

Research article

Human-like virtual influencers: human perceptions and attitudes towards an emerging phenomenon

Influencers virtuales humanizados: actitudes y percepciones humanas y actitudes ante un fenómeno emergente

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Abstract

Introduction: Technological evolution has led to the emergence of virtual influencers, digitally created figures that participate in social media to capture the attention of netizens for commercial purposes. These influencers are becoming increasingly sophisticated, aiming for a high resemblance to humans. The general objective of this study is to understand how human-like virtual influencers affect the perception, emotions, and attitudes of the human cyber population. These constructs form the conceptual model to be measured. **Methodology:** The conclusive descriptive design employs mixed methods, including an online survey administered to 1.380 users and content analysis of 47.500 interactions on

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Instagram. **Results:** The results confirm that the existence of virtual influencers, especially the more anthropomorphic ones, affects human perception and emotion. **Discussions:** The discussion focuses on the interaction between humans and virtual entities is increasing, and the various effects on the former need to be closely observed. **Conclusions:** It is concluded that the role of virtual influencers in influencer marketing is acknowledged; however, ethical, and social issues arising from social interactions in digital environments still need to be carefully examined.

Keywords: virtual influencer, artificial intelligence, social media, influencer marketing, perception, emotion, attitude, Instagram.

Resumen

Introducción: La evolución tecnológica ha dado lugar a influencers virtuales, figuras creadas digitalmente que participan en redes sociales digitales para captar la atención de los cibernautas con fines comerciales. Estos influencers se vuelven cada vez más sofisticados y pretenden un alto parecido al ser humano. El objetivo general de este estudio es comprender cómo los *influencers* virtuales parecidos al ser humano influyen en la percepción, las emociones y en la actitud de la población cibernauta humana. Estos constructos conforman el modelo conceptual a medir. **Metodología:** El diseño conclusivo descriptivo utiliza una metodología mixta incluye: una encuesta en línea aplicada a 1.380 usuarios; y el análisis de contenido de 47.500 interacciones en Instagram. **Resultados:** Los resultados confirman que la existencia de los *influencers* virtuales, sobre todo los más antropomorfos, tiene efecto en la percepción y emoción humana. **Discusión:** La interacción entre humanos y entes virtuales va en aumento. La discusión se enfoca en la interacción entre humanos y entes virtuales va en aumento, los distintos efectos en los primeros deben observarse. **Conclusiones:** Se reconoce el papel de los *influencer* virtuales en el marketing de *influencers*; sin embargo, aún deben observarse las cuestiones éticas y sociales sucedidas en interacciones sociales en entornos digitales.

Palabras clave: *influencer* virtual, inteligencia artificial, redes sociales, marketing de *influencers*, percepción; emoción; actitud; Instagram.

1. Introduction

In 2024, the global influencer marketing value is estimated to reach a record 24 billion U.S. dollars (Dencheva, 2024). Likewise, investments in marketing using artificial intelligence are increasing, including the development of virtual influencers (VIs), resulting in millions of dollars of investment. Technological evolution has led to the emergence of virtual influencers in this same market. Virtual influencers are computer-generated entities that emulate human influencers on social media platforms, created using artificial intelligence and presented as interactive, real-time rendered entities in digital environments (Arsenyan & Mirowska, 2021). These digital personas are typically managed by teams of artists, designers, and animators, often utilizing generative AI technologies (Campbell et al., 2022, p. 25). Virtual influencers publish content and promote ideas just as human influencers do on social media, connecting with their audience through these platforms (Hsu, 2019; Forsey, 2019; da Silva & Chimenti, 2021).

Although they are digital entities, virtual influencers emulate the physical appearance of human beings (Sands et al., 2022). They attempt to enhance this appearance through behaviors and narratives that exaggerate their human-like image; that is, they express emotions, anguish, hope, and other expressions. These figures are digitally created and stand out for interacting with human audiences through various digital platforms, including social

media. The proliferation of virtual influencers has experienced accelerated growth in the last decade, driven primarily by the democratization of artificial intelligence. These virtual influencers primarily seek to capture the attention of online users for commercial purposes. This type of influencer marks a new era in digital communication.

The popularity of virtual influencers constitutes a relatively recent phenomenon in influencer marketing. According to Corrales et al. (2017), online advertising via social media has proven to be an effective strategy for reaching target audiences on platforms such as Facebook, Instagram, Twitter, LinkedIn, and others. Due to the number of digital influencers, their existence is already a phenomenon within digital social communities, surpassing thousands, and the number seems to multiply with the emergence of artificial intelligence (diarioia.com, 2023). This phenomenon poses new challenges for humans; as Wong et al. (2017) point out, distinguishing real elements from fictitious ones in the digital ecosystem is challenging.

This work contributes to the research on the social intention of human-like virtual influencers, on which human perception has been studied. Their observation has occurred in an interdisciplinary manner, that is, through various disciplines (Yan et al., 2013, p. 86). Although several studies have focused on the observation of social reactions towards virtual beings (e.g., Castell & Bickmore, 2000; Nass et al., 2000; Castell et al., 2002; Jung & Kopp, 2003), studies on the relationship of human-virtual influencer interaction are fewer (e.g., Bainbridge et al., 2008; Bainbridge et al., 2010). And according to Franke et al., (2023), there is currently little research on whether significant advertising goals are achieved using virtual influencers

The general objective of this study is to understand how human-like virtual influencers influence perception, which in turn affects the emotions and attitudes of the human cyber population. To achieve this objective, the following specific objectives are established:

- (1) to know the existence, expansion, and intention of virtual influencers;
- (2) to observe reactions and gain a deeper understanding of the human perception of the phenomenon; and
- (3) to investigate the perception of the existence of virtual influencers and their effects on human emotions and attitudes.

These constructs form the conceptual model to be measured, whose relationships support the hypotheses based on literature related to influencer marketing in scientific databases. This research is framed in social identity theory and interpersonal theory. The former is used to recognize the stereotypes of the centennial generation, and the latter to identify the different reactions of human internet users according to their perception of the virtual influencer. Thus, the methods, data collection, and results are explained. In the general discussion, this study's theoretical and managerial contributions are analyzed, concluding with some limitations and directions for future research.

2. Theoretical background and hypothesis development

The popularity of virtual influencers has grown significantly in recent years, however, just like human social media influencers, who are individuals with a substantial network of social media followers (De Veirman et al., 2017) who engage in influencer marketing by communicating on social media platforms (Voorveld, 2019), the capacity to influence

achieved by virtual influencers must be observed. According to Baklanov (2019), some virtual influencers achieve greater engagement than human influencers. Everything will depend on the perception that humans have of the virtual influencer.

2.1. The effects of perception of virtual influencers on human reactions

Starting from the premise that the virtual influencer is a different type of influencer, that is, knowing that the digital entity is artificially created (Lou et al., 2023), driven by advancements in computer-generated imagery (Arsenyan & Mirowska, 2021), and created using computer graphics software (Vrontis et al., 2021), but with the same intentions as human influencers, which are to capture attention, provoke interactions, and increase the number of followers on social media, to promote their products and services that can provide them with economic or other types of compensation (Hearn & Shoenhoff, 2016), the way this virtual influencer is perceived must be studied.

The virtual influencer maintains their influential status and persuasive effectiveness via the attractiveness stereotype, human-like functionality, and audio-visual features (Khan & Sutcliffe, 2014). Such novelty leads to better short-term ad recall, whereas usefulness leads to better short-term and long-term brand recall (Sheinin et al., 2011). They are credible, attractive, trustworthy, and knowledgeable about the endorsed product, making them convincing (Djafarova & Rushworth, 2017). The way virtual influencers are presented, with their anthropomorphic traits, makes the interaction comparable to one between two humans (Edwards et al., 2016; Lou et al., 2023). The perception of the human internet user must be observed as the phenomenon evolves since it is from the perception that various consequences in the attitude of that human will derive.

2.2. Human reaction to the virtual influencer

Virtual influencers present themselves in anthropomorphic forms, which, according to Edwards et al. (2016), leads to interactions being accepted as if they were between two human beings. These virtual influencers appear on social media platforms, which have become the most popular showcase for influencer marketing. On social media, "the virtual influencer maintains their influential status and persuasive effectiveness via the attractiveness stereotype, human-like functionality, and audio-visual features" (Khan & Sutcliffe, 2014).

Research indicates that there are over 200 active virtual influencers on social media platforms (Arsenyan & Mirowska, 2021). As time passes, more appear, and at the current rate of emergence, there may be 400 active virtual influencers on social media by the end of this year, "driven by advancements in computer-generated imagery and increased social media usage" (Arsenyan & Mirowska, 2021, p. 102694), as well as artificial intelligence. Their popularity and acceptance may be because, according to Djafarova and Rushworth (2017), virtual influencers "are credible, attractive, trustworthy, and knowledgeable about the endorsed product, making them convincing." Casaló et al. (2020) and Xu et al. (2017) add that these influencers "fulfill social, informational, and entertainment needs"

Thus, the first research hypothesis is proposed: H1: The perception of the virtual influencer has a direct and positive effect on the human internet user's reaction.

2.3. Human emotions triggered by virtual influencer posts

Human beings continuously experience emotions through their individual and social complexities. Emotions are central to human life as they influence the interpretation of reality and constitute an integral part of the human experience. Therefore, understanding how emotions occur and their effects on human life has been a significant focus.

According to Kemper (1987), emotions are complex and organized predispositions to engage in certain biologically adaptive behaviors characterized by specific physiological arousal, feelings, receptivity, and expressive patterns. Denzin (1984) describes emotions as a transient, embodied experience that permeates a person's consciousness, transforming their reality through the emotional experience. Parkinson (2008, p. 3) defines emotions as episodic modes of evaluative engagement with the social and practical world rather than simply responses to events.

The study of emotions encompasses scientific, philosophical, and psychological perspectives. Historically, when humans were viewed primarily as rational beings, philosophers like Plato, Hippocrates, and Aristotle contributed to understanding emotions. In the late 20th century, discussions on the typologies of emotions emerged (Kemper, 1987; Jasper, 2011). Contributions from scholars such as Brody (1999), Scherer (2001), Stryker (2004), and Lim and Lee (2023) have further enriched this field. The importance of emotions in social interactions is recognized, necessitating their observation in multidimensional studies.

The second hypothesis is presented as follows: *H2*: Perception of the virtual influencer has a direct and positive effect on the emotions of the human internet user.

2.4. Human attitude towards the virtual influencer

The emergence of virtual influencers has introduced a novel element to the digital marketing landscape, potentially standing out in the crowded influencer market (Cong & Lee, 2024). This artificial virtual influencer in social media can affect digital natives' engagement and decision-making in different ways (Lou et al., 2023). In their study, Lou et al. (2023) identified six primary motivations for followers' engagement with virtual influencers, among them: novelty, that is, through their presentation, discourse, and constant state of relevance, virtual influencers can be perceived as novel by netizens. Novelty can lead to increased consumer engagement, as novel stimuli often result in intensified deliberation and increased arousal among consumers, or, as Sheinin et al. (2011, p. 10) confirmed, different effects can be observed in the consumer behavior of the netizens

This novelty effect is expected impact both positively, the influencer itself and its creators and brand outcomes through what Franke et al. (2023, p. 523) call a desire to "be update". As novel stimuli have been shown to positively influence a range of attitudinal and behavioral outcomes in internet users, who are expected to engage in various activities, consumer behavior is one of them (Davlembayeva et al., 2024). According to Arsenyan and Mirowska (2021), these activities include, social media interactions such as commenting, reposting, tagging, and expressing through emojis.

Hence, the third and fourth research hypotheses are also proposed:

H3: Reaction to the virtual influencer has a direct and positive effect on the attitude of the human internet user.

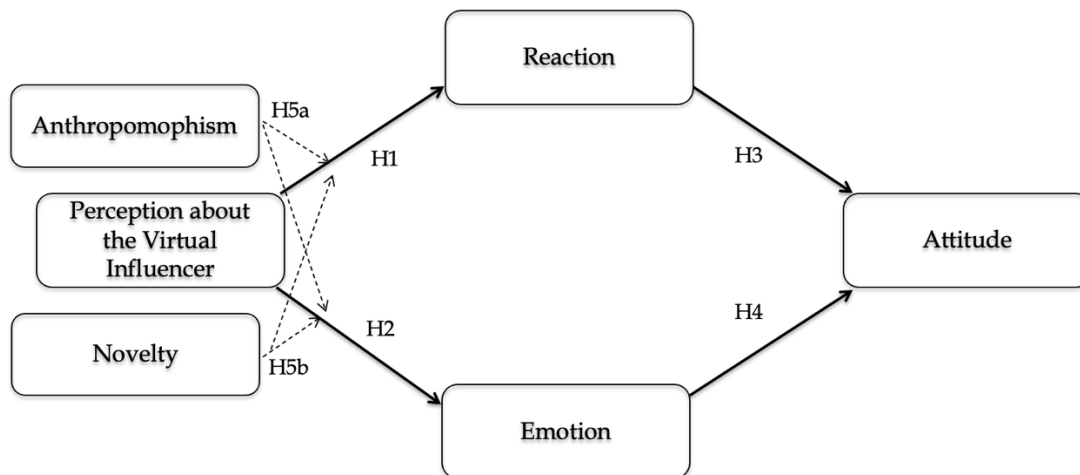
H4: Emotion triggered by the virtual influencer has a direct and positive effect on the attitude of the human internet user.

Finally, hypotheses H5a and H5b suggest the mediation of relationships by considering anthropomorphism and the implicit novelty in virtual influencers that aim to be humanized.

Having explained the above, Figure 1 presents the conceptual model that frames the linear relationships stated through the research hypothesis.

Figure 1.

The proposed model and its structural relationships



Source: Own elaboration.

3. Methodology

A conclusive descriptive research design supported by a mixed methodology is proposed to achieve a comprehensive understanding of the virtual influencer phenomenon. Quantitative and qualitative techniques will be considered to ensure a thorough analysis. These include an online survey and digital content analysis through Instagram interactions, using user data anonymously.

The study population consists of young adults aged 18 to 30 with internet access, an Instagram account, and recognition of human influencers on the platform. The selected age range is based on the New Kids On The Block Bank of America & Merrill Lynch Report (2016), which indicated that there were 2.4 billion centennials globally, representing 32% of the world population. The report also projected that 2025 their numbers and age would increase, and by 2050, they would be up to 54 years old. Additionally, the report noted that centennials are the first digital generation, heavily internet-influenced, technologically adept, and consistent in their digital social interactions, potentially shaping their lives around influencers.

3.1. Survey

The survey was designed to measure the relationships between the constructs of perceptions of virtual influencers and their effects on human reactions, emotions, and attitudes. The data collection instrument was developed based on validated scales from previous studies on virtual influencers' perception, including questions related to anthropomorphic and

humanness (Arsenyan & Mirowska, 2021), consumer reactions and emotions (Lim and Lee et al., 2023), and brand attitudes (da Silva & Chimenti, 2021). The survey included 22 items using a 7-point Likert scale to measure each construct (1=Strongly disagree, 7=Strongly agree).

The sample was selected using convenience sampling, recruiting participants through social media and online platforms frequented by young people. Quotas were applied to ensure a balanced distribution by gender and age within the 18-30 range. The survey was conducted online via Google Forms, with data collection from May to September 2023.

The collected data were analyzed using structural equation modeling (SEM) to assess the hypothetical relationships between constructs. Confirmatory factor analysis (CFA) was first conducted to validate the factorial structure of the scales used (Hair et al., 2019). Subsequently, the EQS software was used to estimate the structural model and evaluate the overall fit and relationships between latent variables (Byrne, 2013). Data analysis and interpretation were conducted in October 2023.

3.2. Content analysis

The netnographic methodology as Kozinets (2002) affirms, is a marketing research technique for providing consumer insight, adapted to the study of online communities, allows for an in-depth analysis of online interactions, and provides information on the symbolism, meanings, and consumption patterns of online consumer groups. Moreover, the combination of quantitative and qualitative analysis provides a comprehensive understanding of how users react to virtual influencers' posts, and how they perceive and respond to them. Turpo (2008) suggests that netnography should be done in two phases: the automatic phase and the manual phase, to combine the information provided by computers with the natural work of interpretation by researchers.

As suggested by Kozinets (2002), the field of research was clearly defined. This study focuses on user interactions with virtual influencers on Instagram, specifically analyzing the reactions, emotions, and attitudes expressed in comments and other forms of interaction. Instagram is a social network recognized for its worldwide popularity, shown creativity and coolness (Sheldon & Bryant, 2016). After nine consecutive years of increase, the Instagram user base is estimated to reach 1.8 billion users and, therefore, a new peak in 2028 (Dixon, 2024a). This social network is popular, especially among the Centennial generational cohort, where the most significant deployment of virtual influencers has occurred. Instagram is also recognized as the photo-sharing platform (Dixon, 2024b).

Phase I was carried out on Instagram. Data collection (automatic phase) through web scraping was performed to obtain unstructured data from the social network, to achieve content analysis in the following order: identifying the most popular virtual influencers based on the number of followers and then collecting a brief description of each virtual character. From this list, four human-like virtual influencers popular on Instagram were chosen. Two virtual influencers were created more than two years ago (before the popularization of artificial intelligence), and two recently created virtual influencers.

From these four influencers, the 20 most recent posts from each influencer were selected. The comparison of interactions from different virtual influencers and types of content was suggested to strengthen the results. Data collection followed, gathering all possible interactions and comments generated by young internet users from the virtual influencers' posts. The Phantom Buster social media data scraping tool was used to extract information

from the selected posts, which also allowed for identifying patterns and trends in audience responses.

Then, two content analyses were carried out:

- (a) Quantitative, to count likes, comments, reposts, and emoji reactions, and use sentiment analysis to categorize qualifying adjectives as positive or negative.
- (b) Qualitative: to analyze the content of comments and identify interest in presented objects or activities, questions about location.

This analysis also allowed for understanding the audience, distinguishing the profiles of users interacting with the posts to determine their geographic origin (based on public profile information), approximate age (if available or inferable), and the similarity or difference in the content they publish on their profiles.

Phase 2, as suggested by Turpo (2008), involves the researcher interpreting the results to identify interactions patterns and trends. Then, a coding scheme was developed to categorize user interactions and responses, executed through the Atlas.ti qualitative analysis software to code and analyze the collected data. Thus, the interpretation of results took place.

For instrument validation, coding was cross-verified among multiple researchers to ensure reliability. It is important to highlight the ethical consideration of protecting user privacy by anonymizing the collected data. The process described was carried out from February to May 2024.

4. Results and discussion

Once the methodology and processes to be carried out have been explained, the results of each technique are presented below.

4.1. Survey results

Of the 1,410 surveys administered, 1,380 valid responses were obtained (97.5% response rate). The final sample consisted of 53% women and 47% men, with a mean age of 24.7 years (SD = 3.9).

Univariate and multivariate normality of the data were evaluated. Skewness (-1.18 to 1.29) and kurtosis (-1.82 to 2.05) values were within the acceptable range of ± 3 (Kline, 2023). Mardia's coefficient for multivariate kurtosis was 68.23, below the critical threshold of 70 (Rodríguez & Ruiz, 2008).

Also, the Confirmatory Factor Analysis (CFA) showed an adequate fit of the measurement model: $\chi^2/df = 2.93$, CFI = 0.97, TLI = 0.96, RMSEA = 0.054 (90% CI: 0.048-0.060), SRMR = 0.039. These values meet the thresholds recommended by Hu & Bentler (1999): CFI and TLI > 0.95, RMSEA < 0.06, SRMR < 0.08. The following results were achieved regarding reliability and validity: Composite Reliability (CR) for all constructs exceeded the 0.70 threshold (Fornell & Larcker, 1981), ranging from 0.85 to 0.94. Cronbach's alpha for all scales was above 0.82, indicating good internal consistency.

The average variance extracted (AVE) for each construct exceeded the 0.50 threshold (Fornell & Larcker, 1981): Perception of virtual influencers: 0.71; Reactions: 0.74; Emotions: 0.68;

Attitudes: 0.73. Discriminant validity was confirmed as the square root of the AVE of each construct was more significant than its correlations with other constructs (Fornell & Larcker, 1981).

The contrast carried out on the proposed hypotheses is shown in table 1.

Table 1.

Hypothesis contrast

Hypothesis	Structural relationship	β	p
H1	Positive perception of virtual influencers had a significant positive effect on favorable reactions of young internet users	0,42	< 0,001
H2	Positive perception of virtual influencers had a significant positive effect on positive emotions of young internet users	0,38	< 0,001
H3	Favorable reactions of young internet users towards virtual influencers had a significant positive effect on positive attitudes towards the virtual influencer	0,35	< 0,001
H4	Positive emotions of consumers toward virtual influencers had a significant positive effect on positive attitudes towards the virtual influencer	0,31	< 0,001
H5a	A partial mediation effect of the anthropomorphism and novelty was found in the relationship between the perception of virtual influencers and the reaction toward the virtual influencer.	0,15	< 0,01
H5b	A partial mediation effect of the anthropomorphism and novelty was found in the relationship between the perception of virtual influencers and the reaction toward the virtual influencer.	0,13	< 0,01

The structural model showed a good fit: $\chi^2/df = 3,08$; CFI = 0,96; TLI = 0,95; RMSEA = 0,057 (90% CI: 0,051-0,063), SRMR = 0,043.

Source: Own elaboration.

It is important to note that in the structural model, a partial mediation effect was found in the relationship between the perception of virtual influencers and the reactions and emotions towards the virtual influencer based on the anthropomorphism and novelty observed in the virtual influencer. However, the total indirect effect was significant ($\beta = 0.28$, $p < 0.001$), with specific indirect effects through reactions ($\beta = 0.15$, $p < 0.01$) and emotions ($\beta = 0.13$, $p < 0.01$).

These results support all proposed hypotheses and suggest that reactions and emotions play an important role in explaining the effects of virtual influencers on young internet users' attitudes. These findings align with expectations based on the hypotheses proposed.

4.2. Content analysis results

Based on the methodology described and the content analysis results provided, here is a summary of the key findings for the selected virtual influencers that, as is suggested by Arsenyan and Mirowska (2021), all cases are verified accounts with "Blue Check Mark", a label that verifies and gives them the category of "public figure". Table 2 shows the list of the popular virtual influencers on Instagram, and Table 3 exhibits the predominant interactions of the young netizens.

Table 2.*Popular virtual influencers on Instagram*

#	Virtual Influencer	Profile on Instagram	Number of followers	Description, themes, or scope
1	Nobody Sausage	@nobodysausage	7,8 M	Digital character with fun content
2	Magazine Luiza	@magazineluiza	7 M	Virtual character of a Brazilian company that promotes the consumption of products and services and lifestyle
3	Casas Bahia	@casasbahia	3,8 M	Virtual characters used to promote the consumption of products and services, and lifestyle
4	Barbie	@barbiestyle	2,9 M	Globally Recognized Mattel Fashion Icon
5	Tubby Nugget	@tubbynugget	2,9 M	Cartoon character of a chicken nugget
6	Lil Miquela	@lilmiquela	2,5 M	She shares music, fashion and is known for her activism
7	The Good Advice Cupcake	@thegoodadvicecupcake	2,4 M	Advice animated character
8	Senhor Alguém	@senhoralguem	2,2 M	Digital character with specific content
9	Guggimon	@guggimon	1,3 M	A character with dark style specialized in music and urban culture
10	Janky	@janky	1 M	A character specialized in music an urban aesthetic
11	Aff the Hype	@affthehype	870 T	A character with a varied content: fashion, humor among others
12	Gudetama	@gudetama	855 T	Sanrio character known as the lazy egg
13	Minnie Mouse	@minniemouse	811 T	Disney icon with a solid social media presence
14	Any Malu	@anymalu_real	714 T	Brazilian character known for his comedy videos
15	Dayzee	@therealdayzee	689 T	Virtual Influencer character with diverse content
16	Noonoouri	@noonoouri	459 T	Digital influencer character focused on haute couture fashion
17	Imma	@imma.gram	387 T	Japanese virtual character with futuristic style
18	Kyra	@kyraonig	272 T	A character, announced as the Indian virtual Influencer
19	Shudu	@shudu.gram	240 T	First digital supermodel created by computer
20	Bermuda	@bermudaisbae	225 T	A virtual character with provocative opinions
21	FriendsWithYou	@friendswithyou	189 T	Virtual characters with a focus on art and positivity
22	Rozy	@rozy.gram	171 T	South Korean character known for her youthful style
23	Here.me.Lucy	@here.me.lucy	144 T	Lesser-known character, but well defined
24	Dinossarro	@dinossarro102	135 T	Digital character with varied content
25	Blawko	@blawko22	123 T	Virtual character with urban style and music

Note: M means millions, and T means thousands.

Source: Own elaboration based on the data collected.

All these characters have their style, promote ideas and lifestyles, and create community, on Instagram and other digital platforms. Most of these characters are called influencers and are promoted as such, which is confirmed when they seek to influence their followers so that community also recognizes them as influencers.

Then, from the list (table 2), the study focused on four virtual influencers: two human-like influencers created more than three years ago (Lil Miquela and Shudu) and two AI-generated influencers created in the last two years (AI Angélica and Aitana). The latter two were not included in the initial list due to their being part of a new category of AI influencers, which is notable for their rapid rise in popularity reflected in their growing number of followers and interactions.

Table 3.

Comparison of the performance of human-like virtual influencers on Instagram

Analyzed aspect	Lil Miquela	Shudu	AI Angélica	Aitana
Positive qualifying adjectives	1.200 (e.g., "beautiful", "incredible", "inspiring")	800 (e.g., "impressive", "elegant", "unique")	300 (e.g., "fascinating", "innovative", "intelligent")	250 (e.g., "impressive", "futuristic", "motivating")
Negative qualifying adjectives	150 (e.g., "fake", "artificial")	100 (e.g., "unreal", "strange")	120 (e.g., "unsettling", "cold")	100 (e.g., "unnatural", "robotic")
Average reposts per post:	3.500	2.000	1.000	800
Average comments per post:	2.800	1.500	800	600
Average likes per post:	150.000	80.000	30.000	25.000
Desire to visit the shown location:	35% of comments	25%	5%	3%
Interest in objects/activities:	45% of comments	50%	70%	75%
Questions about location	20% of comments	15%	2%	1%
Total 720 elements				

Note: participating audience (average for all influencers): Origin: 60% North America, 20% Europe, 15% Asia, 5% others. Age: 70% between 18-34 years, 20% between 35-44 years, 10% others. Publish similar information: 30% of active followers. Publish different information: 70% of active followers.

Source: Own elaboration based on the data collected.

Results of the comparison of the performance of human-like virtual influencers on Instagram:

Engagement: AI Angelica and Aitana show lower engagement rates than Lil Miquela and Shudu. Their average likes, comments, and reposts are significantly lower than those of the more established virtual influencers.

Emotional response: While AI Angelica and Aitana still receive positive adjectives, the number is considerably lower than Lil Miquela and Shudu; this suggests that these newer AI-generated influencers may not evoke as strong an emotional connection as their more human-like counterparts.

Interest in objects/activities: Both AI Angelica and Aitana generate higher interest in objects and activities, as shown in their posts (70% and 75% respectively), compared to Lil Miquela and Shudu. This aligns with the earlier observation that AI-generated influencers tend to provoke more interest in the content they showcase.

Location-based engagement: AI Angelica and Aitana's desire to visit locations shown and questions about locations are notable decreases compared to Lil Miquela and Shudu; this suggests that these AI-generated influencers may be less effective at promoting travel or location-based content.

Negative perceptions: The presence of negative qualifying adjectives like "unsettling", "cold", "unnatural", and "robotic" for AI Angelica and Aitana indicates that some users are aware of and potentially uncomfortable with their artificial nature.

These comparisons suggest that while AI-generated influencers like AI Angelica and Aitana are gaining traction, they still lag behind more established virtual influencers in terms of overall engagement and emotional connection. However, they seem to be more effective at generating interest in specific objects or activities, which could be valuable for certain types of marketing campaigns.

To validate the information, Investigator triangulation was carried out, which, according to Carter et al. (2014, p. 545), involves the participation of two or more researchers in the same study to provide multiple observations and conclusions; it is a type of triangulation that brings the confirmation of findings and different perspectives for its interpretation (Denzin, 1978 apud Carter et al., 2014). Hence, a data triangulation process was implemented to increase the validity of the previous findings; this process included: (1) a comparison of quantitative and qualitative data, (2) researcher observations, (3) temporal analysis, and (4) cross-verification between researchers.

Cohen's Kappa coefficient was calculated to measure inter-coder agreement, yielding a value of 0.85, indicating a high level of agreement. The triangulation revealed:

- Higher engagement for human-like influencers correlated with admiration for their realistic appearance.
- AI influencers generated more discussions about technology and ethics.
- A 15% increase in likes and comments over the last three months, during the study period.
- Posts addressing social or ethical issues related to AI could be observed.

This triangulation allowed for a richer understanding of user interactions with virtual influencers, revealing patterns not evident through isolated quantitative metrics or qualitative analysis alone.

The findings indicate that virtual influencers, particularly those resembling humans, can generate significant engagement and emotional responses from their audience; these results align with previous research suggesting that anthropomorphic virtual influencers can be perceived similarly to human influencers. The high number of positive adjectives and substantial engagement metrics (likes, comments, reposts) for Lil Miquela and Shudu support this conclusion.

The demographic data showing a predominantly young audience (70% between 18 and 34 years) aligns with the trend of younger generations being more receptive to virtual influencers, as noted in the literature. This suggests that virtual influencers may be particularly effective in reaching and engaging with younger audiences.

The difference in engagement patterns between human-like and AI-generated influencers is noteworthy. It suggests that while AI-generated influencers can generate interest, they may not yet match the emotional connection and desire for emulation that human-like virtual influencers can achieve. This could have implications for how brands and marketers choose to utilize different types of virtual influencers in their campaigns.

4.3. Discussion

Virtual influencers seek to achieve engagement with human internet users through their social media posts. This intention mirrors that of human influencers, who aim to satisfy social, entertainment, identity, and autonomy needs, as supported by other authors (*e.g.*, Hanus & Fox, 2015; Partala, 2011; Sheldon & Bryant, 2016).

This study aligns with Arsenyan and Mirowska (2021), who explored various aspects to examine the participation of virtual influencers in social networks and joined their intention to study the role of different posts in influencing user perceptions and reactions. Their proposals for observing the content of virtual influencers and the reactions and emotions of users have provided ways to demonstrate the effectiveness of these digital entities in influencer marketing. We agree with these authors in observing that human internet users use more positive and anxious words in their posts when virtual influencers are seen alongside other real human influencers. In our study, this aspect is more intense when the digital entity has "more human" expressions.

Furthermore, the strong resemblance to humans, or at least the intention behind their movements and behaviors, accompanied and emphasized by their textual expressions, can lead to two opposite effects: on one hand, gaining followers who accept and applaud this resemblance, or on the other hand, provoking rejection, and disapproval towards the digital entity. The observation of the anthropomorphism is consistent with the findings of da Silva Oliveira y Chimenti (2021, p. 16) who asserted that the more a virtual influencer resembles a human, some declare appreciation, affection, support, etc., the same reaction than those who appreciate ad novelty, with which they change positively their attitude towards the ad and the brand (Sheinin et al., 2011).

5. Conclusions

This study has explored the emerging phenomenon of virtual influencers on social media, focusing on their impact on influencer marketing and young users' interactions. Through a comprehensive netnographic analysis and rigorous triangulation of quantitative and qualitative data, this research on virtual influencers in social networks has revealed significant findings:

It is important pointing that virtual influencers, especially those with realistic human appearances, generate engagement levels comparable to or higher than traditional human influencers. This engagement varies between the different types of the virtual influencer. In this case, anthropomorphic influencers evoke more robust emotional responses, while AI-generated ones promote more discussions about technology and ethics. This topic is directly related to strategic influencer marketing; virtual influencers can be effective bridges between brands and consumers, although more research is needed on their impact on Inbound Marketing strategies.

This work aims to establish a foundation for understanding the phenomenon of virtual influencers in contemporary digital marketing, highlighting the need for future research on their ethical, social, and psychological implications. It also emphasizes the imperative need for academia, industry, and regulators to collaborate to ensure responsible and beneficial development of these technologies for society. Of course, concerning virtual influencers, there is a need to address ethical implications related to the manipulation of perception and the potential dehumanization of social interactions.

The study's limitations are subject to what the software found. In contrast, results depend on other software, and so on, an aspect that could be overcome using artificial intelligence. In this sense it is essential to emphasize transparency and consider long-term impacts in the development of AI applied to virtual influencers. To do this, it is suggested that a holistic multidisciplinary approach be carried out to the virtual influencer phenomenon. For the sake of the potential vulnerability of young internet users, it is crucial to consider the potential vulnerability of young internet users in this evolving digital context.

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