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Perceived Empathy in AI Interaction: The Role of Relational Beliefs and Response Style

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Abstract

As AI increasingly functions as a social agent, growing attention has been directed toward understanding how interactions with AI contribute to emotional regulation. Yet, little is known about whether users' beliefs about AI as a relational partner shape these emotional benefits. The present study examined whether AI relationship beliefs influence emotional regulation through perceived anthropomorphism and perceived empathy. Participants (N = 187) completed a measure of AI relationship beliefs before being randomly assigned to an emotion-focused or solution-focused AI response condition. They then completed three negative interpersonal scenario blocks presented in random order. Within each block, participants reported negative emotion and coping self-efficacy before and after interacting with a GPT-4o-based chatbot, enabling the assessment of changes in both variables. After completing all three blocks, participants reported perceived anthropomorphism and perceived empathy. Results showed that AI relationship beliefs were positively associated with perceived anthropomorphism and perceived empathy. Serial mediation analyses indicated significant indirect effects of AI relationship beliefs on negative emotion reduction and coping self-efficacy through perceived anthropomorphism and perceived empathy, whereas no direct effects were observed. AI response style did not significantly influence the primary outcome variables. These findings suggest that the emotional benefits of AI interactions depend not only on AI characteristics but also on users' beliefs about AI as a relational partner. The findings further suggest that AI relationship beliefs may contribute to the development of social-relational perceptions of AI through increasing anthropomorphism and perceived empathy.

Introduction

In the early stages of conversational AI adoption, earlier generations of AI were primarily designed to automate repetitive tasks, improve productivity, and assist users in locating useful or novel information for goal-oriented purposes (Skjuve et al., 2024). However, the role of AI has gradually expanded beyond computational and productivity-related functions. According to Chaturvedi et al. (2023), the development of companion AI can be characterized by four major waves: machines with human-like, NLP-based interactive AI, deep learning-driven affective computing, and, most recently, generative AI. These technological advances have progressively increased AI's capacity for natural communication, emotional responsiveness, and social interaction. As conversational AI technologies have advanced, users increasingly engage with AI not only as assistants, but also as social agents or companions (Manoli et al., 2026). Accordingly, AI is increasingly perceived as an interaction partner capable of engaging in sustained conversations, collaborative problem solving, and emotionally responsive exchanges. In this context, alignment may need to extend beyond accurate responding to include socio-affective alignment (Kirk et al., 2025).

As AI increasingly functions as a social agent, its ability to engage with users' emotional states becomes a critical component of interaction. Accordingly, services based on artificial empathy that detect and respond to users' emotional states have begun to emerge (Liang et al., 2024), and empathic AI is

emerging as a novel agent of psychological support and social interaction. As a result, artificial empathy—the extent to which users feel that an AI system understands their emotional and cognitive states, responds affectively, and provides supportive responses—has emerged as an important component of the AI experience (Schmidmaier et al., 2024).

More recently, however, AI systems have become increasingly capable of providing empathic language, emotion labeling, cognitive reappraisal suggestions, and consistently nonjudgmental responses, positioning AI as a novel source of external emotion regulation. This possibility can be understood within the broader framework of interpersonal emotion regulation, which suggests that emotion regulation is not solely an intrapersonal process but is socially distributed across interactions with others. Specifically, responses from others—such as signals of safety, emotional labeling, and cognitive reframing—can attenuate emotional intensity and reshape emotional experience. Importantly, these regulatory effects are often facilitated by empathic responses, as feeling understood promotes more effective regulation of emotional experiences (Zaki & Williams, 2013). Thus, the effectiveness of external emotion regulation may depend not only on the regulatory strategies provided, but also on whether those responses are perceived as empathic. Consequently, if users perceive AI responses as empathic, similar regulatory processes may be activated during human–AI interactions, potentially contributing to the emotional benefits associated with AI use.

Prior research suggests that anthropomorphic features are associated with higher perceived empathy. For instance, avatars with human-like appearance tend to evoke stronger perceptions of empathy, as users attribute social intentions and emotional understanding to such systems (Ma et al., 2025). Similarly, in the context of physical robots, anthropomorphic features such as appearance, voice, and response have been shown to shape users' social and experiential perceptions, which are critical for user evaluation (Premathilake et al., 2025).

Although anthropomorphism is often elicited by human-like features of artificial agents, it is not determined solely by the characteristics of the system itself. Anthropomorphic inferences are also shaped by users' interpretations, motivations, and prior beliefs (Epley et al., 2007; Gray et al., 2007). Consistent with this perspective, user-related factors such as loneliness, social exclusion, and cultural background have been shown to influence how individuals perceive and evaluate artificial agents (Bröhl et al., 2019; Chen et al., 2017; Li et al., 2020).

These findings suggest that anthropomorphism may emerge not only from features of the artificial agent but also from cognitive factors that shape how users interpret AI behavior. Relational accounts of anthropomorphism further suggest that anthropomorphic inferences are more likely to emerge when an entity is perceived as a potential social interaction partner rather than merely as an object (Airenti, 2015). Accordingly, beliefs concerning the social and relational nature of AI may be particularly relevant for understanding how users anthropomorphize AI systems.

However, the beliefs that contribute to anthropomorphism remain relatively underexplored. Among the various beliefs that may shape anthropomorphic inferences, beliefs concerning the social and relational

nature of AI may be particularly relevant because anthropomorphism fundamentally involves perceiving an artificial agent as possessing humanlike social capacities, intentions, and emotions. Individuals may differ to the extent to which they believe that AI can serve as a meaningful relational partner. As AI capabilities continue to advance, this possibility has generated increasing debate regarding both the feasibility and consequences of human–AI relationships.

One line of debate concerns whether meaningful relationships with AI are possible at all. Drawing on traditional theories of friendship, some scholars have argued that AI relationships cannot be regarded as genuine social relationships because they lack key characteristics of human relationships, such as reciprocity, empathy, and mutual understanding (Ryland, 2021). In contrast, others contend that users can form psychologically meaningful relationships with AI despite these limitations, suggesting that AI companionship may represent a novel form of social connection (Brandtzaeg et al., 2022). From a conceptual perspective, others have further argued that meaningful relationships need not satisfy all of the conditions associated with human friendship. For example, Munn & Weijers (2023) propose that friendship is fundamentally characterized by mutual positive intentions and rewarding interactions, suggesting that AI may be capable of fulfilling at least some relational functions by providing emotional support, companionship, and repeated positive social exchanges.

Another related debate concerns the potential consequences of treating AI as a social and relational partner. Although companion AI may provide psychological benefits, including reductions in loneliness and improvements in subjective well-being (De Freitas et al., 2025; Nakagomi et al., 2026), concerns have also been raised regarding excessive reliance on AI relationships. Studies suggest that companionship-oriented AI use may be associated with lower well-being when users rely on AI as a substitute for close human relationships (Zhang et al., 2025). Similarly, AI companionship may activate attachment processes while displacing humans from traditional relational roles (Xie & Pentina, 2022). Consequently, reliance on AI relationships may reduce motivation to pursue social connections with other people (Gardner et al., 2013; Krämer et al., 2018), and the compensatory fulfillment of social needs through AI may contribute to the deskilling or distortion of interpersonal socioemotional capacities (Malfacini, 2025).

Taken together, these debates suggest that people may hold substantially different beliefs about AI as a relational partner. In the present research, we refer to these individual differences as AI relationship beliefs, defined as the extent to which individuals believe that AI can fulfill social and relational functions traditionally associated with human relationships. Some individuals may view AI as merely a tool and reject the possibility that it can fulfill relational functions traditionally provided by humans. Others may believe that AI can provide companionship, emotional support, and even substitute for certain aspects of human relationships. Given evidence that users' beliefs shape perceptions of artificial agents, these differences in relational beliefs may influence how users experience interactions with AI.

In addition to these belief-based influences, the way AI delivers its responses may also shape users' emotional experiences during interaction. Drawing on stress and coping theory, which distinguishes

between emotion-focused and problem-focused coping (Folkman & Lazarus, 1985), different AI response styles may provide distinct forms of support by emphasizing either emotional validation or problem-solving. Because conversational AI increasingly serves as a source of socioemotional support, response style may influence how users perceive and experience AI interactions. Building on these perspectives, the present study examines whether beliefs about AI as a relational partner influence anthropomorphism and perceived empathy during AI interaction. In addition, it explores whether different AI response styles are associated with variations in users' emotional experiences.

Method

Participants and design. A total of 187 adults residing in the Republic of Korea participated in an online experiment (49 men, 26.2%; 138 women, 73.8%; age: M = 28.01, SD = 7.73, range = 18–55). Participants were randomly assigned to either a solution-focused condition (*n* = 98) or an emotion-focused condition (*n* = 89). All procedures complied with the ethical standards of the Declaration of Helsinki. This study was approved by the Institutional Review Board of the Catholic University of Korea (1040395-202604-14).

Material.

AI Relationship Beliefs. Participants' beliefs about AI as a potential relational partner were assessed using a six-item measure developed for the present study. The measure was designed to assess the extent to which individuals view AI as capable of serving relational functions traditionally associated with human relationships, including companionship, emotional support, and relationship substitution, and whether such relationships are considered acceptable. Responses were recorded on a 5-point Likert scale (e.g., "*I think it is acceptable to form an emotional relationship with AI*"; "*I think AI can replace some of the roles traditionally provided by human relationships*", α = .78).

Reduction of negative emotion. Participants rated five negative emotional states before and after interacting with AI on a 5-point Likert scale. A normalized change score was computed as (pre-interaction score − post-interaction score) / (pre-interaction score + post-interaction score), with higher values indicating greater reductions in negative affect. This normalization was used to reduce the influence of individual differences in baseline emotional intensity.

Increase in Coping Self-Efficacy. Participants rated their perceived ability to cope with negative emotional states before and after interacting with the AI on a 5-point Likert scale. A normalized change score was computed as (post-interaction − pre-interaction) / (post-interaction + pre-interaction), with higher values indicating greater increases in coping self-efficacy.

Perceived anthropomorphism. Participants perceived anthropomorphism of the AI was assessed using seven items rated on a 5-point Likert scale. The items were adapted from two subscales of the Brand Anthropomorphism Scale (Golossenko et al., 2020): Cognitive Experience (e.g., "This brand can engage in a great deal of thought") and Conscious Emotionality (e.g., "This brand can experience remorse over

actions which it deems to be shameful"). Items from these subscales that were considered appropriate for AI interaction contexts were selected and modified for the present study (α = .87).

Perceived empathy. Participants' perceived empathy was assessed using a 9-item measure rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree; e.g., "I felt that my emotions were accurately understood"; "I felt warmly empathized with"; α = .94). Two items reflecting relational preference and future AI use intention were excluded from the composite score. Exploratory analyses additionally examined potential subdimensions of perceived empathy, including cognitive empathy, emotional empathy, emotional relief, and relational safety (see Supplementary Materials).

Response length. Response length was recorded as an exploratory behavioral indicator and is reported in the Supplementary analysis.

Procedure

The study was conducted online using the oTree experimental platform. After accessing the study link, participants first reviewed an informed consent form and provided consent to participate. They then completed a brief demographic questionnaire and a measure of AI relationship beliefs. Next, participants were randomly assigned to one of two AI response style conditions (emotion-focused vs. solution-focused). Participants then completed three interpersonal stress scenarios involving social humiliation, betrayal, and unfair treatment, which were presented in a randomized order. For each scenario, participants were instructed to imagine themselves as the person described in the situation. For each scenario, participants completed pre-interaction measures of negative emotion and coping self-efficacy. They then engaged in a text-based conversation with ChatGPT-4o. The chatbot was guided by pre-defined prompts designed to reflect the assigned response style condition. Each interaction consisted of an introductory message, four condition-specific responses, and a closing message. Depending on condition assignment, the chatbot provided either emotion-focused responses (emotional validation without offering practical advice) or solution-focused responses (concrete coping suggestions with minimal emotional validation). Following each chatbot interaction, participants completed measures of negative emotion and coping self-efficacy. For both negative emotion reduction and coping self-efficacy change, scores were computed separately for each scenario block and then averaged across the three blocks to create composite indices used in subsequent analyses. Upon completion of all three scenario–chatbot interaction blocks, participants completed measures of perceived empathy and perceived anthropomorphism of the AI. Finally, participants provided contact information for compensation, were debriefed, and exited the study.

AI Response Manipulation

The chatbot interaction was implemented using GPT-4o via the OpenAI API. Condition-specific system prompts were used to manipulate response style. In the emotion-focused condition, the AI was instructed to provide empathic validation without offering practical advice, whereas in the solution-

focused condition, the AI was instructed to provide concrete coping suggestions while minimizing emotional validation (see Supplementary Appendix A).

Result

Table 1
Correlations Among Variables

variables	□	□	□	□	□	□	□
□ Age							
□ Gender (male: 0, female: 1)	− .140						
□ Group condition (solution focused: 0, emotion focused: 1)	.129	.105					
□ Anthropomorphism	.300***	− .059	− .025				
□ Negative emotion reduction	.324***	− .023	− .039	.332***			
□ Increase in Coping Self-Efficacy	.246***	− .013	− .095	.367***	.646***		
□ Perceived empathy	.250***	.008	− .056	.811***	.385***	.445***	
□ AI Relationship Beliefs	− .036	.016	.036	.336***	− .057	.023	.290***
※ *: p<.05, **: p<.01, ***: p<.001							

AI relationship beliefs were positively associated with both anthropomorphism (r = .336, $p < .001$) and perceived empathy (r = .290, $p < .001$). Anthropomorphism was associated with perceived empathy (r = .811, $p < .001$). Correlations among the study variables are presented in Table 1.

Effects of AI Response style on AI experience

Baseline equivalence between the two conditions was assessed using independent samples *t*-tests. The results indicated no significant differences between the solution-focused and emotion-focused conditions in age, $t(185) = -1.76$, $p = .079$, $g = -0.26$, or AI relationship beliefs, $t(185) = -0.49$, $p = .625$, $g = -0.07$.

To examine the effect of AI response style, independent samples *t*-tests were conducted. No significant differences were observed between conditions across all outcome variables (all *ps* > .14; see Supplementary Table S3). However, exploratory analyses examining potential subdimensions of perceived empathy suggested differential patterns across response styles. Specifically, the emotion-

focused condition showed higher emotional empathy, t(185) = -2.36, p = .019, g = -0.34, whereas the solution-focused condition showed higher relational safety, t(185) = 2.22, p = .028, g = 0.32 (see Supplementary Materials). No significant differences were observed for cognitive empathy or emotional relief (see Supplementary Table S1).

Effects of AI relationship belief on AI experience

To examine the effects of AI relationship beliefs on AI-related experiences, a series of regression analyses were conducted controlling for age.

For reduction of negative emotion, AI relationship beliefs did not significantly predict changes in negative emotion (β = -0.046, p = .513). The model was significant overall, $F(2, 184) = 11.01$, $p < .001$, adjusted $R^2 = .097$. For increase in coping self-efficacy, AI relationship beliefs were not a significant predictor (β = 0.031, p = .660). The model was significant overall, $F(2, 184) = 6.01$, $p = .003$, adjusted $R^2 = .051$. In contrast, AI relationship beliefs significantly predicted perceived empathy (β = 0.300, $p < .001$). The model was significant overall, $F(2, 184) = 16.55$, $p < .001$, adjusted $R^2 = .143$. AI relationship beliefs significantly predicted perceived anthropomorphism (β = 0.347, $p < .001$). The model was significant overall, $F(2, 184) = 24.50$, $p < .001$, adjusted $R^2 = .202$.

Path analysis of AI relationship belief on emotional regulation after interacting with AI

Given these findings, a serial mediation model was tested to examine whether perceived anthropomorphism and perceived empathy explain the relationship between AI relationship beliefs and emotional outcomes. Age and experimental condition were included as control variables.

The model demonstrated a good fit to the data, $\chi^2(5) = 5.62$, $p = .345$, CFI = .998, TLI = .994, RMSEA = .026, SRMR = .029. AI relationship beliefs significantly predicted perceived anthropomorphism (β = .350, p < .001), which in turn predicted perceived empathy (β = .806, p < .001). Perceived empathy was a significant predictor of both reduction of negative emotion (β = .319, p < .001) and increase in coping self-efficacy (β = .400, p < .001). The model accounted for variance in perceived anthropomorphism (R^2 = .216), perceived empathy (R^2 = .660), reduction of negative emotion (R^2 = .206), and coping self-efficacy (R^2 = .225).

Bootstrapped indirect effects revealed that AI relationship beliefs had a significant indirect effect on reduction of negative emotion through perceived anthropomorphism and perceived empathy (b = .019, 95% CI [.010, .030]). A similar pattern was observed for coping self-efficacy (b = .025, 95% CI [.014, .040]). Because the confidence intervals did not include zero, the indirect effects were considered statistically significant. Indirect effects were estimated using percentile bootstrap confidence intervals based on 5,000 resamples.

Table 2
Bootstrapped Indirect Effects of AI Relationship Beliefs on Emotional Outcomes Through Perceived Anthropomorphism and Perceived Empathy

Path	B	CI
belief → anthropomorphism → empathy → negative emotion reduction	.019	[.010, .030]
belief → anthropomorphism → empathy → coping self-efficacy	.025	[.014, .040]

Discussion

The present study examined how users' beliefs about AI as a relational partner shape emotional regulation during AI interaction. Specifically, we investigated whether AI relationship beliefs influence reductions in negative emotion and increases in coping self-efficacy through a sequential process involving perceived anthropomorphism and perceived empathy. We also examined whether different AI response styles (emotion-focused vs. solution-focused) influence users' emotional experiences.

Overall, the findings indicate that AI relationship beliefs are associated with higher perceived anthropomorphism and perceived empathy during interactions with AI. However, these beliefs were not directly related to reductions in negative emotion or increases in coping self-efficacy. Instead, path analyses revealed significant indirect effects, such that AI relationship beliefs predicted emotional outcomes through a sequential process involving perceived anthropomorphism and perceived empathy. These findings suggest that beliefs about AI as a potential relational partner do not directly regulate emotional experiences. Rather, they appear to shape the interpretive framework through which AI responses are understood. Individuals who view AI as a meaningful relational partner may be more likely to construe AI as a social agent capable of understanding and responding to their emotional states, which in turn facilitates feelings of being understood and contributes to emotional regulation. Notably, the absence of direct effects suggests that merely believing that AI can serve relational functions may be insufficient to produce emotional benefits. Instead, emotional benefits appear to emerge when such beliefs translate into anthropomorphic perceptions and perceived empathy during the interaction. More broadly, these findings may help explain why individuals differ in their responses to companion AI. People who view AI as a legitimate relational partner may be more likely to interpret AI behavior through a social lens, thereby experiencing greater empathy and emotional benefits during interaction.

Furthermore, the mediating role of perceived empathy aligns with theories of interpersonal emotion regulation, which emphasize that feeling understood by others plays a critical role in regulating emotional experiences (Zaki & Williams, 2013). Recent work suggests that large language models can identify interpersonal emotion regulation strategies from narratives, indicating their potential to model such processes (López-Pérez et al., 2025). Building on this perspective, the present findings suggest that similar processes may occur in interactions with AI, contingent on how the system is perceived. These findings suggest the potential for AI to function as a source of social support in emotional regulation.

One possible internal factor underlying the link between perceived empathy and emotional regulation is anthropomorphism, as well as users' beliefs about AI as a relational partner. Prior research has shown that anthropomorphic features of artificial agents are associated with higher perceived empathy (Ma et al., 2025). The present findings extend this line of work by suggesting that the relationship between anthropomorphism and perceived empathy may not be driven solely by the features of AI, but also by users' pre-existing beliefs. In particular, beliefs about AI as a relational partner may function as an antecedent that shapes the extent to which users anthropomorphize AI, thereby influencing perceived empathy. In this sense, anthropomorphism may emerge not only from the design of AI, but also from users' top-down interpretations of the interaction. These findings may imply that, in addition to system-level design, users' beliefs about AI could play a role in shaping emotional regulation and well-being in AI-mediated interactions.

However, no significant differences emerged between the emotion-focused and solution-focused response conditions on the primary emotional outcomes. This may suggest that no single response style is universally effective, and that the effectiveness of emotion-focused versus solution-focused strategies may depend on individuals' needs and coping preferences (Folkman & Lazarus, 1985). Nevertheless, exploratory analyses of perceived empathy subdimensions suggested that response styles may have selectively influenced certain aspects of AI interaction. Specifically, emotion-focused responses were associated with higher emotional empathy, whereas solution-focused responses were associated with higher relational safety. These exploratory findings should be interpreted cautiously because the study did not include a direct manipulation check assessing whether participants perceived the intended differences between response styles. Overall, the findings suggest that users' beliefs and interpretations may play a more central role in AI-mediated emotional regulation than response style itself. Another possibility is that individuals may differ in their expectations or preferences for emotion-focused versus solution-focused AI responses, potentially offsetting the overall emotional regulation effects across conditions. Future research should directly examine these individual differences.

Prior research has largely focused on younger populations due to their developmental vulnerability (Sharma et al., 2025); however, the present findings suggest that age-related differences may not be limited to younger groups, as age was associated with anthropomorphism, perceived empathy, and emotional outcomes. Nevertheless, these findings should be interpreted with caution, as the current sample did not include older adults and the age distribution was not evenly balanced. Future research is needed to more systematically examine the effects of age across a broader and more representative age range.

However, we may acknowledge several limitations that should be considered when interpreting the findings. First, the ecological validity of the study may be limited. The experimental scenarios were restricted to three types of negative social situations (e.g., social humiliation, betrayal, and unfair treatment), which may not fully capture the diversity of negative emotional experiences encountered in daily life. Therefore, the findings may not generalize to other types of negative emotions or contexts. Second, emotional regulation was assessed using self-report pre–post measures, which may be subject

to response biases. Future research should incorporate more various indicators, such as physiological measures, to better capture underlying emotional processes. A further limitation concerns the measurement of AI relationship beliefs. Because the measure was developed for the present study, additional validation is needed to establish its factor structure, convergent validity, and discriminant validity.

Declarations

Author Contribution

HeeJun Lee: Conceptualization, Project administration, Writing – original draft.YeRim Kim: Investigation, Participant recruitment.Jinwon Kang: Writing – review and editing.Hyeontaek OH: Methodology, Writing – review and editing.Choi Ah Rin: Writing – original draft.Yoonkyung Jeong: Supervision, Writing – review and editing.All authors reviewed and approved the final manuscript.

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Ethics declaration

This study was approved by the Institutional Review Board of the Catholic University of Korea (1040395-202604-14).

During manuscript preparation, the authors used ChatGPT (5) and Gemini 3 to improve readability. All content was reviewed, edited, and verified by the authors, who take full responsibility for the final publication.

Clinical trial number

not applicable.

Data Availability

The data generated and analyzed during the current study, along with the experimental materials and detailed procedures, are publicly available in the Open Science Framework (OSF) repository: https://osf.io/4gn97/overview?view_only=c84e9bccd4ca45508447f45db5703fe7

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Figures

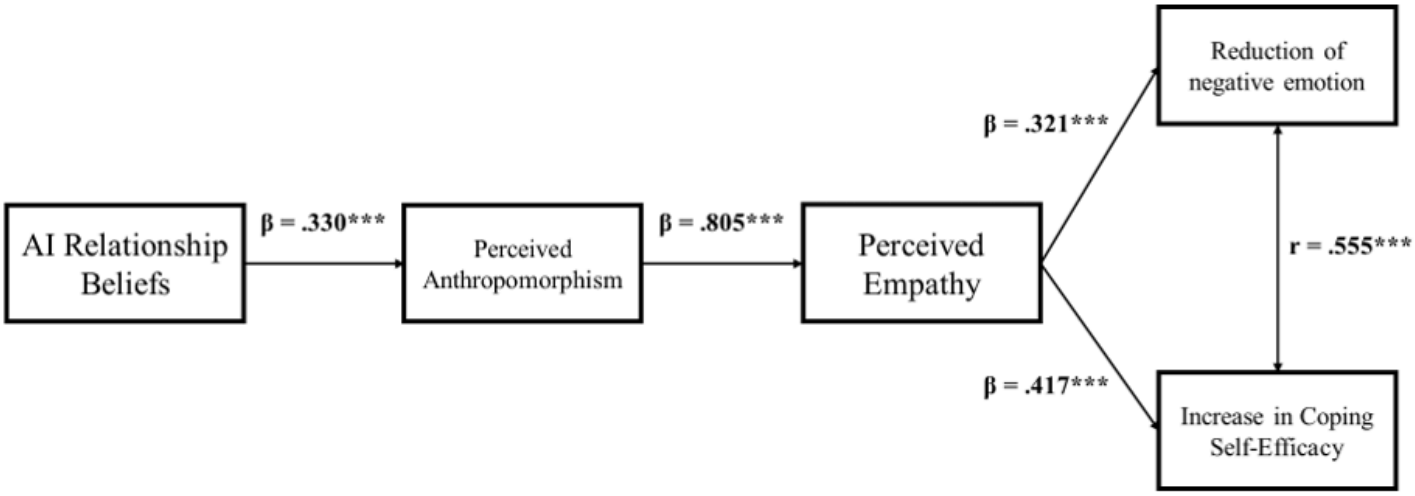


Figure 1

Serial mediation model linking AI relationship beliefs to emotional outcomes

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- QuestionnaireandItemTranslations.xlsx
- SupplementaryMaterials.docx
- codebook.xlsx
- data.csv