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Cognitive Rehabilitation Improves Memory and Distress Tolerance in Social Anxiety Disorder: A Quasi-Experimental Study

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Abstract

Background: *Social Anxiety Disorder (SAD) is a prevalent mental health condition that can substantially impair an individual's quality of life. This study investigates the efficacy of cognitive rehabilitation interventions in ameliorating memory deficits, enhancing distress tolerance, and promoting psychological health among individuals diagnosed with SAD.*

Methods: *This quasi-experimental study utilized a pretest-posttest control group design. The target population consisted of individuals diagnosed with SAD who sought treatment at counseling and psychological service centers in Ahvaz during 2023. A convenience sample of 30 participants, meeting pre-defined inclusion criteria, was recruited. Participants were then randomly assigned to either the experimental (n=15) or control (n=15) group. The experimental group received ten 90-minute sessions of cognitive rehabilitation. The control group received no intervention during the study period. The Retrospective and Prospective Memory Questionnaire (RPMQ), Distress Tolerance Scale (DTS), and Symptom Checklist-25 (SCL-25) served as the assessment instruments. Data were analyzed using analysis of covariance (ANCOVA) conducted in SPSS.*

Results: *The results demonstrated that cognitive rehabilitation significantly improved retrospective memory (F=341.81, P-value<0.001), prospective memory (F=156.43, P-value<0.001), distress tolerance (F=285.75, P-value<0.001), and psychological health (F=180.11, P-value<0.001) in the sample of individuals with SAD.*

Conclusions: *This study strongly supports the efficacy of cognitive rehabilitation for improving key domains in SAD. Significant improvements in retrospective memory, distress tolerance, and psychological health suggest its therapeutic value for this multifaceted disorder, adding to the growing body of literature on cognitive rehabilitation for anxiety disorders.*

Keywords: Rehabilitation, Cognitive, Memory, Psychological health, Anxiety.
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Introduction

Social Anxiety Disorder (SAD) is a chronic and often debilitating condition characterized by a relatively high prevalence, estimated to range between 7% and 13%.[1] Classified as an anxiety disorder, SAD involves intense fear and anxiety in social situations where individuals perceive themselves as being scrutinized by others, leading to significant disruption in daily academic, occupational, and social functioning.[2] As the third most prevalent psychiatric disorder, following depression and alcohol abuse, SAD exerts a substantial negative impact on overall health and quality of life.[3] Individuals with SAD experience marked fear of exhibiting inappropriate behaviors or displaying visible signs of anxiety in social interactions. This fear often results in avoidance of public and social settings, which, paradoxically, can elicit responses of rejection, disinterest, negative evaluation, and non-acceptance from others.[4] Consequently, these individuals often struggle to feel secure in social relationships, experience difficulties with self-disclosure, expressing affection, and engaging in positive social and functional interactions, frequently leading to social withdrawal.[5,6] SAD-related hypervigilance may overload cognitive resources, impairing memory encoding.[1]

The intense anxiety and self-focused attention characteristic of SAD can significantly impair cognitive processes, particularly memory functions, due to the heightened cognitive load and disrupted attentional resources.[7] Deficits in both retrospective and prospective memory represent a significant challenge for individuals with SAD. Memory, a complex mental faculty, enables the retention of self-awareness regarding feelings, inclinations, desires, thoughts, and judgments, facilitating their subsequent recall.[8] As a core cognitive function, memory encompasses the dynamic mechanisms involved in the retention, storage, and retrieval of knowledge and experiences.[9] Temporally, memory is broadly categorized into retrospective and prospective forms. Retrospective memory refers to the capacity to recall past events and experiences, while prospective memory pertains to the ability to remember to perform intended actions at a future time.[10] While retrospective memory is crucial for recalling daily activities, prospective memory is equally essential for navigating daily life.[11] Retrospective memory, the ability to recall past events and phenomena, plays a vital role in successful daily functioning. Prospective memory, conversely, concerns the ability to execute specific tasks at the appropriate time in the future, requiring individuals to recall intended actions while engaged in ongoing activities.[12] The cognitive demands of managing social anxiety, such as hypervigilance to perceived threats and excessive self-monitoring, may overload working memory and attentional systems, thereby contributing to these memory impairments.[7]

Diminished distress tolerance is another common challenge faced by individuals with SAD.[13] Distress tolerance refers to the capacity to effectively manage and respond to negative emotions, encompassing the ability to experience and endure unpleasant emotional states.[14] As a key component of

emotional dysregulation, low distress tolerance is characterized by an inability to withstand distressing and uncomfortable emotional experiences.[15] This construct influences both the appraisal of and the subsequent reactions to negative emotions. Individuals with lower distress tolerance tend to react more intensely to experiences of distress and upset.[16] Those with limited distress tolerance exhibit a reduced capacity to withstand discomfort and distress, often resorting to maladaptive coping strategies such as substance abuse for emotional relief. Furthermore, they may perceive others as possessing greater resilience and access to more adaptive coping mechanisms for managing negative emotional states.[17]

Impaired psychological health is another significant concern for individuals with SAD.[18] Psychological health encompasses the study of behavioral and psychological processes related to health, illness, and healthcare, and involves the promotion and maintenance of individual and social well-being, including the prevention and appropriate treatment of psychological disorders.[19] It represents a crucial function at both the individual and community levels, playing a vital role in the social sphere. The construct of psychological health reflects an individual's sense of self-efficacy, mental comfort, and awareness of their own capabilities to realize diverse cognitive, emotional, and social potential.[20] As a key dimension of overall health, positive psychological health is associated with fewer psychological, emotional, and personality difficulties, a more hopeful and fulfilling life, and the increased utilization of adaptive coping strategies for navigating challenges.[21]

Cognitive rehabilitation programs offer a promising avenue for improving psychological functioning.[22] Integrating findings from cognitive neuroscience and information technology, and grounded in the principle of brain plasticity, these programs aim to enhance performance and maximize health and well-being by targeting improvements in perception, attention, memory, reasoning, and problem-solving skills.[23] Cognitive rehabilitation involves performance-focused educational and therapeutic activities designed to strengthen or stabilize existing behavioral patterns, establish new patterns, and create compensatory mechanisms for cognitive functions affected by damage to the nervous system.[24] As a structured educational and therapeutic approach, cognitive rehabilitation facilitates the restoration of various functions through educational strategies, repetition, and practice. This complex and organized method addresses both cognitive and psychological challenges, encompassing the restoration or compensation of impaired functions through targeted education, repetition, and practice.[25] Essentially, cognitive rehabilitation represents an effort to restore and enhance lost cognitive capacities through the use of specific and purposeful stimuli and exercises.[26] The process typically involves an initial assessment, followed by the design of progressively challenging tasks aimed at strengthening cognitive functions.[27]

Kim et al.[28] demonstrated the efficacy of cognitive rehabilitation in improving prospective memory in individuals with acquired brain injury. Similarly, Ashouri[29] concluded that a cognitive rehabilitation program led to improvements in both retrospective and prospective memory among students with hearing impairment. Further supporting the benefits of cognitive rehabilitation, Pourfereydoun and Dasht Bozorgi[30] found that this therapy reduced psychological distress and increased self-compassion in women experiencing depression following mastectomy. However, the impact of cognitive rehabilitation appears to vary across different outcomes. While Lincoln et al.[31] reported that group-based cognitive rehabilitation improved general health and everyday memory in individuals with multiple sclerosis, they also noted that it did not significantly affect quality of life in this population.

SAD is a highly prevalent condition, with numerous challenges affecting individuals, particularly in the domains of retrospective and prospective memory, distress tolerance, and psychological health.[7,13,18] Consequently, effective educational and therapeutic interventions are essential to address these impairments, and cognitive rehabilitation represents a promising approach.[22] While prior research has demonstrated the efficacy of cognitive rehabilitation in improving memory and psychological outcomes in populations such as those with acquired brain injury or multiple sclerosis, no studies have specifically investigated its effects on retrospective and prospective memory, distress tolerance, and psychological health in individuals with SAD.[7,13] This gap is significant, as SAD-related cognitive impairments, such as those stemming from hypervigilance and excessive self-focused attention, differ mechanistically from those in other disorders, necessitating targeted interventions.[7,9] Furthermore, the findings of the present study may inform healthcare professionals and therapists about the effectiveness of cognitive rehabilitation for these specific outcomes in SAD, aiding decision-making for integrating this intervention into treatment programs. Therefore, this research aimed to determine the effectiveness of cognitive rehabilitation on retrospective and prospective memory, distress tolerance, and psychological health in individuals diagnosed with SAD.

Materials and Methods

This quasi-experimental study employed a pretest-posttest control group design. The target population comprised individuals with SAD who presented at counseling centers and psychological services in Ahvaz between January and June 2023. A consecutive sample of 30 participants was recruited after screening for eligibility based on predefined inclusion criteria, which included a score of 19 or higher on a social anxiety checklist, a minimum of a high school education, age between 20 and 40 years, no current substance dependence or use of psychiatric medications (e.g., anti-anxiety or antidepressant drugs), no history of receiving rehabilitation programs or psychological services within the past three months, and no concurrent participation in other educational or therapeutic interventions. Exclusion criteria included absence from more than two sessions, participant withdrawal, lack of cooperation during sessions, and diagnoses of bipolar disorder or other major comorbid psychiatric conditions.

The study procedures were as follows: After contacting counseling centers and psychological services in Ahvaz, and explaining the purpose and significance of the research, as well as emphasizing the importance of adhering to ethical guidelines, administrators were asked to refer individuals suspected of having SAD. This referral process continued until a sample of 30 participants was recruited, meeting the study's inclusion criteria. The purpose and significance of the research,

along with ethical considerations, were then explained to the selected participants, who subsequently provided written informed consent to participate. Participants were then assigned to either the experimental group or the control group. The experimental group received ten 60-minute sessions of cognitive rehabilitation therapy (two sessions per week), while the control group received no intervention during this period. The group intervention was delivered by a specialist in rehabilitation counseling at a psychological service center in Ahvaz. A summary of the cognitive rehabilitation sessions is provided in Table 1. Both groups were assessed at pre-test and post-test for retrospective and prospective memory, distress tolerance, and psychological health.

Table 1. A summary of the cognitive rehabilitation sessions

Sessions	Content
1	Establishing a proper relationship between the trainer and the clients, introducing people, stating the rules and goals of the sessions, and general knowledge of cognitive rehabilitation methods and exercises.
2	Participants practiced attention exercises by listening to auditory stimuli (numbers, words, and sentences) and compiled a list of stressful and tense life events.
3	The trainer provided a cognitive rehabilitation worksheet, taught attention skills (e.g., reading a text to identify specific letters and words), and guided participants in exercises to maintain and enhance attention.
4	Participants engaged in visual and auditory attention and memory exercises, focusing on selective attention and processing, while the trainer explained their role in improving psychological characteristics.
5	Training attention change exercises to improve comprehension and cognitive expansion and their relationship with distress tolerance and psychological health.
6	Training to observe descending and ascending order to maintain attention and trying to improve comprehension by reading a text and simultaneously searching for pre-determined letters and words.
7	Training to improve logical, visual and auditory memory with the help of numbers, letters, shapes, words and sentences.
8	Practice and repetition of improving verbal and visual memory, verbal organization and creating pair associations and their role in improving distress tolerance and psychological health.
9	Training and practicing strengthening executive functions including a plan related to a simple task, classification, separation and problem solving and their relationship with distress tolerance and psychological health.
10	Practicing previously learned strategies including memory exercises and attention cognitive exercises, summarizing the sessions with the participants, committing to applying the strategies in real life, and thanking and appreciating.

The Prospective and Retrospective Memory Questionnaire (PRMQ): The PRMQ, developed by Crawford et al.[32], consists of 16 items divided into two 8-item subscales: retrospective memory and prospective memory. Responses to each item are recorded using a five-point Likert scale ranging from 1 (never) to 5 (always). Subscale scores are calculated by summing the individual item scores, resulting in a possible range of 8 to 40 for each subscale, with higher scores indicating greater memory difficulties. In an Iranian sample, Zare et al.[33] reported Cronbach's alpha coefficients of 0.64 and 0.73 for the retrospective and prospective memory subscales, respectively. The present study yielded Cronbach's alpha coefficients of 0.72 and 0.79 for the same subscales.

The Distress Tolerance Scale (DTS): The Distress Tolerance Scale (DTS) is a 15-item self-report instrument designed to evaluate an individual's ability to withstand aversive emotional states. The scale comprises four subscales: Tolerance of Distressing Emotions, Absorption in Negative Emotions, Appraisal of Capacity and Distress Experienced, and Regulation of Emotions. Participants rate each item on a five-point Likert scale, ranging from 1 ("totally disagree") to 5 ("totally agree"). Total scores on the DTS can range from 15 to 75, with higher scores indicative of greater distress tolerance.[34] The DTS has demonstrated acceptable internal consistency, evidenced by a Cronbach's alpha of 0.77 reported by Azizi[35]. The scale demonstrated acceptable internal consistency in the present study, with a Cronbach's alpha coefficient of 0.85.

Symptom Checklist-25 (SCL-25): Psychological vulnerability was assessed using the Symptom Checklist-25 (SCL-25). This 25-item instrument measures eight primary symptom dimensions (anxiety, obsessive-compulsive disorder, interpersonal sensitivity, somatization, psychosis, paranoid ideation, depression, and phobia), as well as a ninth factor comprised of additional items. Respondents rate the presence and severity of symptoms experienced during the past week using a five-point Likert scale, ranging from 0 ("not at all") to 4 ("very high"). The total score, calculated by summing the scores across all nine factors, can range from 0 to 100.[36] The questionnaire demonstrated acceptable internal consistency in the present study, with a Cronbach's alpha coefficient of 0.88.

Data were analyzed using analysis of covariance (ANCOVA) in SPSS (Version 26) at a significance level of P-value<0.05, with pretest scores as covariates to control for baseline differences.

Results

The study participants consisted of 30 individuals (both male and female) diagnosed with SAD. The mean age was 32.66±4.35 years for the experimental group and 34.28±5.70 years for the control group. In the experimental group, there were 4 women (26.67%) and 11 men (73.33%). The control group comprised 5 women (66.67%) and 10 men (33.33%). Table 2 presents the means and standard deviations for pre- and post-intervention scores on retrospective memory, prospective memory, distress tolerance, and psychological health for both the experimental and control groups. As shown in Table 2, compared to the control group, the experimental group demonstrated a decrease in post-test means relative to pre-test

means for retrospective memory, prospective memory, and psychological health, and an increase in distress tolerance. Specifically, for retrospective memory (PRMQ, range 8–40), the experimental group's pretest mean of 35.60 indicates clinically significant impairment (>30; Crawford et al., 2003), which improved to 29.20 post-intervention, suggesting reduced memory difficulties. Similarly, prospective memory pretest scores (37.26) also indicated impairment (>30), improving to 32.60 post-intervention. For distress tolerance (DTS, range 15–75), the experimental group's pretest mean of 29.33 reflects low distress tolerance (<45), increasing to 34.66 post-intervention, indicating improved ability to withstand aversive emotional states. For psychological health (SCL-25, range 0–100), the experimental group's pretest mean of 55.93 suggests elevated psychological distress (>50), which decreased to 47.73 post-intervention, reflecting improved psychological well-being. It should be noted that lower scores on the PRMQ indicate fewer memory-related difficulties, while lower scores on the SCL-25 reflect improved psychological well-being, and higher DTS scores indicate greater distress tolerance.

Table 2. Means and standard deviations of research variables for experimental and control groups at pre-test and post-test

Variables	Phases	Experimental group		Control group	
		Mean	SD	Mean	SD
Retrospective memory	Pre-test	35.60	5.88	37.86	4.30
	Post-test	29.20	4.84	38.06	3.71
Prospective memory	Pre-test	37.26	4.69	39.13	4.24
	Post-test	32.60	4.11	39.66	4.15
Distress tolerance	Pre-test	29.33	3.65	30.53	3.68
	Post-test	34.66	4.27	30.6	4.09
Psychological health	Pre-test	55.93	4.7	56.53	5.55
	Post-test	47.73	4.65	56.86	5.91

Prior to conducting analysis of covariance (ANCOVA), the underlying assumptions were assessed. The Kolmogorov-Smirnov test confirmed the normality of pre- and post-test score distributions for retrospective memory, prospective memory, distress tolerance, and psychological health within both the experimental and control groups. Levene's test verified the homogeneity of variance assumption for these variables. Table 3 presents the results of the ANCOVA, which examined the effectiveness of cognitive rehabilitation on each of the aforementioned variables in individuals with social anxiety disorder.

Table 3. Results of analysis of covariance for post-test scores on research variables

Variables	SS	df	MS	F	P	η2
Retrospective memory	344.79	1	344.79	341.81	0.001	0.83
Prospective memory	195.25	1	195.25	156.43	0.001	0.76
Distress tolerance	219.67	1	219.67	285.75	0.001	0.83
Psychological health	498.54	1	498.54	180.11	0.001	0.78

The results indicate a statistically significant effect of the intervention across all measured variables (P-value=0.001 for all). Specifically, retrospective memory showed a significant improvement (F=341.81, η^2=0.83), as did prospective memory (F=156.43, η^2=0.76), distress tolerance (F=285.75, η^2=0.83), and psychological health (F=180.11, η^2=0.78). The eta squared values, interpreted per Cohen, indicate large effect sizes for all variables ($\eta^2 \geq 0.14$ for large effects), suggesting that cognitive rehabilitation had a substantial positive impact on all four domains.

Discussion

This study investigated the efficacy of cognitive rehabilitation for improving retrospective memory, prospective memory, distress tolerance, and psychological health in individuals with a diagnosis of SAD. This study found that cognitive rehabilitation yielded improvements in both retrospective and prospective memory for individuals with social anxiety disorder. These results align with previous research.[29,37] One explanation for these findings lies in the design of cognitive rehabilitation programs, which are often grounded in information processing models. By targeting fundamental cognitive processes, these interventions can enhance mental abilities across various cognitive domains. Furthermore, the literature suggests that active engagement in learning promotes the formation of critical neurological connections, whereas passive engagement does not. Cognitive rehabilitation, under specific conditions, may induce neuroplastic changes that facilitate improvements in cognitive functioning. Consequently, enhancing cognitive functions through such interventions can be expected to mitigate retrospective memory deficits. Given that cognitive exercises can be tailored to increase in difficulty, providing ongoing and engaging cognitive challenges, and fostering motivation and a sense of competition, they can stimulate brain activity and create an environment conducive to cognitive enhancement.[29] As retrospective memory is linked to frontal lobe function, and cognitive rehabilitation targets these brain regions, it is

plausible that such programs can lead to improvements in retrospective memory.

Memory is a critical cognitive domain vulnerable to disruption from various disorders. Cognitive rehabilitation programs can positively influence memory performance through both direct and indirect pathways, impacting executive functions and other related cognitive abilities.[32] Established theoretical frameworks posit that prospective memory tasks are intrinsically linked to intentions and planned actions. Consequently, impairments in prospective memory may negatively affect planning, potentially due to encoding deficits, a component of retrospective memory. Therefore, improvements in cognitive components related to retrospective and prospective memory are interconnected.[37] As an educational or therapeutic intervention, cognitive rehabilitation employs memory-focused strategies, training, repetition, and practice to enhance cognitive capacity and memory, ultimately improving recall by facilitating information access. Thus, it is logical to hypothesize that cognitive rehabilitation can lead to improvements in both retrospective and prospective memory in individuals with social anxiety disorder.

A further finding of this study indicated that cognitive rehabilitation increased distress tolerance in individuals with social anxiety disorder, a result consistent with previous research.[30] These findings can be explained by considering the role of cognitive rehabilitation in enhancing processing speed, cognitive flexibility, and memory, as well as its influence on prefrontal cortex activity. This intervention aims to improve cognitive skills by restoring or developing cognitive abilities through specific and targeted exercises, potentially leading to significant changes in behavioral responses, attention, memory, and other cognitive functions.[25] The hierarchical structure of cognitive rehabilitation programs, with graded levels of difficulty, facilitates gradual improvement in executive functions and psychological characteristics. Furthermore, cognitive rehabilitation can increase awareness of feelings, beliefs, and attitudes related to intrapersonal and interpersonal relationships by modifying maladaptive beliefs, reframing thoughts, increasing awareness of cognitive distortions (such as catastrophizing, labeling, magnification, and overgeneralization), and reducing negative biases in behavioral judgments.[30] Consequently, it is reasonable to expect that cognitive rehabilitation plays an important role in increasing distress tolerance in individuals with social anxiety disorder.

A further finding of this study demonstrated that cognitive rehabilitation enhanced psychological health in individuals with social anxiety disorder, consistent with previous research.[31] These results can be interpreted through the lens of neuropsychological theory, which posits that stimulating specific cognitive domains can improve cognitive flexibility. Cognitive flexibility, the ability to adapt and modify responses based on performance, aims to expand and enhance cognitive functions. This includes stabilizing existing behavioral patterns, establishing new patterns for skilled cognitive and motor activities, and providing compensatory cognitive mechanisms for impaired nervous system function.[24] Consequently, by improving executive functions, cognitive rehabilitation can mitigate anxiety and promote psychological well-being.

Furthermore, cognitive rehabilitation emphasizes the influence of thoughts on emotions and behaviors, focusing on modifying thought patterns and challenging cognitive distortions arising from maladaptive information processing.[23] This process facilitates the development of more adaptive thought patterns, fostering positive emotions and behaviors. The emergence of positive affective and behavioral states subsequently alters an individual's interactions with themselves and others, promoting positive engagement.[27] In essence, by instilling new beliefs and perspectives within revised thought patterns, cognitive rehabilitation influences intrapersonal and interpersonal interactions, ultimately improving psychological health. Therefore, it is plausible that cognitive rehabilitation can effectively enhance psychological health in individuals with social anxiety disorder.

This study has several limitations. The use of a convenience sample may limit the generalizability of findings. The absence of a follow-up assessment precludes conclusions regarding the long-term efficacy of the intervention. Reliance on self-report measures introduces the potential for response bias. Furthermore, the sample's recruitment from individuals seeking treatment for social anxiety disorder at specific clinics in Ahvaz may limit the applicability of these results to other populations.

In conclusion, the findings of this study provide compelling evidence for the efficacy of cognitive rehabilitation in improving several key domains in individuals with social anxiety disorder. The significant improvements observed across retrospective memory, prospective memory, distress tolerance, and psychological well-being suggest that this intervention offers a valuable therapeutic approach for addressing the multifaceted challenges associated with SAD. The brief 10-session protocol demonstrates potential as a scalable and cost-effective treatment option for SAD in low- and middle-income countries, enhancing access to care in resource-constrained settings. These results contribute to the growing body of literature supporting the use of cognitive rehabilitation techniques in the treatment of anxiety disorders and highlight their potential to enhance cognitive function and emotional regulation in this population. Further research, including investigations into the specific mechanisms of action and long-term effects of cognitive rehabilitation, is warranted to optimize treatment protocols and maximize patient outcomes.

Ethical Considerations

This study was conducted in accordance with the ethical principles outlined by the Ethical Committee of Islamic Azad University, Ahvaz Branch (approval code: IR.IAU.AHVAZ.REC.1403.349).

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Conflict of Interest

No conflicts of interest declared.

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