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AI COMPANIONS AND LONELINESS IN UNIVERSITY STUDENTS: A PRE-POST EXPERIMENTAL STUDY

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Abstract

Loneliness has emerged as a pressing mental health concern, exacerbated by digitalization and reduced face-to-face social interactions. With the rise of artificial intelligence (AI), particularly chatbots designed for emotional and conversational engagement, this study investigates whether AI companions can mitigate loneliness and potentially serve as substitutes for new human connections. Grounded in Social Presence Theory, Attachment Theory, and the Media Equation Theory, a pre-post within-group experimental research design was employed involving 5 university students aged 20–24 from Okara University. The UCLA Loneliness Scale (Version 3) was used to measure participants' loneliness before and after interaction with the AI companion. Results indicated a reduction in loneliness scores after interacting with the AI companion, suggesting that AI companions may provide meaningful emotional support, though they are not complete substitutes for human interaction. The study provides insights for mental health professionals, educators, and AI developers aiming to integrate digital companions into support systems.

Keywords: *loneliness, AI companions, chatbots, social presence, digital psychology*

Introduction

one in three individuals report feeling persistently lonely, with rates increasing sharply over the past decade (Qualter et al., 2015; Loades et al., 2020). This alarming trend highlights loneliness as a significant public health concern with long-term implications for psychological, social, and academic development. Emerging adulthood, broadly defined as the developmental period between 18 and 28 years of age, is characterized by profound physical, emotional, and social changes (Steinberg, 2014; Brown & Larson, 2009).

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During this critical phase, establishing meaningful peer relationships and developing a sense of belonging are essential for healthy psychological growth. However, despite the promise of social media and other digital communication tools, many young adults experience superficial connections and heightened social comparison, contributing to increased feelings of isolation (Twenge et al., 2019).

The COVID-19 pandemic has further intensified this issue, limited in-person social interactions and increasing reliance on digital platforms, which, while facilitating connection, cannot fully replace the emotional support derived from real human relationships (Loades et al., 2020). In this context, artificial intelligence (AI) companions, including chatbots designed to simulate human conversation and provide emotional support, have emerged as a novel potential intervention (Fitzpatrick et al., 2017; Inkster et al., 2018). These AI systems are increasingly integrated into mental health and social platforms, raising critical questions about their effectiveness in promoting well-being and their potential to substitute for human interaction (Ho et al., 2021).

To understand the role of AI companions Social Presence Theory posits that media vary in their capacity to convey the presence of others, influencing users' perception of social connection (Short, Williams, & Christie, 1976). In the context of AI companions, a higher degree of social presence may lead participants to perceive the chatbot as a more "real" or human. Attachment Theory (Bowlby, 1969; Ainsworth, 1978) highlights humans' innate need to form strong emotional bonds and suggests that individuals may seek comfort and reassurance from consistently available AI companions.
Media Equation Theory further explains that individuals often respond to computers and media as social actors, attributing human-like qualities to AI systems (Reeves & Nass, 1996). Together, these theories provide a comprehensive framework to analyze how AI-mediated interactions may influence feelings of loneliness and social connectedness.

Empirical research offers preliminary support for the therapeutic potential of AI companions. Early studies demonstrated that chatbots delivering cognitive behavioral therapy (CBT) techniques can reduce symptoms of depression and anxiety among adults (Fitzpatrick et al., 2017; Inkster et al., 2018). Young adults similarly perceive AI chatbots as accessible, non-judgmental, and useful for discussing sensitive topics that may be difficult to share with peers or adults (Schroeder et al., 2020; Laranjo et al., 2018). Experimental and quasi-experimental studies reinforce this potential. Ho et al. (2021) found that social support chatbots significantly reduced perceived stress and enhanced social connectedness among university students, while Miner et al. (2020) reported that mindfulness-based chatbot interventions positively influenced mood and anxiety. Systematic reviews also indicate that AI-powered chatbots offer scalable, accessible mental health support, but emphasize the need for rigorous, long-term, and culturally diverse research to establish efficacy (Sorkin et al., 2021).

Despite these advances, key gaps remain, including limited direct comparisons between AI and human interaction, unclear long-term effects, and a reliance on WEIRD samples that restrict cross-cultural generalizability (Sorkin et al., 2021). Many studies rely on self-reported measures, introducing potential bias, while objective tracking of chatbot use remains limited. Addressing these limitations is crucial for assessing the effectiveness of AI companions as interventions for

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loneliness.

This study examines whether AI companions reduce loneliness and function as partial substitutes for human social connections. It is hypothesized that consistent interaction with AI chatbots will lead to decreased self-reported loneliness.

Method

Research Design

This study employed a pre-post within-group experimental research design to examine the effect of AI companion use (chatbots) on loneliness. Participants' loneliness was measured before (pre-test) and after (post-test) interacting with the AI companion.

Participants:

University students aged 18 to 28 years were participated. Participants were recruited using a convenience sampling method from Okara University. A total of 5 students participated in this study. Their demographic details were as follows:

1. Female, 20 years old, Undergraduate
2. Male, 24 years old, Graduate
3. Male, 22 years old, Undergraduate
4. Female, 21 years old, Undergraduate
5. Female, 23 years old, Undergraduate

The sample consisted of 5 university students aged 20–24 years. Three participants were female and two were male. Four were undergraduate students and one was a graduate student.

Measures

UCLA loneliness Scale (Version 3)

The UCLA Loneliness 10 items rated on a 4-point Likert scale ranging from 1 (Never) to 4 (Often) scale (Version 3) was used to assess subjective loneliness. Both positive and negatively worded items were included, and reverse scoring was applied where appropriate. The scale was administered before and after interacting with the AI companion to measure changes in loneliness.

Ethical Considerations

The study adhered to ethical guidelines for research involving human participants and was approved by the relevant Institutional Review Board (IRB). Key ethical considerations included: Participants provided written informed consent outlining the study purpose, procedures, potential risks, and benefits.

All data were anonymized to protect participant identities. Data were stored securely, accessible only to authorized personnel. Participants were informed of their right to withdraw at any time without penalty. The AI companion was selected or developed to ensure safety, age-appropriate, and support for well-being, with strict content moderation protocols. Researchers were trained to monitor distress and established procedures for referral to mental health professionals if additional

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support was needed.

Results

Descriptive Statistics

Descriptive statistics for participants' loneliness scores before and after interacting with the AI companion are presented in Table 1. The mean loneliness score decreased from pre-test (M = 57.00, SD = 2.92) to post-test (M = 43.00, SD = 5.18), indicating a reduction in subjective loneliness.

Table 1 **1**

Descriptive Statistics for Pre-test and Post-test Loneliness Scores

Measure	N	Mean	SD
Pre-test	5	57.00	2.92
Post-test	5	43.00	5.18

Paired-Samples t-test

A paired-samples t-test was conducted to examine whether interacting with the AI companion significantly reduced loneliness. Results indicated a **statistically significant decrease** in loneliness scores from pre-test to post-test, t(4) = 9.97, p = .001, Cohen's d = 4.46, suggesting a very large effect size. These results indicate that AI companionship had a strong impact on reducing participants' loneliness in this sample.

Table 2

Pre- and Post-test Loneliness Scores of Participants

Variables	Pre score N=5		Post score N=5				Cohens's d
	M	SD	M	SD	t(4)	p	
Loneliness	57	2.915	43	5.177	9.972	.001	4.46

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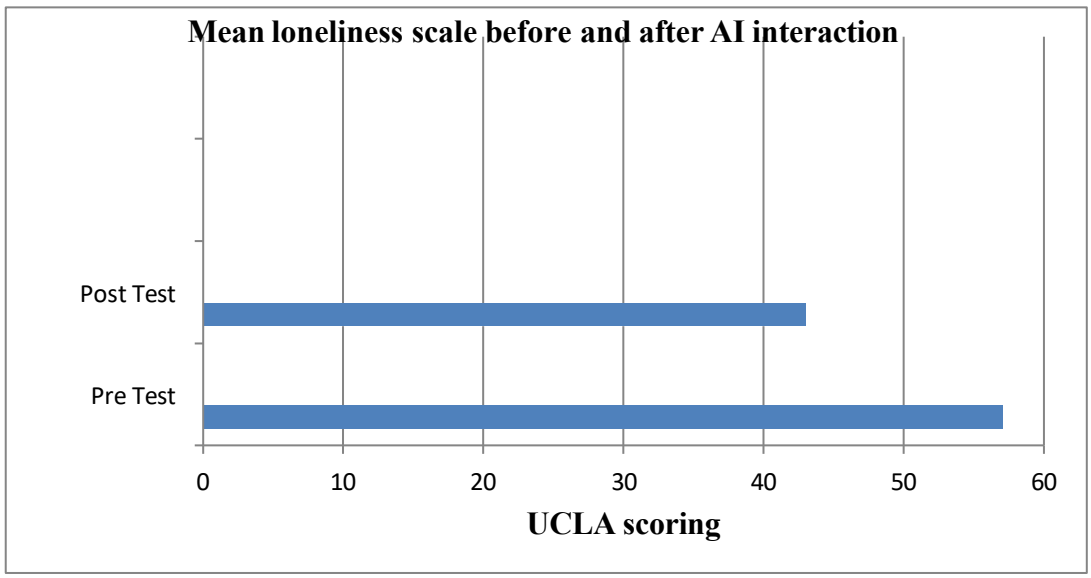
A paired-samples t-test was analyzed to compare loneliness scores before and after the intervention. Results showed a significant decrease in loneliness from pre-test (M = 57, SD = 2.92) to post-test (M = 43, SD = 5.18), t(4) = 9.97, p = .001.

The effect size measured using Cohen's d, was 4.46, indicating a very large effect of the intervention on reducing loneliness. These findings suggest that the intervention had a strong and statistically significant impact in lowering participants' feelings of loneliness. The large Cohen's d value demonstrates that the magnitude of the change was substantial.

Figure 1

Mean Pre- and Post-test Loneliness Scores (N = 5)



Implications

1. **Practical Applications for Mental Health:** The findings suggest that AI companions can serve as an accessible tool to reduce loneliness among university students, especially in situations where in-person social interactions are limited. Mental health professionals can integrate AI chatbots as part of digital support interventions.
2. **Educational Settings:** Universities can offer AI companions as supplementary support for students experiencing social isolation, stress, or transitional challenges.
3. **AI Development:** The results highlight the importance of designing chatbots that foster emotional engagement and social presence, providing meaningful companionship for users.
4. **Future Research:** These findings encourage further exploration of AI interventions targeting other emotional and psychological outcomes, such as stress, anxiety, and depression.

Limitations

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1. **Small Sample Size:** With only 5 participants, generalizability is limited. Future studies should include larger and more diverse samples.
2. **Short-Term Assessment:** The study measured loneliness only immediately after the intervention; long-term effects remain unknown.
3. **Lack of Control Group:** Without a control group, it is difficult to rule out external □

   factors that could influence loneliness reduction
4. . **Self-Reported Measure:** Although the UCLA Loneliness Scale is valid, reliance on self-report introduces potential bias.
5. **Single Institution:** All participants were from Okara University, limiting cross-institutional generalizability.

Conclusion

This study demonstrates that interaction with an AI companion significantly reduces loneliness among university students. The results provide preliminary evidence that AI-based interventions can be a useful tool for promoting emotional well-being in emerging adults. While AI companions cannot completely replace human interaction, they offer accessible and scalable support for students experiencing social isolation. Future research should address limitations by including larger samples, long-term follow-ups, and diverse populations to fully explore the potential of AI companions in mental health interventions.

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