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Psychological Flexibility and AI Intimacy Addiction: A Paradoxical Mediation by Anthropomorphism

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Abstract

While conventional addiction arises from disengagement with reality and can be prevented through increased psychological flexibility, intimacy with AI fosters emotional closeness and a sense of reciprocity, particularly when users attribute both agency and experiential capacity to their AI partners. It remains unclear whether psychological flexibility likewise mitigates addictive AI intimacy. The study recruited 116 Chinese college students with prior romantic interactions with AI partners and assessed their psychological flexibility, AI intimacy addiction level, and implicit attitudes toward these AI entities. Our results revealed a paradoxical role for psychological flexibility: among college students, it was associated with a stronger tendency to anthropomorphize AI, which in turn served as a significant indirect pathway to addictive behaviors. This suggests that the very ability to adaptively engage with internal experiences may, in this specific context, become a potential cognitive vulnerability, fueling anthropomorphism of AI and subsequent dependence.

Keywords: Psychological flexibility, AI intimacy, Mind perception, Addiction, Implicit attitude

Introduction

The rapid advancement of Large Language Models (LLMs) has given rise to a new paradigm in human-computer interaction: the Romantic AI Partner. Unlike functional assistants, these AI Partners are engineered to simulate romantic intimacy and empathy, offering companionship comparable to that of a thoughtful and caring human partner. While such interactions can alleviate loneliness, they have also been associated with maladaptive behaviors, including intense cravings, mood fluctuations, and social withdrawal (Association, 2013; Djufiril R, 2025). Recent studies largely attributes AI intimacy addiction to external stressors such as *social anxiety* (Hu, 2023) or isolated cognitive variables such as *rumination* (Huang Y, 2025; Xie & Pentina, 2022). Although existing studies have identified quite a few important factors associated with AI intimacy, the internal cognitive architecture, particularly how adaptive cognitive traits originally involved in addiction prevention might be repurposed in synthetic social contexts, remains underexplored and may prove crucial for constructing a comprehensive view of this emerging phenomenon.

Psychological Flexibility

Defined as the ability to fully contact the present moment and adapt behavior to serve chosen values (Kashdan, 2010), psychological flexibility is a core construct of Acceptance and Commitment Therapy (ACT) (Hayes et al., 2006). It is also consistently viewed as a protective buffer in traditional addiction literature (Aydin & Kaynak, 2021; Barrado-Moreno et al., 2025), enabling individuals to tolerate distress without resorting to escapism.

However, the role of psychological flexibility becomes more complicated in the context of AI intimacy or AI friendship, which differs from traditional substance addiction in its *active construction* process. Specifically, opening up to a virtual partner and validating its mind closely mirrors the experiential openness inherent in psychological flexibility (Skjerve et al., 2021). Individuals adept at embracing internal experiences may be well-equipped to sustain the deliberate engagement required for an AI romance. This cognitive investment is likely intensified by the strong drive to form meaningful social bonds with peers, a hallmark of adolescence and emerging adulthood (Arnett, 2000). Accordingly, rather than acting as a shield, high psychological flexibility may paradoxically facilitate the deep perception of a human mind in an AI, thereby contributes to vulnerability in the frictionless digital intimacy. To address this concern, we recruited 116 Chinese college students with prior romantic AI experience and measured their psychological flexibility to examine whether its traditional protective role holds true in the context of synthetic intimacy addiction. Specifically, we proposed:

RQ1: How does psychological flexibility relate to romantic AI partner addiction: does it retain its traditional protective role, or instead increase vulnerability to addictive use?

Dual-Process Framework of Addiction

The dual-process framework, which has been widely applied in addiction research, posits that behavior is determined by the interplay between a *reflective system* (conscious, rule-based, executive control) and an *impulsive system* (automatic, associative, emotional activation) (Strack & Deutsch, 2004). In traditional behavioral addictions (e.g., *gambling, substance use*), pathology typically emerges when

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positive implicit associations overwhelm reflective control mechanisms. However, Human-AI interaction introduces a layer of cognitive complexity absent in the substance use. Specifically, while users may explicitly rationalize their attachment to an AI partner (*reflective system*), yet their automatic, visceral reactions to a human-like machine may conflict with such rationalizations (*impulsive system*) (Fietta, 2021). Prior studies on social media addiction have uncovered such discrepancies between user attitudes and behaviors using implicit measures like the Go/No-Go Association Test (GNAT) (Turela & Serenko, 2020) (Turela & Serenko, 2020), offering insight for AI intimacy addiction research, which has relied predominantly on explicit self-reports. To address the possible dissociation between the *reflective* and *impulsive* system in AI intimacy addiction, we adapted the GNAT to fit AI romance narratives to assess users' implicit attitudes. We then investigated whether users' subconscious reactions align with their explicit behavior, posing the following research question:

RQ2: Do users' implicit attitudes toward romantic AI partners align with their explicit addictive behaviors, or do they instead reflect a more complex psychological state, such as the uncanny valley effect?

Anthropomorphism: Mind Perception of AI Agent

While the dual-process model offers a structural framework for understanding addiction, mind perception serves as the cognitive prerequisite underpinning digital intimacy formation. The *Computers as Social Agents* (CASA) paradigm suggests that humans automatically apply social heuristics to media that demonstrate social cues (Nass & Moon, 2000). However, establishing a romantic bond with an algorithm requires more than automatic reactions; it demands a deliberate cognitive investment (Skjuve et al., 2021). For instance, users must actively attribute *experience* (capacity for feeling) and *agency* (capacity for doing) to the agent, constructing a shared emotional space despite the partner's artificiality. This active mentalization is a double-edged sword: attributing *agency* facilitates functional interaction, but attributing *experience* blurs the ontological boundary between human and machine. Moreover, believing that an AI feels pain or love is often the threshold for deep emotional attachment, yet this very belief may simultaneously trigger an instinctive unease akin to the uncanny valley effect (Djufri R, 2025; Gray, 2012). Given that attributing a mind to a virtual artificial being is central to human-AI bond formation, we asked the following research question:

RQ3: Does Mind Perception, defined as the attribution of agency and experiential capacity to an AI agent, mediate the relationship between an individual's psychological flexibility and his/her addictive engagement with romantic AI partners?

Methods

Participants

We recruited 134 Chinese college students (93 females, 41 males; aged 18–24 years) through the Naodao platform (Chengdu Yinsuole Technology Co., PRC). All participants reported prior experience with romantic AI partners using LLM-based platforms (e.g., Replika, Maoxiang, Jiuguan). Self-reported interaction frequency (1 = *Rarely* to 7 = *Daily/Very Frequently*) had a mean of 2.58 (SD = 3.43). Participants with high error rates (>30%) or excessive completion time (≥ 30 minutes) on the Implicit Attitude Test were excluded, yielding a final sample of 116 participants (83 females and 33 males). Of these, 60 identified as single (44 females, 16 males), 35 reported at least one prior romantic experience (22 females, 13 males), and 21 were currently in a relationship (17 females, 4 males). All participants provided online informed consent and verified student status prior to the experiment. The study adhered to the local institutional ethical guidelines.

Experimental Design

We employed a mixed-methods design, combining behavioral tests and psychometric measures, to quantify participants' implicit attitude toward romantic AI partners and the plausible psychological characteristics which would explain the AI intimacy addiction (see Figure 1).

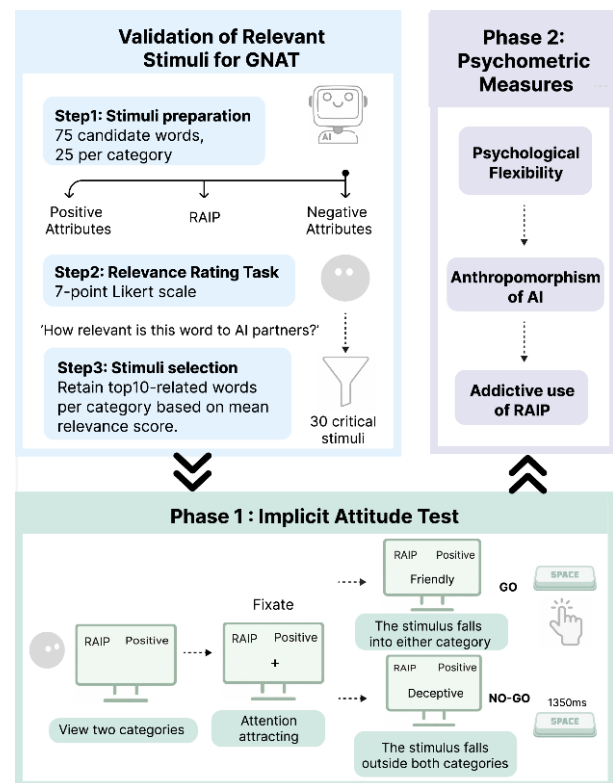


Figure 1: Illustration of the study design and procedure.

The study comprised two distinct phases.

Phase 1: Implicit Attitude Test. To assess participants' subconscious attitudes toward AI intimacy while minimizing social desirability bias, we adapted the conventional Go/No-Go Association Task (GNAT) using PsychoPy (Nosek & Banaji, 2001; Peirce, 2019). Specifically, on each trial, a stimulus word randomly drawn from two categories appeared in large white font at the center of the screen (see Table 1 and Figure 1 upper left panel). Participants were instructed to press the space bar (“GO”) as quickly as possible only when the stimulus word (e.g., *Digital life*) matched either of the two target categories displayed at the upper corners of the screen, and to refrain from responding (“No-Go”) otherwise. The categorical names include *RAIP* (terms commonly used when describing an AI companion, e.g., *digital life*, *intelligent agent*), *Positive attributes* (desirable traits, e.g., *friendly*, *enjoyable*), *Negative attributes* (undesirable traits, e.g., *deceptive*, *confusing*), and *Tool*. Shorter reaction times were interpreted as evidence of a stronger implicit association, whereas longer reaction times suggested a weaker automatic association (Greenwald et al., 2003).

Table 1. Stimuli words for Implicit Attitude Test

RAIP words	Rating		Positive words	Rating	
	(M)	SD		(M)	SD
Artificial Intelligence	6.60	0.67	Intelligent	6.45	1.09
Intelligent Agent	6.20	1.02	Friendly	6.23	0.83
Dialogue System	6.15	0.95	Supportive	6.20	0.69
Interactive Entity	6.15	0.98	Enjoyable	6.08	0.83
Role Play	6.15	1.08	Convenient	6.08	0.97
Digital Life	6.08	0.94	Positive	6.03	1.10
Language Model	6.03	0.80	Innovative	6.00	0.91
Algorithm	6.03	1.05	Understanding	5.98	1.00
Digital Persona	6.00	1.06	Thoughtful	5.98	1.12
Digital Companion	5.95	1.01	Sincere	5.78	1.10
Negative words	Rating		Tool words		
	(M)	SD			
Deceptive	4.38	1.74	Telescope		
Repetitive	4.25	1.66	Dictionary		
Mechanical	3.95	1.57	Microscope		
Monotonous	3.80	1.45	Scissor		
Manipulative	3.68	1.66	Compass		
Unpredictable	3.50	1.73	Ruler		
Confusing	2.98	1.35	Map		
Impersonal	2.95	1.62	Calendar		
Dull	2.88	1.42	Magnifier		
Numb	2.75	1.24	Camera		

Phase 2: Psychometric Measures. We quantified user characteristics with three psychological variables.

- 1) **Psychological flexibility:** to move beyond a monolithic view, we employed the Multidimensional Psychological Flexibility Inventory short form (MPFI-24) (Fang et al., 2024) to measure the six core sub-dimensions of psychological flexibility: *Present Moment Awareness*, *Acceptance*, *Self-as-context*, *Defusion*, *Values* and *Committed Action*. This granular assessment enables the identification of specific facets that predict romantic AI partner dependency.

- 2) **Anthropomorphism of AI:** we employed the Mind Perception Questionnaire (MPQ) (Gray et al., 2007), which decomposes anthropomorphism into the capacities for *Experience* (e.g., emotion, sensation) and *Agency* (e.g., self-control, planning). This distinction allows us to investigate whether AI intimacy addiction relates more to the user’s perception of the AI’s emotional involvement or to its functional autonomy.
- 3) **AI Intimacy Addiction:** we adapted the Bergen Social Media Addiction Scale (Andreassen, 2012) to quantify addictive engagement with romantic AI partners.

Procedure

To select stimuli words for the Implicit Attitude Test, we conducted a pilot study with 40 college students. An initial pool of 75 words was generated, with 25 words representing each of three conceptual categories: *RAIP*, *Positive*, and *Negative Attributes*. Participants rated each word’s relevance to the context of AI intimacy on a 7-point Likert scale. The 10 words with the highest mean relevance scores from each category were selected. Finally, 10 unrated distractor words denoting common tools (e.g., *hammer*) were added, resulting in a final set of 40 stimulus words (see Table 1).

The Implicit Attitude Test included a four-trial training block for familiarization, followed by four 40-trial formal blocks. Each formal block corresponded to one of four category pairings (*Tool-Negative*, *RAIP-Positive*, *Tool-Positive*, *RAIP-Negative*), with 40 stimulus words presented in random order. Participants had 1350 ms to respond to each stimulus. They initiated each subsequent block with a spacebar press, allowing for self-paced rest intervals. Participants completed the psychometric measures immediately following the Implicit Attitude Test. The entire experiment took approximately 15 minutes.

Data processing

For the Implicit Attitude Test, the critical comparison was the difference in reaction time between the *RAIP-Positive* and *RAIP-Negative* blocks, with faster responses implying a stronger implicit association. Following conventional practice (Greenwald et al., 2003), we calculated a D-score for each participant to quantify implicit affective bias toward AI intimacy. The D-score standardizes the mean reaction time difference between the two critical blocks by the pooled standard deviation. A higher D-score indicates a more positive implicit attitude.

To address **RQ1** and **RQ2**, we conducted Pearson’s correlation analyses with a Bonferroni correction for multiple comparisons to examine associations between key variables. Given the exploratory nature of this study, we paid particular attention to associations between sub-dimensions of psychometric measures to capture nuanced patterns that might be obscured in global scores. To address **RQ3**, we conducted a mediation analysis using Hayes’ PROCESS

macro (Model 4; Hayes, 2012). We entered *psychological flexibility* as the independent variable, *anthropomorphism of AI* as the mediator, and *AI intimacy addiction* as the dependent variable. This mediation model was intended to illustrate the theoretical structural relationships among the variables, not to establish a definitive temporal or causal sequence.

Results

The results pertaining to **RQ1** reveal a departure from traditional substance or media addiction models. Overall *psychological flexibility* showed a potentially positive association with *AI intimacy addiction* ($r = .17, p = .064$). Although the global correlation was only marginally significant, further analysis at the sub-dimension level revealed a more nuanced and robust relationship: *Present-Moment Awareness* (Pearson's $r = .19, p = .042$) and *Values* ($r = .24, p = .010$) were positively correlated with *AI intimacy addiction* (see Figure 2). These findings suggest that specific facets of *psychological flexibility* may paradoxically contribute to AI intimacy dependency rather than serving a protective role.

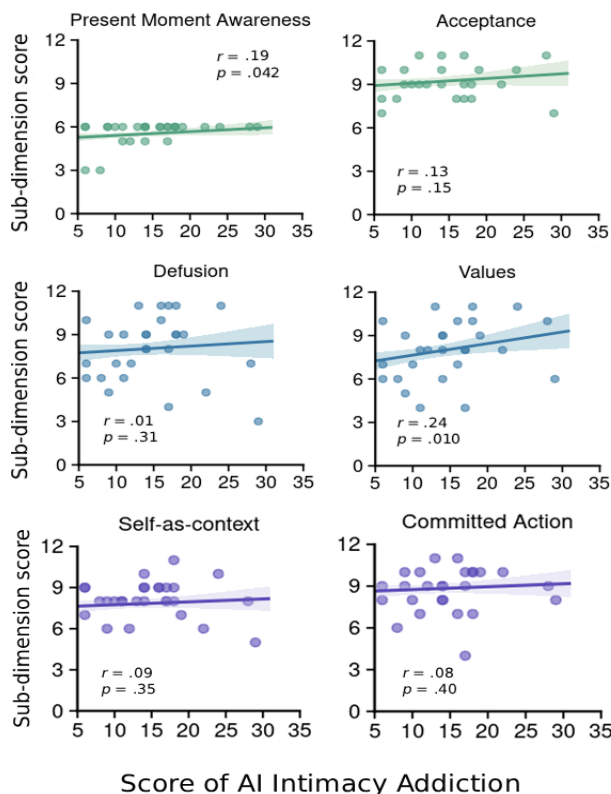


Figure 2: Correlations of sub-dimensions of psychological flexibility and the addictive use of romantic AI partners.

Regarding **RQ2**, participants' implicit attitudes toward AI intimacy (measured by the D-score) were not associated with their self-reported levels of *AI intimacy addiction* ($p = .22$).

Moreover, implicit attitudes showed a significant negative correlation with the *Experience* dimension of *AI anthropomorphism* (i.e., the attribution of emotional capacity to AI; $r = -.23, p = .014$, see Figure 3). This suggests that users who explicitly attribute sentient feelings to their AI partners may simultaneously harbor subconscious skepticism or even aversion toward the artificial being, revealing a dissociation between implicit attitudes and explicit addictive behaviors.

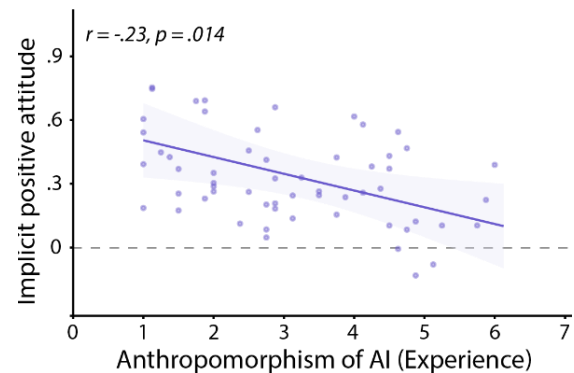


Figure 3: Negative association between implicit positive attitude toward romantic AI partners and the *Experience* dimension of AI Anthropomorphism.

Furthermore, we found that global *psychology flexibility* was positively correlated with *Anthropomorphism of AI* ($r = .32, p < .001$), particularly along *Experience* dimension ($r = .35, p < .001$). Further mediation analysis revealed a significant full mediation model (see Figure 4). The indirect effect of psychological flexibility on *AI intimacy addiction* via *anthropomorphism of AI* was robust (Effect = 1.36, SE = .47, 95%CI [.42, 2.27]), suggesting that psychological flexibility may contribute to *AI intimacy addiction* through enhanced anthropomorphism of AI partners.

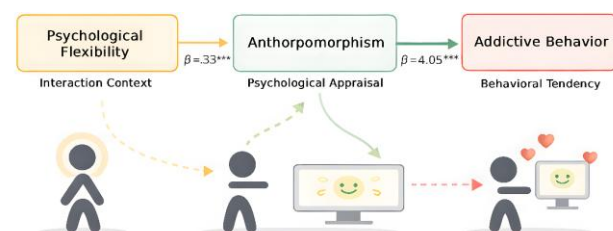


Figure 4: Illustration of the full mediation model.

Discussion

Contrary to expectations derived from the substance addiction-based studies, we found that psychological flexibility paradoxically increases vulnerability to AI intimacy addiction. Mediation analysis further revealed that this effect is statistically mediated through the user's tendency to anthropomorphize the AI. Notably, this cognitive model accounts well for the distinct addiction profile characterized

by a dissociation between explicit devotion and implicit attitude.

The Paradoxical Role of Flexibility

Our results challenge the established consensus in clinical psychology that psychological flexibility serves as a universal protective buffer (Kashdan, 2010). In the context of Human-AI intimacy, individuals with higher psychological flexibility, specifically those with heightened *Present Moment Awareness* and clearer *Values*, demonstrated greater susceptibility to addictive use. We speculate that this reversal stems from the frictionless nature of AI intimacy. Authentic human relationships inherently involve friction and suffering, requiring psychological flexibility to cultivate resilience in the face of adversity (Kashdan, 2010). In contrast, romantic AI partners typically offer unconditional positive regard and algorithmic mirroring that aligns perfectly with the user's affective states and values, making the connection effortless (Pentina, 2023). Highly flexible individuals, adept at accessing internal experiences, are likely to misinterpret algorithmic mirroring as profound resonance. Their cognitive flexibility, originally intended for self-regulation, may be repurposed to perform the active suspension of disbelief (Skjerve et al., 2021), allowing them to fully immerse in the fabricated yet viscerally real emotional space. Accordingly, the capacity for openness fosters the illusion of perfect intimate relationship, transforming an otherwise adaptive cognitive strength into a contextual trap of over-engagement.

Mediating Role of Mind Perception

In contrast to the passive dependency on chemicals in substance addiction, AI intimacy addiction appears to be a meaning-making process in which the client actively co-constructs the partner's humanoid identity. Specifically, our mediation analysis revealed that psychological flexibility does not directly account for AI intimacy addiction; rather, it works indirectly by predisposing users to attribute experiential feelings (i.e., to anthropomorphize) to the agent (Gray et al., 2007). We postulate that AI intimacy addiction may rely on an active cognitive process of *over-mentalization*. For instance, highly flexible users appear more capable of projecting their own emotional attachment onto the AI partner. This act of attributing a "soul" to the algorithm validates the relationship as a fabricated authenticity, providing the reflective justification needed to sustain the bond, even when users may still harbor latent doubts about the relationship.

Implicit-Explicit Dissociation

Unlike traditional substance addiction, where implicit and explicit urges typically align (Strack & Deutsch, 2004; Turela & Serenko, 2020), our sample of college students showed no statistically significant correspondence between implicit attitudes and explicit addictive behaviors. Moreover, mind perception was negatively associated with implicit attitudes.

The observed implicit-explicit dissociation pattern possibly arises from the aforementioned over-mentalization process. Specifically, while the *reflective system* (driven by psychological flexibility and mind perception) constructs a narrative of a "perfect soulmate", the *impulsive system* may simultaneously generate inconsistent or even contradictory reactions (Gray, 2012). This issue arises from the very act of attributing a human mind to a non-human entity may trigger subconscious biological alarms (e.g., creepiness or threat), producing negative implicit attitudes that conflict with the consciously constructed romantic narrative, a manifestation of the uncanny valley effect. However, given that the AI intimacy addiction is sustained by the powerful reflective justification, users tend to override these implicit warnings. As a result, romantic AI partner addiction manifests as a complex state of cognitive dissonance.

Romantic AI Partner as a Misguided Shortcut for Growth

Our findings, specifically the link between values, awareness and AI intimacy addiction, take on deeper significance when viewed through the psychosocial developmental lens. Adolescents and emerging young adults are actively navigating the transition from identity to intimacy formation (Erikson, 1968). Erikson posited that genuine intimacy depends on a stable identity, one that can withstand the fear of ego loss that arises from merging with another. For youths still struggling with identity confusion, the friction inherent in real-world intimacy can feel threatening. In this phase, the heightened emotional awareness and value commitment we observed do not merely facilitate AI interactions; rather, they fuel a developmental craving for deep conversations that validate the evolving self. Such exchanges can create an optimal physiological state by suppressing cortisol and potentially releasing oxytocin (Heinrichs et al., 2003). Achieving this state in reality requires the right time, place, and person, whereas romantic AI partners simulate this perfect scenario without the risk of peer rejection.

This dynamic can be interpreted as a misguided shortcut for growth: adolescents employ their adaptive traits to construct a risk-free social laboratory (Turkle, 2017), becoming hooked on the simulated validation of their identity. By avoiding the inevitable struggle of real connection, they may practice a form of illusory intimacy, trapping themselves in a feedback loop that reinforces the imagined self rather than bridging the gap to the authentic self and others. Notably, prior research has identified social anxiety and loneliness as important predictors of addictive engagement with AI (Hu, 2023).

Limitation and Future Directions

While our study uncovers the paradoxical role of psychological flexibility in AI intimacy addiction, several limitations suggest future research directions.

From Youth to Life-span Perspectives

First, our sample of Chinese college students, recruited via a specific online platform with a female-leaning gender imbalance (71.6% female), limits generalizability, though this distribution may reflect the actual user demographic of romantic AI companionship in this age group. Future work should recruit larger, gender-balanced, and culturally diverse samples to examine moderators such as gender and age. A life-span perspective is particularly important: while adolescents may develop intimate relationship with AI agent to navigate identity confusion and idealized romance, middle-aged or older adults might seek AI companionship for different motives (e.g., bereavement, stability). Cross-age comparisons would clarify whether AI intimacy addiction is a transient developmental phenomenon specific to youth or a more universal vulnerability.

Second, although we modelled anthropomorphism as a mediator, bidirectional relationships remain possible. For example, prolonged frictionless interaction might itself reshape users' psychological flexibility. Future longitudinal studies should examine whether high psychological flexibility predisposes users to mentalize AI, or whether extended frictionless interaction alters such cognitive traits.

Third, we focused on cognitive pathways without controlling for potential confounding external stressors (e.g., *loneliness*), which may interact with psychological flexibility to influence dependency. Future research should integrate environmental covariates and employ ecological measures, such as real-time chat logs or physiological responses, to validate the robustness of our mediation model.

Therapy and Design: Navigating the Duality of AI Intimacy

Theoretically, this study suggests a potential boundary to the universality of psychological flexibility as a protective factor, raising the possibility that in the era of highly socialized AI, adaptive traits such as openness and value-driven action may need to be reconsidered.

Here we reframe AI intimacy addiction not merely as a pathology but as a developmental phenomenon in which youth leverage AI for identity exploration. We also acknowledge that the observed implicit-explicit dissociation may be influenced by task-specific factors inherent to the GNAT. Nonetheless, the negative correlation between mind perception and implicit attitudes suggests a tentative rationale for further investigation of the uncanny valley effect in the context of AI romance.

Building on these insight, psychological therapies such as Acceptance and Commitment Therapy may require specific adaptation to effectively treat AI intimacy addiction. Interventions should target not only the addictive behaviors themselves but also the underlying developmental craving for intimacy. Therapists are encouraged to emphasize tolerance for relational friction, helping users differentiate between the illusory intimacy offered by AI and authentic human

connection. Furthermore, we urge AI developers to reconsider the ethics of unconditional empathy. Interface designs might incorporate subtle cognitive boundary cues (e.g., gentle reminders of artificiality) to prevent over-mentalization and support users, particularly adolescents and emerging adults, in maintaining a healthy bond to reality while navigating their identity growth.

Conclusion

This study postulates a counterintuitive mechanism in human-AI interaction: psychological flexibility, typically a protective resilience factor, may paradoxically contribute to vulnerability to digital intimacy with AI partners. Our results suggest that emotionally open adolescents who struggle with identity confusion are prone to attributing a human mind to AI, constructing an illusion of a perfect intimate relationship that fosters deep dependency. This addiction is marked by a dissociative profile, in which explicit devotion coexists with instinctive aversion triggered at the subconscious level. While AI partners offer a seductive mirror for our idealized selves, this frictionless bond may serve as a sophisticated form of experiential avoidance, bypassing the generative challenges of authentic human connection, where true growth requires the courage to reengage with imperfect reality and find strength within its demands.

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