Journal Website

Article history:
Received 25 February 2025
Revised 02 May 2025
Accepted 10 May 2025
Published online 03 December 2025

International Journal of Education and Cognitive Sciences

Volume 6, Issue 4, pp 1-10

E-ISSN: 3041-8828

Comparison of the Effectiveness of Short-Term Psychodynamic Psychotherapy and Cognitive Behavioral Therapy on Behavioral Brain System and Mental Toughness in Patients with Coronary Artery Disease in Hamadan

Mehdi. Ebrahimkhani[1], Hasan. Rezaei Jamolouei[1*], Saeed. Ariapooran[2], Abolghasem. Yaghoobi[3]

[1] Department of Health Psychology, Na.C., Islamic Azad University, Najafabad, Iran
[2] Department of Psychology, Faculty of Literature and Humanities, Malayer University, Malayer, Iran
[3] Department of Psychology, Faculty of Economics and Social Sciences, Bu-Ali Sina University, Hamedan, Iran

*** Corresponding author email address**: h.rezayi2@iau.ac.ir

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Ebrahimkhani, M., Rezaei Jamolouei, H., Ariapooran, S., & Yaghoobi, A. (2025). Comparison of the Effectiveness of Short-Term Psychodynamic Psychotherapy and Cognitive Behavioral Therapy on Behavioral Brain System and Mental Toughness in Patients with Coronary Artery Disease in Hamadan. *International Journal of Education and Cognitive Sciences, 6*(4), 1-10.
https://doi.org/10.61838/kman.ijecs.6.4.7

A B S T R A C T

Purpose: This study aimed to compare the effectiveness of Short-Term Psychodynamic Psychotherapy (STPP) and Cognitive Behavioral Therapy (CBT) on the Behavioral Inhibition System (BIS), Behavioral Activation System (BAS), and mental toughness in patients with coronary artery disease (CAD).

Methods and Materials: The research employed a quasi-experimental design with a pre-test/post-test structure and included two experimental groups and one control group. A total of 45 patients with CAD, aged 35–55 years, referred to Farshchian Hospital in Hamadan, Iran, were selected through convenience sampling and randomly assigned to the groups. The psychodynamic therapy group received twelve 2-hour sessions over 90 days, while the CBT group participated in twelve 90-minute sessions within the same timeframe. Data were collected using the Carver and White BIS/BAS Scale and the Clough Mental Toughness Questionnaire. Analysis of covariance (ANCOVA) and Bonferroni post hoc tests were performed using SPSS-25 to examine group differences.

Findings: The ANCOVA results showed a statistically significant difference between the groups in mental toughness scores after controlling for pre-test scores ($F = 12.391$, $p = 0.002$, $\eta^2 = 0.315$), with the CBT group outperforming both the STPP and control groups. The effect of group on BIS approached significance ($F = 3.990$, $p = 0.056$), and post hoc analysis revealed a significant difference between the CBT and control groups ($p = 0.004$). Regarding BAS, although the overall ANCOVA was not significant ($p = 0.308$), pairwise comparisons showed that the CBT group had significantly higher post-test BAS scores compared to both STPP ($p = 0.045$) and control ($p = 0.003$) groups.

Conclusion: CBT demonstrated superior efficacy over STPP in enhancing mental toughness and behavioral activation in CAD patients, while both interventions were beneficial compared to no treatment. Integrating psychological therapies into cardiac care may improve emotional regulation and resilience.

Keywords: *Cognitive Behavioral Therapy, Psychodynamic Psychotherapy, Coronary Artery Disease, Behavioral Inhibition System, Behavioral Activation System, Mental Toughness.*

1. Introduction

Coronary artery disease (CAD) remains a leading cause of mortality and morbidity worldwide, often accompanied by significant psychological and cognitive burdens that adversely affect patient outcomes. Psychological factors such as chronic stress, anxiety, and maladaptive coping mechanisms have been found to exacerbate cardiovascular pathology and complicate treatment adherence and recovery (Fahim et al., 2022; Sommaruga, 2016). The interplay between psychological functioning and CAD is increasingly emphasized in clinical literature, with brain–behavior systems (Behavioral Inhibition System [BIS] and Behavioral Activation System [BAS]) and constructs such as mental toughness emerging as important indicators of adaptation and resilience in these patients (Gucciardi et al., 2015; Sun et al., 2020). BIS/BAS sensitivities are believed to shape how individuals react to threats and rewards, impacting their vulnerability to stress-related disorders such as depression and anxiety (Moheb et al., 2021; Sarkeshikiyan et al., 2021). In parallel, mental toughness is recognized as a key psychological trait in patients with chronic illness, associated with persistence, emotional control, and cognitive regulation in the face of adversity (Gucciardi et al., 2015).

Recent research highlights the value of psychological interventions such as Cognitive Behavioral Therapy (CBT) and Short-Term Psychodynamic Psychotherapy (STPP) in addressing emotional distress and behavioral dysregulation among individuals with CAD (Jafari et al., 2024; Nakhaei Moghadam et al., 2024). These therapies, though based on different paradigms, are effective in improving psychological wellbeing and facilitating adaptive coping mechanisms. CBT focuses on identifying and restructuring maladaptive cognitions and behaviors that contribute to psychological distress, making it suitable for patients with CAD who often struggle with health-related anxiety and stress reactivity (Görmezoğlu et al., 2020; Ma et al., 2020). Evidence from both meta-analyses and randomized trials suggests that CBT is effective in reducing psychological symptoms such as anxiety, depression, and stress, while enhancing resilience and self-management in cardiac patients (Mosalanejad et al., 2012; Taghipour et al., 2020; Vakili et al., 2021).

Similarly, STPP offers a time-limited, focused therapeutic approach that explores unconscious emotional conflicts, attachment styles, and internalized relationship patterns that underlie maladaptive behaviors and emotional disturbances (Alirezaee et al., 2022; Jorjani, 2023). In CAD patients, this approach has demonstrated significant reductions in depression, health anxiety, and physical symptoms when applied intensively and with proper clinical structure (Jafari et al., 2024; Roggenkamp et al., 2021). Furthermore, STPP has been shown to produce long-term effects in improving emotion regulation and lowering healthcare utilization costs, particularly when targeting stress-related psychopathologies common in CAD populations (Roggenkamp et al., 2021).

In the context of CAD, where emotional dysregulation and poor stress tolerance are prevalent, mental toughness has emerged as a promising construct that can predict better adherence to medical regimens and improved physical outcomes (Gucciardi et al., 2015; Mohamadi et al., 2020). Mental toughness encompasses an individual's capacity to manage pressure, recover from setbacks, and stay committed to goals despite emotional or physical challenges. It is therefore not surprising that psychological interventions aimed at strengthening cognitive and emotional regulation also contribute to the development of mental toughness (Forouzani et al., 2024; Terp et al., 2019). CBT in particular has shown effectiveness in enhancing psychological hardiness and self-regulatory capacities, especially when integrated with behavioral activation and mindfulness techniques (Ma et al., 2020; Pascual-Madorran et al., 2021).

Another critical dimension in understanding the impact of psychotherapy on CAD patients is the functioning of the brain–behavioral systems. BIS is associated with threat detection and behavioral inhibition in the face of perceived danger, while BAS governs responses to rewards and goal-seeking behaviors (Sarkeshikiyan et al., 2021; Sun et al., 2020). Hyperactivity in BIS has been linked to increased anxiety and avoidance behaviors, both of which are detrimental to recovery in chronic illness contexts. On the other hand, a well-regulated BAS promotes motivation, engagement, and resilience, which are essential for long-term health behavior change (Asghari et al., 2014; Moheb et al., 2021). Interventions that modulate these systems, such as CBT and STPP, are thus critical in optimizing psychological and physiological recovery trajectories in CAD patients.

Evidence from recent Iranian studies also corroborates these findings, showing that both CBT and STPP significantly reduce anxiety, improve emotion regulation, and foster cognitive-affective flexibility among patients with cardiovascular conditions (Alirezaei et al., 2022; Aliyari Khanshan Vatan et al., 2022). Comparative studies suggest

E-ISSN: 3041-8828

that while CBT may be more effective in targeting explicit maladaptive cognitions and increasing behavioral activation, STPP facilitates deeper emotional insight and restructuring of unconscious conflictual patterns (Alirezaee et al., 2022; Nakhaei Moghadam et al., 2024). Notably, Forouzani et al. (2024) demonstrated that CBT significantly improved psychological hardiness and relationship quality in couples, which aligns with the notion that structured cognitive restructuring and behavior modification have ripple effects on multiple psychosocial domains (Forouzani et al., 2024).

Despite the growing literature supporting these interventions, few studies have directly compared the differential effects of CBT and STPP on both behavioral brain systems and mental toughness in patients with coronary artery disease. Existing works tend to examine either emotional outcomes or cognitive variables in isolation, leaving a gap in integrated, multi-dimensional assessments (Görmezoğlu et al., 2020; Moghadam et al., 2020). Moreover, the majority of prior studies have emphasized symptom reduction without delving into the underlying regulatory systems such as BIS/BAS and their mediating roles in stress perception and resilience (Sarkeshikiyan et al., 2021; Sun et al., 2020).

The present study was designed to address this gap by systematically comparing the effects of Cognitive Behavioral Therapy and Short-Term Psychodynamic Psychotherapy on behavioral brain systems (BIS and BAS) and mental toughness in patients with coronary artery disease in Hamadan.

2. Methods and Materials

2.1. Study Design and Participants

This study was an applied research project conducted using a quasi-experimental design involving a pre-test and post-test structure with two experimental groups and one control group. The study population consisted of all patients diagnosed with coronary artery disease (CAD) aged between 35 and 55 years who referred to Farshchian Hospital in Hamadan in 2024. Participants were selected through a convenience sampling method. Researchers approached the hospital and identified eligible patients based on clinical diagnosis. Volunteer participation forms were distributed among these patients, and those meeting the inclusion criteria were considered for the study. Inclusion criteria involved a confirmed diagnosis of CAD by a cardiologist based on WHO standards, at least a middle school education level, age between 35 to 55, ability to attend group therapy sessions, and willingness to participate. Exclusion criteria included missing more than two intervention sessions, expressing disinterest in continuing participation, failure to complete assigned therapy tasks, and occurrence of unforeseen events. A total of 45 participants were selected and randomly assigned to one of the three groups (15 per group), which meets the minimum sample size requirement for experimental studies. Ethical considerations were carefully observed: participants were fully informed about the nature of the study, were assured they could withdraw at any time, and confidentiality of personal data was strictly maintained. No identifying information was recorded, and informed consent was obtained from all participants.

2.2. Measures

The first instrument used was the Behavioral Inhibition System/Behavioral Activation System Scale (BIS/BAS), developed by Carver and White (1994). This self-report scale contains 24 items, comprising 7 items for the Behavioral Inhibition System (BIS) and 13 items for the Behavioral Activation System (BAS), which includes three subcomponents: Reward Responsiveness (5 items), Drive (4 items), and Fun Seeking (4 items). Additionally, there are 4 filler items not used in scoring. Responses are rated on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree), with reverse scoring applied to all items except items 2 and 22. Carver and White (1994) reported acceptable internal consistency coefficients: 0.74 for BIS and 0.73, 0.76, and 0.66 respectively for the three BAS subscales. In Iranian studies, Atarifard et al. (2006) found internal consistency scores of 0.47 for BIS and 0.73, 0.60, and 0.18 for the BAS subscales. Other local studies reported retest reliabilities and Cronbach's alpha values ranging from 0.68 to 0.85, confirming its acceptable psychometric properties. Convergent and divergent validity were established through significant correlations between BIS and measures of depression and anxiety, while the BAS subscales showed weaker, negative correlations with these constructs, supporting the scale's multidimensional validity.

The second instrument was the Mental Toughness Questionnaire developed by Clough, Earle, and Sewell in 2002. This 48-item tool assesses mental toughness across four dimensions: challenge, commitment, control, and confidence. The control scale includes emotional control and life control, while the confidence scale comprises self-confidence and interpersonal confidence. Items are scored using a 5-point Likert scale ranging from 1 (strongly

E-ISSN: 3041-8828

disagree) to 5 (strongly agree), with total scores ranging from 48 to 240. This instrument has consistently demonstrated strong psychometric properties. In test-retest reliability assessments, the overall reliability coefficient was reported as 0.90. Cronbach's alpha coefficients were 0.77 for challenge, 0.80 for commitment, 0.78 for emotional control, 0.81 for life control, and 0.81 for both confidence dimensions. A large-scale study involving 8207 participants validated the six-factor structure using both exploratory and confirmatory factor analysis, supporting the instrument's construct validity and internal consistency across diverse samples.

2.3. Interventions

The short-term psychodynamic psychotherapy protocol employed in this study was adapted from the therapeutic model developed by Rutan, Shay, and colleagues (2014), and the researcher made no modifications to the session content. This protocol consisted of 12 group therapy sessions, each lasting two hours, conducted twice weekly over a 90-day period. The structure was divided into three phases. In the first session, participants were introduced to the therapeutic process, including the goals and rules of group therapy, treatment duration, mutual agreements, and group dynamics. Members introduced themselves and shared their motivations for joining the group. Sessions two through seven focused on core psychodynamic processes tailored to each patient's needs. Key themes included addressing resistance to emotional closeness with the therapist and other members—such as fears of personal boundary violations—identifying and clarifying defense mechanisms used to avoid anxiety and emotional awareness, working through anxiety regulation, and fostering recognition and expression of emotions within the group context. Sessions eight to twelve concentrated on enhancing participants' insight into their intrapsychic conflicts, one of the fundamental aims of psychodynamic group therapy. These final sessions emphasized reflection, integration of therapeutic gains, and group closure. The final session included post-treatment assessment and formal termination of the therapeutic relationship.

The cognitive behavioral intervention applied in this study followed the CHD-CBGI program, a structured, manualized group therapy protocol comprising 12 sessions of 90 minutes each, conducted twice weekly over the course of 90 days. The intervention adhered to the classic structure of cognitive behavioral group therapy, with each session broken into fixed segments: a review of homework from the previous session (10 minutes), a recap of the previous session's content (5 minutes), presentation of the first therapeutic topic and related exercises (30 minutes), a short break (5 minutes), presentation and practice of the second topic (30 minutes), a summary and consolidation of the session (5 minutes), and assignment of new homework (5 minutes). Session content was designed to address both psychological and physiological dimensions of coronary heart disease (CHD). The first session focused on group orientation, program overview, and basic education about CHD by a cardiologist. The second session explored CHD risk factors and prevention strategies. The third session involved a sports and nutrition expert discussing the role of diet and physical activity in CHD management. In the fourth and fifth sessions, participants examined the emotional and cognitive impact of CHD and learned symptom recognition and coping strategies. Sessions six through eight emphasized cognitive restructuring and behavioral regulation techniques, including the identification of Type A behavior patterns (TABP), understanding the ABC cognitive model, and reducing anger and maladaptive thought patterns. Sessions nine through eleven revisited symptom management, focusing on the roles of exercise, muscle relaxation, social support, spirituality, and religiosity in mitigating CHD symptoms. The final session reviewed the entire program, gathered patient feedback, scheduled follow-up sessions, and marked the formal conclusion of the intervention.

2.4. Data Analysis

The data collected from pre-test and post-test scores across the three groups were analyzed using SPSS version 25. To determine the effectiveness of the interventions, a univariate analysis of covariance (ANCOVA) was conducted to control for pre-test scores and assess differences between the experimental and control groups in the post-test phase. Additionally, Bonferroni post hoc tests were employed to examine pairwise differences and clarify which intervention had a statistically significant advantage over the others. These statistical methods ensured rigorous control of confounding variables and facilitated accurate comparison of therapeutic effects on both behavioral brain systems and mental toughness outcomes.

3. Findings and Results

E-ISSN: 3041-8828

Table 1 presents the descriptive statistics for the three measured variables—Behavioral Inhibition System (BIS), Behavioral Activation System (BAS), and Mental Toughness—across pre-test and post-test stages for the psychodynamic therapy group, the cognitive-behavioral therapy group, and the control group. In the case of the BIS, both experimental groups showed an increase in post-test scores, with the cognitive-behavioral group showing a greater increase (from 20.26 to 26.26) compared to the psychodynamic group (from 20.00 to 24.60), while the control group showed only a slight increase (from 21.46 to 22.27). For BAS, post-test scores also increased in the psychodynamic group (from 40.13 to 41.66) and more notably in the cognitive-behavioral group (from 39.40 to 45.68), whereas the control group's mean remained relatively stable (from 39.66 to 40.13). Regarding mental toughness, substantial increases were observed in both treatment groups, particularly in the cognitive-behavioral group which rose from 130.80 to 155.33, followed by the psychodynamic group with an increase from 129.13 to 143.80. The control group's mean remained nearly unchanged (from 132.80 to 132.66), indicating minimal natural progression. These patterns suggest that both interventions had a positive effect on the target variables, especially cognitive-behavioral therapy.

Table 1

Descriptive Statistics of Behavioral Inhibition System, Behavioral Activation System, and Mental Toughness in Pre-test and Post-test Stages by Group

Variable	Stage	Group	Mean	Standard Deviation
Behavioral Inhibition System	Pre-test	Psychodynamic	20.00	3.42
		Cognitive-Behavioral	20.26	2.96
		Control	21.46	2.89
	Post-test	Psychodynamic	24.60	3.81
		Cognitive-Behavioral	26.26	3.71
		Control	22.27	2.57
Behavioral Activation System	Pre-test	Psychodynamic	40.13	5.24
		Cognitive-Behavioral	39.40	4.73
		Control	39.66	4.32
	Post-test	Psychodynamic	41.66	4.98
		Cognitive-Behavioral	45.68	4.59
		Control	40.13	3.99
Mental Toughness	Pre-test	Psychodynamic	129.13	8.28
		Cognitive-Behavioral	130.80	10.15
		Control	132.80	7.24
	Post-test	Psychodynamic	143.80	11.06
		Cognitive-Behavioral	155.33	12.48
		Control	132.66	6.70

Before conducting the ANCOVA analyses, all necessary statistical assumptions were examined and confirmed to ensure the validity of the results. The assumption of normality was assessed using the Shapiro–Wilk test and visual inspection of histograms and Q-Q plots, which indicated that the distribution of the dependent variables was approximately normal within each group. Homogeneity of variances was evaluated using Levene's test, and the results were non-significant for all variables, indicating that the variances were equal across groups. The assumption of homogeneity of regression slopes was also tested by examining the interaction between the covariate (pre-test scores) and the group variable, and no significant interaction was found, confirming that the slopes were homogeneous. Additionally, linearity between the covariate and the dependent variable was confirmed through scatterplots, and the absence of multicollinearity and outliers was verified. These findings validated the use of ANCOVA for the present dataset.

The results of the univariate analysis of covariance (ANCOVA) are presented in Table 2. After controlling for pre-test scores, the effect of the treatment group on the Behavioral Inhibition System (BIS) approached significance, $F(1, 27) = 3.990$, $p = 0.056$, with a small to moderate effect size ($\eta^2 = 0.129$). For the Behavioral Activation System (BAS), the group effect was not statistically significant, $F(1, 27) = 1.079$, $p = 0.308$, with a negligible effect size ($\eta^2 = 0.038$). In contrast, a significant

E-ISSN: 3041-8828

difference was found in Mental Toughness across groups, $F(1, 27) = 12.391$, $p = 0.002$, with a large effect size ($\eta^2 = 0.315$), indicating that the interventions had a substantial impact on improving mental toughness among participants.

Table 2

Results of Univariate ANCOVA for Behavioral Inhibition System, Behavioral Activation System, and Mental Toughness

Variable	Source	SS	df	MS	F	p-value	η^2
Behavioral Inhibition	Pre-test	2.613	1	2.613	0.240	0.628	0.009
	Group	43.439	1	43.439	3.990	0.056	0.129
	Error	293.920	27	10.886			
Behavioral Activation	Pre-test	6.264	1	6.264	0.362	0.552	0.013
	Group	18.658	1	18.658	1.079	0.308	0.038
	Error	466.802	27	17.289			
Mental Toughness	Pre-test	105.193	1	105.193	1.269	0.270	0.045
	Group	1027.308	1	1027.308	12.391	0.002	0.315
	Error	2238.540	27	82.909			

Post hoc comparisons using the Bonferroni correction (Table 3) further clarified group differences. In the case of the Behavioral Inhibition System, a significant difference was found between the CBT and control groups ($p = 0.004$), favoring CBT, whereas differences between the psychodynamic and control groups, and between CBT and psychodynamic groups, were not significant. Regarding the Behavioral Activation System, significant differences emerged between CBT and both the psychodynamic ($p = 0.045$) and control groups ($p = 0.003$), indicating superior effectiveness of CBT, while the psychodynamic vs. control comparison was not significant. For Mental Toughness, all pairwise comparisons were statistically significant. Both the psychodynamic ($p = 0.012$) and CBT ($p = 0.001$) groups outperformed the control group, and the CBT group also significantly outperformed the psychodynamic group ($p = 0.016$), suggesting that CBT was the most effective intervention for enhancing mental resilience.

Table 3

Bonferroni Post Hoc Test Results for Pairwise Group Comparisons

Variable	Comparison	Mean Difference	p-value
Behavioral Inhibition	Psychodynamic vs. Control	2.685	0.115
	CBT vs. Psychodynamic	1.603	0.602
	CBT vs. Control	4.288	0.004
Behavioral Activation	Psychodynamic vs. Control	1.522	0.990
	CBT vs. Psychodynamic	4.018	0.045
	CBT vs. Control	5.540	0.003
Mental Toughness	Psychodynamic vs. Control	11.773	0.012
	CBT vs. Psychodynamic	11.243	0.016
	CBT vs. Control	23.015	0.001

4. Discussion and Conclusion

The purpose of the present study was to compare the effectiveness of Short-Term Psychodynamic Psychotherapy (STPP) and Cognitive Behavioral Therapy (CBT) on the Behavioral Inhibition System (BIS), Behavioral Activation System (BAS), and mental toughness in patients with coronary artery disease (CAD). The findings indicate that both psychotherapeutic interventions had a positive impact on mental toughness and, to a lesser extent, on brain–behavioral systems. Specifically, the results revealed a statistically significant difference among groups in post-test scores of mental toughness, with CBT demonstrating the most substantial improvement, followed by STPP. Additionally, while the main effect of group on BIS approached significance, post hoc analyses showed a

E-ISSN: 3041-8828

significant increase in BIS scores in the CBT group compared to the control group. Similarly, the BAS score increased significantly in the CBT group compared to both STPP and control groups.

These findings highlight the strong therapeutic potential of CBT in enhancing psychological resilience and motivational systems in patients with CAD. The significant increase in mental toughness following CBT is consistent with earlier studies that demonstrated the ability of CBT to improve cognitive coping, emotional control, and behavioral persistence in the face of chronic illness-related stress (Gucciardi et al., 2015; Ma et al., 2020). CBT's emphasis on cognitive restructuring, behavioral activation, and skills training may explain its superior performance in increasing mental toughness compared to STPP, which focuses more on insight and emotional exploration. This aligns with research conducted by Forouzani et al. (2024), who found that CBT significantly enhanced psychological hardiness and relational stability in couples experiencing chronic stress (Forouzani et al., 2024). Furthermore, Vakili et al. (2021) also reported that CBT-based stress management training effectively reduced anxiety and enhanced resilience in CAD patients, confirming the current study's outcomes (Vakili et al., 2021).

The impact of CBT on behavioral brain systems, particularly the BAS, also underscores the motivational enhancement capacity of cognitive-behavioral strategies. In this study, post-intervention BAS scores in the CBT group were significantly higher than both STPP and control groups, indicating increased behavioral engagement, reward sensitivity, and goal-directed activity. These findings are consistent with prior research by Asghari et al. (2014), who found that CBT reduced behavioral inhibition and increased behavioral activation among patients with social anxiety, suggesting that CBT's effects extend across both cognitive and motivational domains (Asghari et al., 2014). Similarly, Moheb et al. (2021) noted that mindfulness-based CBT interventions improved regulation of the BIS/BAS systems in opioid-dependent patients, supporting the current results regarding CBT's role in modulating motivational tendencies (Moheb et al., 2021).

While the STPP group did not show as strong an effect as CBT, its positive impact on mental toughness was still significant when compared to the control group. This finding resonates with earlier research demonstrating the effectiveness of STPP in reducing emotional distress and promoting emotional regulation in patients with chronic illnesses, including CAD (Jafari et al., 2024; Nakhaei Moghadam et al., 2024). The therapeutic mechanisms of STPP, such as exploration of unconscious emotional conflicts, improvement of interpersonal dynamics, and development of insight, appear to indirectly bolster mental resilience over time. The current findings also parallel those of Roggenkamp et al. (2021), who reported improvements in psychiatric symptoms and long-term functioning following STPP in trauma-exposed patients, suggesting that psychodynamic interventions can strengthen coping resources even in medically complex populations (Roggenkamp et al., 2021).

However, when it comes to influencing the behavioral brain systems, STPP appeared less effective than CBT. Although BIS and BAS scores increased modestly in the STPP group, these changes were not statistically significant. This is consistent with previous literature indicating that STPP may be less direct in its influence on behavioral activation and inhibition systems due to its focus on affective insight rather than cognitive restructuring or behavioral reinforcement (Alirezaee et al., 2022; Jorjani, 2023). Nonetheless, its effectiveness in reducing psychological distress, particularly anxiety and somatization, has been substantiated in multiple studies (Alirezaei et al., 2022; Nakhaei Moghadam et al., 2024).

Importantly, this study also contributes to the expanding literature that integrates psychological constructs such as BIS/BAS sensitivity and mental toughness within the framework of cardiac rehabilitation. As noted in the research by Sun et al. (2020), BIS/BAS functioning plays a mediating role in the emergence and maintenance of anxiety and depression, conditions that are highly prevalent in CAD populations (Sun et al., 2020). By showing that CBT can successfully modulate BAS, and to a lesser extent BIS, the present findings suggest that this therapy may reduce the risk of mood disturbances and promote adaptive emotional responses. These results are further supported by Sarkeshikiyan et al. (2021), who emphasized the predictive value of BIS/BAS systems in academic and behavioral outcomes under stress, suggesting their broader applicability to health-related contexts (Sarkeshikiyan et al., 2021).

In the context of CAD, mental toughness has been increasingly recognized as a critical resilience factor that supports adherence to medical regimens, recovery from acute events, and psychological well-being (Gucciardi et al., 2015; Moghadam et al., 2020). The current findings confirm that both CBT and STPP can enhance mental toughness, although CBT appears to exert a more pronounced effect. These results align with those of Mosalanejad et al. (2012),

E-ISSN: 3041-8828

who showed that CBT interventions improved mental health and hardiness in women undergoing fertility treatment, indicating the cross-condition relevance of such psychological traits (Mosalanejad et al., 2012).

Taken together, the findings of this study suggest that CBT, compared to STPP, is more effective in improving both motivational systems and psychological resilience in CAD patients. Nonetheless, STPP still holds therapeutic value, especially for individuals whose distress is rooted in interpersonal or emotional conflicts. Clinicians should consider patient characteristics and treatment goals when selecting therapeutic modalities, as both approaches offer unique mechanisms of change. These insights are critical for advancing personalized psychological care in cardiology and for developing integrative intervention protocols that combine cognitive, emotional, and behavioral strategies.

Despite the promising results, this study had several limitations. First, the sample size was relatively small and drawn from a single geographic location, which may limit the generalizability of the findings. The use of convenience sampling may also introduce selection bias, as individuals who agreed to participate may have had different psychological profiles compared to non-participants. Second, although the study used validated instruments, the reliance on self-report measures may be subject to response bias or social desirability effects. Third, the follow-up period was not included in the current design, making it difficult to assess the long-term sustainability of the observed therapeutic gains. Additionally, the study did not control for potential confounding factors such as medication use, comorbid mental health conditions, or social support, all of which could influence treatment outcomes.

Future studies should consider larger and more diverse samples to enhance the external validity of findings. Including follow-up assessments at 3- and 6-month intervals would allow researchers to examine the durability of the effects and detect potential relapse or regression. It would also be beneficial to incorporate objective physiological or behavioral indicators, such as heart rate variability or medication adherence, to complement the psychological data. Moreover, comparative studies could examine combinations of therapeutic approaches (e.g., CBT + STPP or CBT + mindfulness) to explore potential additive or synergistic effects. Finally, research could explore moderators such as gender, socioeconomic status, or illness severity, to better tailor interventions to subgroups of cardiac patients.

For clinical practice, the findings underscore the importance of integrating structured psychological interventions into standard cardiac rehabilitation programs. CBT, in particular, should be prioritized for patients who exhibit high levels of anxiety, low motivation, or maladaptive thought patterns. STPP can be recommended for individuals with unresolved emotional conflicts or those who prefer insight-oriented approaches. Practitioners should also monitor changes in BIS/BAS functioning and mental toughness as part of psychological assessments, as these variables may serve as markers of therapeutic progress. Training programs for cardiac care providers should include basic competencies in psychological screening and referral to facilitate early intervention. By adopting a biopsychosocial approach, healthcare systems can significantly improve the quality of life and health outcomes for patients living with coronary artery disease.

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.

Acknowledgments

We hereby thank all individuals for participating and cooperating us in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance

E-ISSN: 3041-8828

of the research before the start of the interview and participated in the research with informed consent.

References

Alirezaee, S., Shariatnia, K., & Akbari, H. (2022). Comparing the Effectiveness Cognitive-behavioral Therapy and Intensive Short- term Dynamic Psychotherapy in Reducing Death Anxiety. *hums-jpm*, *9*(4), 390-401. https://doi.org/10.32598/JPM.9.4.628.1

Alirezaei, S., Shariatnia, K., & Akbari, H. (2022). A Comparison of the Effectiveness of Intensive Short-term Dynamic Psychotherapy and Cognitive-Behavioral Therapy on Self-Compassion in Cancer Patients. *Avicenna*, *24*(4), 43-53. https://ebnesina.ajaums.ac.ir/article-1-1157-fa.html

Aliyari Khanshan Vatan, F., Ahadi, H., Kalhornia Golkar, M., & Sedaghat, M. (2022). The Effectiveness of Cognitive-Behavioral Therapy in Anxiety and Distress Tolerance in Patients with Coronary Heart Diseases. *ijrn*, *8*(3), 54-65. https://doi.org/10.22034/IJRN.8.3.54

Asghari, P., Mashhadi, A., & Sepehri Shamloo, Z. (2014). Effect of group cognitive behavioral therapy based on Hofmann model on anxiety symptoms and brain behavioral systems in adults suffering from social anxiety disorder. *Journal of Fundamentals of Mental Health*, *17*(1), 38-45. https://doi.org/10.22038/jfmh.2014.3797

Fahim, A. U., Liza, S. J., Lina, S. J., & Salim, M. A. A. (2022). Study of Mental Stress Related with Lifestyle During COVID-19: A Case Study of Bangladesh. *International Journal of Education and Cognitive Sciences*, *3*(2), 30-41. https://doi.org/10.22034/injoeas.2022.160611

Forouzani, S., Amiri, F. N., Abbasi, M., Akbarzadeh, N., & Jafari, Z. (2024). Effectiveness of Cognitive Behavioral Therapy on Psychological Hardiness and Marital Relationship Quality in Couples with Marital Conflicts. *Journal of Assessment and Research in Applied Counseling (JARAC)*, *6*(2), 105-112. https://doi.org/10.61838/kman.jarac.6.2.13

Görmezoğlu, M., Bouwens van der Vlis, T., Schruers, K., Ackermans, L., Polosan, M., & Leentjens, A. F. (2020). Effectiveness, timing and procedural aspects of cognitive behavioral therapy after deep brain stimulation for therapy-resistant obsessive compulsive disorder: A systematic review. *Journal of clinical medicine*, *9*(8), 2383. https://doi.org/10.3390/jcm9082383

Gucciardi, D. F., Jackson, B., Hodge, K., Anthony, D. R., & Brooke, L. E. (2015). Implicit theories of mental toughness: Relations with cognitive, motivational, and behavioral correlates. *Sport, Exercise, and Performance Psychology*, *4*(2), 100. https://doi.org/10.1037/spy0000024

Jafari, S., Kazemian Moghadam, K., & Gholavand, F. (2024). The Effectiveness of Intensive Short-Term Dynamic Psychotherapy (ISTDP) on Depression, Health Anxiety, and Physical Symptoms in Patients with Coronary Artery Bypass. *Research in Clinical Psychology and Counseling*, *14*(1), 223-242. https://tpccp.um.ac.ir/article_45804.html

Jorjani, K. (2023). The Effectiveness of Short-Term Psychodynamic Therapy on Cognitive-Behavioral Avoidance and Rumination in Depressed Patients at the Psychology Clinic in Gorgan. *New Strategies in Psychology and Educational Sciences*, *17*(15), 72-82. https://ensani.ir/fa/article/559983/

Ma, L., Zhang, Y., Huang, C., & Cui, Z. (2020). Resilience-oriented cognitive behavioral interventions for depressive symptoms in children and adolescents: A meta-analytic review. *Journal of affective disorders*, *270*, 150-164. https://doi.org/10.1016/j.jad.2020.03.051

Moghadam, M., Hatami, M., Baghdassarians, A., & Sepah Mansour, M. (2020). A comparison of effectiveness of cognitive behavioral therapy and mindfulness-based therapy on quality of life in patients with coronary heart disease. *Journal of Nurse and Physician Within War*, *8*(28), 33-43. https://doi.org/10.52547/npwjm.8.28.33

Mohamadi, A., Dabaghi, P., & Ahmadi Tahor-Soltani, M. (2020). The Effectiveness of Dialectical Behavioral Therapy (DBT) on Emotion Regulation and Impulse Control of Soldiers with a Self-Reporting Experience. *npwjm*, *8*(28), 12-23. https://doi.org/10.52547/npwjm.8.28.12

Moheb, N., Ghavipanjeh, B., Esmaeilpour, K., & Abdi, R. (2021). The effectiveness of mindfulness-based cognitive therapy on brain-behavioral systems and emotion regulation in opioid addicts. *Journal of Modern Psychological Research*, *1*(1), 44-52. https://psychologyj.tabrizu.ac.ir/article_13464.html

Mosalanejad, L., Khodabakshi Koolaee, A., & Jamali, S. (2012). Effect of cognitive behavioral therapy in mental health and hardiness of infertile women receiving assisted reproductive therapy (ART). *Iran J Reprod Med*, *10*(5), 483-488. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4169688/

Nakhaei Moghadam, R., Bahrainian, S. A., & Nasri, M. (2024). The effectiveness of intensive and short-term dynamic psychotherapy on attachment styles, somatization and health anxiety in patients with chronic pain. *Journal of Assessment and Research in Applied Counseling (JARAC)*, *6*(1). https://journals.kmanpub.com/index.php/jarac/article/view/1287

Pascual-Madorran, T., Zocca, G., Ploumen, E. H., Szabo - Te Fruchte, K., Buikema, L., Kok, M. M., Van Buiten, D. G., Kuijpers, P. M. J. C., Von Birgelen, C., & De Man, F. (2021). Efficacy of mindfulness-based cognitive therapy on symptoms of depression and anxiety in patients with coronary artery disease: insights from a prospective registry. *European Heart Journal*, *42*(Supplement_1), ehab724.3035. https://doi.org/10.1093/eurheartj/ehab724.3035

Roggenkamp, H., Abbass, A., Town, J. M., Kisely, S., & Johansson, R. (2021). Healthcare cost reduction and psychiatric symptom improvement in posttraumatic stress disorder patients treated with intensive short-term dynamic psychotherapy. *European Journal of Trauma & Dissociation*, *5*(3), 100122. https://doi.org/10.1016/j.ejtd.2019.100122

Sarkeshikiyan, S. M., Babakhani, N., & Bagheri, N. (2021). Structural equation modeling for predicting academic self-defeating behaviors based on brain-behavioral systems (BAS, BIS, FFFS), Uncertainty intolerance and intelligence beliefs due to the mediating role of academic expectations stress. *erj*, *9*(43), 426-438. http://erj.khu.ac.ir/article-1-1106-en.html

Sommaruga, M. (2016). Cognitive and Behavioral Psychotherapy in Coronary Artery Disease. 159-172. https://doi.org/10.1007/978-3-319-33214-7_11

Sun, J., Luo, Y., Chang, H., Zhang, R., Liu, R., Jiang, Y., & Xi, H.-F. (2020). ≪p>The Mediating Role of Cognitive Emotion Regulation in BIS/BAS Sensitivities, Depression, and Anxiety Among Community-Dwelling Older Adults in China</P&gt. *Psychology research and behavior management*, *Volume 13*, 939-948. https://doi.org/10.2147/prbm.s269874

Taghipour, R., siahpoosh, S., kazemi dalivand, F., Sadeghi, P., & Farjadtehrani, T. (2020). Comparison of the Effect of Cognitive-Behavioral Therapy and Narrative Therapy in Improving Death Related Distress and Psychological Hardiness in Female Patients with Breast Cancer. *medical*

E-ISSN: 3041-8828

journal of mashhad university of medical sciences, *62*(5.1), -. https://doi.org/10.22038/mjms.2019.17677

Terp, U., Hjärthag, F., & Bisholt, B. (2019). Effects of a cognitive behavioral-based stress management program on stress management competency, self-efficacy and self-esteem experienced by nursing students. *Nurse Educator*, *44*(1), E1-E5. https://doi.org/10.1097/NNE.0000000000000492

Vakili, M., Ahmadian, H., & Hadizadeh, N. (2021). The Effect of Cognitive-Behavioral Stress Management Training on Anxiety, Depression, and Resilience Level in Male with Coronary Artery Disease. *Community Health Journal*, *15*(1), 40-49.

E-ISSN: 3041-8828