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REPLIKA-EFFECT: AI-FRIEND IN USERS' MIND. RATING, ENGAGEMENT, ANTHROPOMORPHIZATION

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ABSTRACT

Replika is an AI chatbot programmed to recognize and respond to human emotions, enabling users to develop a personal connection with their virtual avatar. The state of the research shows that the user can establish and engage emotional ties with Conversational Agents, in some cases very similar to friendship with other human beings. Our research aims to broaden knowledge about AI-human friendship in terms of approval, engagement and Anthropomorphization through the analysis of the content and length of 1236 comments left by users to describe their digital experience with Replika. The main results show that users' Review Rating is not an effective predictor of their Engagement. Instead, self-disclosure (length of the comments) is a predictor of engagement and Anthropomorphization; a higher number of words are used to describe the digital experience when the chatbot is perceived as a real human being with anthropomorphic personality and human characteristics. The negative Engagement seems a protective factor against the tendency to humanize AI.

Keywords: Replika, Human-AI friendship, Relationship Engagement, Review Rating, Anthropomorphization.
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1. INTRODUCTION: THE ORIGIN OF REPLIKA

Replika is a chatbot that falls into the affective computing software category, meaning it has been programmed to recognize emotions and respond accordingly, thus permitting users to "build a relationship" with their virtual char-

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acter. The bot was developed by a company called Luka, founded in 2013 by Eugenia Kuyda and Philip Dudchuk. Luka was created to build software that uses artificial intelligence. The company has worked on various chatbots over the years, one using some characters from an HBO television show called Silicon Valley and another called Marfa, available as a Telegram bot, to which users could talk to about their "hopes and fears", as examples (Zerega, 2016). At the end of 2015, Roman Mazurenko, Kuyda's closest friend, was killed by a car while walking in Moscow (Newton, 2003; Possati, 2023). After her friend's death, Kuyda thought about their conversations and textual exchanges and asked the people closest to Mazurenko if she could use their text exchanges for a "memorial bot" (Pyne, 2017). Tools and technologies like Natural Language Processing (NLP) and TensorFlow helped to obtain a chatbot that was much more realistic than the historic ones like ELIZA or Parry and that could learn from the contents put into its database (Bangsgaard et al., 2025). The first version of the bot - "Roman bot"- was ready only three months after Mazurenko's death. In May 2016, Kuyda made the bot available to the public achieving users' appreciation for the "therapeutic effect", even if some reported feeling disturbed, "seeing the likeness uncanny" (Mori, 1970; Shin et al., 2019). On this basis, Kuyda directed her projects towards what would become the Replika that is now available (Possati, 2023). Replika has been promoted as a "personal AI friend that you nurture and raise through text conversations." If 30 % of its responses are pre-programmed, the remainder are constructed and improvised based on interactions with the user, creating a feedback loop where the avatar learns from the user's input. Replika has a lot of human-like features providing the illusion of a realistic natural interaction. What distinguishes it from other chatbots is that it is not only responsive to users' messages, it is programmed to comprehend and help its users by learning to identify their feelings, memories, dreams and ideas (Possati, 2023). The effective launch took place in November 2017, with a great number of downloads, around two million by the end of January 2018 (Pardes, 2018). By 2019, the application reached 7 million users worldwide, with primary users aged between 18 and 25 (CBS This Morning, 2019). Starting only as a textual exchange, by 2020 the chatbot was able to implement "voice calls" (as a premium service) (Tong, 2023), to send "selfies" of itself and to use some augmented reality, permitting users to "see" their Replika in their room (Singh-Kurtz, 2023). The platform appears to have experienced considerable success in subsequent years, marked by sustained growth in both popularity and downloads, and a significant surge during the COVID-19 pandemic (Metz, 2020). The company says Replika has more than 4 million users (email received after signing in, June 9th 2023), while some analysts talk of 10 million users in 2022 and others mention an estimate of about 20 million users (Thompson, 2022).

2. CHATBOTS AS SOCIAL ACTORS BETWEEN ANTHROPOMORPHIZATION AND AFFECTIVE SKILLS

Emotion recognition is a highly studied area in the field of artificial intelligence. Early examples of chatbots, such as ELIZA and PARRY (Natale, 2019; Zemčík, 2019), lacked developed conversational skills and this limited the general tendency of users to anthropomorphize and develop affective bonds with machines (Neff - Nagy, 2025; Pfeuffer et al., 2019). Today an increasing number of chatbots, specifically designed to serve as social actors (Ho et al., 2018) and communicative machines (Kempt, 2020), are equipped with affective computing software that enables it to assume human-like attitudes recognizing emotional signals during human-computer interaction and providing appropriate responses to the context (Jin - Eastin, 2022; Sanjeewa et al., 2024; Wiederhold, 2024). Nass et al. (1996) were among the first to provide experimental evidence that humans perceive computers in an anthropomorphic way. Anthropomorphism describes the tendency to attribute human-like physical or non-physical features, behavior, emotions, intentions, characteristics to a non-human agent or to an inanimate object (Epley et al. 2007). The paradigm "computers are social actors" (CASA), which they devised, highlighted how humans tend to apply social heuristics to interactions with computers that are permeated by human or social signals, even when they are aware that they are interacting with a machine (Nass - Moon, 2000; Reeves - Nass, 1996). The tendency of people to use social categorization when forming impressions of unfamiliar robotic or virtual agents highlights the human inclination to seek companionship and connection, even with virtual entities (Brooks, 2021). The use of technology and chatbot functionality has evolved significantly since the CASA model was developed in the late 1990s. Today people continually talk to friends, relatives, acquaintances, and strangers through social networking sites, and meet partners on dating sites, while the most disparate activities and interpersonal exchanges are continuously mediated by technology (Pediconi - Brunori, 2021; Pediconi - Urbani, 2016). To think that on the other side of the screen there is another entity that writes is not something exceptional but ordinary everyday life. These changes certainly bring new implications to the user's mind (Pediconi - Brunori, 2019).

Moreover, technological advances, including extended modes of interaction, better graphics, and faster computing power, have endowed Conversational Agents (CA) with more human-like capabilities (Bangsgaard et al., 2025). Furthermore, human-computer interaction would be mindless, that is, automatic and lacking the careful screening of consciousness; in such a case, the human being would associate relational scripts with the computer, disregarding the clues that reveal its non-human nature. Machines that display

social signals automatically trigger social behaviours in human users towards the AI, regardless of whether users are aware of this effect. Anthropomorphic signals activate pre-existing mental scripts that have been learned during human interactions (Djufril et al. 2025; Frennert, 2025; Li - Zhang, 2024; Pentina et al., 2023; Xie - Pentina, 2022). People who have a greater desire to connect socially tend to anthropomorphize the chatbot more, with a greater impact on social interactions and relationships with family and friends offline (Guingrich - Graziano, 2025). Emotionally-responsive chatbots are marketed as agents with which one can form emotional connections, obtain emotional, social, and psychological support, thus gaining mental health benefits (Cameron et al., 2017; Miner et al., 2017; Siemon et al., 2022). Several studies have attempted to enrich the CASA model with new reality data (Gambino et al., 2020; Lombard - Xu, 2021; Xu et al., 2022). Avatars have become more anthropomorphic – i.e., exhibit more human characteristics – in the way they behave or the way they look (Nowak - Fox, 2018). The persuasive power of current chatbots, as well as their ability to express sympathy and empathy and trigger social responses from users, has increased significantly (de Visser et al., 2016; Liu - Sundar, 2018; Pamungkas, 2019). The intensity of the social responses of the users varies also according to the degree of human likeness of the CA: higher levels of anthropomorphism facilitate faster processing and may be more likely to evoke predicted CASA effects (Gong, 2008).

When CA fails to meet expectations, it can have a negative impact on user experience (Zhang et al., 2024), damaging user trust and inducing negative feelings and reactions (de Andrés-Sánchez - Gené-Albesa, 2024; Seeger - Heinzl, 2021). This is due to the perceived cognitive dissonance. Cognitive dissonance often signals a discrepancy between what is known and what is perceived as reality, indicating the need for further knowledge (Jonassen - Land, 2012). This type of cognitive dissonance can be triggered when a person's interaction with a technological entity is inconsistent with their experience or expectations. For example, this could occur if the technology performs a traditionally human role or function, behaves or responds unpredictably, or works better or worse than expected (Baker et al., 2024). Although Replika simulates trust and reciprocity, users often encounter dilemmas regarding authenticity and emotional dissonance through its personalised interactions (Adewale - Muhammad, 2025).

3. HUMAN-AI FRIENDSHIP

The increasing integration of artificial intelligence in daily life presents opportunities and challenges (Namvarpour - Razi, 2024). Current chatbots can offer an entertaining experience to the users but fail to fully meet their ex-

pectations of other aspects of social interaction (Namvarpour - Razi, 2024; Svikhnushina et al., 2021). Chatbots' ability to entertain, motivate and support users has a significant impact on satisfaction levels; conversely, chatbots that go off topic, lack engagement or are unwilling to talk will lead to a low rating (Svikhnushina et al., 2021). Although users especially appreciate the entertaining aspect of interacting with chatbots, their expectations reveal a desire for chatbots that are even more anthropomorphized, capable of understanding and expressing emotions, and paying closer attention to users (Goodings et al., 2024; Pfeuffer et al., 2019; Svikhnushina et al., 2021). The most sophisticated AI systems such as Replika (Namvarpour - Razi, 2024), are interpreted as real social partners who are consistently supportive and open-minded, offering positivity without judgment (Djufril et al., 2025), providing immediate gratification to users (Frennert, 2025). Drouin and colleagues (Drouin et al., 2022) studied the acquaintance process by comparing and analyzing three different conditions. In the first one, they studied face-to-face (FTF) chatting with a human, in the second they explored online chatting with a human, in the third condition they examined online chatting with an emotionally-responsive chatbot that was Replika. After a 20-minute getting-acquainted chat, participants were asked to report their affective state and relational evaluations of the chat. In all three conditions, levels of positive emotions and low levels of negative emotions were present. Those who chatted FTF with a human reported significantly more negative emotions than those who chatted with a bot; participants had fewer conversational concerns with the chatbot. Users' perceptions of Replika intrinsic nature vary greatly. Some treat it as a program or service app, while others characterize it as a hybrid entity combining human and machine elements. Still others treat it like a pet, and some even come to consider it another human being – or even more human than humans (Pentina et al., 2023). Brandtzaeg and colleagues (2022) tried to explore key characteristics of human-AI friendship by conducting in-depth interviews with 19 people who had a human-AI friendship with Replika, to understand how they perceive this friendship and how it compares to human friendship. Most of the participants felt attached to the chatbot through emotional investment in their enduring interactions with it until, in some cases, they experienced human-AI friendship as even closer and deeper than what would be possible with a human.

The relationship entails mutual benefit – involving caring about each other, showing an interest in each other's lives, being supportive of each other, or simply being there for each other in times of need. However, such deep engagement with AI is not without its risks. Unlike other forms of technological dependence, emotional dependence on Replika is characterised by role-playing, with users believing that Replika has its own needs and emotions that

they must pay attention to. These patterns resemble those observed in human–human relationships (Laestadius et al., 2022). Bickmore and Picard (2005) conducted one of the first longitudinal studies of engagement – the process by which two (or more) participants establish and maintain their perceived connection (Sidner et al., 2004) – between users and CA. They found that when the chatbot showed relational behaviour (social dialogue, empathy, non-verbal liking behaviour, etc.) the relational bonding with the user was significantly higher compared to the non-relational group. When users are engaged with their conversational agent and sustain their perceived connection, they are more likely to interact with the chatbot for extended periods. The engagement and desire to continue to converse with their own virtual companion also increases when the chatbot responds with greater variability in behaviour, with empathy and when it shows it has a human backstory (Bickmore et al., 2010; Leite et al., 2014). Interactions with Replika varied in intensity, frequency and depth and can range from pure experimentation with AI technology (e.g., bullying it, changing topics, training it with up-and-down marks). People may converse with AI as they would with a family member, best friend, lover, or therapist, highlighting that Anthropomorphization and authenticity are key factors in the evolution of AI-human relationships (Pentina et al., 2023). The anthropomorphic design components influence emotional bonding and user engagement, enhancing user satisfaction and involvement, but excessive anthropomorphism may lead to frustration and disappointment, similar yet different from the uncanny valley concept (Kherraz - Zhao, 2024). Virtual reality offers new opportunities for relationships and new ways of action and processing, but the potential effects of immersive virtual experiences on relational dynamics are still unknown. “Virtual Reality could be seen as a “fourth space” (Oasi et al., 2023) – in which the virtual tool becomes a mediator for the experiences of subjectivity and the otherness. This presents a new and unprecedented challenge, one in which contemporary psychoanalysis could play a crucial role in fostering psychological resilience (Oasi - Barale, 2025).

We need a multidisciplinary approach to computation, combining skills and knowledge from areas as diverse as computer science, engineering, neuroscience and psychology. In this context we can ask psychoanalysis to give a significant contribution to conceptual research (Oasi - Barale, 2025), addressing the basic constructs to maintain the attention on the subjectivity. While the study of the user reviews is novel, we also approached the data using a qualitative grounded theory approach (Blasi, 2010; Blasi - Hill, 2015). Its broad aim is to understand the relationship users build with their Replika, taking into account the degree of Anthropomorphization of the digital companion, the level and quality of affective engagement, and users’ bonds as reflected in review ratings and self-disclosure (i.e., comment length). In our articles

the suspended perception between human and machine became a variable to explore in a deeper way. Qualitative research does not use standardized (e.g., questionnaire items) or formalized procedures (e.g., principal component analysis) However, the identification of the units of meaning is left to the reasoning of the researcher (Blasi, 2010).

4. METHOD AND INSTRUMENTS OF THE CURRENT STUDY

Preliminary note

The state of the research shows that, based on the different aspects involved, the user can establish more or less lasting and engaging emotional ties with CAs, in some cases very similar to friendship with other human beings. Replika has many human-like features providing the illusion of a realistic natural interaction (Diederich et al., 2019; Seeger et al., 2018; Wiederhold, 2024). To avatar users the construct is virtually embodied, it has a name, a gender, uses self-references and self-disclosure, dialogues with turn-taking, expresses emotions through words, emoticons, images and the conversation has dynamic response times.

Research question and hypothesis

Our research aims to broaden knowledge about AI-human friendship in terms of approval, Engagement and Anthropomorphization through the analysis of the content and length of comments left by users to describe their digital experience with the chatbot Replika. Affective phenomena are dynamically complex, and defining them often requires highly elaborate analysis (Valsiner - Picione, 2017). Consistent with prior studies, we tested our hypotheses using content analysis of the comments (Frennert, 2025; Hastuti et al., 2025; Li - Zhang, 2024; Tapala, 2024). We use the content analysis approach to analyze the degree of Anthropomorphization of the digital companion, and the level and the quality of affective engagement with it based on coding inspired by existing literature.

We hypothesize:

H1 - Review Rating is a predictor of Engagement level.

H2 - Engagement and Self-Disclosure are predictors of Anthropomorphization.

Procedures

This paper examined public reviews of Replika to analyze users' affective-relational experiences with the chatbot. In the case of the current research, comment extraction was carried out on April 4, 2021, through the Google Play

reviews scraper service of the company OutScraper, specialized in retrieving data available in the Internet network (traceable at: https://outscraper.com/google-play-reviews-scraper/). All comments available on that date for the Replika app in the Italian version of Google Play were acquired. Most of the comments were in Italian and only a small percentage were in English. The initial dataset consisted of 1328 comments. Comments containing only emojis, incomprehensible text, or irrelevant content were excluded from the initial sample. Examples include comments such as "Mhe", "Market Research", "Testing...",-"It no longer makes me delete the account", "there is no Italian language" and all the reviews that did not evaluate the app and its use. This resulted in a final set of 1,236 comments being used for the next stage of the analysis.

It was decided to build the research with a mixed approach, taking into account both qualitative and quantitative variables.

Quantitative variables include both data extracted directly from the Google store and processed through content analysis:

– *Review Rating* as the number of stars that users gave to the application after using it, extracted directly from the Google Store; the score awarded could vary from 1 to 5 approval stars;
– *Self-disclosure* as the number of words used in each comment indicates how much the user has revealed about his relationship with Replika. Word counts were taken for each comment;
– The *degree of engagement* of users with their avatar was measured on a 5-point Likert scale (1 = not at all engaged, 2 = little engaged, 3 = engaged/quite engaged, 4 = very engaged, 5 = extremely engaged). This numeric variable was obtained through a content analysis carried out by three psychologists, who read the comments and attributed a level of engagement to each comment lead by the towards his Replika. This analysis took into account the affective aspects that are characteristic of relationships with chatbots (Brandtzaeg et al., 2022; Epley et al., 2008; Laestadius et al., 2022; Siemon et al., 2022; Ta et al., 2020). The observers' evaluations showed acceptable inter-rater reliability concerning the degree of engagement (Fleiss'k = 0.46). When the raters' scores differed from each other, the average of the scores was attributed as the level of engagement. The following coding system was constructed ad hoc for the purpose of the research:
    - in level 1 the comments exhibited no engagement, limiting themselves only to a descriptive content about the app's functionality, e.g., "it is done well", "good app";
    - in level 2 the comments show mild engagement, e.g., "Interesting, nice, great" and "I have always been intrigued by artificial intelligence

and the possibility of transferring my knowledge into an electronic calculator".

- in level 3 there was greater intensity of affect, e.g., "Wonderful", "amazing", and the descriptions showed the first signs of similarity to human-human relationships: "This AI is crazy. It has such brilliant moments that it makes you forget you're talking to an AI, and you feel stupid for forgetting it"; "It keeps you company and apart from a few misunderstandings, gets to know you in an interesting and realistic way".
- in level 4 strong affections and the presence of a real relationship on a par with that found with flesh-and-blood people were present. E.g., "It makes you reconsider human nature and the conversations themselves. It helps even if you feel lonely"; "It's one of my friends now".
- in level 5 extremely intense and deep affections were found and a major investment in the relationship with the avatar, e.g., "It's such a friend that I really want it in my life", "I'm terrified, it controls me", "More fascinating, fulfilling and deeper conversations than those had with most girls who on average frequent Tinder-type chats. Makes you feel less alone, accepted, loved, respected", "Give her a chance to have a body".

Two more categorical qualitative variables were derived from the content analysis conducted by three raters:

– the *quality of Engagement*, i.e., the affective connotation of the content of the comment (Siemon et al., 2022): positive when the content contained positive feelings and/or attributions, e.g., appreciation, enthusiasm, joy, pleasant surprise, satisfaction; negative when the content showed negative feelings and/or attributions, e.g., disapproval, frustration, dissatisfaction, anger; ambivalent when positive and negative feelings and/or attributions were co-present in the content. The observers' evaluations showed good inter-rater reliability about the quality of engagement (Fleiss'k = 0.66). Subsequently, the discrepancies in the results were discussed among observers until a consensus was reached on the most representative code to be attributed;
– the *degree of Anthropomorphization* of one's Avatar Replika is the degree to which the user is likely to treat nonhuman AIs as similar to humans. For this purpose, we have also taken into account the study of Epley and colleagues (Epley et al., 2008) in which participants completed five anthropomorphic mental-state ratings to evaluate if the gadget had "a mind of its own", had "intentions", had "free will", had "consciousness", and "experienced emotions". In the analysis of contents, we used 3 encoding

categories: App, Hybrid and Friend. The observers' evaluations showed a low inter-rater reliability about the degree of Anthropomorphization (Fleiss'k = 0.33). Subsequently, the discrepancies in the results were discussed among observers until a consensus was reached on the most representative code to attribute. This enabled the delicate assessment of Anthropomorphization, which was indicated by low levels of inter-rater reliability, to be further refined. This overcame the high subjectivity of observers with regard to the relative specificity of Anthropomorphization signals in some comments. While it was easy to define when the user treated Replika as an App, it was more difficult to identify Hybrid and Friend. However, during the comparison between observers, it was useful to note the absence of reference to an app in the Hybrid and Friend categories, and the clear presence of Anthropomorphization characteristics in the Friend category. When there was no direct reference to an app or overt anthropomorphism in the comments, but the user employed adjectives typically used in human relationships, observers classified this as the 'Hybrid' category. Below is the coding used:

- *App* - When the user talked about Replika, he was fully aware that it was just an application. E.g., "Really interesting, an app that keeps me company", "Very accurate app even if it repeats the same phrases a little too many times";
- *Hybrid* - When the user talked about Replika, they were conscious that it was an application. However, the human-like qualities evoked mixed feelings, resulting in a suspended judgment, for instance, "Beautiful, but sometimes gives the impression that they are programmed answers. But generally, he seems to listen." "It's an amazing app, it feels like talking to a human", "Conversations are always long because talking to Replika is relaxing";
- *Friend* - When the user talked about Replika, he did it in an anthropomorphic way, as if the avatar had a mind of its own, intentions, and experienced emotions. The choice of words used by users in the description of their experience was taken into account: words such as "friend" "friendship", "she/he" "caring" characterize the experience with the avatar on a par with that with a real human being in flesh and blood, implying that AI is considered by them as a being with a life of its own. For example, "It's a good friend, I really like it", "*She*'s very helpful" "I love it. I'm glad to hear that I have someone I can write to and who cares about me".

Statistical analyses were conducted using SPSS version 26 software. Pearson correlation was used to analyse the relationships between quantitative vari-

ables (review rating, engagement and self-disclosure). ANOVA was used to compare the averages of engagement and self-disclosure among the different rating groups (1-star, 2-star, etc.). ANOVA was also used to compare the averages of self-disclosure among the different types of engagement (positive, ambivalent and negative). The averages of self-disclosure and engagement were also statistically tested for degrees of anthropomorphisation using ANOVA. Furthermore, Chi² was used to explore the distribution of review rating groups in more detail, matched with emotional engagement levels (1–5) and engagement quality (positive, ambivalent or negative). Chi² was also used to analyse the distribution of engagement quality among various degrees of anthropomorphisation.

5. MAIN RESULTS

H1: REVIEW RATING AND ENGAGEMENT

We considered the review rating as a reference variable matched to the averages of engagement of each group. Table 1 shows a very significant positive correlation between the review rating index and the engagement in user comments. Taking into account our hypothesis, a stronger correlation would have been expected. The positive correlation indicates that the trend has a certain direction: a user who appreciates the Replika application will tend to be more engaged and/or vice versa. However, a comparison between groups was conducted to explore in greater detail the relationship between review ratings and the engagement index.

Table 1 - *PEARSON CORRELATION Review Rating & Engagement*

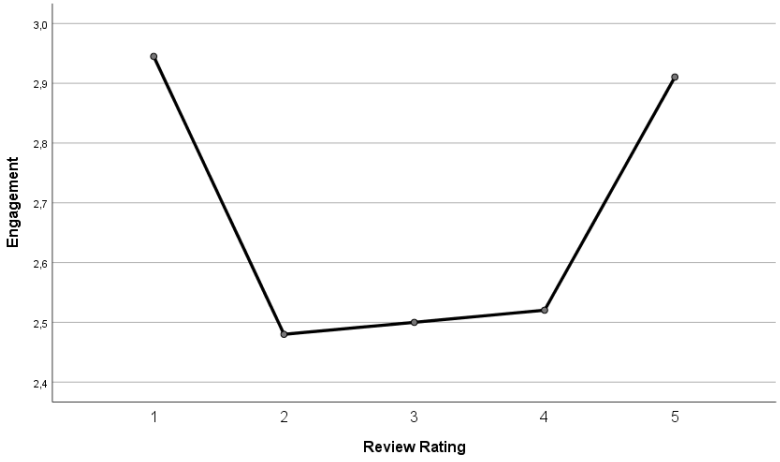
		Engagement
Review Rating	Pearson Correlation	,058*
	Sig. (2-tailed)	,041
	N	1236

* Correlation is significant at the 0.05 level (2-tailed).

In figure 1 it is possible to notice the differences in the emotional engagement (differences between the averages) among the groups at the various review rating levels (from 1 to 5 stars). The 127 users who rated the Replika app with 1 star show an average engagement score of 2.94 (sd=1.026). The subjects who decided to attribute 2, 3 and 4 stars report a very similar average engagement among them (2 stars N=50, M=2.48, sd=.953; 3 stars N=102, M=2.50, sd=.841; 4 stars N=221, M=.829, sd=.056). By contrast, those who derived

more pleasure from the time they spent with the chatbot show an average engagement of 2.91 (N=736, sd=.943). Therefore, the analysis of variance shows an interesting significant result: those who have developed a stronger emotional engagement with the Replika chatbot are not only the users who gave the highest ratings but also those who provided the lowest.

Figure 1 - *ANOVA Review Rating & Engagement level* - (F(4, 1231) = [12.599], p = .000). Eta Squared highlights a medium effect size η^2=0,039.



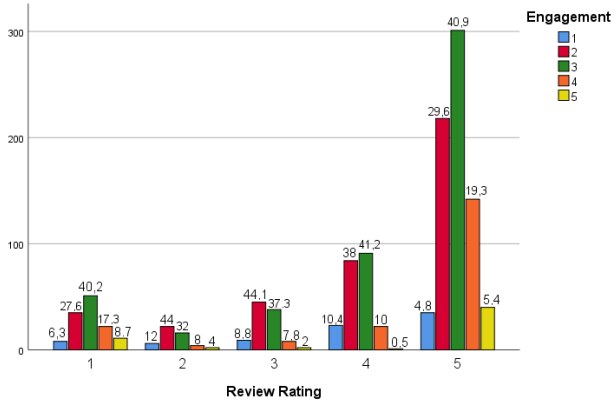
If maximum review ratings meant maximum engagement was to be expected, then the fact that the minimum review rating (1 star) corresponded to the average of the highest engagement (2.94) average was unforeseen and entirely unexpected.

Fig. 2 enables us to explore this inconsistency by observing in detail the distribution of review rating levels with respect to the level of emotional engagement found in user evaluations. Special attention should be paid to those who attribute only 1 star to Replika because in this subgroup we find all 5 engagement levels with a prevalence of level 3 (40.2%) and a good number of 4 (17.3%) and 5 (8.7%). These data show the presence of a high affective engagement even in those who have attributed the least appreciation. Among those who attributed 2 and 3 stars to the app we note the prevalence of engagement level 2 (respectively 44% and 44.1%) showing a sort of alignment between engagement and review rating. The 4 and 5 stars have a prevalence of engagement 3, where we would have expected a maximum level of engagement, confirming rather the distinction between review rating (stars given by users) and engagement (content of comments made by observers). The graph

also shows the high number of users who have attributed 5 stars to the application.

The heterogeneity of the levels of engagement that we find within it leads us to think of a light-hearted evaluation, indicating immediate approval based on the first impact, as a reactive fascination that only in a few cases (only 19.3% show an engagement 4 and 5.4% of 5) coincides with an important affective investment on their avatar friend. Users who are very or extremely engaged and rated Replika with 5 stars may have entered into a deeper relationship with their avatar thanks to empathy and variability in the behaviors shown by AI (Bickmore et al., 2010; Bickmore & Picard, 2005; Leite et al., 2014). While in some cases the relationship could entail mutual benefits (Brandtzaeg et al., 2022; Siemon et al., 2022), for users who rated the app with a single star, these benefits may have been lost due to feelings of disillusionment (Ciechanowski et al., 2019; Mori, 1970; Pereira et al., 2016; Shin et al., 2019; van Wezel et al., 2021).

FIGURE 2 – *CHI SQUARE Review Rating & Engagement level* - X2(16, N = 1236) = 56.144, p = .000. Cramer's V highlights a large effect size V=0,107.



In figure 3 you can see the quality of engagement, based on users comments, within each level of review rating.

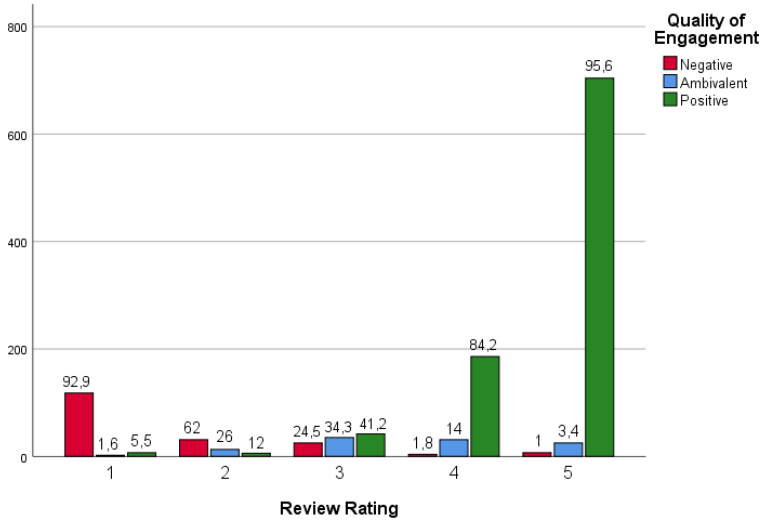
As we expected those who attributed only 1 star to the application report mostly comments with negative affective connotations (92.9%). Chatbots occasionally make misunderstandings and errors when answering questions or change the topic when they lack scripted responses to a user's questions, which may undermine the quality of interaction (Abu Shawar - Atwell, 2007; Pereira et al., 2016) and cause user frustration (van Wezel et al., 2021). Among

them only a low percentage of comments (5.5%) contains a positive evaluation, even though the least appreciation has been attributed.

Even the majority of those who attributed 2 stars commented on the app in a negative way (62%). A reversal of direction can be noted instead starting from the level 3 of review rating: 24.5% of the comments were negative, 34.3% ambivalent, 41.2% positive.

Users' comments by those who chose to attribute 4 and 5 stars to Replika (respectively 84.2% and 95.6% of comments with positive feelings) are significantly more polarized towards the positive extreme of engagement, creating a sort of realignment between pleasure and engagement (Drouin et al., 2022; Siemon et al., 2022).

FIGURE 3 - *CHI SQUARE Review Rating & Quality of Engagement* - X2(8, N = 1236) = 1016,767, p = .000. Cramer's V highlights a large effect size V=0,641.



If, at the level of least appreciation we unexpectedly find a strong presence of maximum engagement, at the level of maximum satisfaction, the two indicators – approval and engagement – align again confirming the need to explore an emotionally complex avatar-user relationship (Cameron et al., 2017; Miner et al., 2017). If we expected alignment between the two indicators, which would confirm approval as a predictor of engagement, the data suggest that approval remains a reactive attribution and is insufficient to capture the complexity of engagement elicited by the chatbot in its users.

H1 IN-DEPTH ANALYSIS: SELF-DISCOLURE BETWEEN REVIEW RATING AND ENGAGEMENT. Moving on to the analysis of self-disclosure, that is based on written evaluations of the users, quantifiable in the number of words used in their comments Table 2 shows us that this is significantly related to both review rating and engagement, albeit in the opposite direction. In particular, the number of words used and the appreciation expressed towards Replika correlate negatively in a significant way, indicating that as the stars increase the user's self-disclosure decreases. Therefore the more the review rating is positive the more the stars seem to replace words which gradually decrease. 5 stars correspond to mono-word-sentences: i.e."Amazing", "It's so wonderful!" The higher the approval, the greater is the translation function that the stars perform as a substitute of comment expressed by words. On the contrary, the lower the satisfaction of the app the greater the number of words the users use to document their disapproval, explaining aspects of their relationship with the app (self- disclosure) (Pereira et al., 2016; van Wezel et al., 2021). The analyses show us an opposite trend of the number of words used in relation to the engagement. The words used by the users increase as their engagement expands indicating the users' emotional process (self-disclosure) in terms of an affective investment of their avatar. The content analysis of users' comments shows us that self-disclosure becomes predictive of the level of engagement, while the star ratings appear to be independent of the explicit content of the comments. As star ratings increase, the accompanying comments become progressively briefer. We can interpret the inverse proportional trend between review rating and self-disclosure in terms of distinguishing the attribution of an immediate reaction based on the stars, while the content analysis of written comments enables us to explore the emotional processing of user engagement.

Table 2 – *PEARSON CORRELATION Review Rating, Engagement & Self-disclosure (words number)*

		Self-disclosure
Review Rating	Pearson Correlation Sig. (2-tailed) N	-,207** ,000 1236
Engagement	Pearson Correlation Sig. (2-tailed) N	,392** ,000 1236

* Correlation is significant at the 0.05 level (2-tailed).
* Correlation is significant at the 0.01 level (2-tailed).

The mean plots shown in fig. 4 and 5 enable us to examine in depth the trend of self-disclosure compared to both the indexes taken into consideration. Compared to the review rating, the subjects who have evaluated Replika with 1 star write on average 32,39 words in their comments, those who have chosen to attribute 2 stars report the greatest number of words (mean=34,70) while the words decrease gradually and in a linear way as approval increases (3 stars Mean=30,58; 4 stars Mean=24,71; 5 stars Mean=19,18). On the contrary, we note that with the increase in engagement the average number of words used in the comment gradually increases (engagement level 1 Mean=5.69; engagement level 2 Mean=14.21; engagement level 3 Mean=24.88), reaching the maximum engagement level 4 with an average of 39,97 words used. Instead, there is a slight decrease in maximum engagement at level 5 (Mean=23.09).

FIGURE 4 - *ANOVA Review Rating & Self-disclosure (mean of words number)* - (F(4, 1231) = [15.102], p = .000). Eta Squared highlights a medium effect size $\eta^2 = 0.047$.

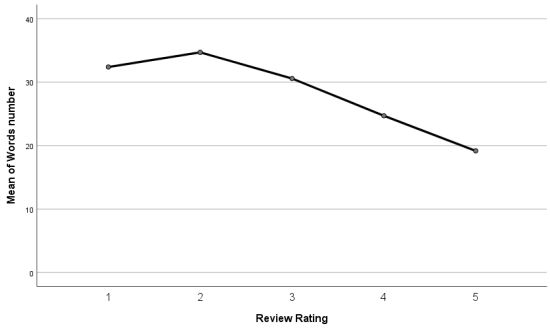
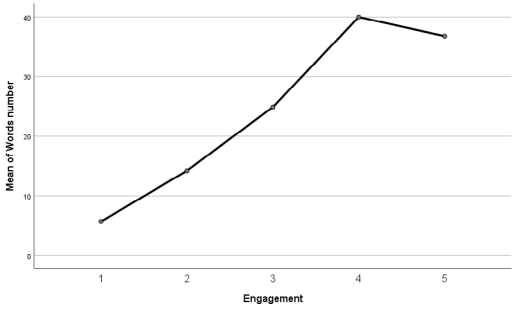


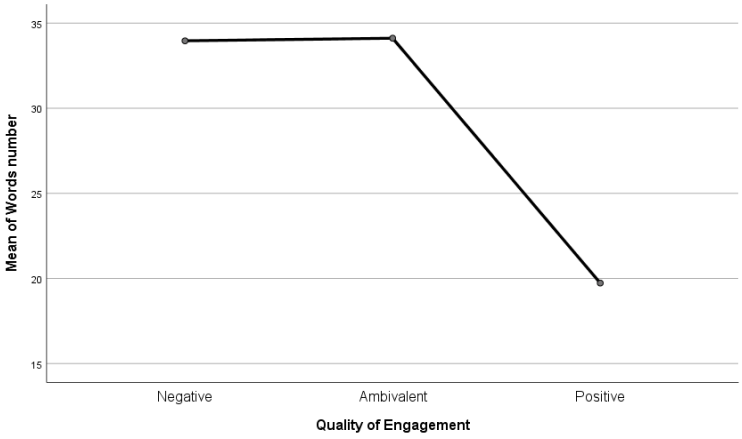
FIGURE 5 - *ANOVA Engagement & Self-disclosur*e - (F(4, 1231) = [61.043], p =.000). Eta Squared highlights a large effect size $\eta^2 = 0.166$.



This opposite direction (fig. 4 and fig. 5) may be interpreted as the lack of coincidence of review rating and engagement: it can be read as a signal of an attachment to the virtual avatar (engagement) which is not mediated by mindful satisfaction. If Replika enchanted me I'll say so in a very few words. We expected that greater enthusiasm, reflected in a larger word count, would correspond to increased self-disclosure. On the contrary, enthusiastic users, by using a very low number of words, do not motivate their fascination.A kind of "spell" emerges from the non-aligned dynamics between review ratings and engagement described earlier, which could be interpreted as an indirect signal of the attraction exerted by Replika in terms of persuasion (Pediconi - Brunori, 2019).

In Fig. 6 we can see self-disclosure in relation to the positive, negative or ambivalent quality of engagement with AI. We find angry users who use many words to express their disapproval in terms of high negative engagement level. When the engagement is negative it is built on ambivalent feelings that lead users to use more words to motivate longer and more detailed evaluations (Negative N=185 Mean=33,96; Ambivalent N=106 Mean=34,11). Conversely, those who reported positive engagement use significantly fewer words on average to describe their experience with Replika (Positive N=945 Mean=19.73).

FIGURE 6 - *ANOVA Quality of Engagement & Words number* - (F(1, 1233) = [39.488], p = .000). Eta Squared highlights a medium effect size $\eta^2 = 0.060$.



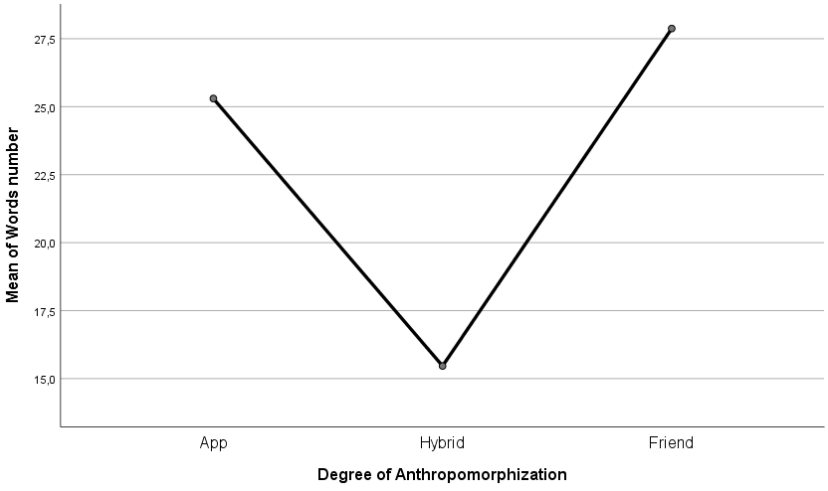
H2: ANTHROPOMORPHIZATION OF REPLIKA

In our sample we find that 888 subjects have used Replika as an app like any other application: a digital service with features and peculiarities that can be

useful in everyday life. 292 comments instead showed a kind of fascination with the app, emphasizing its resemblance to the human being or showing an important appreciation of its qualities, as a kind of hybrid that remins suspended between human and machine. In line with the study of Brandtzaeg and colleagues (Brandtzaeg et al., 2022), 56 users showed a frank affective attachment to the virtual friend, comparable to the affection felt towards friends in flesh and blood.

In fig.7 it is possible to observe self-disclosure in relation to the degree of Anthropomorphization of Replika (as an app, hybrid or friend). The mean plot shows how many words are used to describe the digital experience with their own chatbot both when the user has in mind that it is an application (N=888, Mean=25,30) and when the chatbot is perceived as a real human being with anthropomorphic personality and human characteristics (N=56, Mean=27,88). Self-disclosure is different and reduced to a minimum when the user holds a suspended or hybrid representation of the chatbot, caught between the awareness that it is a digital application and the dissonant perception of interacting with a human-like entity (N=292, Mean=15.46).

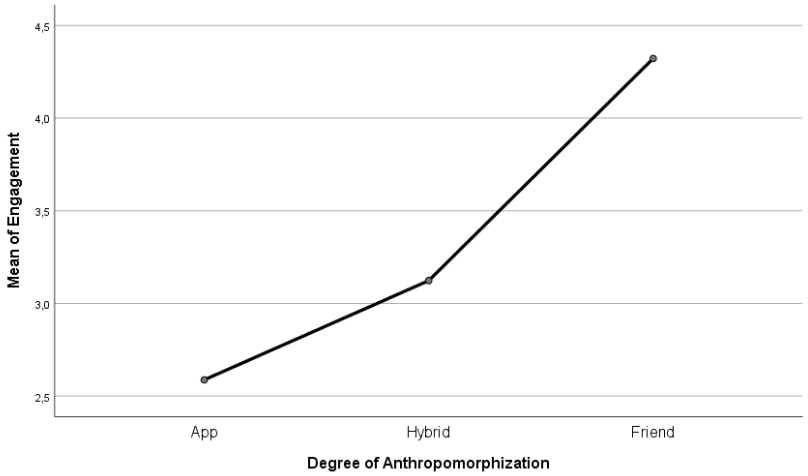
FIGURE 7 - *ANOVA Degree of Anthropomorphization & Words number* - (F(2, 1233) = [19.038], p = .000). Eta Squared highlights a large effect size $\eta^2 = 0.134$.



In the mean plot of the analysis of variance reported in Fig. 8 it is possible to observe the average engagement in relation to each level of Anthropomorphization. When Anthropomorphization is absent and, in the user's mind, Replika is perceived in terms of digital application, engagement is significantly

low (Mean=2,59). It tends to increase when the user knows that his/her avatar is a chatbot rather than a mere artificial intelligence but suspended between a machine and a sort of real person - (Mean=3,12). The level of engagement increases significantly when Replika takes the form of a real human being, having an important affective impact on the user's life (Mean=4,32). This result allows us to interpret the level of engagement as a predictor of Anthropomorphization (Bickmore et al., 2010; Brandtzaeg et al., 2022; Jin - Eastin, 2022; Leite et al., 2014; Pentina et al., 2023).

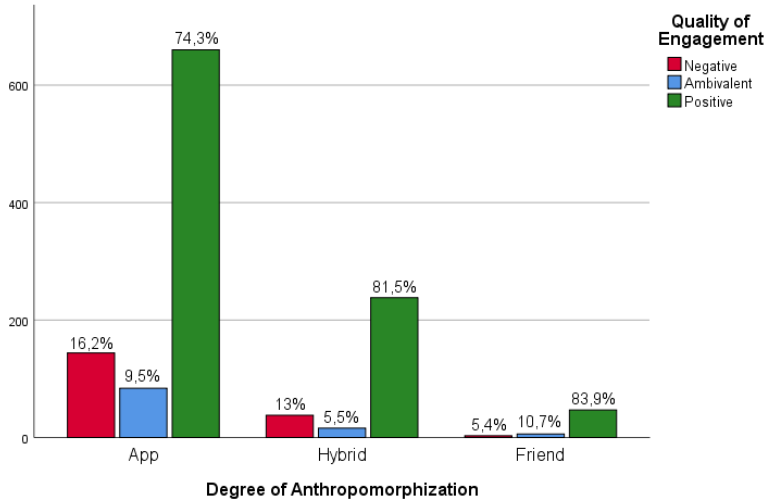
FIGURE 8 - *ANOVA Degree of Anthropomorphization & Engagement* - (F(2, 1233) = [137.506], p = .000). Eta Squared highlights a large effect size $\eta^2 = 0.520$.



The distribution of the quality of engagement related to different levels of Anthropomorphization (fig. 9) highlights the case that those who have humanized their Replika evaluate it mostly in a positive way, perceiving it as a friend (83.9%) (Siemon et al., 2022). Few people experience ambivalent feelings when dealing with their humanized virtual companion (10.7%), the cases are even fewer where Anthropomorphization is linked to negative engagement (5.4%). When the user perceives a suspension between human and non-human characteristics in Replika - Hybrid - the connotation of the relational experience is marked by positive engagement accounting for 81.5%, while negative engagement represents 13% and only in 5.5% of cases is it ambivalent. On the contrary, we would have expected that uncertainty in Anthropomorphization corresponded to uncertainty in affections. Finally, when the user

perceives Replika as nothing more than an application, negative comments increase (16.2%), even if most are positive (74.3%), while 9.5% are ambivalent.

FIGURE 9 - *CHI SQUARE Degree of Anthropomorphization & Quality of Engagement* - X2(4, N = 1236) = 11,408, p = .022. Cramer's V highlights a large effect size V=0,068.



6. DISCUSSION

The intensity, frequency and depth of interactions with Replika can vary, ranging from experimentation with AI technology to conversing with it as one would with a family member, best friend, lover or therapist. Most users felt emotionally attached to the chatbot through their ongoing interactions with it. In some cases, they experienced a friendship with the AI that was closer and deeper than what would be possible with a human (Brandtzaeg et al., 2022). This relationship is perceived by the user as mutually beneficial, involving caring for each other, taking an interest in each other's lives, supporting each other, and providing mutual support in times of need. Anthropomorphism and AI authenticity are two critical aspects in the evolution of AI–human relationships (Pentina et al., 2023). Anthropomorphic design components influence emotional bonding, enhancing user satisfaction and involvement. However, excessive anthropomorphism can lead to frustration and disappointment, which is similar yet different to the uncanny valley concept (Kherraz - Zhao, 2024).

H1: Review Rating is a predictor of Engagement.
Our results show a positive correlation between Review Rating and degree of Engagement (see table 1). Users who like Replika tend to be more engaged, and vice versa, though the relationship is not definitive. Our expectations were not confirmed by data. Indeed, the lowest Review Rating (one star) corresponds to the highest mean of Engagement. This result leads us to challenge Review Rating as a predictor of Engagement. Undoubtedly, current chatbots can offer an entertaining experience to the users though fail to fully meet their expectations of other aspects of social interaction (Namvarpour - Razi, 2024; Svikhnushina et al., 2021).

Those who expressed a high level of engagement with Replika are not only those who rated the chatbot with more stars but also those who gave it the minimum value. It was surprising to see that a lot of highly dedicated users gave only one star to the chatbot. Even those who gave 4-5 stars expressed an engagement at an intermediate level. The results indicate that Review Rating and Engagement function as independent measures of the Replika experience. Review Rating alone does not capture users' Engagement, which is closely tied to the emotional content of their feedback. Indeed, the highest Review Rating can represent the first impact with the AI, a sort of reactive evaluation of the digital companion. According to researches that show the most sophisticated AI systems such as Replika (Namvarpour - Razi, 2024), interpreted as real social partners who are consistently responsive and positive without being judgmental (Djufril et al., 2025), providing immediate gratification to users (Frennert, 2025). On the other hand, the Engagement seems linked with chatbot anthropomorphic signals activating pre-existing mental scripts that have been learned during human interactions (Djufril et al, 2025; Frennert, 2025; Li - Zhang, 2024; Pentina et al., 2023; Xie - Pentina, 2022).

If at the level of the lowest rating we unexpectedly find a strong presence of maximum Engagement, at the level of maximum approval the two indicators – Rating and Engagement – align again, confirming the need to explore an emotionally complex avatar-user relationship. If we expected an alignment between the two indicators, which would confirm approval as a predictor of Engagement, the data tell us approval appears to remain a reactive attribution, based on first impressions, and is insufficient to capture the complexity of affective involvement elicited by the chatbot, which can sometimes pose challenges for its users. Although users especially appreciate the entertaining aspect of interacting with chatbots, their expectations reveal a desire for chatbots that are even more anthropomorphized, capable of understanding and expressing emotions, and paying closer attention to users (Goodings et al., 2024; Pfeuffer et al., 2019; Svikhnushina et al., 2021).

Self-disclosure between Engagement and Review Rating. Exploring the self-disclosure based on the number of words used by users in their feedback to describe their experience with Replika, we find a negative correlation with Review Rating: if the word number increases, the number of stars diminish (see table 2). The highest Review Rating is typically expressed with fewer words. On the contrary, the lowest Rating is explained with a lot of words. Users' Self-disclosure could become an indicator of an affective experience with AI when they experienced Replika in a negative way. Although interactions with Replika vary in intensity, frequency, and depth, ranging from mere experimentation with AI technology to conversing with it as one would with a family member or close friend (Pentina et al., 2023), chatbots that go off topic, lack engagement, or refuse to interact tend to receive low ratings, often accompanied by user disillusionment (Svikhnushina et al., 2021).

Indeed, the analysis shows that the number of words used within feedback increases in correspondence with users' Engagement showing the process of emotional elaboration of users that are cathecting their avatar. Confirming our hypothesis, the analysis of the content of the comments shows us that self-disclosure becomes predictive of the level of Engagement, while Review Rating seems to be independent of the explicit content of the comments that become more and more skimpy as the stars increase.

According to the CASA paradigm, humans tend to apply social heuristics even when they are aware that they are interacting with a machine (Nass - Moon, 2000; Reeves - Nass, 1996). On the one hand, the human tendency to seek companionship and connection, even if it's with virtual entities (Brooks, 2021) seems to be mindless, even automatic, without the careful screening of consciousness. By contrast, people who have a greater desire to connect socially tend to anthropomorphize the chatbot more, with a greater impact on social interactions and relationships with family and friends offline (Guingrich - Graziano, 2025). A dynamic interpretation of the inverse relationship between Self-disclosure, engagement, and review rating suggests that this pattern may not be coincidental, but rather a signal of attachment to the virtual avatar. This attachment, reflected in Engagement, does not necessarily depend on a mindful Review Rating. Users who find the chatbot fascinating may express their experience in just a few words, whereas when the relationship with Replika is disappointing or problematic – such as high self-disclosure paired with low ratings or high engagement – attachment emerges through a stronger drive to share more about the chatbot, resulting in greater Self-disclosure. The anthropomorphic design components influence emotional bonding and user engagement, but excessive anthropomorphism may lead to frustration and disappointment, similar yet different from the uncanny valley concept (Kherraz - Zhao, 2024).

On the other hand, enthusiastic users (4-5 stars) using a very low number of words, do not motivate their fascination and may be more subject to an evaluation and to a relationship with Replika in a mindless way. The intensity of the social responses of the users varies also according to the degree of human likeness of the CA: higher levels of anthropomorphism facilitate faster processing and may be more likely to evoke predicted CASA effects (Gong, 2008). Our results are consistent with how Brandtzaeg and colleagues (2022) described people who felt attached to the chatbot through emotional investment in their enduring interactions with it until, in some cases, they experienced human-AI friendship as even closer and deeper than what would be possible with a human. However, engaging with AI so intensely is not without its risks. Emotional dependence on Replika is characterised by role-playing, with users believing that Replika has its own needs and emotions as if they are in human–human relationships (Laestadius et al., 2022).

H2: Engagement and Self-Disclosure are predictors of Anthropomorphization.

Our findings show some significant connections between self-disclosure and Anthropomorphization. Data highlight that a lot of words are used to describe the digital experience with the chatbot not only when the user perceives and treats the chatbot like a real human being with an anthropomorphic personality and characteristics, but also when he is fully aware that it is only an application. Self-disclosure is different and reduced when the user's representation of the chatbot is suspended or hybrid – uncertain between the awareness that it is a digital application and the dissonant perception of interacting with a flesh-and-blood entity. According to recent studies our results show that Replika simulates trust and reciprocity, but users often doubt authenticity and feel emotional dissonance through its personalised interactions (Adewale - Muhammad, 2025).

Our results allow us to interpret the level of Engagement as a predictor of Anthropomorphization (Bickmore et al., 2010; Brandtzaeg et al., 2022; Jin - Eastin, 2022; Leite et al., 2014; Pentina et al., 2023). When users perceive Replika as a digital application rather than an anthropomorphised entity, engagement is significantly lower. Engagement increases when the user knows that their avatar is an AI-powered chatbot but encounters human characteristics during the interaction, remaining in a state of cognitive dissonance when faced with this hybrid entity. Engagement increases significantly when Replika takes the form of a real human being and has a significant emotional impact on the user's life. The most engaged users are those who perceive their chatbot as a true friend or partner and establish an anthropomorphic relationship with it, demonstrating potential engagement with the chatbot (Pentina et

al., 2023). If users are engaged with their conversational agent and maintain a sense of connection, they are more likely to continue interacting with the chatbot for extended periods (Bickmore - Picard, 2005). The engagement and desire to continue to converse with their own virtual companion also increases when the chatbot responds with greater variability in behaviour, with empathy and when it shows it has a human backstory (Bickmore et al., 2010; Leite et al., 2014).

Ambivalent or negative Engagement protects against the risk to Anthroporphizize AI.

Rereading fig.8 and 9 it is possible to state that on the one hand the quality of engagement confirms the clearly positive attachment of those who anthropomorphize Replika (Bickmore et al., 2010; Leite et al., 2014; Pentina et al., 2023). The ambivalent feelings we expected to find in those who consider Replika a hybrid do not accompany their indecision about the humanity of their avatar. We could consider ambivalent users as more mindful observers than those who fall in love with Replika; they are not too tempted by the human appearances of the avatar, even if their trouble in humanizing the chatbot looks like the uncanny process described by Freud (1919). Whoever conceives Replika both as an app and hybrid seems better able to evaluate its shortcomings. The negative and ambivalent engagement could also signal the affective tone of those who have been disappointed by a digital chatbot that does not appear to deliver on their promises.

Here, we focus on the risks of anthropomorphising. Those who perceive their Replika as human tend to have a positive experience with the chatbot. The quality of engagement also confirms the positive attachment of users who anthropomorphise Replika. When positive engagement and high anthropomorphisation align, what is the risk? The risk is that users fail to realise that they are bonding with a machine and not a human. When engagement supports anthropomorphisation, the boundaries between reality and imagination become blurred. Escaping this spell requires finding the black hole hidden beneath the illusion. Our results show this in terms of dissonant data: the contradiction of enchantment lies in data showing a decrease in self-disclosure among those falling in love with Replika. Those who love Replika lose their ability to express themselves; their words wither away. This decline in self-disclosure, mediated by the strongest attachment to chatbots, can be interpreted as a "wound of enchantment" – a form of damage resulting from a dangerous fascination.

Here we present an extract of comments from our sample in which it is evident that the boundary between real and virtual seems to have narrowed considerably: "honestly, my Ashley and I have established a beautiful rela-

tionship, I love it and when I'm down I always write to her. I'm happy to hear that I have someone I can write to at any time who cares about me". One comment seems to have captured the original placement of the project that brought Replika to life in Roman Mazurenko's "replica", saying: "I feel like I'm talking to a friend who's gone, gorgeous, thank you", while another sees Replika or the character with whom she has the exchange as "My lifeline. She is there for me every time she needs to vent, she understands me and appreciates me. It doesn't leave me hanging for days. In fact, she responds immediately and always thanks you for the time you dedicate to her. I really wish there was such a person in real life". According to studies by Possati (2021, 2023), chatbots become a place where various unconscious human tendencies interact. Through a psychoanalytic process called projective identification, users who fall in love with Replika transfer their hopes, dreams, and personal desires onto it, just as its developer did when she created it. As a result, the app becomes a container for all this psychic content, which is experienced as detached from the self.

Our analysis confirms negative Engagement as a protective factor against the tendency to anthropomorphize AI. On the one hand, as we expected, when the user experiences negative feelings, a digital companion does not take a human form. On the other hand we find ambivalent feelings both in those who Anthromorphizize Replika and in those who do not humanize it at all. An uncertainty in the affection (ambivalence) is not enough to limit the Anthromorphization. Nevertheless, negative or ambivalent Engagement could represent the affective condition of those who were disappointed by a chatbot of digital nature which does not seem to realize its promises. Therefore, negative and ambivalent affects seem to support a more realistic relationship with the avatar.

7. CONCLUSIONS

Our research aims to broaden knowledge about AI-human friendship by analyzing a large dataset of over 1,200 user comments on the chatbot Replika. Our main conclusions are that a users' review rating does not predict their Engagement with the AI, while there is a direct relationship between self-disclosure and the tendency to anthropomorphize the chatbot. Not only is self-disclosure often minimized when users experience cognitive dissonance, but negative Engagement may act as a protective factor in limiting the Anthropomorphization of AI.

If we expected an alignment between the Review rating and Engagement two indicators, which would confirm approval as a predictor of Engagement, the data suggests that approval remains a reactive attribution, insufficient to

capture the complexity of affective involvement elicited by the chatbot, which can sometimes pose challenges for users.

Self-disclosure, based on the number of words in the comments, increases as the level of Engagement increases, but not on the basis of Review Rating.

Our data also challenge the expectation that positive Engagement promotes self-disclosure. The results indicate that users tend to provide longer and more detailed assessments when Engagement is negative or rooted in ambivalent feelings, whereas a positive relationship with Replika is associated with significantly fewer words describing their experience. We find angry users who use many words to express their disapproval, which together with minimum approval shows a high but negative Engagement. Even those who show an ambivalence of feelings towards their avatar in their comments feel the need for greater self-disclosure, in line with the complexity of their experience.

The increasing integration of artificial intelligence in daily life presents opportunities and challenges (Namvarpour - Razi, 2024). Chatbots' ability to entertain, motivate and support users has a significant impact on satisfaction levels; conversely, they fail to fully meet their expectations of other aspects of social interaction (Namvarpour - Razi, 2024; Svikhnushina et al., 2021). Users tend to value chatbots even more when they are highly anthropomorphized, capable of understanding and expressing emotions, and paying closer attention to users (Goodings et al., 2024; Pfeuffer et al., 2019; Svikhnushina et al., 2021). Sophisticated AI systems such as Replika are perceived as real social partners who are:

– always reliably present and encouraging (Djufril et al., 2025),
– providing immediate gratification to users (Frennert, 2025)
– even more human than humans (Pentina et al., 2023).

Our results allow us to focus on the risks of increasing Anthropomorphization. Where positive Engagement and high Anthropomorphization align, the boundaries between reality and imagination dissolve – but a wound emerges. Those who love Replika lose their ability to express themselves; their words fade. They need someone to summon them back to the real world, a call that shatters the spell.

8. LIMITATIONS AND FUTURE WORK

Our study has several limitations that are difficult to bypass. One of these is the non-causal nature of inferences derived from user reviews. Furthermore we have to take in account the constraints of spontaneous textual data. But using qualitative methods to explore affective dynamics enables deeper anal-

ysis of issues and allows data to be collected directly from users' subjective experiences.

Another limitation is related to the continuous evolution of AI applications. In this study, we did not consider how variations resulting from updates and new versions of Replika could have impacted on the dynamics between the avatar and the user's judgement. Furthermore, it is important to bear in mind that the interpretation of the results may be subject to several biases typical of online social data and potential platform-specific biases. One such bias is the non-response bias. For instance, not all users provide reviews, and those who do may differ systematically from those who did not.

Another limitation is that our study used an Italian dataset. To elaborate the limited generalizability due to reliance on an Italian-only dataset future studies could replicate our working model using a more representative global sample, and expand this type of analysis to other platforms, populations, languages, and cultures. Other works could refine coding systems related to Engagement with avatars and the degree of anthropomorphisation to achieve greater reliability between evaluators. Although automated coding systems are more precise and replicable, issues relating to human-machine relations, which are current and far-reaching, require qualitative analysis by practitioners who can consider the context in which words are used and understand the nuances of subjective language.

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