


# AI and VR-Powered Interventions for Social Anxiety: A Review

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## ABSTRACT

This study aims to investigate the potential benefits and efficacy of incorporating Artificial Intelligence into mental health interventions for individuals battling social anxiety. The objective is to evaluate how different AI interventions influence the reduction of symptoms, social functioning, and overall quality of life. The research will examine the feasibility of AI as a means of delivering Cognitive-Behavioral Therapy (CBT) and compare its effectiveness with established therapeutic approaches. The methodology involves a systematic literature review and comprehensive database searches. The findings suggest that AI therapy chatbots, which use machine learning to deliver individualized interventions, present an accessible and scalable alternative for mental health assistance, with the potential to relieve anxiety and depression symptoms. Virtual Reality Exposure Therapy (VRET) efficiently tackles social anxiety, although further study on AI's effectiveness in this setting is needed.

## KEYWORDS

Artificial Intelligence (AI), Social Anxiety Disorder (SAD), Cognitive Behavioural Therapy (CBT), Explainable Artificial Intelligence(XAI), Virtual Reality (VR), Virtual Reality Exposure Therapy (VRET)

## 1. INTRODUCTION

Social Anxiety Disorder (SAD) is a form of anxiety disorder in which an individual experiences anxiety or nervousness in social settings due to fear of being judged, looked at, or scrutinized by others (Stein & Stein, 2008). It has a wide-ranging impact, affecting functionality in many areas of life and reducing overall happiness and well-being (Mineka et al., 1998). Individuals grappling with this disorder often encounter challenges in performing everyday tasks, such as eating or drinking in public, navigating job interviews, or engaging with new people (Stein & Stein, 2008). Additionally, they may exhibit visible struggles, including reduced facial expressions, avoidance of eye contact, and increased difficulty initiating and maintaining conversations (Sansoni et al., 2024). SAD ranks

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as the third most common mental health condition, following substance use disorder and depression, with an annual diagnosis of 15 million in the United States alone (Cleveland Clinic, 2022). Globally, it affects approximately 5% - 10% of the population (Sansoni et al., 2024) widespread, treatment seeking remains low, ranging from 4% to 20% (Dalrymple & Zimmerman, 2011), leaving the majority of individuals with SAD without the support and treatment they may need.

One of the most extensively researched and proven methods of addressing and treating SAD is through psychotherapy, particularly Cognitive Behavioural Therapy (CBT) (Stein & Stein, 2008). CBT provides individuals with practical skills to challenge and reshape negative thought patterns and gradually help build confidence in social situations. Some of the most effective CBT techniques for treating SAD include exposure therapy and cognitive restructuring (Hambrick et al., 2003). Exposure therapy is a technique that focuses on gradually exposing individuals to their fears, aiming to help them challenge and overcome those fears, enabling them to engage in activities they have been avoiding (Stein & Stein, 2008). In contrast, cognitive restructuring helps patients assess feared situations with a more realistic perspective, contributing to a positive shift in how these situations are perceived and managed (Hambrick et al., 2003).

Research has consistently demonstrated the efficiency of CBT techniques in addressing SAD. In a study analyzing the effects of individual cognitive-behavioural therapy on SAD, researchers examined a sample of 93 adults seeking treatment (Butler et al., 2021). After approximately 20 weeks of psychotherapy, the findings indicated a significant decrease in social anxiety and an improvement in the quality of life for the patients (Butler et al., 2021). However, despite its effectiveness, accessing CBT can be challenging due to several factors, such as geographical constraints, financial limitations, social stigma, and lack of mental health experts (Rani et al., 2023).

Fortunately, the latest advancements in technology, particularly in Artificial Intelligence (AI), have opened new avenues for addressing these limitations. AI chatbots, in particular, have become increasingly prevalent, playing a significant role in various domains. Research has shown that employing chatbots for mental health support is not only feasible but also effective in engaging users and alleviating symptoms of anxiety and depression (Omarov et al., 2023). These AI chatbots leverage natural language processing to engage in conversations with individuals and can be customized to provide CBT interventions (Rani et al., 2023). Given the structure and time-limited nature of Cognitive Behavioural Therapy, it is well suited for integration with technology, making it an optimal choice for AI-powered interventions (Omarov et al., 2023).

Essentially, AI has the potential to address SAD through various mechanisms and theories. As mentioned earlier, the use of AI-assisted psychotherapy can offer efficient and standardized psychotherapy models to improve the availability and efficacy of treatments for anxiety disorders (Su et al., 2022). Also, the interweaving of human interaction with AI-driven virtual companionship can impact psychological well-being, especially in relation to social anxiety (Z. Xie & Wang, 2024a). By leveraging AI technologies, mental health practitioners can enhance patient care and deliver support for individuals with anxiety disorders (Cecil et al., 2024). Again, the use of AI in healthcare settings can provide innovative solutions for managing anxiety disorders. For instance, the application of AI in healthcare has the potential to offer cost-effective and time-efficient interventions for anxiety disorders such as SAD (Tekkeşin, 2019). Additionally, the predictive role of academic identification and trait anxiety in early academic dropout intentions suggests that understanding the interaction between anxiety and other factors can help in identifying at-risk individuals and providing timely interventions (BOSTAN-TOFAN et al., 2023). By addressing negative thinking patterns and cognitive processes associated with anxiety disorders, AI interventions can potentially help individuals with SAD manage their symptoms more effectively. Furthermore, the development of AI technologies that focus on social attraction and user satisfaction can contribute to reducing loneliness and enhancing social interactions, which are relevant factors in addressing social anxiety (Choi & Choi, 2023).

Research exploring the potential impact of AI in addressing mental health has significantly increased. However, there exists a notable research gap regarding the specific implications of AI on

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