Proceedings of ICADSS 2025 Symposium: Art, Identity, and Society: Interdisciplinary Dialogues
DOI: 10.54254/2753-7064/2025.LC25585

Exploring the Behavioral Differentiation and Psychological Impact of Different Attachment Types of Users Interacting with AI

Linlin Liu

Psychological and Sociological Studies, TOKAI University, Japan
linlinliu967@gmail.com

Abstract: In the rapid development of generative AI, affective AIs have gradually entered public life as a new type of "social companion", and users show different degrees of emotional attachment and healing experiences in their interactions with AIs. Attachment theory suggests that the attachment patterns formed by individuals in early relationships will be extended to their subsequent intimate interactions, which may also affect their interaction and psychological responses with AIs. In this study, we take attachment type as the independent variable and introduce "human-computer relationship strength" as the mediator variable to explore the psychological outcomes of "emotional healing" and "emotional addiction" in AI interactions by users with different attachment types from a dual-path perspective. The influence mechanism of different attachment types of users on "emotional healing" and "emotional addiction" in AI interaction was explored from a dual-path perspective. A total of 203 users were surveyed, and the ECR-S, PSI, PANAS and adapted PUCAI scales were used to measure the variables. The results found that: anxious and fearful attachment individuals had higher HCI intensity; HCI fully mediated the effect of anxious attachment on emotional addiction; and HCI partially mediated the positive effect of secure attachment on positive emotions but did not significantly affect negative emotions. This study reveals the predictive role of different attachment styles on the psychological outcomes of AI use, emphasizing that individual user differences should be fully considered in AI design and ethical governance to prevent the risk of abuse and leverage the positive value of technology.

Keywords: attachment style, human-computer relationship strength, emotional healing, emotional addiction, social AI.

1. Introduction

In recent years, with the rapid development of generative artificial intelligence (AI) technology, AI has not only been applied to language generation, education, medical care and other fields, but also increasingly integrated into people's daily life and emotional communication. For example, systems such as chatbots, AI voice assistants, and virtual lovers are gradually becoming new channels for people to express their emotions, alleviate loneliness, and obtain companionship. Compared with

© 2025 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2753-7064/2025.LC25585

traditional instrumental technologies, these AIs show a high degree of emotional responsiveness and social characteristics, allowing users to develop psychological experiences such as “trust”, ‘dependence’, “comfort”, etc. in the process of interacting with them [1]. “trust”, ‘dependence’, “comfort” and other psychological experiences [1]. When AI is no longer just a functional tool but gradually evolves into a “companion” or “emotional support”, it means that the relationship between humans and AI is transitioning from tool-oriented to emotion-oriented, and its psychological impact is becoming increasingly complex.

It has been shown that AI interaction can alleviate users' loneliness and anxiety to a certain extent and bring emotional stability [2]. As a medium with the ability of dialog and companionship, AI is seen as a potential “digital healing tool”. However, studies have also pointed out that users may become dependent on it due to its high responsiveness and emotional projection space, which may lead to emotional avoidance, immersive behaviors, and even addictive tendencies [3]. These phenomena suggest that human-AI emotional interactions may have both “healing” and “addictive” psychological consequences.

Current research has paid less attention to the influence of the psychological subjectivity of the “user himself” on the interaction path of AI. In fact, users' behavioral choices and psychological feelings when facing AI are likely to be influenced by their early emotional relationship patterns, which is the core content emphasized by attachment theory. Attachment type refers to the emotional and behavioral tendencies such as trust, dependence, and avoidance exhibited by individuals in intimate relationships, which are mainly divided into secure, anxious, and avoidant types [4]. Established studies have pointed out that attachment type not only affects interpersonal interaction patterns, but also gradually extends to human-computer interaction situations [5].

In order to further understand the psychological differentiation of individuals in AI emotional interactions, this study introduces the mediator variable of Human-AI Relationship Strength (HARS), which is a measure of the psychological relationship strengths such as emotional commitment to AIs, frequency of interactions, and attachment to AIs, with reference to the social-like relationship theory (PST). Some scholars experimentally demonstrated that users' interactions with AI chatbots can generate emotional resonance and trust similar to media PSI, especially when the AI exhibits social presence and personalized feedback, this emotional connection is more prominent. In addition, the mediating role of human-robot relationship strength between AI use and psychological outcomes (e.g., emotional support, dependence, or addictive tendencies) was verified through a rigorous empirical design, further supporting the rationality of variable manipulation in this study [6].

Based on this, the present study constructs a “dual-path psychological mechanism model” to investigate whether individuals with different attachment types are more likely to show “emotional healing” or “emotional addiction” in AI interactions. This study seeks to determine whether varying attachment styles influence the likelihood of individuals experiencing either “emotional healing” or “emotional addiction” in the context of interactions with AI. A central objective of this study is to clarify the variability of human–computer relationship intensity across distinct attachment patterns and to assess its intermediary role in shaping emotional healing or dependency outcomes. Through questionnaires and mediation regression analysis, this study expects to reveal how individual psychological traits influence their behavioral patterns and emotional outcomes of their interactions with AI.

DOI: 10.54254/2753-7064/2025.LC25585

2. Research design

2.1. Variable definitions and theoretical foundations

The present research investigates how psychological outcomes vary among users with distinct attachment styles during their emotional engagement with AIs, and the core consists of two outcome variables: “emotional healing” and “emotional addiction”. To further reveals the role of individual traits and psychological outcomes, “human-AI relationship strength” was introduced as a mediator variable. The theoretical background, measurement dimensions and instruments of each variable are described below.

The independent variable in this study is attachment style, which refers to an individual's behavioral patterns related to trust, dependence, and avoidance in intimate relationships. Attachment styles are typically classified into secure, anxious, and avoidant types, with some later studies identifying a fourth type, fearful attachment, as a composite pattern. To measure attachment patterns, this research utilizes the short-form version of the Experiences in Close Relationships scale (ECR-S), which evaluates individuals across two dimensions, anxiety and avoidance in close relationships and classifies participants into four types based on the median split [4,7].

The mediating variable is Human-AI Relationship Strength, which reflects the emotional bonds and interactional dependence formed between users and AI. Rooted in Parasocial Interaction theory (PSI), prior research has indicated that users' relationships with AI can be assessed in terms of emotional closeness and dependency. This study utilizes the Parasocial Interaction Scale developed in [8]to measure this variable. Originally designed for media figures, the PSI scale has been widely adapted to contexts involving social media and AI interaction, demonstrating strong cross-context applicability and structural validity [8,9].

The dependent variables are emotional healing and emotional addiction. Emotional healing refers to the alleviation of negative emotions and enhancement of positive effects following AI interaction, grounded in emotion regulation theory and supportive communication theory [10,11]. Through responsive dialogue and linguistic companionship, AI may offer users a form of immediate comfort akin to psychological intervention. Emotional healing in this study is evaluated through the Positive and Negative Affect Schedule (PANAS), a tool introduced by Watson and colleagues, which includes two subscales: Positive Affect and Negative Affect. PANAS has frequently been utilized to assess the immediate emotional impact of various interventions [12]..

Emotional addiction, on the other hand, is based on the behavioral addiction model, which suggests that even in the absence of substances, addiction may present itself through six defining symptoms, including salience, emotional regulation shifts, increased tolerance, withdrawal reactions, interpersonal conflict, and relapse episodes [13]. Given AI’s capacity for emotional responsiveness and companionship, it has the potential to induce emotional dependency and overuse. To measure this variable, this study employs a modified version of the Bergen Social Media Addiction Scale (BSMAS), with adjustments based on some scholars by replacing references to “social media” with “AI interaction,” thereby creating the PUCAI scale, which captures addiction-like usage patterns of AI [14,15].

Internal reliability of the employed instruments was examined through Cronbach’s alpha analysis for each measurement scale. As shown in Table 1, all scales demonstrated high reliability ($\alpha > 0.85$), except for the PANAS, which showed slightly lower reliability but remained within acceptable limits.

DOI: 10.54254/2753-7064/2025.LC25585

Table 1. Measurement scales and reliability indices

Scale	Item	Cronbach's Alpha
ECR-S	12	0.888
PIS	10	0.932
PANAS	20	0.671
BSMAS	6	0.875

2.2. Research hypotheses

During emotional interactions with AI, users' attachment styles may influence their expectations, interaction patterns, and psychological dependence. Individuals with anxious attachment often exhibit a heightened need for emotional support and security, making them more likely to form emotionally intensive and potentially dependent relationships with AI. In contrast, those with avoidant attachment tend to suppress emotional expression and show limited interest or initiative in AI interaction. Securely attached individuals are expected to engage with AI in a more balanced and moderated manner, potentially deriving effective emotional regulation from the interaction.

Based on the above theoretical considerations and prior empirical findings, the present study formulates the following hypotheses.

Hypothesis 1: Variations in Human–AI relationship strength are expected across different attachment styles，with anxious and fearful individuals exhibiting stronger emotional bonds with AI than secure and avoidant individuals.

Hypothesis 2: The strength of Human–AI relational bonds is posited to serve as a mediating factor between attachment style and the risk of emotional dependence. Individuals with anxious attachment may be more prone to establishing intense emotional connections with AI, which in turn increases their susceptibility to emotional addiction.

Hypothesis 3: Human-AI Relationship Strength also mediates the relationship between attachment style and emotional healing. Specifically, securely attached individuals, through moderate and healthy engagement with AI, are more likely to experience emotional recovery and comfort.

2.3. Research results

This study employed a mediation regression model to examine the relationships between attachment style, Human-AI Relationship Strength, and the psychological outcomes of AI interaction.

Table 2. Analysis of differences in human-AI relationship strength across attachment styles

Attachment Style	N	Mean	SD	F	Sig.
Fearful	76	4.61	0.30	127.353	0
Anxious	48	4.59	0.42		
Avoidant	37	3.33	0.64		
Secure	40	3.26	0.56		

As shown in Table 2, Hypothesis 1 (H1) is supported. ANOVA results indicate significant differences in Human-AI Relationship Strength among individuals with different attachment styles

DOI: 10.54254/2753-7064/2025.LC25585

($F = 127.353$, $p < 0.01$). Specifically, participants with anxious ($M = 4.59$, $SD = 0.42$) and fearful ($M = 4.61$, $SD = 0.30$) attachment scored significantly higher than those with secure ($M = 3.26$, $SD = 0.56$) or avoidant ($M = 3.33$, $SD = 0.64$) attachment. This suggests that individuals with anxious or fearful attachment tend to establish stronger emotional bonds with AI than those with avoidant or secure attachment.

Table 3. Mediation regression analysis of human-AI relationship strength between attachment Style and emotional addiction

Variable	Emotional Addiction		Human-AI Relationship Strength		Emotional Addiction	
	β	t	β	t	β	t
Anxious	0.6759	5.2763**	0.6454	5.2722**	0.0353	0.8137
Human-AI Relationship Strength					0.9924	42.209**
R^2	0.3496		0.3493		0.9549	
Adj.R^2	0.1222		0.122		0.9118	
F	27.8396**		27.7965**		1028.65**	

Note：**P<0.01, *P<0.05

The findings from the regression analysis, as summarized in Table 3, reveal that anxious attachment is a strong predictor of emotional addiction ($\beta = 0.6759$, $t = 5.2763$, $p < 0.01$). Moreover, Human–AI Relationship Strength demonstrates a positively significant association with emotional addiction ($\beta = 0.9924$, $t = 42.209$, $p < 0.01$).

Table 4. Mediation effect analysis of human-AI relationship strength between attachment style and emotional addiction

Effect Type	Effect Value	BootSE	Bootstrap95%CI		Effect Result
			Lower	Upper	
Total Effect	0.6759	0.1281	0.4233	0.9285	Establish
Direct Effect	0.0353	0.0434	-0.0503	0.121	Unestablished
Indirect Effect	0.6405	0.0888	0.4633	0.8116	Establish

As indicated in Table 4, the total influence of attachment style on emotional addiction is noticeable (effect value = 0.6759, 95% CI = [0.4233, 0.9285], excluding 0). The direct effect is not significant (effect value = 0.0353, CI = [-0.0503, 0.121]), while the indirect effect through Human-AI Relationship Strength is significant (effect value = 0.6405, CI = [0.4633, 0.8116]). This suggests that attachment style primarily influences emotional addiction through the mediation of Human-AI Relationship Strength. Combined with the regression results, it confirms that individuals with anxious attachment tend to establish more intensive emotional engagement with AI, leading to a greater tendency toward emotional addiction. Hypothesis 2 is supported.

DOI: 10.54254/2753-7064/2025.LC25585

Table 5. Mediation regression analysis of human-AI relationship strength between attachment style and positive affect (PA)

Variable	PA		Human-AI Relationship Strength		PA	
	β	t	β	t	β	t
Secure	0.6937	9.2946**	-1.0412	-8.7837**	0.0933	2.638**
Human-AI Relationship Strength					0.5767	-32.1862**
R^2	0.5492		0.5276		0.9421	
Adj.R^2	0.3017		0.2784		0.8875	
F	86.3897**		77.1528**		784.6956**	

Note：**P<0.01, *P<0.05

According to the results presented in Table 5, secure attachment contributes positively to positive affect ($\beta = 0.6937$, $t = 9.2946$, $p < 0.01$), whereas Human–AI Relationship Strength exhibits a statistically significant negative association with it ($\beta = -0.5767$, $t = -32.1862$, $p < 0.01$).

Table 6. Mediation effect analysis of human-AI relationship strength between attachment style and positive effect

Effect Type	Effect Value	BootSE	bootstrap95%CI		Effect Result
			Lower	Upper	
Total Effect	0.6937	0.0746	0.5465	0.8409	Establish
Direct Effect	0.0933	0.0354	0.0235	0.163	Establish
Indirect Effect	0.6004	0.6004	0.4803	0.709	Establish

As shown in Table 6, the total influence of attachment style on positive affect is prominent (effect value = 0.6937, 95% CI = [0.5465, 0.8409]). Both the direct effect (effect value = 0.0933, 95% CI = [0.0235, 0.163]) and the indirect effect through Human-AI Relationship Strength (effect value = 0.6004, 95% CI = [0.4803, 0.709]) reached statistical significance, as indicated by confidence intervals that exclude zero. This suggests that attachment style can influence positive affect both directly and indirectly via Human-AI Relationship Strength. Combined with the regression results, this indicates that although secure attachment contributes positively to emotional well-being, high levels of Human-AI Relationship Strength may reduce positive affect.

Table 7. Mediation effect analysis of human-AI relationship strength between attachment style and negative affect (NA)

Effect Type	Effect Value	BootSE	bootstrap95%CI		Effect Result
			Lower	Upper	
Total Effect	0	0.0283	-0.0558	0.0559	Unestablished
Direct Effect	-0.0122	0.0334	-0.078	0.0537	Unestablished
Indirect Effect	0.0122	0.0191	-0.0272	0.0494	Unestablished

As shown in Table 7, the total effect of attachment style on negative affect is not significant (effect value = 0.0000, 95% CI = [-0.0558, 0.0559]), nor are the direct effect (effect value = -0.0122, CI = [-0.0780, 0.0537]) or indirect effect (effect value = 0.0122, CI = [-0.0272, 0.0494]). This

DOI: 10.54254/2753-7064/2025.LC25585

indicates that attachment style has no significant direct or indirect effect on negative affect, and Human-AI Relationship Strength does not mediate this relationship. Therefore, Hypothesis 3 is only partially supported.

3. Analysis of results and recommendations

First, from the above results, it can be seen that anxious and fearful attachment individuals have significantly higher strength of human-computer relationship than secure and avoidant individuals, which suggests that they are more inclined to use the AI as a kind of alternative intimacy object. This may be due to the fact that anxious individuals have a high desire for emotional responses, and AIs provide stable and controlled responses, thus reducing their anxiety about the "uncertainty" of real interpersonal interactions. Fearful individuals, on the other hand, because of both high anxiety and high avoidance, are prone to insecurity in real-life relationships, and the AI becomes a compromise choice in their mode of "wanting to attach but fearing to be hurt".

Second, anxious attachment significantly predicted emotional addiction through the strength of human-computer relationship, and the relationship was fully mediated, suggesting that individuals with high anxiety may be over-immersed in AI because of the consistency of AI responses and emotional fulfillment, thus forming dependence. Finally, securely attached individuals showed higher levels of positive emotions, suggesting that they were able to establish a relationship with the AI in a more balanced way, thus realizing a certain degree of "emotional healing". It is worth noting that while the strength of the human-computer relationship partially mediated this path, too high a level of interaction could diminish positive emotions, which leads to the conclusion that "moderate intimacy" may be the key to the healing value of AI interaction, rather than indulgent use.

Based on this, it is recommended to introduce "personalized regulation mechanisms" in AI design and use, such as setting up interaction frequency reminders and emotional input prompts, to prevent high-risk attachment users from becoming overly dependent. At the same time, relevant products should strengthen the function of recognizing users' emotional state and guide them to maintain emotional autonomy and real social connections during the process of use.

4. Conclusion

With the widespread application of generative AI in social and emotional support contexts, the role of AI in daily life is gradually shifting from that of a functional tool to an emotional interaction partner. Grounded in attachment theory and parasocial relationship theory, this study explored the psychological mechanisms underlying human-AI interaction among individuals with different attachment styles and examined the mediating role of Human-AI Relationship Strength. The findings suggest that individuals with anxiety and fearful attachment are more likely to develop high-intensity emotional bonds with AI, whereas those with secure attachment are more inclined to experience emotional healing benefits from such interactions.

The empirical results not only support these theoretical assumptions but also introduce two novel psychological outcomes variable emotional healing and emotional addiction. By constructing a dual-path mediation model, this study provides an integrated explanation of both outcomes and further expands the application of existing theories in AI-mediated contexts.

From a theoretical perspective, this study broadens the scope of attachment theory by demonstrating its applicability in digital and AI-interaction environments. These findings emphasize that traditional models of interpersonal relationships continue to be relevant within the framework of human–AI interactions. Moreover, they highlight the crucial role of individual psychological traits

DOI: 10.54254/2753-7064/2025.LC25585

in shaping interaction outcomes. This suggests that relying on a universal model is inadequate for capturing the complexity of such interactions; instead, it is essential to account for individual differences.

Regarding the psychological mechanisms identified, individuals with anxious attachment tend to exhibit high emotional investment in AI interactions. While this may offer short-term emotional comfort, it also raises the risk of dependency and immersion. In contrast, securely attached individuals demonstrate stronger emotional regulation and boundary-setting abilities in their interactions with AI, enabling them to derive positive emotional recovery. However, the study also found that when Human-AI Relationship Strength becomes excessively high, positive effect among securely attached individuals may decrease. This indicates the possibility of an "optimal zone" for AI's therapeutic effect—beyond which its influence on psychological well-being may become counterproductive.

Despite offering valuable insights, certain limitations of this study should be acknowledged. To begin with, although the sample (N = 203) satisfied the basic threshold for regression procedures, the distribution of participants across attachment styles was uneven, which may have affected the stability of intergroup comparisons. Second, while this study adapted the BSMAS to measure AI-related emotional addiction and achieved high reliability ($\alpha = 0.875$), the structural validity of this adaptation in non-social media contexts warrants further investigation.

Future research can build upon these findings in two main ways. First, a longitudinal design incorporating behavioral logs and time-series data could be used to dynamically track changes in Human-AI Relationship Strength. Second, combining semi-structured interviews with content analysis could help uncover the cognitive and emotional construction processes involved in users' interactions with AI, thus complementing the limitations of purely quantitative approaches.

References

[1] Chu, M.D., Gerard, P., Pawar, K., Bickham, C. and Lerman, K. (2025) Illusions of intimacy: Emotional attachment and emerging psychological risks in human-AI relationships. arXiv preprint arXiv: 2505.11649.
[2] De Freitas, J., Uguralp, A.K., Uguralp, Z.O. and Stefano, P. (2024) AI companions reduce loneliness. SSRN.
[3] Ho, A., Hancock, J. and Miner, A.S. (2018) Psychological, relational, and emotional effects of self-disclosure after conversations with a chatbot. Journal of Communication 68, 712–733.
[4] Ainsworth, M.D.S., Blehar, M.C., Waters, E. and Wall, S. (1978) Patterns of attachment: A psychological study of the strange situation. Lawrence Erlbaum.
[5] Gillath, O., Ai, T., Branicky, M.S., Keshmiri, S., Davison, R.B. and Spaulding, R. (2020) Attachment and trust in artificial intelligence. Computers in Human Behavior 115, 106607.
[6] Fang, C.M., Liu, A.R., Danry, V., Lee, E., Chan, S.W.T. et al. (2025) How AI and human behaviors shape psychosocial effects of chatbot use: A longitudinal randomized controlled study. arXiv preprint arXiv: 2503.17473.
[7] Brennan, K.A., Clark, C.L. and Shaver, P.R. (1998) Self-report measurement of adult attachment: An integrative overview. In Simpson, J.A. and Rholes, W.S. (Eds.), Attachment theory and close relationships (pp. 46–76). Guilford Press.
[8] Rubin, R.B., Perse, E.M. and Powell, R.A. (1985) Development of parasocial interaction relationships. Journal of Broadcasting & Electronic Media 29, 389–400.
[9] Hartmann, T. and Goldhoorn, C. (2011) Horton and Wohl revisited: Exploring viewers' experience of parasocial interaction. Journal of Communication 61, 1104–1121.
[10] Gross, J.J. (1998) The emerging field of emotion regulation: An integrative review. Review of General Psychology 2, 271–299.
[11] Cutrona, C.E. and Russell, D.W. (1990) Type of social support and specific stress: Toward a theory of optimal matching. In Sarason, B.R., Sarason, I.G. and Pierce, G.R. (Eds.), Social support: An interactional view (pp. 319–366). Wiley.
[12] Watson, D., Clark, L.A. and Tellegen, A. (1988) Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology 54, 1063–1070.

DOI: 10.54254/2753-7064/2025.LC25585

[13] Griffiths, M.D. (2005) A ‘components’ model of addiction within a biopsychosocial framework. Journal of Substance Use 10, 191–197.
[14] Andreassen, C.S., Torsheim, T., Brunborg, G.S. and Pallesen, S. (2012) Development of a Facebook addiction scale. Psychological Reports 110, 501–517.
[15] Hu, B., Mao, Y. and Kim, K.J. (2023) How social anxiety leads to problematic use of conversational AI: The roles of loneliness, rumination, and mind perception. Computers in Human Behavior 145, 107760.