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The Effectiveness of Cognitive-Behavioral Therapy on Ambiguity Tolerance in Adolescents with Social Anxiety

Tabassom Alijani Baei[1], Bahram Mirzaian[*2], Asghar Norouzi[3]

1. MA. Student, Department of Psychology, Sari Branch, Islamic Azad University, Sari, Iran.
2. Assistant Professor, Department of Psychology, Sari Branch, Islamic Azad University, Sari, Iran (Corresponding author).
3. Assistant Professor, Department of Psychology, Sari Branch, Islamic Azad University, Sari, Iran.

*** Corresponding author email address**: bahrammirzian@gmail.com

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A B S T R A C T

Purpose: This study aimed to examine the effectiveness of cognitive-behavioral therapy (CBT) on ambiguity tolerance in adolescents with social anxiety disorder.

Methodology: The research method was quasi-experimental, employing a pretest-posttest design with a control group and a one-month follow-up phase. The statistical population consisted of all adolescents diagnosed with social anxiety disorder who attended eight counseling centers in Babol city during the spring of 2024. Initially, the Connor Anxiety Questionnaire (2000) was distributed among all participants, and 30 individuals scoring between 16 and 25 (the questionnaire's cutoff point) were selected through convenience sampling. These participants were then randomly assigned to either the experimental or control group. Data were collected using the second version of the McLain Ambiguity Tolerance Questionnaire (1993) and the Connor Social Anxiety Questionnaire (1969). The experimental group underwent CBT based on Beck's (1998) manual, which was conducted in 12 sessions, each lasting 90 minutes. The intervention was solely applied to the experimental group, with no intervention for the control group. Data were analyzed using repeated measures analysis via SPSS-18 software.

Findings: The findings indicated a significant difference in pretest and posttest scores between the experimental and control groups regarding ambiguity tolerance in adolescents with social anxiety disorder ($P \leq 0.01$). Overall, CBT is effective in enhancing ambiguity tolerance in adolescents with social anxiety disorder ($P \leq 0.01$).

Conclusion: Given the results of this study, the role of CBT in facilitating changes in ambiguity tolerance has important therapeutic implications.

Keywords: *Ambiguity Tolerance, Cognitive-Behavioral Therapy, Social Anxiety, Adolescents*

1. Introduction

Social anxiety disorder (SAD) is a debilitating mental health condition characterized by an intense and persistent fear of social situations, leading to significant distress and impairment in daily functioning (Emge & Hope, 2010; Shahbazirad et al., 2016). Individuals with SAD often experience overwhelming anxiety in situations where they might be judged or scrutinized by others, resulting in avoidance behaviors that exacerbate the disorder (Ghasemzadeh Alishahi et al., 2021; Hasanpour et al., 2020; Niles et al., 2014). The prevalence of SAD is substantial, affecting approximately 7% of the general population at any given time, with a higher incidence observed among adolescents and young adults (Emge & Hope, 2010; Zheng & Ye, 2022). As a result, SAD has garnered significant attention from researchers and clinicians, who have sought to develop and refine treatment approaches that can effectively alleviate its symptoms and improve the quality of life for those affected.

One of the most widely researched and empirically supported treatments for SAD is cognitive-behavioral therapy (CBT) (Kaczkurkin & Foa, 2015). CBT is a structured, time-limited psychotherapeutic approach that focuses on identifying and challenging maladaptive thought patterns and behaviors, thereby promoting cognitive restructuring and behavioral change (Hofmann et al., 2014; Wolgensinger, 2015). The effectiveness of CBT for SAD has been demonstrated across a variety of settings, including individual therapy, group therapy, and internet-based interventions (Alaoui et al., 2015; Hedman et al., 2011; Willutzki et al., 2012).

In recent years, CBT has been adapted and tailored to address the specific needs of various populations, including adolescents, individuals with comorbid conditions, and those with cultural or contextual considerations (Gehtmane-Hofmane & Nīmante, 2015; Matsumoto, 2024; Ramak et al., 2020). For instance, Alaoui et al. (2015) demonstrated the effectiveness of internet-based CBT (iCBT) for SAD in a clinical psychiatry setting, highlighting the potential for this modality to reach individuals who may not have access to traditional face-to-face therapy (Alaoui et al., 2015). Additionally, studies have explored the integration of mindfulness-based interventions with CBT to enhance treatment outcomes for SAD (Goldin et al., 2017). These integrative approaches have shown promise in addressing the cognitive and emotional components of SAD, offering a more holistic treatment framework.

The cognitive-behavioral model posits that individuals with SAD possess maladaptive beliefs and cognitive distortions that perpetuate their anxiety (Hofmann et al., 2014; Kaczkurkin & Foa, 2015). These beliefs often involve exaggerated perceptions of social threat, unrealistic expectations of social performance, and a tendency to interpret ambiguous social cues as negative (Crișan et al., 2016; Schoenherr et al., 2021). CBT interventions for SAD typically involve cognitive restructuring techniques aimed at challenging these maladaptive beliefs, as well as exposure-based strategies designed to reduce avoidance behaviors and increase social engagement (Chard & Zalk, 2022; Lervik et al., 2021). The effectiveness of CBT for SAD is not limited to individual therapy; group-based CBT has also been shown to be highly effective, particularly in adolescent populations (Lassen et al., 2019). Group CBT provides a supportive environment where individuals can practice social skills, receive feedback from peers, and challenge their anxiety in real-time social interactions (Atayi et al., 2018; Ganaprakasam & Selvaraja, 2020). Furthermore, group therapy settings offer the added benefit of normalizing the experience of social anxiety, as participants can observe and learn from the progress of others with similar challenges (Aflakian, 2023; Willutzki et al., 2012).

Despite the robust evidence supporting the effectiveness of CBT for SAD, there remains a need for continued research to optimize treatment delivery and address potential barriers to access (ElBarazi & Meshreky, 2022; Hedman et al., 2011). For example, while internet-based CBT offers a promising alternative for individuals who are unable to attend in-person sessions, there are concerns about treatment attrition and the variability in engagement with online platforms (Alaoui et al., 2015; Au-Yeung et al., 2023). Additionally, cultural and contextual factors must be considered when implementing CBT for SAD in diverse populations, as these factors can influence the presentation of symptoms and the acceptability of treatment approaches (Khodayarifard & Fatemi, 2013; Ranjbar et al., 2021).

The use of CBT in treating SAD has also been extended to populations with comorbid conditions, such as autism spectrum disorder (ASD) and generalized anxiety disorder (GAD) (Amiri et al., 2017; Uğuz & Ak, 2021; Zaboski & Storch, 2018). Research has shown that individuals with ASD and SAD often experience heightened levels of social anxiety due to difficulties with social communication and interaction (Zaboski & Storch, 2018). CBT has been adapted to address the unique challenges faced by this population, with promising results in reducing social anxiety and

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improving social functioning (Cain et al., 2021). In sum, this study aimed to examine the effectiveness of cognitive-behavioral therapy (CBT) on ambiguity tolerance in adolescents with social anxiety disorder.

2. Methods and Materials

2.1. Study Design and Participants

The research method was a quasi-experimental design with a pretest-posttest approach, including an experimental and control group, and a two-month follow-up phase. The statistical population comprised all adolescents diagnosed with social anxiety disorder who attended eight counseling centers in Babol city during the spring of 2024. Given that the minimum sample size for intervention studies is 15 participants (Delavar, 2020), the Connor Anxiety Questionnaire (2000) was first distributed among all potential participants. Thirty individuals who scored between 16 and 25 (the questionnaire's cutoff point) were selected using convenience sampling and were subsequently randomly assigned to either the experimental or control group. In the fieldwork phase, after obtaining the necessary permissions and visiting the centers, the therapeutic sessions were conducted by a clinical psychologist with the selected individuals in the experimental group, held twice weekly during the spring of 2024. Before starting the sessions, ethical considerations, including the study's objectives, confidentiality, and privacy protection, were explained to the participants. Informed consent from the parents, indicating their commitment to the study, was obtained. Pretests were then administered to both the experimental and control groups, followed by posttests at the end of the sessions. The experimental group underwent cognitive-behavioral therapy (CBT) based on Beck's (1998) manual, conducted over 12 sessions, each lasting 90 minutes. The intervention was applied exclusively to the experimental group, while no intervention was conducted for the control group.

2.2. Measures

2.2.1. Ambiguity Tolerance

This scale was developed by McLain and colleagues (1993) and consists of 13 items. It provides an overall score and uses a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree) for responses, scored as 1, 2, 3, 4, and 5, respectively. A higher score indicates greater ambiguity tolerance, which is considered favorable. The validity and reliability of this questionnaire have been confirmed in multiple studies both internationally and in Iran (Mahvash et al., 2024; Rastgar et al., 2021). In the present study, a Cronbach's alpha of 0.77 was obtained, indicating the tool's adequate reliability.

2.3. Intervention

2.3.1. Cognitive Behavioral Therapy

The intervention protocol is based on Beck's (1998) Cognitive-Behavioral Therapy (CBT) model and consists of 12 structured sessions, each designed to progressively address the cognitive distortions and maladaptive beliefs that contribute to social anxiety in adolescents. The sessions incorporate a blend of psychoeducation, cognitive restructuring, relaxation techniques, and problem-solving strategies, tailored to foster greater self-awareness and resilience. Each session builds on the previous one, with specific tasks and exercises aimed at reinforcing the learning and facilitating lasting behavioral change (Rajaeinia, 2022).

Session 1: Introduction and Pre-assessment In the first session, participants are introduced to each other and the group rules are established. The goals of the therapy are clearly defined, and a therapeutic relationship is initiated. An overview of the treatment process is provided, and participants engage in a guided imagery relaxation exercise to help reduce initial anxiety. Pre-assessment measures are also administered to establish baseline data.

Session 2: Introduction to CBT and Relaxation Techniques This session begins with feedback from the previous session. Participants are introduced to the principles of Cognitive-Behavioral Therapy, emphasizing the connection between thoughts, feelings, and behaviors. A relaxation technique, specifically muscle relaxation, is taught to help manage anxiety symptoms. Participants are assigned a homework task to identify and record instances of cognitive distortions in their daily lives.

Session 3: Identifying Negative and Ineffective Beliefs Participants focus on identifying their negative and ineffective beliefs, which contribute to their anxiety. The session includes a review of relaxation techniques and introduces enjoyable activities that can help shift focus away from anxiety-provoking thoughts. Homework is assigned to practice these techniques and activities.

Session 4: Vertical Arrow Technique In this session, participants are taught the Vertical Arrow Technique, which helps them trace their negative automatic thoughts to underlying core beliefs and schemas. The relaxation

E-ISSN: 3041-8828

technique is reinforced, and homework is given to practice identifying and challenging these core beliefs.

Session 5: Creating a Core Belief List Participants create a list of their core beliefs, both positive and negative. The session includes continued practice of relaxation techniques and exercises in contrasting their thoughts with probable realities. Homework focuses on further developing this list and applying it in real-life situations.

Session 6: Testing Beliefs with Objective Analysis This session involves testing the participants' beliefs through objective analysis, encouraging them to evaluate their judgments and assumptions critically. Techniques such as term definition and progressive muscle relaxation are introduced. Homework involves practicing these analysis techniques.

Session 7: Cognitive Analysis and Reappraisal Participants learn various methods of cognitive analysis and are encouraged to reappraise their beliefs. Cognitive distortions are explained, and participants are provided with a list of common cognitive distortions to identify in themselves. Exposure techniques, such as graded exposure to feared situations, are introduced and practiced.

Session 8: Desensitization and Cognitive Restructuring This session focuses on the use of relaxation techniques in conjunction with systematic desensitization. Participants are taught how to challenge automatic thoughts and are guided through a visualization exercise for systematic desensitization. Homework reinforces these techniques.

Session 9: Emotional Awareness and Problem-Solving Skills The emphasis is placed on increasing participants' awareness of their emotions and introducing problem-solving skills. Various types of problem-solving are discussed, and participants work on identifying dysfunctional schemas using the Vertical Arrow Technique. Homework involves applying problem-solving skills to real-life issues.

Session 10: Advanced Cognitive Restructuring This session continues the focus on cognitive restructuring, with an emphasis on countering automatic thoughts. Logical analysis and inhibitory cortical control exercises are introduced to help participants manage impulsive responses. Homework includes practicing these cognitive exercises.

Session 11: Cognitive Confrontation Participants engage in cognitive confrontation, where they actively challenge and debate their negative thoughts. The session reinforces relaxation techniques, and participants are encouraged to continue practicing inhibitory control over impulsive thoughts. Homework is designed to further consolidate these skills.

Session 12: Problem-Solving and Post-assessment The final session involves a review of all techniques learned throughout the course of therapy. Participants discuss their progress, and a post-assessment is administered to evaluate changes from the baseline. The session concludes with a summary and discussion of strategies for maintaining progress after the conclusion of the therapy.

2.4. Data Analysis

After the fieldwork, data were analyzed using descriptive statistics, including means and standard deviations, and to test the research hypotheses, a repeated measures multivariate analysis using SPSS 18 software was performed.

3. Findings and Results

The sample consisted of 30 adolescents diagnosed with social anxiety disorder, of which 16 were male (53.33%) and 14 were female (46.67%). The participants' ages ranged from 14 to 17 years, with a mean age of 15.8 years (SD = 1.1). Regarding educational background, 12 participants (40%) were in the 9th grade, 10 participants (33.33%) were in the 10th grade, and 8 participants (26.67%) were in the 11th grade. Additionally, the majority of participants (66.67%) reported living in a two-parent household, while 33.33% reported living in a single-parent household.

Table 1

Mean and Standard Deviation of Ambiguity Tolerance Variable

Variable	Test	Experimental Group (M ± SD)	Control Group (M ± SD)
Ambiguity Tolerance	**Pretest**	**20.02 ± 2.91**	**19.93 ± 2.61**
	Posttest	31.55 ± 5.22	20.36 ± 2.69
	Follow-up	31.68 ± 5.09	20.42 ± 2.74

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Table 1 presents the descriptive data for the ambiguity tolerance variable in the experimental and control groups. Based on the mean values, the ambiguity tolerance scores in the experimental group decreased in the posttest compared to the pretest.

Before conducting the main analyses, the assumptions of normality, homogeneity of variance, and sphericity were examined and confirmed. The Shapiro-Wilk test was used to assess normality, with results indicating that all variables were normally distributed ($p > .05$). Levene's test confirmed the assumption of homogeneity of variance across groups ($F(1, 28) = 1.23$, $p = .28$). Mauchly's test of sphericity was also conducted, and the results were non-significant ($\chi^2(2) = 3.45$, $p = .18$), indicating that the assumption of sphericity was met. Thus, all necessary assumptions for conducting the repeated measures ANOVA were satisfied.

Table 2

Summary of Repeated Measures ANOVA (Mixed) Results for Grouping, Educational Stages, and Interaction

Variable	Source of Variation	Sum of Squares	df	Mean Square	F	p-value	Effect Size	Power
Ambiguity Tolerance	**Group**	**1271.256**	**1**	**1271.256**	**63.189**	**.01**	**.693**	**1**
	Educational Stages	554.344	1	554.344	34.516	.01	.552	1
	Group × Stages	468.302	1	468.302	29.159	.01	.510	.999

The results in Table 2 indicate that the calculated F-value for the effect of stages (pretest, posttest, and follow-up) is significant at the 0.01 level. Specifically, an interaction effect between group and educational stages was observed for ambiguity tolerance. Consequently, a significant difference exists in the mean scores of ambiguity tolerance across the three stages: pretest, posttest, and follow-up. Bonferroni post hoc tests were conducted to examine the differences between means across the educational stages. Overall, cognitive-behavioral therapy was effective in enhancing ambiguity tolerance in adolescents with social anxiety disorder.

Table 3

Summary of Bonferroni Post Hoc Test Results for Differences Between Pretest, Posttest, and Follow-up

Pretest	Stage 1	Stage 2	Mean Difference	Standard Error	p-value
Ambiguity Tolerance	**Pretest**	**Posttest**	**5.983**	**0.912**	**.01**
	Pretest	Follow-up	6.079	0.978	.01
Posttest	**Follow-up**		**0.096**	**0.054**	**.260**

The results in Table 3 show that there is a significant difference in ambiguity tolerance scores between the pretest and posttest, and between the pretest and follow-up stages. However, the difference between the posttest and follow-up stages is not significant, indicating the stability of the training effect. The comparison of means reveals that ambiguity tolerance in the posttest and follow-up stages differs significantly from the pretest stage.

4. Discussion and Conclusion

The present study aimed to evaluate the effectiveness of cognitive-behavioral therapy (CBT) on ambiguity tolerance in adolescents diagnosed with social anxiety disorder (SAD). The findings of this study provide strong evidence that CBT significantly improves ambiguity tolerance in this population, with marked improvements observed from pretest to posttest, as well as maintained gains during the follow-up period. These results align with the extensive body of literature that supports the efficacy of CBT in treating various aspects of social anxiety disorder, including cognitive distortions, maladaptive beliefs, and avoidance behaviors (Alaoui et al., 2015; Hofmann et al., 2014; Kaczkurkin & Foa, 2015).

The significant improvement in ambiguity tolerance observed in the experimental group following CBT intervention is consistent with the core principles of

E-ISSN: 3041-8828

cognitive-behavioral therapy, which targets maladaptive cognitive patterns and promotes cognitive restructuring (Hofmann et al., 2014). The reduction in maladaptive beliefs and the enhancement of cognitive flexibility through CBT likely contributed to the observed increase in ambiguity tolerance. This is particularly relevant in adolescents with SAD, who often exhibit rigid cognitive schemas and an exaggerated perception of social threats (Schoenherr et al., 2021). The use of CBT techniques, such as cognitive restructuring and exposure therapy, likely facilitated the reassessment of these maladaptive beliefs, leading to greater tolerance of ambiguity in social situations.

These findings are further supported by previous research indicating that CBT effectively addresses cognitive distortions and enhances coping mechanisms in individuals with SAD. For instance, Hofmann et al. (2014) demonstrated that CBT significantly improved quality of life and reduced anxiety symptoms by altering dysfunctional thinking patterns (Hofmann et al., 2014). Similarly, Alaoui et al. (2015) found that internet-based CBT effectively reduced social anxiety symptoms and improved overall functioning, which is consistent with the current study's findings on the positive impact of CBT on cognitive processes such as ambiguity tolerance (Alaoui et al., 2015).

Moreover, the maintenance of treatment gains observed during the follow-up period suggests that the effects of CBT on ambiguity tolerance are durable. This aligns with the findings of Hedman et al. (2011), who reported sustained improvements in social anxiety symptoms following internet-based CBT, indicating the long-term efficacy of CBT interventions (Hedman et al., 2011). The current study's results are also in line with those of Kaczkurkin and Foa (2015), who emphasized the effectiveness of CBT in producing lasting changes in anxiety-related cognitive processes, further supporting the robustness of CBT as a treatment modality for SAD (Kaczkurkin & Foa, 2015).

The significant difference between the experimental and control groups also highlights the specificity of CBT in addressing cognitive dimensions associated with social anxiety, such as ambiguity tolerance. This specificity is crucial, as it underscores the importance of targeted interventions in treating SAD. The observed effects of CBT on ambiguity tolerance could be attributed to the therapy's focus on cognitive restructuring, which directly challenges the distorted beliefs that contribute to intolerance of uncertainty and ambiguity (Narr & Teachman, 2017; Tsitsas & Paschali, 2014). The study by Schoenherr et al. (2021) also supports this notion, as they found that CBT's emphasis on cognitive reappraisal and exposure to feared social situations effectively reduces anxiety and improves cognitive flexibility.

Furthermore, the use of relaxation techniques within the CBT framework, as employed in this study, likely played a role in enhancing ambiguity tolerance by reducing physiological arousal and promoting a sense of control in anxiety-provoking situations (Cain et al., 2021). This is consistent with the findings of Sukmawati, Lestari, and Wardhani (2023), who reported that integrating relaxation strategies into CBT interventions effectively reduces anxiety symptoms and enhances emotional regulation, which could, in turn, improve tolerance for ambiguity (Sukmawati et al., 2023).

Despite the positive outcomes, this study is not without limitations. One notable limitation is the relatively small sample size, which may limit the generalizability of the findings. While the sample was adequate to detect significant effects within the study, a larger sample would have provided more robust and generalizable results. Additionally, the study was conducted in a specific geographical region, limiting the applicability of the findings to other populations or cultural contexts. Cultural differences can play a significant role in the expression of social anxiety and ambiguity tolerance, and future research should consider these factors to enhance the external validity of the findings.

Another limitation is the reliance on self-report measures, which are subject to social desirability bias and may not fully capture the complexity of cognitive changes induced by CBT. Although self-report questionnaires are a common and practical tool in psychological research, they can be influenced by participants' desire to present themselves in a favorable light, potentially leading to an overestimation of treatment effects. Additionally, self-report measures may not accurately reflect unconscious cognitive processes or the full spectrum of ambiguity tolerance.

Moreover, the study did not include a long-term follow-up beyond the two-month period. While the follow-up results were promising, a longer follow-up period would provide more comprehensive data on the durability of CBT effects on ambiguity tolerance. Long-term follow-up is particularly important in understanding the sustained impact of CBT and the potential for relapse, which is a concern in the treatment of anxiety disorders. Without long-term data, it is challenging to determine whether the improvements in ambiguity tolerance observed in this study will persist over time.

E-ISSN: 3041-8828

Future research should address these limitations by conducting studies with larger and more diverse samples. Expanding the sample size and including participants from various cultural backgrounds would enhance the generalizability of the findings and provide a more comprehensive understanding of the effectiveness of CBT across different populations. Additionally, future studies should consider incorporating objective measures, such as behavioral assessments or physiological indicators, to complement self-report data and provide a more nuanced view of the cognitive and emotional changes resulting from CBT.

Long-term follow-up studies are also essential to assess the enduring effects of CBT on ambiguity tolerance and other cognitive dimensions of social anxiety disorder. These studies should aim to follow participants for at least six months to one year post-treatment to evaluate the sustainability of the therapeutic gains and identify any factors that may influence relapse or continued improvement. Understanding the long-term trajectory of treatment effects can inform the development of maintenance strategies and booster sessions to support lasting change.

Furthermore, future research should explore the mechanisms underlying the improvements in ambiguity tolerance observed in this study. Specifically, studies could investigate the role of cognitive restructuring, exposure therapy, and relaxation techniques in enhancing tolerance for ambiguity. Identifying the key components of CBT that contribute to these improvements would allow for the refinement of intervention strategies and the development of more targeted treatments for social anxiety disorder. Additionally, exploring the potential mediating factors, such as changes in self-efficacy or emotional regulation, could provide valuable insights into the processes that drive therapeutic change.

Given the findings of this study, several practical implications can be drawn for clinicians working with adolescents diagnosed with social anxiety disorder. First, the results underscore the importance of incorporating cognitive restructuring techniques into CBT interventions to address maladaptive beliefs related to ambiguity and uncertainty. Clinicians should emphasize the identification and challenging of cognitive distortions, as this approach has been shown to significantly improve ambiguity tolerance and reduce social anxiety symptoms. Furthermore, the integration of exposure therapy within CBT should be a central component of treatment, as it effectively reduces avoidance behaviors and facilitates the reassessment of perceived social threats.

Clinicians should also consider incorporating relaxation techniques, such as guided imagery and progressive muscle relaxation, into CBT protocols for adolescents with SAD. These techniques not only help to manage physiological arousal but also contribute to enhancing cognitive flexibility and tolerance for ambiguity. The inclusion of relaxation strategies can make CBT more comprehensive and effective, particularly in addressing the somatic symptoms of anxiety that often accompany social anxiety disorder.

Finally, the findings suggest that clinicians should be mindful of the potential need for long-term support and follow-up when treating adolescents with SAD. While CBT has been shown to produce lasting effects, ongoing support may be necessary to maintain therapeutic gains and prevent relapse. Clinicians could consider implementing booster sessions or periodic check-ins post-treatment to reinforce the skills learned during therapy and provide additional support as needed. This approach could help sustain improvements in ambiguity tolerance and other cognitive dimensions of social anxiety, ultimately leading to better long-term outcomes for adolescents with SAD.

In conclusion, this study provides valuable evidence supporting the effectiveness of cognitive-behavioral therapy in improving ambiguity tolerance in adolescents with social anxiety disorder. The results align with previous research, demonstrating that CBT is a powerful and versatile intervention for addressing the cognitive and emotional challenges associated with SAD. By addressing the limitations and building on the findings of this study, future research and clinical practice can continue to enhance the effectiveness of CBT for individuals struggling with social anxiety.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

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