argue that in

many cases, viewers might still attribute less human mind to these entities. In summary, we thus propose the following hypotheses (using the term *streamers* to describe influencers from the video streaming context):

H1. PSIs with human streamers will be stronger than PSIs with digitally created streamers.

H2. The effect in H1 will be mediated by (a) the visual human-likeness and (b) the mental human-likeness ascribed to the streamer.

Moreover, we expected two additional psychological mechanisms to contribute to the supposed PSI advantage of real humans over virtual influencers: *Perceptions of similarity* and *wishful identification*. Indeed, previous literature on the emergence of parasocial phenomena emphasizes that perceiving a media character as similar to oneself is one of the most important predictors for intense PSI (e.g. Giles, 2002). While this is, to some degree, also covered by the abovementioned concept of human-likeness, it stands to reason that similarity perceptions may also arise from many other characteristics. Turner (1993), for instance, reported that viewers' parasocial response to television characters not only increased with visual resemblances, but also with the impression of shared attitudes and social background—a finding that has since been replicated in many other media contexts (e.g. Tian and Hoffner, 2010; Xu et al., 2021). For the topic at hand, we deemed it likely that a digitally created influencer would be seen as rather dissimilar from the self. Specifically, we expected this not only due to the different ontological nature and physical features of the virtual character but also because audiences might ultimately perceive them to belong to a social out-group with different beliefs and experiences. Likewise, we assumed that viewers might find it more challenging to adopt the perspective of a digitally created persona, which should further decrease their psychological closeness and, in turn, the observed PSI.

At the same time, it should be noted that even if media users do not consider a certain media persona as similar to themselves, they might still aspire to become more like them—which might again increase parasocial reactions (Lim et al., 2020; Schouten et al., 2020). In media psychology, this motivational state has been labeled *wishful identification* (Hoffner, 1996; Hoffner and Buchanan, 2005), showing notable overlap with—but also significant differences to—forms of engagement that are based on perceived similarities (Feilitzen and Linné, 1975; van Looy et al., 2012). Indeed, research suggests that viewers' desire to be like a media character usually evokes higher involvement with that character and, in turn, fosters parasocial ties (Lim et al., 2020; Tian and Hoffner, 2010). Considering the discussed types of influencers, however, we again assumed that wishful identification would turn out lower toward digitally created characters. As virtual influencer profiles and channels often involve stylized, exaggerated, or unnatural aesthetics, media users might find it less appealing—or appropriate—to become like them. Furthermore, the fact that virtual influencers belong to a completely different ontological category may prevent viewers from even considering the possibility of wishful identification in the first place. Taken together, we hypothesized:

H3. The effect in H1 will be mediated by (a) the perceived similarity to and (b) the wishful identification with the streamer.

Concluding our research propositions, we strived to investigate potential emotional and behavioral by-products of the evoked PSIs. As parasocial phenomena are regarded as central prerequisites of media entertainment (Green et al., 2004; Vorderer et al., 2004), they have been shown to also predict higher levels of media *enjoyment*—one of the most crucial aspects of people’s media experience (Dibble and Rosaen, 2011; Hartmann et al., 2008). For the context of influencers, we believe that this connection should be particularly evident in terms of hedonic enjoyment (i.e. the experience of strong positive emotions such as joy, pleasure, and excitement), considering that social media and streaming content often focuses on lighthearted subject matter. Finally, it stands to reason that the heightened hedonic enjoyment among viewers would go along with stronger future viewing intentions (Hu et al., 2017; Wulf et al., 2021):

H4. Stronger PSIs between the recipient and the streamer are positively related to (a) experienced levels of hedonic enjoyment and (b) a higher motivation for further engagement.

Method

All hypotheses and analysis plans for the current study were preregistered prior to data collection (https://aspredicted.org/Ts4_RYB). Furthermore, all obtained data and analysis codes (including exploratory analyses) are provided in an Open Science Framework repository at <https://osf.io/p6ht5/>.

Participants

Based on our planned statistical analyses, we used the *Monte Carlo Power Analysis for Indirect Effects* method provided by Schoemann et al. (2017) to calculate the minimum sample size for the current study. Assuming moderate correlations between the variables, 80% power, and a parallel mediation model, we obtained a lower threshold of 155 participants.

Using recruitment calls on social media groups, university mailing lists, and personal contacts, we recruited a total of 183 participants. However, based on preregistered exclusion criteria to ensure high data quality, we had to remove the data of three participants who indicated careless responding in a self-report item, as well as one participant who did not identify the correct experimental condition in an attention check question. As such, our final sample consisted of $N = 179$ participants (age $M = 23.83$ years, $SD = 6.09$; range: 18–65 years), with a slight imbalance in the gender distribution (114 female, 64 male, 1 other). In terms of educational background, we observed a relatively high level of education among our sample, with 83.2% of participants indicating that they were currently enrolled as university students. Regarding their familiarity with the subject matter, a control question on participants’ use of video streaming platforms (“such as YouTube or Twitch”) showed that a large percentage of our participants used these

services on a daily (32.4%) or weekly (24.6%) basis, in contrast to 43 individuals who used them hardly ever or never. Similarly, 52% of the sample explained that they followed only a few or no influencers on these platforms, whereas 31.1% reported subscribing to more than 10 influencer channels.

Procedure

The current study took place in the form of an online experiment, employing a one-factorial between-subjects design. After giving their informed consent, participants were randomly assigned to one of two conditions—which asked them to watch the video recording of either a human or a digitally created influencer from the streaming platform Twitch. In order to ensure that participants viewed the full 3-minute video, a timer function was embedded on the respective page, which only allowed to proceed after the clip had ended. On the subsequent online survey pages, we presented all participants with the same measures on PSI, perceived human-likeness, similarity and wishful identification, willingness for further engagement, and hedonic enjoyment. Moreover, individuals' familiarity with streaming videos was assessed as a potential covariate. Finally, we added several measures to ensure careful responding (i.e. attention check, self-report diligence item, open text field for technical problems) as well as questions on sociodemographic data. To thank them for their time, we offered participants the chance to take part in a gift raffle of €60; in case they were local students, partial course credit could also be chosen as compensation.

Stimuli

While we initially considered focusing our research on the popular social network Instagram, we ultimately decided to select virtual influencers from the well-known video streaming platform Twitch, on which gaming enthusiasts may share their experiences while playing video games. This decision was informed by the fact that videogame play tends to evoke strong affective reactions (Yannakakis and Paiva, 2014), so that we expected Twitch streams to be more evocative of (emotionally loaded) parasocial reactions. Furthermore, Twitch streamers typically address the audience in a direct manner—another factor that is directly connected to stronger PSIs. Especially considering that participants would only be exposed briefly to the media personas in question, we thus deemed videogame streaming as a suitable context for our research. In addition to that, it may be noted that Twitch has emerged as one of the most popular platforms for digitally created influencers in the recent past (e.g. Rasmussen, 2021), so that choosing this context also seemed appropriate to increase external validity.

In terms of internal validity, however, a great challenge arose as we strived to select a human and a digitally created influencer of high comparability. After all, keeping constant as many aspects apart from our independent variable (i.e. the influencer's ontological category) as possible was all but essential for the soundness of our results. Following a search procedure that involved hundreds of channels, we eventually came across two popular Twitch users that had streamed remarkably similar content: The virtual influencer "CodeMiko" and the human influencer "MeghanYeah." Whereas Meghan Yeah

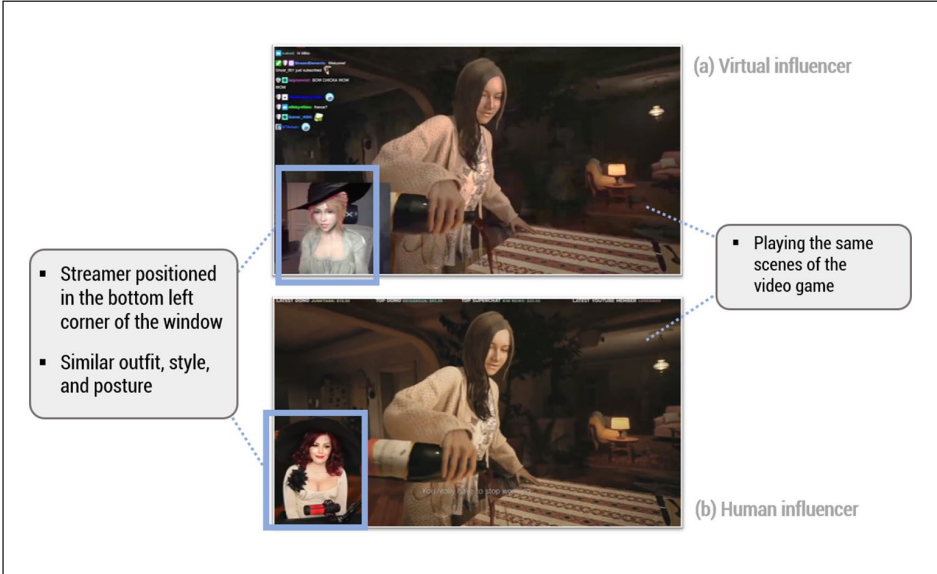


Figure 1. Screenshots from the Stimulus Videos for the Experimental Conditions Virtual Influencer (top side; “CodeMiko”) and Human Influencer (bottom side; “MeghanYeah”).

appears in her videos as a young adult human woman, CodeMiko takes on the form of a highly realistic digital rendering—using image replacement technology to mirror the real-world actions of Korean-American streamer Youna Kang.

In the respective videos, both CodeMiko and MeghanYeah had played the exact same sequence of the horror videogame “Resident Evil 8” while being dressed in highly similar witch costumes (see Figure 1). Although several subtle differences may be noted between the two streaming videos—for example, differently positioned text inserts, deviations in vocal pitch—we found that this selection provided us with an astonishingly close match, despite being based on unrelated, natural materials. To further increase the resemblance between both stimuli, we edited both original videos (which lasted about 20 minutes) into 3-minute montages of highly similar scenes, focusing on the same story sequences in the played video game as well as equal numbers of emotional outbursts by both streamers. Although the resulting stimuli might be described as rather brief, previous literature has demonstrated that comparably short (or even shorter) instances of media exposure sufficed to evoke notable PSIs (Hartmann and Goldhoorn, 2011; Kim, 2022; Oliver et al., 2019). Also, as we did not want to frighten the participants of our study, we made sure not to include any overly graphical or tense scenes from the depicted videogame, which practically limited the parts of the chosen content that could be featured in our edit. While it may be noted that our final edit of game scenes briefly depicted an in-game character (i.e. a female protagonist from “Resident Evil 8”), this appearance only lasted about 20 seconds, whereas the streamer was constantly visible throughout the materials. As such, we assumed that the virtual in-game character would not interfere with our participants’ PSI in a critical manner.

Measures

All measures were presented with a 5-point Likert-type answer format (1 = *fully disagree*; 5 = *fully agree*). For the obtained means and standard deviations, we refer to the “Results” section.

PSI. As the conceptualization of PSI has changed significantly throughout the past few decades, ever-new operationalizations of the construct have been proposed as well. In recent years, a particularly comprehensive contribution in this regard has emerged in form of the PSI Process Scales (Schramm and Hartmann, 2008), which provide 14 different sub-scales covering a broad psychological range of audience reactions. Adhering to the authors’ suggestion, we selected a thematically fitting set of 15 items for the current study. Specifically, we chose six cognitive (e.g. “I was observing closely how the streamer behaved.”), five affective (e.g. “I liked the streamer.”), and four behavioral items (e.g. “I often felt compelled to tell the streamer my opinion.”) to assemble a composite PSI score. Good internal consistency was observed for the resulting measure, Cronbach’s $\alpha = .78$.

Similarity and wishful identification. To assess participants’ perception of their similarity to, as well as their wishful identification with, the presented influencers, we obtained two suitable sub-scales from the work of van Looy et al. (2012). We decided that these measures would be appropriate for our study not only due to their pragmatic scope and good psychometric qualities, but also because they were developed in the context of video-games—matching the focus of our planned experiment. After slightly modifying their wording, we presented five items on perceived similarity (e.g. “The streamer is like me in many ways”; “The streamer is similar to me”; Cronbach’s $\alpha = .92$) and five items on wishful identification (e.g. “If I could become like the streamer, I would”; “I would like to be more like the streamer”; Cronbach’s $\alpha = .87$).

Attributions of human-likeness. Literature from the field of human–computer interaction offers an abundance of scales that measure participants’ impressions of human-likeness regarding various types of artificial entity (e.g. Bartneck et al., 2009; Ho and MacDorman, 2017). However, we noticed that none of the consulted measures differentiated between visual and mental human-likeness, which seemed less-than-ideal for our study. Taking some inspiration from the abovementioned questionnaires, we therefore developed our own scales, consisting of six items on perceived visual human-likeness (e.g. “The streamer looks like an artificial character”; “The facial and body expressions of the streamer seem natural”) and six items on perceived mental human-likeness (e.g. “The streamer seems to have their own personality”; “The streamer appears soulless to me”). Internal consistency turned out very good for both measures, Cronbach’s $\alpha = .90$ for the visual and $.83$ for the mental human-likeness scale.

Enjoyment and willingness for future engagement. Psychological research has indicated that enjoyment should actually be considered as a two-dimensional construct, stemming from both hedonic (e.g. feeling happy or excited) and eudaimonic (e.g. feeling moved and

inspired) experiences (e.g. Tamborini et al., 2011). For the current experiment, however, we focused only on the former, considering that the chosen subject matter would be mostly related to hedonic enjoyment. As such, we employed the three-item scale by Wirth et al. (2012), which offers a highly economic yet valid measure (e.g. “All in all, I felt entertained by the video”; “I generally enjoyed watching the video”). The observed internal consistency turned out excellent, Cronbach’s $\alpha = .96$.

Participants’ willingness to further engage with the shown influencer was measured using three self-created items (e.g. “I want to know how the streamer continues playing the game in the video”; “I plan on watching more videos of this streamer in the future”). Again, a high Cronbach’s α (.81) was found, supporting the reliability of our scale.

Results

For an overview of the obtained means and standard deviations in both experimental groups as well as a first examination of group-level effects (Welch’s *t*-tests), readers may consult Table 1. In addition, Table 2 presents the zero-order correlations among the measured variables.

Impact of different types of influencer on participants’ PSI

In order to give an answer to our main hypothesis, we focused on the result of an independent Welch’s *t*-test that compared the obtained PSI scores between the virtual and the human influencer conditions. Doing so, we found that the intensity of participants’ PSI had not differed significantly between the two groups (see Table 1 for numerical results). From an exploratory perspective, it was further observed that this result remained unchanged even when controlling for participants’ familiarity with streaming platforms and interest in streamer channels. As such, we report that our data did not support assumption H1.

Mediation effects

In the history of mediation analysis, it was previously assumed that mediation effects may only be tested after a significant direct effect from the independent to the dependent variable has been established (see *causal steps approach*, Baron and Kenny, 1986). In recent years, however, this condition has been disregarded, making room for new, less restrictive approaches (Hayes, 2017). As such, we continued with our analysis despite the lack of a significant group difference regarding our main dependent variable.

Using the PROCESS macro for SPSS (Hayes, 2017) set to 10,000 bootstrap iterations, we calculated a parallel mediation model¹ including our four theoretically relevant mediators: Visual human-likeness, mental human-likeness, perceived similarity, and wishful identification. Figure 2 summarizes the model, showing unstandardized coefficients and standard errors for all paths.

We observed significant *indirect effects* of the shown influencer on PSI via mental human-likeness, $b = .10$, standard error (SE) = .06, 95% confidence interval (CI) [.01, .21], and perceived similarity, $b = .09$, $SE = .04$, 95% CI [.02, .17]—but not via visual

Table 1. Descriptive statistics for the obtained measures.

Variable	Virtual influencer		Human influencer		Welch's <i>t</i> -test		
	(n = 93)		(n = 86)		t-statistic	<i>p</i>	Cohen's <i>d</i>
	M (SD)	M (SD)	M (SD)	M (SD)			
Parasocial interaction	3.09 (0.52)	3.00 (0.57)	1.05	.295	0.16		
Visual human-likeness	2.75 (0.74)	3.97 (0.83)	-10.30	<.001	1.55		
Mental human-likeness	3.35 (0.80)	4.07 (0.58)	-6.94	<.001	1.03		
Perceived similarity to oneself	1.85 (0.81)	2.21 (0.90)	-2.78	.006	0.42		
Wishful identification	1.43 (0.59)	1.60 (0.62)	-1.87	.064	0.28		
Hedonic enjoyment	2.69 (1.12)	3.10 (1.14)	-2.41	.017	0.19		
Willingness to further engage with the persona	1.57 (0.75)	1.72 (0.85)	-1.22	.224	0.36		

SD: standard deviation.

All scales range from 1 to 5.

Table 2. Zero-order correlations between study variables.

Variable	1	2	3	4	5	6	7	8	9
1 Age	–								
2 Gender ^a	.19*	–							
3 Parasocial interaction	-.28***	-.17*	–						
4 Visual human-likeness	-.11	.03	.10	–					
5 Mental human-likeness	-.27***	-.07	.27***	.60***	–				
6 Perceived similarity	-.23**	-.11	.46***	.39***	.47***	–			
7 Wishful identification	-.13	-.04	.29***	.23**	.22**	.59***	–		
8 Hedonic enjoyment	-.04	-.03	.46***	.35***	.37***	.36***	.24**	–	
9 Willingness to further engage with the persona	-.05	.08	.46***	.30***	.24**	.51***	.52***	.55***	–

^aGender coded with "0" = female, "1" = male.

p* < .05, *p* < .01, ****p* < .001.

human-likeness, $b = -.03$, $SE = .06$, 95% CI [-.15, .09] and wishful identification, $b = .01$, $SE = .02$, 95% CI [-.02, .05]. Regarding the residual *direct effect*, our analysis further uncovered a significant negative relation between the assigned condition and participants' PSI, $b = -.26$ ($SE = .09$, 95% CI [-.44, -.08]). Thus, with direct and indirect effects running in opposite directions, the *total effect* of the model turned out insignificant, $b = -.09$, $SE = .08$, 95% CI [-.25, .07].

Keeping in mind our specific dummy-coding of the experimental conditions (0 = virtual influencer, 1 = human influencer), our results suggest that participants perceived the digitally created character CodeMiko to possess significantly less mental human-likeness than the human influencer, and that this impression, in turn, contributed to lower PSI. Similarly, participants perceived the human streamer as significantly more similar

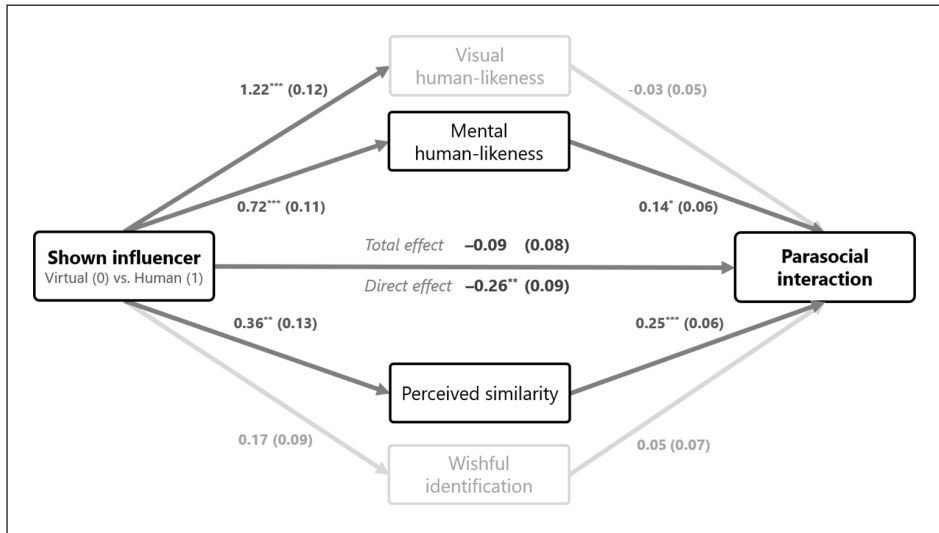


Figure 2. Parallel mediation model.

Standard errors in parentheses.
 * $p < .05$, ** $p < .01$, *** $p < .001$.

to themselves than the virtual character, which increased their self-reported PSI. At the same time, the negative direct effect implies that after controlling for the four mediators, participants actually showed a stronger parasocial response to the virtual influencer. In statistical terms, this means that perceived mental human-likeness and similarity served as *suppressor* variables, overriding the otherwise more positive perception of the digitally created streamer.

In summary, we report a positive answer to hypotheses H2b and H3a. Conversely, hypotheses H2a and H3b could not be supported by our data.

Associations between PSI, enjoyment, and willingness for future engagement

Proceeding to our final hypothesis on potential downstream effects of participants' parasocial experience, we conducted two linear regression analyses. Here, we entered participants' age, gender, and individual level of PSI as predictors and either their hedonic enjoyment or willingness to engage further with the portrayed influencer as respective criteria. In the first analysis, we found a significant regression equation, $F(3, 175) = 16.34, p < .001, R^2 = .22$. With age and gender controlled, PSI indeed predicted hedonic enjoyment in a significant manner, $\beta = .49, p < .001$. Similarly, the second linear regression analysis examining participants' willingness for further engagement turned out significant, $F(3, 175) = 18.06, p < .001, R^2 = .24$. Again, participants' PSI was found to be a highly relevant predictor ($\beta = .50, p < .001$). In addition to that, we observed that these effects persisted even when controlling for

participants' previous exposure to online streaming and interest in video streamers, as well as the four measured mediators. As such, both parts of hypothesis H4 can be answered affirmatively based on our data.

Discussion

The world of social media and video streaming services has introduced young generations to completely new forms of stardom—but the huge number of users on the respective platforms makes standing out from the crowd a difficult endeavor. Striving for ever-new ways to gain viewers' attention, more and more content creators are taking on the form of virtual influencers, that is, carefully crafted, digital personas that present typical influencer content. Intrigued by this novel trend, we scrutinized several theoretically grounded assumptions as to how the ontological nature of an influencer might affect viewers' parasocial response. To our surprise, we did not observe the expected advantage of a human over a virtual online persona in terms of parasocial experience; instead, both examined influencers from the video streaming context elicited similar levels of PSI in our experiment.

Taking a closer look at potential mechanisms behind participants' responses, however, we found two opposing effects at play. On one hand, the digitally created influencer indeed evoked lower mental human-likeness attributions and was seen by participants as more dissimilar from themselves, which further predicted less intense PSIs. On the other hand, once we controlled for these indirect pathways, a direct effect in the reverse direction remained—implying that other, non-examined factors actually fostered a stronger parasocial reaction toward the digitally created video streamer.

Faced with this pattern of results, we pondered several possibilities as to which unexplored variables might have strengthened participants' PSIs toward the virtual influencer and, thus, counteracted both mediation effects. First and foremost, we suppose that our observations were probably influenced by a *novelty effect*. At the current time, virtual influencers are still a relatively new occurrence, and as such, many participants in the respective condition might have felt intrigued by the depicted character of CodeMiko. In turn, this curiosity and fascination may have translated into a stronger inclination to form PSIs—explaining the positive direct effect that balanced out the two negative mediation paths (via mental human-likeness and perceived similarity). Furthermore, due to our focus on externally valid stimuli, we cannot rule out that subtle differences between the chosen influencer videos affected the experience of our participants. Despite our best efforts to select highly similar materials—in terms of the streamers' visual appearance, emotional reactions, and streamed content—we did not achieve perfectly standardized conditions. Hence, certain statements or actions by CodeMiko may have triggered a different impulse to react than those of the human streamer MeghanYeah. In a similar sense, we note that the stimulus video of the virtual influencer contained a small textbox with feedback messages by other viewers, whereas the human influencers' video only showed the most recent audience message at the top of the screen. Although we made sure to display our stimulus videos in a medium-size format so that these messages could hardly be read (and explicitly introduced both clips as recordings and not actual live streams), the text inserts may still have conveyed different levels of audience engagement, thus

influencing participants' own PSI. As such, future studies are encouraged to blur out any indicators of social interaction in order to remove a potential confound. Nevertheless, we suggest that this methodological limitation does not take away from the main results of our mediation analyses: As anticipated, viewer–persona homophily and impressions of (mental) human-likeness both played a substantial role for viewers' involvement with virtual versus real influencers. If anything, we expect that preparing even more equivalent stimuli would only accentuate these effects—potentially removing some confounding variables that worked against them in our data.

At the same time, we were surprised to find that two of the four proposed indirect effects did not turn out significant in our experiment. Even though the assigned influencer category strongly affected viewers' attributions of visual human-likeness, the latter could not be connected to PSI intensity in our analysis. In our interpretation, this outcome might be a specific artifact of the chosen influencer context. Compared to visual-based social media such as Instagram, users' evaluation of video streams on Twitch typically depends much more on the actual content (shown actions, spoken comments, etc.) than on the appearance of the respective influencers (e.g. Sakib et al., 2020; Zhao et al., 2021). In turn, this implies that with regard to our operationalization of human-likeness, the mental dimension may have been much more relevant for how participants perceived the depicted online celebrities than the visual sub-scale.

Concerning the statistical irrelevance of wishful identification, on the contrary, we suppose that a possible explanation may rest in participants' relatively brief exposure to the shown streamers. After all, encountering a media persona for only a couple of minutes may not convey enough information for viewers to wishfully identify with them. Moreover, the weak relationship between this variable and our main outcome (PSI) might again be due to the chosen setting—in the world of video streaming, idolizing a persona may be less crucial than, for instance, perceiving them as close friends or enjoyable entertainers in order to form strong PSIs.

Limitations and future research

Reflecting on our work, we would like to emphasize that our study only addressed a small empirical cutout from the large field of social media influencing. Keeping this in mind, future studies are encouraged to replicate our experiment with different types of online celebrities, ideally including influencers from other social media platforms (e.g. Instagram or TikTok). Since our materials were specific to the videogame streaming context, which typically invokes strong emotionality and lighthearted entertainment (e.g. Wulf et al., 2020), empirical results might indeed turn out differently for influencer accounts that pursue, for example, more persuasive intentions. In any case, scholars might want to make sure that their materials only depict the influencers in question—since portraying them next to other individuals might exert a disrupting influence.

Moreover, it should be taken into account that the virtual influencer depicted in our study uses image replacement technology to exchange a real person with a digital avatar; based on this, we think that different effects might occur once participants encounter an entity they consider as completely artificial from the outset. Even though our stimuli never acknowledged the human individual behind CodeMiko—and the significantly

lower mental human-likeness ratings in this condition arguably show that participants perceived her as more artificial than a real person—we believe that experiments with other types of virtual influencer technology (e.g. AI-based characters) are all but needed to corroborate and expand upon the obtained evidence.

Pondering the stability of the observed effects, it may be mentioned that our experiment only involved a single media exposure and measurement, so that it remains unclear how viewers' experience might change across multiple encounters with the same influencer. By conducting follow-up studies with a focus on long-term effects—and examining not only immediate PSIs but also overarching PSRs—scholars could gain valuable insight into this. Certainly, doing so might also help to reveal whether potential novelty effects (as suggested in our discussion) subside after a certain amount of time, which would ultimately be detrimental to the success of virtual influencers. Also, we would like to remind readers that, for the sake of feasibility, our study only employed a relatively brief recording of a video stream instead of actual live content. In all probability, having participants experience more extensive, real-time media might shift their level of involvement (presumably) toward a more engaged and emotionally loaded response (Luo et al., 2020). With regards to this, we also want to highlight that participants' PSIs in the current experiment only turned out moderate on average, so that we ask readers to consider potential implications with caution.

Finally, explorations with different samples, for example, in terms of age, cultural background, or thematic interest, will also be necessary to gain a deeper understanding of the phenomenon at hand. While the current study featured mostly young, media-savvy participants expressing different levels of familiarity with the context at hand, it might be worthwhile to only focus on the responses of those who are either completely unaccustomed to—or avid fans of—social media influencing. Of course, such research would also benefit greatly from involving different age brackets, as younger participants are usually much more acquainted with digital technology (and digitally created characters) than older individuals and might therefore show different reactions.

Conclusion

According to our experiment, virtual influencer accounts may currently be in a unique position: Although some aspects of the shown personas seem to be disadvantageous for audiences' parasocial response, they seem to be fascinating enough to yield similar levels of involvement as fully human influencers. Yet, it remains to be seen how these effects change once virtual influencers have become a common trope in the online space. Keeping in mind the well-established importance of authenticity and intimacy perceptions on social media (e.g. Guthrie, 2020; Stein et al., 2020b), such artificial creations might ultimately be facing a "humanness ceiling" that limits their ability to make viewers connect with them. On contrary, it should be noted that society's understanding of (online) identity is constantly evolving—which might also change how people approach digital celebrities. In any case, given the ongoing proliferation of virtual influencers on several media platforms, it may be a worthwhile task, both for scientists and media observers, to deepen the understanding of this fascinating phenomenon.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Note

1. In our preregistration, we considered two parallel mediation models (with two mediators each) as potential analysis plan; however, we ultimately entered all mediators into one model in order to acknowledge their interplay. It should be noted, however, that calculating two separate models resulted in exactly the same pattern of significant results.

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