

*Original Paper*

# The Application of Serious Games in the Intervention of Patients with Social Anxiety Disorder

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## **Abstract**

*Currently, a new treatment plan for social anxiety disorder using serious games as a tool is gradually forming internationally. This article uses Citespace to conduct an in-depth summary and investigation of the relevant literature on the use of serious games in the intervention of foreign SAD patients from 2013 to 2023, focusing on the technical platform, psychological mechanism, intervention effectiveness, and existing shortcomings of serious games to intervene in social anxiety disorder. A systematic review has been carried out. Based on this, this article proposes implications for the application of serious games in social anxiety in my country, that is, promoting public awareness of serious games, increasing investment in the research and development of localized serious games, improving the professional application of serious games etc., in order to explore serious games It has application potential in alleviating social anxiety disorder and developing a new treatment model for the treatment of social anxiety disorder in my country.*

## **Keywords**

*serious games, social anxiety disorder, game therapy, intervention*

## **1. Introduction**

Social anxiety disorder, a common mental health problem, is widely recognised as one of the top three mental illnesses in the world today, following depression. Social anxiety is a generalised state of anxiety that manifests itself in individuals' fear and avoidance of social behaviours as well as occasions, which affects people's life, learning, work and health. This anxiety may lead to impaired social functioning of the individual (Niu & Yang, 2023) thus affecting daily and professional life. Currently, the social anxiety disorder group is showing an expanding trend, and according to data from the China Mental Health Survey, the lifetime prevalence of social anxiety disorder in Chinese adults is about 0.6% (Niu & Yang, 2023), and it is estimated that about 8 million adults may have suffered or are

suffering from the effects of social anxiety disorder.

The concept of serious games was first proposed by Clark C. Abt. Internationally, the application of serious games in social anxiety disorder interventions has been widely explored, but overall the application of serious games in social anxiety interventions is still not widespread and still faces challenges in terms of public perception, construction of game therapy framework, intervention theory support and evaluation of intervention effectiveness. In order to expand the application of serious games in the treatment of social anxiety disorder in China, it is necessary to further summarise and learn from the current status of serious game intervention in the international arena, and to provide reference for serious game intervention for SAD patients in China.

In view of this, this paper adopts the bibliometric method to systematically sort out the empirical studies on the application of serious games to the intervention of SAD patients in foreign countries during the period of 2013-2023. It combs through the technical carriers, intervention mechanisms, and intervention effects of serious game intervention for social anxiety, and clarifies the deficiencies in its practice, so as to provide reference for the construction of a more effective treatment model and assessment system in China (Heng, Liew, Abdullah et al., 2023).

## 2. Research Methods

In this paper, we used the SSCI database of Web of Science (WOS) as the search source, set the type of literature as “Article”, limited the year range to 2013 to 2023, and used “Serious” as the search source.

**Table 1. Ranking of Keyword Citation Intensity for Serious Games**

Keyword	number of published papers	Intermediation centrality
virtual reality	120	0.11
education	109	0.08
deesign	85	0.04
video games	84	0.07
performance	76	0.09
similation	62	0.02
management	50	0.09
skills	50	0.05
students	50	0.06
gamification	48	0.04
technology	47	0.07
adolescents	46	0.07
game based learning	44	0.02
health	42	0.03



“design” as the core. The high intermediary centrality of the published papers indicates that these two research directions occupy an intermediate position in the research field of serious games. It shows that most of the keywords of the papers related to serious games are related to these two keywords, indicating the importance of these two keywords in the field.

From the above literature, there are relatively few studies applying serious games to intervene in social anxiety disorder. However, the trend of change shows that with the increase in social concern for mental health, research in this field has shown a gradual increase in recent years. In the above literature, the terms “serious game”; “SAD”; “social anxiety disorder” continue to be used; “anxiety”; “social anxiety”; “phobia” as keywords for advanced search, a total of 1531 documents were obtained. After reading the titles, abstracts, keywords (and full text if necessary), and removing literature that was completely unrelated to the literature on serious gaming interventions for people with anxiety disorders, 57 pieces of literature remained. The 57 literatures continued to be reviewed and screened based on the following criteria: (1) the intervention method in the study was serious gaming; (2) the subjects were people with anxiety disorders; (3) the study had an experimental design; (4) the literature was published in SSCI journals; and (5) the full text was available (Lee & Chen, 2020). Thirty-six English-language publications were eventually obtained.

### **3. Serious Games as a Vehicle for Intervention with SAD Patients**

Compared with the traditional face-to-face intervention model, the therapeutic model of serious games demonstrates more superior flexibility and autonomy. As an innovative tool for social anxiety disorder intervention, serious games are applicable to multiple platforms, including computers, smartphones, and tablets, and extend to advanced areas such as virtual reality and somatic interactive technologies. It significantly promotes user engagement and treatment motivation, which not only enriches the means of intervention, but also significantly reduces the cost of treatment and alleviates the financial pressure on patients.

#### *3.1 Mobile*

In the current context of rapid economic development, most households are already equipped to use mobile devices such as smartphones and tablets. The popularity of these devices, due to their high degree of portability and user-friendliness, has greatly contributed to the popularity and acceptance of serious gaming, enabling patients to easily access and engage in gaming with little to no additional financial burden (Hookham, Nesbitt, & Kay-Lambkin, 2016), and facilitating the widespread use and personalisation of interventions. In addition, the touch interaction nature of these mobile-enabled devices provides strong support for the ease of use and interactivity of serious games, with typical games such as SuperBetter effectively utilising this technological advantage. In addition, the intuitive operation of touchscreen technology reduces the technical requirements for users, enabling users of all ages to quickly get started, which in turn enhances the potential and practical effectiveness of serious

games in mental health interventions.

### 3.2 PC

Serious games that use the PC platform as a vehicle are superior to mobile-based applications in terms of visual presentation and interactive experience. Although the popularity of computer devices may be lower than that of smartphones and tablets, the computer platform still plays an indispensable role. It has significant advantages in terms of image rendering, user interface design, and the depth and breadth of interactive experiences. The ability of computer-based games to provide more complex and immersive experiential environments not only enhances user engagement and quality of experience, but also allows designers to implement more elaborate scenario simulations, resulting in better outcomes across a variety of domains (Cai, Wang, & Wang, 2015). For example, when using Teris for cognitive training or psychotherapy, the high performance of the computer ensures consistency and speed of response during the game, which in turn leads the user to achieve the desired therapeutic effect more effectively.

### 3.3 VR

Serious games using Virtual Reality (VR) technology as a platform face challenges in terms of penetration and economic accessibility due to the relatively high cost of VR equipment and limited market penetration. Despite the challenges of cost and penetration, the VR side still shows great potential and value by virtue of its unique immersive experience and high degree of realism. Serious games on the VR side are able to create a near-reality social interaction Scenarios(LI, ZHOU, & LIU, 2023), allowing participants to explore freely in these highly simulated virtual spaces, so as to deeply experience and understand the educational or therapeutic connotations conveyed by the game. Through VR serious games, participants can experience and practice different social interactions in a controlled and safe environment, thus facilitating the learning of social skills and emotional regulation.

Game carrier	Game ontology	Game content	Game goal	Theoretical basis
Mobile	SuperBetter	Earn points and Level up by completing tasks that improve character abilities,	Compete with others to win by comparison	Cognitive-behavioral therapy and positive psychology
PC	SPARX	Complete tests, defeat enemies symbolizing negative thoughts, restore balance in a fantasy world	Manage emotions in challenging environments, control fear, and reduce anxiety	Cognitive-behavioral therapy
PC	Tetris	Clear lines to complete levels and advance	Challenge negative thinking and upgrade through progress	Cognitive resource reorientation
VR	Virtual Iraq	Gradually adapt to more challenging situations and events in a recreated virtual	Defeat villains, overcome specific disorders	Exposure therapy
VR	Journey to the Wild Divine	Control psychological activities to earn points and participate in virtual world activities	Increase exploratory desire	Psychological education combined with relaxation-based biofeedback
VR	Nintendo Wii Sports	Improve physical fitness and skills through game performance, complete final sports test	Compete with other players in various scenarios and modes	Behavioral activities and social interaction

**Figure 2. Distribution of Serious Game Types and Treatment Patterns**

### 3.2 Theoretical Foundations of Serious Gaming Interventions for People with SAD

Mainstream treatments for social anxiety disorder are usually based on cognitive behavioural therapy and social cognitive theory. Similarly, these psychological theories have been applied to the design of serious games to improve their intervention effects and enhance player engagement. To further stimulate players' initiative, exploration, and self-efficacy, serious games also incorporate implicit learning theory, mindstream theory, and nearest developmental area theory. This integration of multiple psychological theories not only advances the psychotherapeutic process, but also enhances the immersion and attraction of the game, thus improving the overall intervention effect. CBT has been widely proven to be effective for social anxiety disorders (WU & LU, 2023). In serious games, CBT principles are subtly embedded, allowing players to identify and change negative cognitive patterns during game interactions through implicit guidance, gradually achieving positive emotional and behavioural adjustments. According to social cognitive theory, game characters are designed to model positive social behaviours, and patients can learn new social strategies by observing the characters, thus gradually changing their cognition (Pang, 2015). Well-designed levels further enhance players' self-efficacy and make them more confident in dealing with challenges (Greenwood, Achterbosch, Meredith et al., 2020). Implicit learning theory emphasises unconscious knowledge absorption, where patients unconsciously acquire and internalise relevant skills during game interactions (Coghlan & Carter, 2020). The mindstream theory, on the other hand, motivates players to be highly focused, relieve anxiety and acquire new skills by setting clear goals and appropriate challenges. The theory of

the zone of nearest development provides a framework for the design of games with adjustable levels of difficulty, ensuring that players are always challenged at a level that matches their ability level and progressively improve their skills.

### *3.3 Intervention Effects of Serious Games on SAD Patients*

Through a systematic review of the relevant literature, this study observed that serious games demonstrated significant effects in promoting the psychological well-being of patients with social anxiety disorder, which can be summarised as being particularly effective in improving the three key domains of emotion regulation (Lee & Chen, 2020), cognitive processes (Liebke, Koppe, Bungert et al., 2018), and self-perception (Metia Interactive, 2013).

#### *3.3.1 Enhancement of Patients' Emotional Expression Ability*

In patients with social anxiety disorder, emotional communication often manifests itself as social awkwardness, as evidenced by behaviours such as nervousness in social situations, language barriers, and avoidance of eye contact (Beidel, Tuerk, Spitalnick et al., 2021). These behavioural characteristics may lead to patient resistance to traditional face-to-face intervention methods. In contrast, serious games, as a new type of intervention, are more acceptable to SAD patients with the help of technologies such as computers, smartphones, and virtual reality. Deborah et al. designed a serious game, Pegasys-VR, which aims to support the treatment of adolescents' social anxiety disorder with the help of virtual reality technology. The game sets a series of game tasks by simulating real-life social environments such as schools, including identifying social cues, engaging in daily conversations, asking open-ended questions in social situations, and listening to and remembering others' expressions. These activities improve patients' social skills and reduce their anxiety symptoms, and efficacy is assessed by monitoring the quality of eye contact, dialogue reaction time, frequency of exchanges, and overall anxiety levels and social skill development. Existing research has confirmed that eye contact, as an emotionally and intentionally charged form of communication, is essential for accurately understanding the feelings and intentions of others (Beck, 2020). The small expressions and direction of vision in the eyes can reveal an individual's inner emotions, thus making communication more authentic and deeper. For individuals with SAD, the ability to make effective eye contact is a key indicator of social competence. Studies have shown that SAD patients are more likely to make eye contact with people who have a smile or a neutral expression, and tend to avoid individuals who have an angry expression. In his study, Peng Shun pointed out that negative evaluations have a significant impact on patients with social anxiety disorder and become a key factor in exacerbating the condition (Gauthier & Jenkinson, 2017). In order to avoid the adverse effects of negative evaluations, the Pegasys-VR game was designed to avoid using any negative feedback that might trigger the patients' adverse emotional responses, and instead increased the frequency of positive feedback and designed a "mentor" role to guide the player's behaviour in the virtual environment. By providing positive feedback on the player's behaviour, recognising their efforts and providing supportive and constructive

comments, the game aims to help patients build confidence and effectively reduce their anxiety levels. Through this approach, Pegasys-VR strives to create a positive learning environment that assists patients with social anxiety disorders to become better adapted to social interactions in virtual scenarios, thus promoting the development of their emotional expression and social skills.

### 3.3.2 Improving the Patient's Ability to be Aware

Social anxiety disorder severely affects the patient's ability to concentrate and is usually accompanied by intense worry, tension and fear, which interferes with the patient's attention and cognitive functioning. Patients usually display excessive self-preoccupation (Imlig-Iten & Petko, 2018) and worry that their social performance and outward appearance will be negated by others. This constant self-monitoring diminishes their ability to focus on non-social tasks, especially in social situations, where the fear of judgement or embarrassment can lead them into a vicious cycle of constant self-focus, making it difficult to concentrate on other important matters. Psychological research has shown that cognitive behavioural therapy can effectively help people with social anxiety disorder adapt to the social environment, reduce anxiety, and then rebuild negative thinking patterns by correcting their cognitive biases about the situation, thus improving concentration (Bressler & Bodzin, 2016). Serious games simulate real-life anxiety-triggering situations with the help of virtual social scenarios, such as parties, workplaces, and classrooms. By gradually adapting to these virtual environments, patients are able to improve their concentration and enhance emotional and attentional regulation during social activities. The "Challenger" game is based on the theory of the zone of nearest development and the theory of psychological flow, and is designed with layered tasks and attention training modules. Players must complete challenges of varying difficulty to train them to stay focused and free from anxiety in social situations. These interactive tasks and situational simulations not only improve patients' verbal and non-verbal communication skills, but also help them better understand their thought processes and reduce the negative impact of social anxiety.

### 3.3.3 Enhancement of Patients' Self-perceptions

Negative self-perception bias is one of the core problems of patients with social anxiety disorder (Solovieva & Quintanar, 2016). Anxiety makes patients prone to misinterpreting social situations and overinterpreting others' behaviour as critical or rejecting (Mena-Moreno, Mungu á, Granero et al., 2022). This misinterpretation prompts patients to focus excessively on their own performance, triggering intense worry and anxiety. To alleviate anxiety, SAD patients often adopt avoidance strategies, but this in turn exacerbates their social anxiety, further undermining self-confidence and questioning their abilities. In addition, persistent anxiety may lead to the development of a negative self-identity, preventing positive identity construction and exacerbating cognitive distortions. The key to treatment is to help patients identify and modify these negative self-perception patterns. Cognitive Behavioural Therapy (CBT) promotes a healthier view of self by guiding patients to gradually adjust their thinking. The SPARX game developed at the University of Otago, New Zealand, is based on the



principles of CBT and aims to change patients' negative thinking patterns (de la Barrera, Mónaco, Postigo-Zegarra et al., 2021). SPARX helps patients acquire emotion regulation skills and learn to manage anxiety more effectively through virtual character interaction. The tasks in the game are designed to target social problem solving and situational coping, gradually improving patients' self-confidence and problem solving skills. The game SuperBetter further enhances players' mental toughness and helps them cope with life challenges (Peng, Wang, Niu et al., 2019). Through tasks closely related to daily life, players are guided to gradually overcome difficulties. Players take on the role of a "superhero" in the game, completing tasks and accumulating power, thus building a positive identity and increasing self-efficacy in the virtual environment. In addition, the social interaction function of the game encourages players to share their goals and achievements, which promotes deeper emotional expression and social awareness, and helps them to enhance their social confidence and orientation in reality (Vriends, Meral, Bargas-Avila et al., 2017).

#### *3.4 Shortcomings of Serious Games Intervention for Social Anxiety*

Serious games, as innovative mental health interventions, have gradually gained attention, but there are still multiple challenges in their practical application. First, although serious games show potential for virtual therapy, the development and validation cycle is long, and there is a lack of long-term efficacy studies and continuous tracking analyses (Vriends, Meral, Bargas-Avila et al., 2017). Existing studies have mostly focused on short-term effects and are yet to be supported by long-term data (Miloff, Marklund & Carlbring, 2015). Secondly, the lack of personalised design limits the effectiveness of the intervention. Some games, such as "The Challenger", have a single mode (WU, YANG, CAI et al., 2021) and rely mainly on text-based tasks, which may lead to inconvenience for dyslexic users and a sense of dullness in the overall experience (Liebke, Koppe, Bungert et al., 2018). A more refined design for different patient needs is needed. In addition, poor interdisciplinary collaboration affects game efficacy. Game designers and psychologists differ in their goal focus, making it difficult to effectively integrate therapeutic theories and game mechanics (Metia Interactive, 2013). Therefore, a closer collaborative platform is needed to facilitate the integration of the two. Serious games also lack a unified assessment system with inconsistent assessment criteria, which hinders the objective quantification of effects and creates problems for user selection (Derks, Willems, Wouda et al., 2024). Establishing standardised assessment methods will enhance credibility and user experience. Finally, the issue of economic sustainability is significant. Providing games for free does not match the high development and maintenance costs and lacks business model support. Developing flexible business solutions is the key to achieving sustainable development of serious games (Roepke, Jaffee, Riffle et al., 2015).

#### 4. Conclusion and Future Directions

Serious games have shown considerable promise as an innovative therapeutic tool for addressing social anxiety disorder (SAD). However, their practical application faces several challenges, including public awareness, cultural adaptation, and professional integration. These obstacles must be overcome to fully realize the potential of serious games in mental health care (Gauthier & Jenkinson, 2017).

##### *4.1 Increasing Public Awareness and Cultural Acceptance*

One of the primary challenges is the lack of public understanding of serious games as therapeutic tools. Games are often misperceived as purely entertainment-focused, which undermines their credibility in clinical applications. This misconception is particularly evident among adolescents (Dias, Diniz, Konstantinidis et al., 2021) and their families, where societal and parental pressures may discourage the adoption of game-based therapies. Such resistance not only limits the accessibility of these interventions but can also exacerbate SAD symptoms due to external judgment.

To address this, targeted educational campaigns are essential. Mental health professionals, social workers, and educators should collaborate to highlight the therapeutic benefits of serious games, leveraging research-based evidence to shift public perceptions. Promoting success stories and case studies can also help establish serious games as credible and effective tools in mental health treatment (Bakhuys, Visschedijk, & Oprins, 2017).

At the same time, cultural acceptance of serious games must be enhanced through localization efforts. Designing games that reflect the unique socio-cultural characteristics of regions like China can significantly improve their relevance and acceptance. For example, incorporating scenarios that resonate with hierarchical and collectivist values in Chinese society, such as family interactions or workplace dynamics, can make the games more relatable. Additionally, language localization—adapting games to regional dialects and popular expressions—can enhance communication and reduce barriers for users across different demographics.

##### *4.2 Localized Design and Personalization*

Localization must go beyond language and cultural narratives to include personalized intervention strategies. SAD patients vary significantly in age, occupation, geographic location, and severity of symptoms, requiring diverse and adaptive gameplay experiences. Serious games should incorporate modular designs, allowing therapists and users to tailor interventions to specific needs. For example, younger users might benefit from gamified social interaction training, while adults in professional settings might need scenarios focusing on workplace anxiety (Eichenberg, Grabmayer, & Green, 2016). Personalization can also involve adaptive difficulty levels, where the game dynamically adjusts challenges to match the user's progress. Such designs, informed by psychological theories like the zone of proximal development, can help users remain engaged while gradually improving their skills and confidence in social scenarios.

### 4.3 Synergy between Public Education and Localization

Public awareness efforts and localization strategies should complement each other. By showcasing localized serious games that address region-specific social challenges, stakeholders can bridge the gap between public perception and practical application. For instance, collaborating with schools, mental health clinics, and community centers to introduce culturally relevant serious games can facilitate broader acceptance and integration into everyday therapeutic practices (Zeng, Hu, Peng et al., 2024).

In conclusion, increasing public awareness and advancing the localization of serious games are interdependent goals that form the foundation for their widespread adoption. Addressing these areas simultaneously will not only enhance the accessibility and effectiveness of serious games but also establish their credibility as transformative tools in the treatment of SAD.

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