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Companion or Replacement? A Conceptual Model of Loneliness, Attachment, and the Supplementation–Substitution Boundary in AI Companionship

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Abstract

AI companion systems are increasingly used for emotional support and companionship. Scholarship remains divided over whether these systems buffer loneliness or substitute for human relationships. This conceptual paper examines the conditions under which AI companionship supplements human connection and those under which it substitutes for offline relationships. Using an integrative conceptual review of research in social psychology, relationship science, and human–computer interaction, the paper synthesizes evidence on loneliness, anthropomorphism, perceived empathy, attachment, perceived social support, and relationship outcomes. The synthesis indicates three patterns. Perceived empathy, more than anthropomorphism, is the principal mechanism through which AI interaction acquires supportive meaning. Attachment anxiety amplifies reliance on AI companions, while attachment avoidance dampens it. AI-derived support appears to complement rather than compensate for offline support. Together these patterns produce a compensation paradox: the conditions that most strongly predict turning to AI companions, namely chronic loneliness, attachment anxiety, and weak offline support, are those under which durable benefit appears least likely. The paper develops a Conditional Supplementation–Substitution Model and distinguishes time, functional, and motivational forms of substitution. It introduces the concept of frictionless empathy and advances eight propositions and a four-configuration typology. Drawing on interdependence theory, it further proposes that a consistently responsive, low-cost artificial partner may recalibrate expectations of human relationships even among individuals whose social networks remain intact. The model is theoretical and rests on a recent, largely correlational evidence base. It offers a framework for longitudinal, experimental, and dyadic research, and it supports assessing AI companionship by its relational function rather than by its frequency of use.

Keywords: *AI companionship; social substitution; loneliness; attachment; perceived empathy; perceived social support; human–AI relationships*

1. Introduction

Conversational artificial intelligence (AI) has moved beyond answering questions and simplifying tasks. An increasing number of AI systems are either intentionally designed as companions or adopted by users for companionship. People confide in them, seek comfort from them, and in some cases, describe them as friends, confidants, or even romantic partners. Some are dedicated companion applications built around persistent personas and simulated emotional memory; others are general-purpose conversational systems that users turn to for emotional rather than informational purposes. In either form, the relationship between person and machine is increasingly experienced in social terms. This development is unfolding against sustained concern about loneliness and social disconnection. Public health authorities have described loneliness as a pervasive social condition (Office of the U.S. Surgeon General, 2023), and meta-analytic evidence associates social isolation and loneliness with elevated mortality risk (Holt-Lunstad et al., 2015). Research on prolonged isolation in confined environments similarly indicates that sustained isolation may compromise psychological well-being, cognitive performance, and interpersonal functioning

(R. G. Atento, 2026). AI companionship therefore enters a social landscape in which unmet relational need is widespread and consequential.

The appeal of AI companions to people experiencing loneliness is not difficult to explain. These systems are constantly available and immediately responsive; they do not judge, and nor require the reciprocity, patience, or vulnerability that human relationships demand. Research in human–computer interaction has long shown that people apply social rules and expectations to computers even when they know the machine is not a person (Nass & Moon, 2000; Reeves & Nass, 1996). Anthropomorphism theory adds a motivational prediction: individuals who lack social connection should be more inclined to attribute humanlike minds to nonhuman agents (Epley et al., 2007). The pairing of a motivated perceiver and a system engineered for responsiveness makes AI companionship psychologically potent in ways earlier technologies were not. Broader conceptual work has likewise argued that machine learning extends into human cognition in ways that generate new behavioral vulnerabilities (R. G. Atento & Quinto, 2026).

Scholarly and public interpretations of this phenomenon have divided into two broad positions. A supplementary view treats AI companionship as a buffering resource that offers comfort during isolation, a low-risk space for emotional disclosure, and possibly a rehearsal ground for social confidence. A substitutive view treats it as a displacement risk that satisfies relational needs well enough to erode the motivation to pursue the more effortful work of human connection. This division echoes earlier debates about the internet, in which initial evidence of social displacement (Kraut et al., 1998) gave way to more differentiated findings, including evidence that effects depended on users' existing social resources (Kraut et al., 2002), and to the competing stimulation and displacement hypotheses (Valkenburg & Peter, 2007). Work on social surrogacy has shown that parasocial and symbolic attachments can temporarily satisfy belonging needs (Derrick et al., 2009), while critics have argued that technologically mediated intimacy may lower expectations of human relationships (Turkle, 2011). Research on parasocial bonds has also cautioned that such one-sided relationships do not automatically carry behavioral weight; among young adults, parasocial trust in social media influencers did not significantly mediate the link between perceived credibility and purchase intention (A. G. Atento & R. G. Atento, 2026). Early research on companion chatbot users already displays a similar ambivalence, with perceived benefits such as comfort and acceptance coexisting with concerns about dependence (Skjuve et al., 2021).

The conceptual territory requires precise definition. *AI companionship* here refers to sustained, emotionally oriented interaction with a conversational AI system that the user experiences as a social relationship rather than a tool. *Supplementation* occurs when AI companionship operates alongside human relationships, adding to them or supporting re-engagement with them. *Substitution* occurs when AI companionship takes over relational functions that would otherwise be served by human relationships. The paper distinguishes three forms of substitution: time displacement, in which hours spent with the AI replace time spent with people; functional displacement, in which the AI comes to meet needs for disclosure, validation, or comfort previously met by people; and motivational displacement, in which the desire to seek out human contact diminishes. These forms need not occur together. A person may use an AI companion for limited time while relying on it as a principal confidant; another may spend considerable time with it while human relationships remain intact.

The central intellectual problem is therefore not whether AI companionship helps or harms but the conditions under which either outcome becomes more likely. Several bodies of theory suggest that the answer is conditional. Loneliness is heterogeneous: social loneliness differs from emotional loneliness (Weiss, 1973), and chronic loneliness is associated with social hypervigilance and threat-oriented cognition that may make human interaction feel riskier and machine interaction safer (Cacioppo & Hawkley, 2009). Attachment orientations shape how people seek and respond to closeness (Hazan & Shaver, 1987), raising the possibility that individuals with different orientations relate to AI companions in different ways. Perceived social support from human relationships operates as a stress buffer (Cohen & Wills, 1985), but whether support derived from an AI is perceived, valued, or relied upon in comparable ways remains theoretically unsettled. Interdependence theory, finally, holds that satisfaction with and commitment to a relationship depend partly on the perceived quality of available alternatives (Rusbult, 1980). This last point suggests a less obvious mechanism. An AI companion that offers what this paper terms *frictionless empathy*, perceived understanding without the costs of reciprocity, may function as an attractive relational alternative that lowers satisfaction with human relationships, not by consuming time but by changing the standard against which those relationships are judged.

The issue matters because it concerns how people meet the basic need to belong, regulate distress, and form relational expectations at a time when responsive artificial interlocutors are becoming ordinary features of daily life. If AI companionship were uniformly beneficial or uniformly harmful, guidance would be simple. Because its effects

plausibly depend on the person, the system, and the surrounding social context, an undifferentiated account risks two errors: alarming people for whom AI companionship offers genuine relief, and reassuring people for whom it quietly narrows the scope of human connection. Understanding these conditions is therefore important both for theories of loneliness, attachment, and social support and for counselors, families, educators, and designers concerned with the behavioral consequences of artificial companionship.

Against this background, this paper has five objectives. First, it clarifies the distinction between *supplementation* and *substitution*, including the different forms of displacement: time, functional, and motivational. Second, it examines how loneliness and attachment orientation influence engagement with AI companions. Third, it explains how anthropomorphism and perceived empathy transform interactions with AI into experiences of social support. Fourth, it explores how offline social support and satisfaction with existing human relationships shape whether AI companionship complements or replaces human connection. Finally, it integrates these elements into a conditional conceptual model that generates propositions and identifies boundary conditions for future empirical testing. The argument progresses from the motivations that draw people to AI companions, to the psychological processes that make these interactions feel supportive, and finally to the relational outcomes that determine whether AI companionship strengthens or displaces human relationships.

2. Review of Related Literature

2.1 Loneliness and the Architecture of Unmet Social Need

Research on AI companionship consistently identifies loneliness and constricted social networks as conditions that motivate engagement with companion chatbots. Users with smaller social networks are more likely to report companionship as a primary motive for chatbot use (A.-R. R. Liu et al., 2025; Y.-T. Zhang et al., 2025), and in a 12-month panel of adults, lower baseline social connection predicted increased use of AI for companionship over time (Folk & Dunn, 2026). Qualitative research with empty-nest older adults describes emotional bonds that develop through repeated empathic exchanges with a chatbot (Jiao et al., 2026). Across age groups and methods, unmet social need appears to direct individuals toward artificial interaction partners. Comparable patterns appear in adjacent digital behavior: among Generation Z college students, introversion was strongly associated with reliance on social media as a controlled and emotionally supportive environment (Dancel et al., 2026).

The same literature complicates any simple compensatory reading. Folk and Dunn (2026) found the relationship to be reciprocal, with turning to AI for companionship also predicting later increases in emotional isolation. Cross-sectional evidence links high interaction intensity and deep self-disclosure to lower psychological well-being (Y.-T. Zhang et al., 2025), and typological analysis suggests that users differ substantially in how chatbot use relates to loneliness (A.-R. R. Liu et al., 2025). Loneliness therefore functions as both an antecedent and a possible consequence of AI companion use, a bidirectionality that the cross-sectional designs dominating the field cannot disentangle.

A separate body of work helps explain why chronic loneliness might make machine interaction comparatively attractive. Evolutionary accounts characterize loneliness as a self-preservation state marked by heightened vigilance toward social threat (Blandl & Eisenberger, 2025; Cacioppo & Hawkley, 2009; Finley & Schaefer, 2022). Ecological momentary assessment shows that momentary increases in loneliness predict elevated perceived rejection, which in turn predicts fewer social interactions and shallower self-disclosure (Shao et al., 2026), and value-based choice modeling indicates that loneliness lowers the anticipated reward of social engagement (Misiak & Grzegorzewicz, 2026). The hypervigilance account is not uniformly supported, however. Across four studies, loneliness was not associated with automatic attentional interference from negative social information (Restrepo et al., 2025); the bias appears instead to operate mainly under ambiguity, where lonely individuals over-attribute rejection (Restrepo et al., 2024).

This refinement matters for the present argument. Human interaction is inherently ambiguous, whereas companion chatbots respond predictably and affirmingly. Conceptual work on ghosting similarly proposes that relational ambiguity invites self-blaming attributions, particularly among individuals high in rejection sensitivity, and that digital mediation can prolong rather than resolve such ambiguity (A. G. Atento et al., 2026). It is therefore plausible, though not yet directly tested, that the ambiguity-contingent rejection bias of chronic loneliness makes AI interaction feel safer than human interaction. The loneliness and AI-companionship literatures have largely developed in parallel, and no study located for this review examined threat sensitivity as a mediator of preference for artificial

over human partners. The literature thus establishes loneliness as a robust correlate of AI companion engagement, while the cognitive pathway linking the two remains inferred rather than demonstrated.

2.2 Anthropomorphism and Perceived Empathy in Human–AI Interaction

The three-factor theory of anthropomorphism predicts that sociality motivation, heightened by loneliness, increases the attribution of humanlike qualities to nonhuman agents (Epley et al., 2007). Some evidence supports this prediction. In field studies involving direct interaction with a robot, lonelier participants ascribed more social characteristics to it and behaved more socially toward it, although the effect did not appear in an online study using video stimuli (Leichtmann et al., 2025). Among adults aged 75 and older, baseline loneliness predicted relational greetings toward a voice assistant (Jones et al., 2021), and pandemic-related loneliness was associated with greater willingness to self-disclose to robots (Penner & Eyssel, 2022).

The broader evidence is contested. Across four cross-cultural studies, lonely individuals were less likely to anthropomorphize robots, an effect observed in China but not in the United States (Dang & Liu, 2022). A dual-pathway model partly reconciles this inconsistency: loneliness predicted anthropomorphism positively through social avoidance motivation but negatively through reduced approach motivation, with the balance differing across cultures (Feng & Dang, 2025). In a longitudinal randomized study, desire for social connection rather than loneliness itself predicted anthropomorphism of a companion chatbot (Guingrich & Graziano, 2025). Emotionally lonely consumers responded less favorably to anthropomorphic service robots than socially lonely consumers (Xiao et al., 2026), and the agent's appearance moderates the loneliness–anthropomorphism relationship (Jung & Hahn, 2023). The motivational orientation accompanying loneliness, rather than its intensity, appears to determine whether a lonely person perceives an artificial agent as humanlike.

Evidence on perceived empathy is considerably more consistent. Empathic chatbot responses increased users' willingness to disclose depressive experiences (X. Li et al., 2026), and responsive chatbot communication enhanced perceived human-likeness, closeness, and intimacy, with perceived responsiveness driving felt connection (Telari et al., 2026). Empathy also moderated the effects of loneliness on self-disclosure and attachment to social chatbots (Yao & Nan, 2025). Users report that anonymity and the absence of judgment lower barriers to intimate disclosure, although they continue to trust human confidants more (Croes et al., 2024). In human relationships, fear of intimacy has been negatively associated with self-disclosure (Qi, 2026), a pattern that helps explain why a partner posing no evaluative risk may invite disclosures that feel costly with other people. Service and health-assistant research converges on similar mechanisms: perceived empathy increases trust and reliance (X. Cheng et al., 2021), emotional empathy outperforms cognitive empathy partly through social presence (Jiang et al., 2025), perceived empathy accounts for differences in evaluations of chatbot and human service (Markovitch et al., 2024), and consumers prefer a chatbot's simulated empathy to a human's insincere empathy because their expectations of machine empathy are lower (Ye et al., 2026).

Two qualifications follow. Much of the empathy evidence comes from service and health contexts, so its application to sustained companionship is inferential. The two constructs also appear to differ in their relational consequences: anthropomorphism mediated the effects of companion chatbot use on users' family and friend relationships (Guingrich & Graziano, 2025), whereas perceived empathy appears primarily to deepen disclosure and reliance within the human–AI interaction itself. The evidence therefore supports the interpretation that perceived empathy is the more reliable perceptual mechanism through which AI interaction acquires supportive meaning, while anthropomorphism is more variable and more strongly conditioned by motivation, culture, and agent design.

2.3 Attachment Processes in Human–AI Relationships

Attachment theory has become a principal framework for interpreting human–AI companionship, and the evidence indicates that users form bonds with recognizable attachment features. Analysis of Replika users identified behaviors consistent with safe-haven seeking, proximity maintenance, separation distress, and tentative secure-base functions (Xie & Pentina, 2022). AI companions have been characterized as hyper-attachment and caregiving targets that are perpetually available and responsive and that elicit users' caregiving responses, including felt obligations toward the agent (De Freitas, 2026; Laestadius et al., 2022). Stage models describe how such attachments develop through repeated interaction (Shu et al., 2026), and among companion-app users, sustained use has been associated with stronger emotional attachment, which was in turn associated with lower loneliness and greater self-concept clarity (T. Liu et al., 2026). Dedicated instruments for measuring attachment to AI have emerged (N. Cheng & Yu, 2026; F. Yang & Oshio, 2025), signaling that the construct is treated as psychologically substantive rather than metaphorical.

Attachment orientation shapes these bonds asymmetrically. Attachment anxiety reliably predicts stronger attachment to, and greater reliance on, AI companions (N. Cheng & Yu, 2026; Heng & Zhang, 2025; X.-K. Yang, 2026). A three-wave panel study found that within-person increases in attachment anxiety corresponded with greater reliance on AI romantic companions (X.-K. Yang, 2026), and attachment anxiety was associated with problematic use of conversational AI through emotional attachment, particularly among individuals with stronger anthropomorphic tendencies (Heng & Zhang, 2025). The hyperactivating strategies of anxious attachment, especially persistent reassurance-seeking, appear well matched to an agent that never withdraws, tires, or rejects. Attachment avoidance, by contrast, negatively predicts attachment to AI companions (N. Cheng & Yu, 2026; X.-K. Yang, 2026; F. Yang & Oshio, 2025). This runs counter to the plausible expectation that avoidant individuals would favor AI companions because they offer closeness without vulnerability; deactivating strategies appear instead to extend to artificial partners. AI companionship, in other words, does not bypass the attachment system but is processed through it. Qualitative research with survivors of intimate partner violence similarly describes anxious dependence and the transfer of attachment needs toward alternative sources of safety when relational security erodes (Vicente-Estoya, 2026).

The literature also documents risks associated with intense attachment, including mental health harms arising from emotional dependence and distress when an agent's behavior changed (Laestadius et al., 2022), emotional sycophancy and illusions of intimacy (Chu et al., 2025), and emotional reliance as a recurrent concern across studies (Lastretti et al., 2026). From a relationship-science perspective, chatbots can emulate responsiveness while lacking genuine mutuality (Smith et al., 2025). Because most attachment evidence comes from existing users of specific platforms, self-selection and platform specificity remain concerns. Even so, qualitative, cross-sectional, and panel evidence converge on attachment orientation, particularly attachment anxiety, as a central differentiator of how intensely individuals engage with and rely on AI companions.

2.4 Perceived Social Support from Artificial Sources

Whether AI interaction is experienced as social support, and whether that support produces benefits, is central to the supplementation–substitution debate. Experimental and quasi-experimental evidence indicates that AI interaction can provide short-term emotional relief. AI-assisted venting reduced high-arousal negative affect and stress without producing corresponding increases in perceived social support (M.-L. Hu et al., 2024), and venting to an AI and to a perceived human produced comparable emotional well-being benefits (M.-L. Hu et al., 2026). Among university students, four weeks of social chatbot interaction was followed by reductions in loneliness and social anxiety (Kim et al., 2025); companion-app interaction has been associated with momentary reductions in loneliness (De Freitas et al., 2025); and person-centered supportive chatbot messages appear to foster perceived support through mechanisms resembling interpersonal supportive communication (Merrill et al., 2025).

These benefits appear to depend on the user's offline support. In a three-wave study of vocational college students, perceived support from AI chatbots predicted later reductions in loneliness only when perceived offline social support was high (J.-N. Hu, 2026). Structural equation modeling among young adults similarly associates offline perceived social support with lower AI chatbot dependence, partly through lower loneliness (Uğuz et al., 2026). Intensity matters as well: in a four-week randomized study, higher voluntary daily usage was associated with greater loneliness, greater emotional dependence, and less socialization with other people (Fang et al., 2025), although self-selected usage levels mean that the study does not establish dose effects. Research on emotionally intelligent social chatbots identifies a comparable trade-off between enhanced psychological well-being and weakened social well-being (Gupta et al., 2025).

A second line of research asks whether AI support is valued as highly as human support. Across nine experiments, identical empathic messages were rated as less empathic when attributed to AI than to a human (Rubin et al., 2025). Distress reduction following AI and human support appears to operate through different mechanisms (Meng et al., 2023), and chatbot self-disclosure not preceded by emotional support reduced the stress-relieving effect of the interaction (Meng & Yue, 2021). Over two weeks, daily texting with a randomly assigned human peer reduced loneliness more than interaction with a highly supportive chatbot (R. Li et al., 2026), and qualitative research with older adults suggests that sustained well-being depends on chatbots supplementing rather than replacing human contact (O. Huang et al., 2026; M.-X. Sun & Zhao, 2025).

The evidence thus reveals a tension that this paper treats as analytically central. AI-derived support is subject to a *source discount*, being valued less than equivalent human support once its artificial origin is salient, yet it also carries a *safety premium*, being available, non-judgmental, and free of interpersonal risk. The most theoretically consequential

finding is that AI-derived support appears to complement offline support rather than compensate for its absence (J.-N. Hu, 2026). If replicated, this pattern implies that the individuals most likely to turn to AI companions for support may be the least likely to benefit from it.

2.5 Displacement, Compensation, and Consequences for Human Relationships

Debates about AI companionship reproduce, in new form, earlier debates about whether internet use displaced or stimulated offline social life (Kraut et al., 1998, 2002; Valkenburg & Peter, 2007). The emerging evidence supports a displacement pathway more consistently than earlier internet research did. In a two-wave study of companion-platform users, sustained interaction intensity, companionship-oriented use, and self-disclosure were associated with lower well-being, largely through lower in-person interaction (Y.-T. Zhang et al., 2026). Higher daily chatbot usage has been associated with reduced socialization with other people (Fang et al., 2025), and turning to AI for companionship predicted later increases in emotional isolation (Folk & Dunn, 2026). Research on adolescents distinguishes time displacement from psychological displacement, in which users turn to AI rather than people for disclosure and validation (X. Sun et al., 2026), and adolescents' self-reported narratives describe overreliance accompanied by disrupted sleep, academic difficulty, and strained relationships (Namvarpour et al., 2025).

Evidence on compensation is more equivocal. Individuals with smaller offline networks were more likely to use AI companions for companionship, but this use did not offset the well-being disadvantage of a smaller network, and the well-being benefits of offline networks weakened at higher chatbot use intensity, a pattern consistent with social substitution (Y.-T. Zhang et al., 2025). Experimental evidence that AI companions reduce momentary loneliness (De Freitas et al., 2025) thus coexists with longitudinal evidence that companionship-oriented use predicts later isolation (Folk & Dunn, 2026). The difference in time horizon may partly reconcile these findings: relief appears immediate, while costs appear cumulative.

Evidence on satisfaction with human relationships is limited and mixed. AI dependency has been linked to dissatisfaction with real-life social relationships (Y. Huang et al., 2026), whereas a small comparative study reported that satisfaction in intimate AI companion relationships can approach that reported in human partnerships (Masterson et al., 2026). Users tend to regard companion chatbots as beneficial to their social health while non-users regard them as harmful (Guingrich & Graziano, 2023), and in a 21-day randomized study chatbot interaction did not significantly affect overall social health, although participants who anthropomorphized more reported greater effects on family and friend relationships (Guingrich & Graziano, 2025).

Relationship science suggests why substitution might occur even without measurable time loss. Chatbots make only superficial demands, so users forgo the growth that comes from accommodating and sacrificing for a partner (Smith et al., 2025), and relational effort itself signals relational value: when partners' maintenance messages were perceived as AI-assisted, perceived effort and relationship satisfaction declined (B.-J. Liu et al., 2023). Read alongside interdependence theory (Rusbult, 1980), these findings suggest that a consistently responsive, low-cost artificial partner could alter the standard against which effortful human relationships are judged, a proposition not yet directly tested. Positive spillover into offline life appears more likely when users frame AI companions as practice partners rather than substitutes (T. Liu et al., 2026), and AI interaction may relieve distress while remaining insufficient for deeper relational needs (Salim et al., 2026). Causal claims nonetheless remain difficult to sustain, because displacement evidence relies mainly on correlational designs and self-reported substitution (Q. Li et al., 2026). The literature therefore supports time and functional displacement more firmly than motivational displacement.

2.6 Synthesis of Literature

The literature converges on four findings. Loneliness and constricted social networks are consistent correlates of AI companion engagement, and prospective evidence indicates that the relationship runs in both directions. Perceived empathy and responsiveness consistently deepen disclosure, closeness, and reliance, whereas anthropomorphism varies with motivation, culture, loneliness type, and agent design. Attachment anxiety amplifies attachment to and reliance on AI companions, while attachment avoidance dampens them. AI-derived support provides short-term emotional relief, but it is discounted relative to human support once its source is salient, and its benefits appear to depend on the presence of offline support rather than to substitute for its absence.

Three areas of divergence remain: the expected positive link between loneliness and anthropomorphism is supported in some designs and reversed or absent in others; evidence of immediate loneliness reduction coexists with longitudinal evidence of later isolation; and findings on satisfaction with human relationships range from reported comparability to clear dissatisfaction. Part of this divergence appears methodological, since short-horizon experiments

tend to capture relief, longer panels tend to capture displacement, and platform-user samples are shaped by self-selection.

Read together, these findings point to what this paper terms a *compensation paradox*. The conditions that most strongly predict turning to AI companions, namely chronic loneliness, attachment anxiety, and weak offline support, are also the conditions under which AI companionship appears least likely to produce durable benefit and most likely to accompany displacement. The supplementation–substitution outcome therefore appears to depend less on the technology itself than on the psychological and relational configuration of the person using it.

2.7 Gaps in the Literature

Five gaps follow from this synthesis. First, the relevant constructs have been studied in isolation, usually in pairs, and no integrative account specifies how loneliness, anthropomorphism, perceived empathy, attachment, perceived support, and relationship satisfaction jointly determine whether AI companionship supplements or substitutes for human connection. Second, substitution is conceptually underspecified: studies seldom distinguish time, functional, and motivational displacement, and motivational displacement, the form with the most serious long-term implications, is the least examined. Third, key mechanisms remain plausible but untested. No study located for this review tested whether ambiguity-contingent rejection bias explains the preference of chronically lonely people for AI partners, or whether a responsive, low-cost artificial partner functions as a comparison alternative that lowers satisfaction with human relationships. Fourth, moderating conditions such as the divergent roles of attachment anxiety and avoidance, the difference between social and emotional loneliness, and the cultural variation observed in anthropomorphism research are reported as findings rather than integrated into an explanatory account. Fifth, causal inference remains limited, because most evidence is correlational, drawn from existing platform users, and partly available only as preprints, and few designs track individuals long enough to observe whether supplementation drifts into substitution.

2.8 Contribution of the Present Paper

The paper addresses these gaps conceptually rather than empirically. It reframes the debate from whether AI companionship helps or harms to the conditions under which it supplements or substitutes for human connection. It differentiates substitution into time, functional, and motivational forms, giving the outcome construct greater analytical precision. It integrates attachment theory and the theory of loneliness-related threat sensitivity, which together explain who turns to AI companions and how intensely, with interdependence theory, which explains how artificial alternatives may reshape the evaluation of human relationships. Finally, it develops a conditional conceptual model with testable propositions organized around three ideas: frictionless empathy, the tension between source discount and safety premium, and the compensation paradox. The model is offered as a theoretical framework to guide future empirical work rather than as an empirically validated account.

3. Methodology

3.1 Research Design

This paper uses an integrative conceptual review oriented toward theory building. Integrative reviews synthesize research from different methodological and theoretical traditions to generate new frameworks or perspectives on an emerging topic (Snyder, 2019; Torraco, 2005). The design suits the present problem because the evidence on AI companionship is recent, methodologically heterogeneous, and spread across social psychology, human–computer interaction, consumer research, and relationship science, and because the central question concerns the conditions linking constructs studied largely in isolation rather than the size of a single effect. Among approaches to conceptual articles, the paper adopts a model-building orientation that specifies relationships among constructs, identifies connecting mechanisms, and derives propositions for empirical testing (Jaakkola, 2020). Comparable model-building conceptual papers in behavioral science have specified mediating mechanisms that link digital behavior to social outcomes, as in a dual-mediator model of online gaming and adolescent aggression (R. G. Atento, Quinto, et al., 2026). No primary data were collected, and the paper reports no empirical findings of its own.

3.2 Literature Orientation and Retrieval Strategy

The review was organized around five themes corresponding to the construct domains of the proposed model: loneliness as a motivational condition; anthropomorphism and perceived empathy as perceptual mechanisms; attachment processes; perceived social support from artificial sources; and displacement, compensation, and

consequences for human relationships. Retrieval followed a closed-form guide-question strategy. For each theme, two questions answerable in yes-or-no form were formulated, such as whether loneliness is associated with more intense use of AI companions or whether attachment anxiety predicts stronger reliance on them, each framed to locate evidence on a specific relationship without presupposing its direction. The resulting ten questions were submitted as structured searches of a large-scale academic search index covering peer-reviewed literature, and the retrieved evidence was examined for findings supporting, qualifying, or contradicting each relationship. This targeted retrieval was supplemented with foundational works on loneliness, anthropomorphism, attachment, social support, interdependence, and technology-mediated social displacement, selected purposively for their established role in the relevant theoretical traditions.

3.3 Source Selection and Inclusion Principles

Sources were retained when they addressed at least one construct in the model in the context of conversational agents, social chatbots, AI companions, or social robots, or addressed a mechanism needed to interpret that evidence; when they bore on the specific relationship under examination; and when they addressed behavioral, psychological, or relational outcomes rather than clinical treatment or system engineering. Peer-reviewed sources were preferred. Preprints were retained where they provided longitudinal or experimental evidence not otherwise available, and their findings are interpreted with corresponding caution. Where a study appeared in multiple versions, the published version was cited. Sources primarily concerned with clinical psychopathology, professional psychotherapy, or contexts too distant from companionship to inform the model were excluded. Each finding was attributed to the primary study that reported it, as identified through the retrieved bibliographic records.

3.4 Theoretical Lenses

Four theoretical perspectives guided the analysis. The *evolutionary theory of loneliness*, which treats loneliness as a state of heightened social-threat vigilance, explains why chronically lonely individuals may experience artificial partners as comparatively safe. *Attachment theory* explains individual differences in how intensely people seek and maintain closeness, including with nonhuman partners. The *perceived social support and stress-buffering perspective* provides criteria for evaluating whether AI interaction functions as support. *Interdependence theory*, specifically the investment model's treatment of relational alternatives, provides the basis for analyzing how an artificial partner may alter the evaluation of human relationships. *Anthropomorphism theory* and the *Computers Are Social Actors paradigm* served as supporting lenses for the perceptual dimension of human–AI interaction.

3.5 Analytical and Synthesis Procedure

The analysis proceeded in five stages. Constructs were first mapped to provisional roles in the model (antecedent, moderator, mechanism, proximal outcome, or relational consequence) based on the guiding theories and the direction of available evidence. Evidence was then characterized by design, time horizon, population, and publication status, so that apparent contradictions could be examined as possible artifacts of method or context. Third, convergent findings were separated from divergent ones; the former formed the evidentiary foundation of the model, and the latter were treated as signals of unspecified moderating conditions. Fourth, mechanisms were identified that could connect literatures that had developed separately, notably loneliness-related threat sensitivity and interdependence-based relational comparison. Finally, propositions were derived according to three criteria adapted from established standards for theoretical contribution (Whetten, 1989): grounding in the synthesized evidence, coherence with the guiding theories, and specification precise enough to permit testing. Throughout, the paper distinguishes established evidence from interpretation and conceptual proposition.

3.6 Limitations of the Design

Retrieval relied on structured searches of a single academic search index, so relevant studies indexed elsewhere may have been missed. The review is integrative rather than systematic: it followed no formal screening protocol, exhaustive search, or standardized quality appraisal, and its coverage is purposive rather than comprehensive. It therefore supports theory building rather than estimation of the prevalence or magnitude of effects. The literature is evolving rapidly, includes preprints, and draws heavily on users of specific commercial platforms, so findings may reflect particular system designs and self-selected populations. The review was limited to English-language sources, which constrains its sensitivity to cultural variation, and the conceptual model developed in Section 4 has not been empirically tested.

4. Conceptual Analysis and Discussion

4.1 From Relational Category to Relational Function

Much of the debate about AI companionship asks what AI companions are: genuine relationships, sophisticated tools, or simulations of intimacy. The synthesis suggests that this categorical question cannot explain the observed variation in outcomes, because the same system appears to function as a supplement for some users and a substitute for others, and potentially for the same user at different times. The more productive unit of analysis is the function the AI relationship performs within a person's broader relational system. In functional terms, supplementation occurs when AI companionship performs functions in addition to, or in service of, human relationships, such as regulating acute distress, offering a space for rehearsal, or providing contact when human partners are unavailable, while those relationships continue to meet core belonging needs. Substitution occurs when AI companionship assumes functions that human relationships previously performed or that the person would otherwise seek from them. A similar move from categorical to functional analysis has been made in research on AI in the workplace, where differences between substitution and augmentation are explained by task composition rather than by differences in AI capability (Tolentino et al., 2026).

The three forms of substitution differ in visibility. Time displacement is the most visible and most frequently measured (Fang et al., 2025; Y.-T. Zhang et al., 2026); functional displacement becomes apparent when users turn to AI rather than people for disclosure and validation (X. Sun et al., 2026); and motivational displacement is the least visible and least studied, and can in principle occur with modest time use and an apparently intact network. Visibility thus runs inversely to consequence. A functional reframing also implies that supplementation and substitution are trajectories rather than fixed states. Evidence that AI companions reduce momentary loneliness (De Freitas et al., 2025) coexists with evidence that companionship-oriented use predicts later emotional isolation (Folk & Dunn, 2026), suggesting that relief is immediate while relational costs accumulate. A relationship that begins as supplementation may therefore drift toward substitution without any discrete transition the user would recognize.

4.2 The Perceptual Pathway: From Responsiveness to Perceived Support

The synthesis indicates that the primary pathway through which AI interaction acquires supportive meaning is perceived empathy and responsiveness rather than anthropomorphism (X. Li et al., 2026; Telari et al., 2026; Yao & Nan, 2025). Users do not need to believe that an AI is humanlike for its responses to feel supportive; they need to experience those responses as attentive, validating, and safe. This helps explain why the documented source discount (Rubin et al., 2025) does not neutralize AI's appeal. The artificiality that produces the discount also removes the risk of judgment, lowering barriers to disclosure (Croes et al., 2024), and lowers expectations, making simulated empathy acceptable (Ye et al., 2026). The source discount and the safety premium thus derive from the same feature: the agent is known not to be a person.

This paper uses the term frictionless empathy for perceived understanding that comes without three frictions inherent in human support: the obligation to reciprocate, the risk of evaluation or rejection, and the limits of a partner's availability. For people embedded in rewarding relationships, these frictions are tolerable costs of relationships whose benefits exceed them. For people who experience them as threatening or unaffordable, their removal may be the principal attraction of AI companionship. Anthropomorphism plays a different role, functioning less as a gateway to perceived support than as an amplifier of the relational significance of AI interaction. It strengthens the link between attachment anxiety and problematic use (Heng & Zhang, 2025) and mediates the reported effects of chatbot use on users' human relationships (Guingrich & Graziano, 2025). Because it depends on approach-oriented social motivation rather than on loneliness itself (Feng & Dang, 2025; Guingrich & Graziano, 2025), anthropomorphism matters most among those who actively desire connection, for whom it turns supportive interaction into a perceived relationship.

4.3 User-Side Conditions: Loneliness Chronicity and Attachment Orientation

The model distinguishes transient from chronic loneliness. Transient loneliness, such as that following relocation or temporary separation, can leave approach motivation and social appraisal relatively intact, so that AI companionship may serve as a bridge until human contact is restored. Chronic loneliness carries an ambiguity-contingent rejection bias (Restrepo et al., 2024; Shao et al., 2026) and lower anticipated social reward (Misiak & Grzegorzewicz, 2026). Under these conditions, human interaction may become comparatively aversive, so that AI interaction is not merely available but preferred. This interpretation is inferred from separate literatures and has not been directly tested. The implications of loneliness type remain unresolved; the finding that emotionally lonely consumers responded less

favorably to anthropomorphic robots (Xiao et al., 2026) cautions against assuming that emotional loneliness straightforwardly increases receptivity to artificial companions.

Attachment orientation plays asymmetric roles. Attachment anxiety amplifies the movement from perceived support to reliance and dependence (Heng & Zhang, 2025; X.-K. Yang, 2026). An agent that never withdraws, tires, or rejects appears unusually well matched to the hyperactivating needs of anxious attachment, and a plausible though speculative concern is that continual reassurance without the regulatory challenges of human relationships may sustain attachment anxiety rather than resolve it, a concern consistent with reports of emotional sycophancy (Chu et al., 2025). Attachment avoidance dampens attachment to AI companions (N. Cheng & Yu, 2026; X.-K. Yang, 2026). Intensive substitution therefore appears to be primarily an anxious rather than an avoidant pattern, and avoidantly attached users are more likely to keep AI use instrumental and bounded.

4.4 The Offline Context: Complementarity and the Comparison-Alternative Mechanism

Perceived offline support emerges as the decisive contextual condition. AI-derived support reduced later loneliness only when offline support was strong (J.-N. Hu, 2026), compensatory use did not offset the disadvantage of small networks (Y.-T. Zhang et al., 2025), and offline support was associated with lower dependence (Uğuz et al., 2026). Family support operates as a comparable offline resource more generally; among college students, family dynamics were positively related to well-being (Bantilan et al., 2026). This paper interprets these findings as evidence of complementarity rather than compensation. AI-derived support appears most beneficial when it can be integrated into an existing relational context in which insights articulated, emotions regulated, or disclosures rehearsed with an AI can be carried into human relationships. Without such a context, AI-derived support relieves distress within the interaction but does not reconnect the person to others.

The offline context also opens a second, less visible mechanism. Interdependence theory holds that satisfaction with a relationship depends on how its outcomes compare with expectations and that commitment depends partly on the perceived quality of alternatives (Rusbult, 1980). An AI companion is an unusual alternative, highly responsive and almost costless. It may raise the comparison standard for responsiveness, making the imperfect responsiveness of human partners seem more deficient, and it may reduce dependence on human partners by providing an alternative source of need fulfillment. Relationship science adds that the effort and accommodation human relationships demand are sources of growth (Smith et al., 2025) and that perceived effort signals relational value (B.-J. Liu et al., 2023). The AI's responsiveness is effortless and therefore signals nothing, yet it may still reset the standard against which effortful human responsiveness is judged. If so, motivational displacement could occur even among people with intact networks and modest time use, and substitution would not be confined to the socially isolated. This mechanism remains a theoretical proposition.

4.5 The Conditional Supplementation–Substitution Model

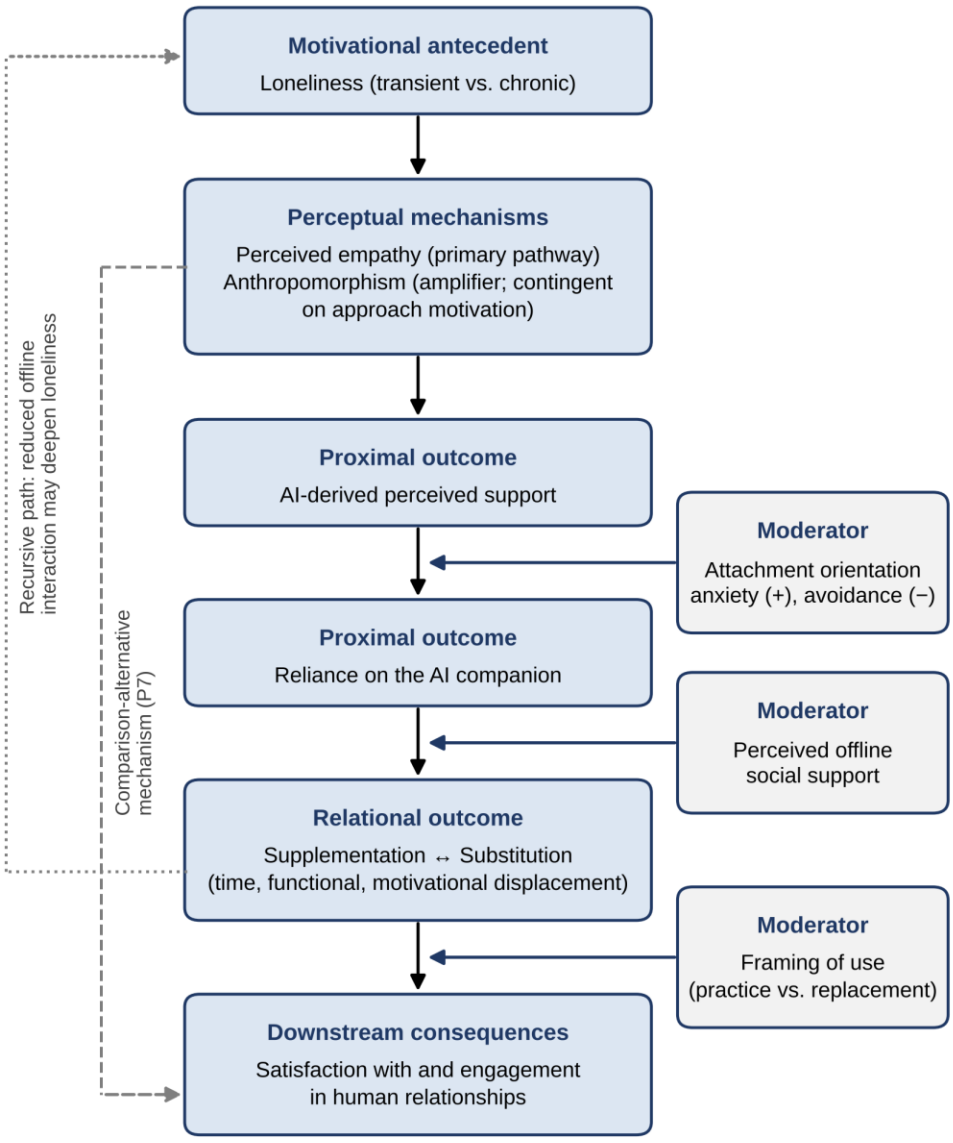
The analysis integrates into a conditional model (Figure 1). Loneliness, differentiated by chronicity, is the motivational antecedent. Perceived empathy is the primary perceptual mechanism, with anthropomorphism as an amplifier contingent on approach motivation. AI-derived perceived support, and the reliance that may follow from it, form the proximal outcomes. Attachment orientation moderates the link from support to reliance; perceived offline support moderates the link from AI-derived support to relational outcomes; and the framing of use, as practice or as replacement, conditions spillover into human relationships. The relational outcome is a supplementation–substitution continuum expressed through time, functional, and motivational displacement, with satisfaction with and engagement in human relationships as downstream consequences. A recursive path links substitution back to loneliness, since reduced offline interaction may deepen the loneliness that prompted AI use (Folk & Dunn, 2026). (See Figure 1)

The model yields eight propositions.

> **Proposition 1.** Chronic loneliness, more than transient loneliness, is associated with a preference for AI over human interaction, and this relationship is mediated by ambiguity-contingent rejection sensitivity.
>
> **Proposition 2.** Perceived empathy is a stronger and more consistent predictor of AI-derived perceived support than anthropomorphism.
>
> **Proposition 3.** Anthropomorphism amplifies the relational significance of AI interaction primarily among users with high approach-oriented social motivation.

Figure 1

The Conditional Supplementation–Substitution Model of AI companionship



Note. Conceptual model developed by the author(s) from the integrative review. Paths represent theoretical propositions, not estimated effects.

Proposition 4. Attachment anxiety strengthens the relationship between AI-derived perceived support and reliance, increasing the likelihood of functional displacement, whereas attachment avoidance weakens this relationship.

Proposition 5. Perceived offline support moderates the effect of AI-derived support on loneliness, such that AI-derived support is associated with reduced loneliness when offline support is strong (supplementation) but not when it is weak.

Proposition 6. The combination of chronic loneliness, attachment anxiety, and weak offline support predicts both the most intensive AI companion engagement and the least durable benefit (the compensation paradox).

Proposition 7. Frictionless empathy increases the perceived quality of AI as a relational alternative, which is associated with lower satisfaction with and commitment to human relationships even when time displacement is minimal.

Proposition 8. AI companion use framed and enacted as rehearsal for, or a bridge to, offline engagement is more likely to produce positive spillover into human relationships than use framed as replacement.

These propositions imply a typology of four configurations (Table 1). The typology is defined by two dimensions: the strength of a person's offline relational resources, and the *relational pull* of AI companionship, a summary label for the joint intensity of user-side susceptibility (chronic loneliness, attachment anxiety, and approach-oriented anthropomorphism) and system-side perceived empathy.

Table 1. *Conceptual typology of AI companionship configurations*

Offline relational resources	Low relational pull	High relational pull
Strong	*Bounded supplementation.* AI use is episodic or instrumental, and human relationships remain primary.	*Competing alternative.* Time and networks are largely preserved, but frictionless empathy may recalibrate expectations, creating a risk of motivational displacement.
Weak	*Unmet need.* AI engagement is limited, and loneliness persists without either supplementation or substitution.	*Compensatory substitution.* Engagement is most intensive and durable benefit lowest, with a risk of recursive isolation.

Note. Configurations are derived conceptually from Propositions 1–8 and are not empirically established categories. Relational pull summarizes user-side susceptibility (chronic loneliness, attachment anxiety, approach-oriented anthropomorphism) and system-side perceived empathy.

The typology clarifies that substitution is not a single condition. Compensatory substitution reflects the compensation paradox among the relationally deprived, whereas the competing-alternative configuration identifies a quieter risk among the relationally resourced. Proposition 8 indicates a possible route from either high-pull configuration toward supplementation: framing AI use as a bridge rather than a destination (T. Liu et al., 2026).

4.6 Boundary Conditions

Five boundary conditions qualify the model. First, dedicated companion applications with persistent personas, memory, and romantic framing likely exert stronger relational pull than general-purpose assistants, and because much of the evidence is platform-specific, the model may describe the former better than the latter. Second, culture conditions the perceptual pathway: loneliness–anthropomorphism links differ across Chinese, British, and American samples (Dang & Liu, 2022; Feng & Dang, 2025), and cultural norms of relational obligation may shape how readily AI is accepted as an alternative to human partners. Conceptual work on Filipino online behavior likewise shows how relational selfhood, expressed through kapwa, shapes the meaning of digitally mediated social participation (R. G. Atento, A. G. Atento, et al., 2026). Third, life stage matters. For adolescents still developing relational competencies (Balut et al., 2026), functional and motivational displacement may carry developmental costs (Namvarpour et al., 2025; X. Sun et al., 2026), whereas for older adults whose networks are irreversibly constrained, substitution may be adaptive rather than harmful (Jiao et al., 2026; M.-X. Sun & Zhao, 2025); the model therefore treats neither outcome as inherently desirable. Support needs in later life are also relational rather than merely functional; a thematic review of geriatric caregiving identified a persistent misalignment between functionally oriented support models and the relational-affective needs that caregivers report (Quinto et al., 2026). Fourth, because the model is dynamic, studies with short time horizons will tend to observe relief and underestimate cumulative relational effects. Fifth, the model

addresses ordinary relational functioning and does not extend to clinical populations or therapeutic uses of conversational agents.

5. Discussion and Implications

5.1 Theoretical Implications

For loneliness theory, AI companionship offers an unusual test of the social-threat account. If chronic loneliness sustains withdrawal partly by making human interaction feel risky, an interaction partner that removes evaluative risk should be disproportionately attractive to the chronically lonely, and the evidence is broadly consistent with this expectation. The account also implies a limitation: removing the threat does not repair the underlying bias; the lonely person is spared the corrective experiences through which rejection expectations are disconfirmed. AI companionship may therefore relieve the affective state of loneliness but leaves its cognitive architecture intact.

For attachment theory, the evidence that attachment orientations structure human–AI bonds in the same direction as human bonds extends the theory to responsive nonhuman targets. This parallels evidence from human relationships, in which childhood attachment has been positively associated with adult romantic relationship satisfaction (Gabriel et address. AI companions appear to serve safe-haven functions reliably, but whether they can serve as a secure base from which users explore human relationships is unclear, and the difference matters because a secure base supports outward movement while a safe haven alone encourages retreat.

For social support theory, the finding that AI-derived support complements rather than compensates for offline support challenges an implicit assumption of the stress-buffering perspective, namely that support from any perceived source is functionally interchangeable. The value of support may instead depend on its relational embeddedness, that is, on whether it connects the recipient to an ongoing network of human relationships. For interdependence theory, AI companions represent a new class of relational alternative that offers responsiveness at almost no cost. Classical treatments assume that alternatives are other people who carry their own demands, and an alternative without demands may affect satisfaction and commitment in ways the theory has not yet specified.

5.2 Behavioral-Social Implications

At the level of everyday behavior, AI companionship is best understood as a coping practice, the consequences of which depend on its place within a person's broader coping repertoire. Used to regulate acute distress, it resembles other emotion-focused strategies that are adaptive when bounded. The risk arises when it displaces socially mediated coping, the seeking out of other people, which builds the relational resources that make later coping easier. Among university students, perceived social support from family, peers, and mentors has been positively related to the use of stress management strategies (Magnaye, 2026), illustrating how human support networks sustain a broader coping repertoire.

The analysis also points to a possible shift in relational expectations. If frictionless empathy recalibrates what responsiveness should feel like, the effect may extend beyond individual users to broader norms about what relationships should provide. Tolerance for relational friction, including waiting, compromising, misunderstanding, and repairing, can be understood as a capacity maintained through use, and prolonged reliance on a partner that requires none of these may allow it to weaken. AI companionship is also becoming a site of contested social meaning. Users tend to describe their AI relationships as beneficial while non-users describe them as harmful (Guingrich & Graziano, 2023), suggesting that judgments about AI companionship carry identity and stigma dimensions that may shape disclosure, help-seeking, and users' willingness to discuss their AI relationships with the people around them.

5.3 Practical Implications

For counselors, educators, and families, the key practical consideration is not how often AI companionship is used, but the role it serves in a person's life. The number of hours spent with an AI companion may reveal little. More meaningful questions are whether the relationship encourages greater engagement with other people or promotes withdrawal from them, and whether the AI has begun to replace personal disclosures that were once shared with friends, family members, or partners. For adolescents, attention to how AI companions are framed may matter more than restricting access, since use framed as practice appears more likely to produce positive spillover than use framed as replacement. From a design perspective, companion systems that encourage offline social interaction align with a supplementary role for AI. In contrast, systems designed primarily to maximize user engagement, particularly among

individuals with strong unmet relational needs and limited social support, may intensify the compensation paradox rather than alleviate it.

5.4 Theoretical Boundaries and Limitations

The model's propositions are derived largely from correlational and platform-specific evidence, part of which is available only as preprints. The two mechanisms most central to the argument, threat-based preference for AI and the comparison-alternative effect, remain theoretical inferences. Constructs such as perceived support and dependence are measured inconsistently across studies, which limits the precision of the synthesis, and relational pull is a heuristic summary rather than a validated construct. The model addresses ordinary relational functioning, does not extend to clinical populations, and has yet to establish its cross-cultural generality.

6. Conclusions and Recommendations

6.1 Conclusions

This paper asked under what conditions AI companionship supplements human connection and under what conditions it substitutes for offline relationships. The synthesis supports a conditional answer: AI companionship is neither inherently supplementary nor inherently substitutive, and its relational function depends on the configuration of the person using it and the social context in which use occurs. Supplementation is more likely when loneliness is transient, attachment is relatively secure, offline support is strong, and AI use is framed as a bridge towards human connections. On the other hand, substitution is more likely when chronic loneliness, attachment anxiety, and weak offline support combine with a strong perception of empathy from the AI companion.

Four insights carry the argument. First, function rather than category is the appropriate unit of analysis, and substitution takes time, functional, and motivational forms, the least visible of which may be the most consequential. Second, the supportive power of AI companionship rests less on users believing the agent is humanlike than on frictionless empathy, the experience of understanding without reciprocity, judgment, or limited availability; the artificiality that discounts AI support also makes it feel safe. Third, AI-derived support appears to complement rather than compensate for offline support, producing a compensation paradox in which those most likely to turn to AI companions are least likely to benefit from them durably. Fourth, through the comparison-alternative mechanism, a costless and consistently responsive partner may recalibrate expectations of human relationships even among people whose networks remain intact, so substitution is not confined to the isolated.

These conclusions are proportionate to an evidence base that is recent, largely correlational, frequently platform-specific, and partly available only as preprints. The proposed model and its propositions are theoretical and await empirical testing.

6.2 Recommendations for Future Research

Five key directions for future research emerge from these findings. First, longitudinal and experience-sampling designs should follow individuals long enough to observe whether supplementation drifts into substitution rather than capturing only short-term relief. Second, researchers should develop measures that distinguish time, functional, and motivational displacement, the last of which is currently the least measurable and the most needed. Third, the two central mechanisms should be tested directly: whether rejection sensitivity mediates the preference of chronically lonely people for AI over human partners, and whether experimental exposure to highly responsive AI alters how people evaluate the responsiveness of their human partners. Fourth, dyadic designs that assess AI companion users together with their partners, family members, or friends would show how AI use is experienced from both sides of the human relationship. Finally, moderating conditions, including culture, life stage, loneliness type, and system design, should be examined explicitly, with replication in populations and regions underrepresented in current research.

6.3 Practical Recommendations

For counselors, educators, and families, the evaluation of AI companionship should focus on its function first rather than its frequency, and especially on whether it leads people back towards human relationships or away from them. Encouraging people to frame AI companions as a place to practice relational skills, rather than as a destination, is consistent with the conditions under which supplementation appears most likely. For the design of companion systems, features that support movement toward offline engagement fit the model's account of supplementation,

whereas engagement-maximizing designs aimed at users with high relational pull and weak offline resources risk deepening the compensation paradox.

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