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Comparison of the Effectiveness of Cognitive-Behavioral Therapy and Mindfulness Therapy on Craving in Methamphetamine-Addicted Patients

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A B S T R A C T

The present study aimed to compare the effectiveness of Cognitive-Behavioral Therapy (CBT) and Mindfulness Therapy on the craving of methamphetamine-addicted patients. The research method was quasi-experimental with a pretest-posttest control group design and a follow-up period (three months). The statistical population included all addicts who referred to addiction treatment clinics in Tehran from August to February 2021. A total of 45 participants were selected through purposive sampling and were randomly assigned to two experimental groups and one control group. The research instrument was the Craving Beliefs Questionnaire by Wright et al. (1993). The interventions, based on Free's CBT protocol (2008) and Kraft and Williams' mindfulness therapy protocol (2012), were administered over eight sessions to the experimental groups, while the control group did not receive any intervention. Data were analyzed using repeated measures ANOVA. The findings indicated a significant difference between the groups in posttest and follow-up regarding the craving of methamphetamine-addicted patients ($P<0.05$). Both therapies had a significant effect on correctly completed categories, perseverative errors, and total errors ($P<0.05$). Mindfulness therapy was superior to CBT in reducing perseverative errors in the posttest phase ($P<0.05$). It can be concluded that mindfulness therapy is more effective in reducing cravings in methamphetamine-addicted patients. Therefore, mindfulness therapy can be more widely used in the treatment of substance-dependent individuals.

Keywords: *Mindfulness, Cognitive-Behavioral Therapy, Craving, Addiction.*

1. Introduction

Addiction, in all its forms and dimensions, is considered one of the most serious issues today, arising from various factors. Substance dependence is one of the most significant social harms, forming the foundation of many other societal problems and posing a major threat to the safety and health of humanity (1). Among stimulant substances, amphetamines, particularly methamphetamine, are the most potent and carry a higher risk of dependence and mental health problems. They are associated with high rates of psychosis (2), depression (3), and cognitive problems such as attention, distraction, and impaired executive functioning (4). In the treatment process for addicts, once abstinence is achieved, there is often a strong

craving to re-experience the effects of the psychoactive substance. Therefore, craving plays a critical role in relapse after treatment, maintaining substance use, and sustaining dependence (5). Craving is rooted in cognitive distortions regarding the perceived need for substances. It appears that substance cravings are controlled by cognitive, emotional, automatic, or non-automatic processes, as craving theories generally emphasize that cravings in individuals are linked to the activation of emotions and substance-seeking motivations (6).

One of the effective treatments in the field of addiction is Cognitive-Behavioral Therapy (CBT). Meta-analytic reports indicate that CBT has been successful in treating addiction in various groups (7). Techniques used in CBT for addiction treatment include stimulus control, positive reinforcement, cognitive-behavioral strategies for managing and coping with stress, providing social support, cognitive restructuring, and relaxation through offering alternative responses to stress (8). CBT is effective in helping individuals with addiction because these individuals have not only a physiological dependence on substances, which can be controlled with medication, but also psychological and behavioral dependence (9). CBT is highly effective in influencing thoughts, emotions, behavior, and enhancing self-efficacy, as well as creating the ability to successfully quit and particularly to adapt and learn ways to control and cope with stress during and after the quitting phase (10). Research has confirmed the effectiveness of CBT in addicted individuals (7, 10, 11).

Another treatment introduced in this field is mindfulness-based therapy. In mindfulness-based interventions, unlike change-based strategies, instead of changing the content of thoughts and dysfunctional attitudes, emphasis is placed on acceptance, decentering, and changing the individual's relationship with their thoughts as a form of mental reality. Moreover, instead of changing or avoiding negative emotions, emphasis is placed on non-judgmental acceptance, confrontation, and increased tolerance of negative emotional states, thoughts, and images. Mindfulness-based interventions have recently gained attention in the treatment of substance use disorders (12). Initially, standardized mindfulness training programs focused on reducing emotional distress. In fact, mindfulness-based interventions have proven effective and comparable to other active therapies in treating psychiatric disorders and symptoms through meta-analysis (13). Mindfulness-based interventions teach techniques designed to elicit a mindfulness state, which is a form of metacognitive awareness characterized by careful, non-judgmental moment-to-moment monitoring of thoughts, emotions, sensations, and perceptions without clinging to thoughts of the past or future. Mindfulness practice has been proposed to involve two main components: focused attention and open monitoring. During focused attention practice, attention is focused on a sensory object (often the sensation of breathing, although internal body sensations or external visual focal points may also be used), while acknowledging and then disengaging from distracting thoughts and feelings (14).

Thus, in the treatment and prevention of substance relapse, using methods that can impact these problems is crucial, and mindfulness appears to enhance treatment effectiveness. Some researchers believe that using mindfulness, due to its mechanisms such as acceptance, increased awareness, desensitization, presence in the moment, non-judgmental observation, confrontation, and release, in combination with traditional CBT techniques, can reduce post-quitting symptoms and outcomes, increase treatment effectiveness, and help prevent substance relapse (15-22).

As observed, previous studies have confirmed the effectiveness of both CBT and mindfulness-based therapy on addiction and executive functioning variables. However, researchers and specialists in various fields of psychopathology are constantly seeking more effective, evidence-based, and efficient treatments. Nonetheless, a review of the research in this area shows that few studies have specifically examined the comparison of these two treatments in addiction, particularly concerning craving, emotional regulation, and executive functions in addicted individuals. Therefore, this study aimed to compare the effectiveness of CBT and mindfulness therapy on the craving of methamphetamine-addicted patients in 2021.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a quasi-experimental research design with a pretest-posttest control group and a

Health Nexus
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three-month follow-up period. The statistical population of this study included all addicts who referred to addiction treatment clinics in Tehran from August to February 2021. The sample size for this study was determined based on the number of groups and variables under investigation. Accordingly, 45 individuals were selected purposively from this population after a preliminary interview, based on inclusion and exclusion criteria, and were randomly assigned to three groups: (1) CBT experimental group (15 participants), (2) mindfulness experimental group (15 participants), and (3) control group (15 participants). The inclusion criteria were: 1) age between 20 and 45 years, 2) a minimum education level of middle school, 3) meeting the diagnostic criteria for methamphetamine dependence based on a primary diagnosis by a psychiatrist and clinical psychologist using the Structured Clinical Interview based on DSM-5, 4) a minimum of one full year of substance use, 5) not receiving any other psychological intervention, and 6) providing full consent to participate based on a participation form. The exclusion criteria included: 1) intellectual disability, psychotic disorders, or organic brain disorders based on the Structured Clinical Interview for DSM-5, 2) serious suicidal thoughts based on a psychiatric interview, 3) full criteria for a personality disorder based on the Structured Clinical Interview for DSM-5, 4) current enrollment in psychology or counseling studies, 5) concurrent participation in another psychological intervention, and 6) absence from more than two sessions or failure to complete questionnaires in the pretest, posttest, and follow-up stages. The research was conducted as follows: After making the necessary arrangements with the management of the Baran Counseling Center in Rudehen, the participants' files were made available to the researcher. Initial telephone interviews were conducted with each of the methamphetamine addicts, and based on the inclusion and exclusion criteria, 45 men were selected and randomly assigned to the three groups (two experimental and one control group). After group assignment, participants completed the Wisconsin Card Sorting Test (WCST) as the pretest. The first experimental group received CBT, and the second experimental group received mindfulness therapy, both in eight 90-minute group sessions, held twice weekly, conducted by the researcher. The control group did not receive any intervention. After the therapeutic sessions, all three groups completed the posttest, and 90 days later, the follow-up was conducted.

In this study, ethical considerations were observed as follows: 1) Before the study began, participants were informed about the purpose and methods of the research. 2) The researcher committed to protecting participants' private information and using the data solely for research purposes. 3) The researcher committed to interpreting the results for participants if they desired. 4) Any ambiguities were clarified for participants. 5) Participation in the study incurred no financial costs for participants. 6) The research did not conflict with the participants' religious and cultural values.

2.2. Measures

2.2.1. Craving Beliefs

This is a self-report scale developed by Wright et al. (1993) that measures beliefs related to substance craving. The questionnaire consists of 20 items and aims to assess the level of craving for substance use. It uses a 7-point Likert scale, and the total score is calculated by summing all items, ranging from 20 to 140. Higher scores indicate stronger cravings (23). This scale has demonstrated good reliability and validity, with a Cronbach's alpha of 0.95 reported (24). Rahmanian, Mirjafari, and Hassani (2006) reported a Cronbach's alpha of 0.84 and a split-half reliability of 0.81 for this scale. In Mir Jafari et al.'s (2007) study, the internal consistency of this scale, based on Cronbach's alpha, was 0.77 (25).

2.3. Interventions

2.3.1. Mindfulness Training

The mindfulness protocol, based on Kraft and Williams' (2012) application of mindfulness in addiction and addictive behaviors (15), was conducted in eight 60-minute weekly sessions by the researcher for the experimental group.

Session 1: The session begins with an introduction where group members get to know each other and establish a therapeutic relationship. Participants are introduced to the research topic, provided with preliminary explanations, and the problem is conceptualized. The session includes relaxation techniques and positive mental imagery exercises,

Health Nexus
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along with completing pre-test questionnaires. The participants receive an explanation about self-guidance and relapse, followed by feedback and a homework assignment, which involves writing down intrusive and negative thoughts.

Session 2: After reviewing the previous assignment, the session focuses on introducing mindfulness concepts. Participants are guided to become more aware of their feelings, thoughts, and bodily sensations in the moment, and to accept unpleasant thoughts and emotions. The session covers awareness of triggers and cravings. Participants receive feedback and are assigned homework to observe their thoughts and emotions without reacting.

Session 3: This session starts with a review of the previous homework. It provides training on the functioning of emotions and encourages participants to observe thoughts and emotions without judgment. Positive emotions (such as joy, interest, and love) are explored, and participants are taught how to change old thought habits. Mindfulness in daily life is introduced, and participants are given feedback. Homework involves documenting major positive emotions.

Session 4: After reviewing the previous assignment, the session discusses avoiding painful experiences and raises awareness of the consequences. It introduces the concept of accepting and experiencing negative emotions (such as anxiety, sadness, anger, and hatred). Participants practice mindfulness in high-risk situations. Feedback is provided, and homework involves documenting major negative emotions.

Session 5: The previous assignment is reviewed, and a three-dimensional behavioral model is introduced to explain the relationship between behavior, emotions, psychological functioning, and observable behavior. The session discusses attempts to change behavior based on this model, emphasizing acceptance and skillful action. Feedback is provided, and participants are given homework to reframe their thoughts.

Session 6: This session reviews previous homework and includes practical exercises of learned concepts. The discussion focuses on the roles of perception and sensory awareness, as well as distinguishing sensory perceptions from mental content. Participants are encouraged to view thoughts as just thoughts. Feedback is provided, and homework involves reattributing thoughts.

Session 7: After reviewing previous homework, participants report their progress. Mindfulness exercises (focusing on breathing, environmental sounds, walking, eating, brushing teeth, etc.) are practiced, along with balancing self-care and lifestyle. Feedback is provided, and homework involves focusing and re-evaluating values.

Session 8: The final session reviews the previous assignment, revisits muscle relaxation and positive mental imagery, and discusses negative events and the concept of relapse. Future planning and the application of mindfulness techniques in all situations are emphasized, with a focus on social support and continuing practice. The sessions are summarized, post-test questionnaires are completed, and participants receive lifelong homework to maintain mindfulness practice.

2.3.2. Cognitive Behavioral Therapy (CBT)

The CBT protocol was conducted in eight 60-minute sessions. The intervention was based on Free's (2008) guidelines (26).

Session 1: Group members are introduced to each other, and an explanation of the group counseling process and related rules (including the number of sessions, interaction guidelines, and participation expectations) is provided. The purpose and structure of the therapy are clarified.

Session 2: The session focuses on discussing participants' readiness to quit successfully. It explores how physical factors, thoughts, emotions, behaviors, habits, social support, and situations influence successful quitting. A quit date is established, and the group discusses preparations for the upcoming process.

Session 3: Participants' current conditions are assessed, and they are encouraged to stay committed to the quitting program. The session addresses cravings after quitting, and participants share their experiences regarding physical symptoms during the withdrawal process.

Session 4: The concept of stress is defined, and the session focuses on stress and negative emotions. Participants discuss alternative strategies for dealing with negative emotions and stress in challenging situations.

Session 5: The session defines slip-ups and relapse, and a group discussion is held to change participants' perspectives on slips and relapses, viewing them as learning experiences

Health Nexus
E-ISSN: 2981-2569

for future success. The technique of thought-stopping is introduced.

Session 6: Dysfunctional thoughts in high-risk situations, which increase the likelihood of substance use, are examined. Participants practice replacing these thoughts with positive and encouraging self-talk related to abstaining from substance use.

Session 7: The session reviews situations that trigger negative emotions, such as hunger, anger, fatigue, and loneliness. The group discusses alternative behaviors to reduce these negative feelings, offering new coping strategies.

Session 8: Participants are asked to reflect on their self-image and discuss how they feel about themselves. The group works on creating a new self-image as a non-addicted person and explores strategies to maintain this new perspective in their daily lives.

2.4. Data Analysis

The data were analyzed using mixed ANOVA and SPSS version 26.

3. Findings and Results

The findings regarding demographic information showed that 45 participants (15 in the Cognitive-Behavioral Therapy group, 15 in the Mindfulness Therapy group, and 15 in the control group) were involved in the study. The mean and standard deviation of age for the Cognitive-Behavioral Therapy group were 34.51 (SD = 5.29), for the Mindfulness group 33.75 (SD = 5.61), and for the control group 33.58 (SD = 5.48). Additionally, all participants were male. Descriptive findings for the study variables are presented below. The mean was used as a central tendency measure, and the standard deviation was used as a measure of dispersion.

Table 1

Mean (SD) of Craving in Pretest, Posttest, and Follow-up Phases

Variable	Group	Pretest (M [SD])	Posttest (M [SD])	Follow-up (M [SD])
Craving	Control	129.13 (14.93)	128.47 (14.72)	128.87 (14.28)
	Cognitive-Behavioral	134.33 (16.21)	90.40 (10.80)	90.13 (10.70)
	Mindfulness	130.93 (13.45)	69.27 (9.34)	68.87 (9.78)

As shown in Table 1, the craving levels for the three groups (control, Cognitive-Behavioral Therapy, and Mindfulness Therapy) were measured at three points: pretest, posttest, and follow-up. To examine the significance of these changes, a mixed ANOVA was used. Before performing the mixed ANOVA, the Kolmogorov-Smirnov test was conducted to check for normal distribution of craving scores across the three measurement stages ($p > .05$). Levene's test was used to assess homogeneity of variances for craving scores at the pretest ($F = 0.186$, $p = 0.20$), posttest ($F = 1.105$, $p = 0.123$), and follow-up ($F = 1.33$, $p = 0.263$) stages. Additionally, Mauchly's test was used to check the sphericity assumption, and the results indicated that the assumption of sphericity was not met for any of the craving components except for correctly completed categories. Therefore, the Greenhouse-Geisser correction was applied to interpret the results.

Table 2

Mixed ANOVA Results for Within-Group and Between-Group Effects

Variable	Factor	Source of Variation	Sum of Squares	df	Mean Square	F	p	Effect Size
Craving	Within	Time	416.41	1.73	240.08	2.54	.09	0.06
		Time × Group	151.31	3.47	43.63	0.46	.74	0.02
		Error	6218.93	65.91	94.36	-	-	-
	Between	Group	94.72	2	47.36	0.52	.60	0.03
		Error	3446.53	38	90.7	-	-	-

Health Nexus
E-ISSN: 2981-2569

As shown in Table 2, the mixed ANOVA results indicate that the effect of time on craving is significant ($p < .05$). This shows a significant difference between the pretest, posttest, and follow-up stages. Additionally, a significant difference was found in craving between the two treatment groups and the control group across the three stages (pretest, posttest, and follow-up). Furthermore, group effects, as indicated by the F values and significance levels, show that there is a significant difference between the Cognitive-Behavioral Therapy group, the Mindfulness Therapy group, and the control group in correctly completed categories and craving. Pairwise comparisons of these groups for each stage were performed using the Bonferroni test, and the results are presented in Table 3.

Table 3

Bonferroni Post-Hoc Test for Pairwise Comparison of Mean Craving

Variable	Group 1	Group 2	Pretest (Mean Diff / Test Stat / p)	Posttest (Mean Diff / Test Stat / p)	Follow-up (Mean Diff / Test Stat / p)
Craving	Cognitive-Behavioral	Control	5.200 / 5.443 / 1.000	-38.067 / 4.323 / .000	-38.733 / 4.291 / .000
	Mindfulness	Control	3.400 / 5.443 / 1.000	-59.200 / 4.323 / .000	-60.000 / 4.291 / .000
	Mindfulness	Cognitive-Behavioral	-3.400 / 5.443 / 1.000	-21.133 / 4.323 / .000	-21.267 / 4.291 / .000

As observed in Table 3, there is a significant difference between the Cognitive-Behavioral Therapy group and the control group in craving ($p < .05$). Significant differences were also found between the Cognitive-Behavioral Therapy group and the control group, and between the Mindfulness Therapy group and the control group ($p < .05$). The results also showed a significant difference between the Mindfulness Therapy and Cognitive-Behavioral Therapy methods at the significance level of $p < .05$. According to Table 3, the difference in mean scores between Cognitive-Behavioral Therapy and Mindfulness Therapy in craving was positive and significant at the posttest and follow-up stages. Therefore, Mindfulness Therapy demonstrated greater effectiveness in reducing craving compared to Cognitive-Behavioral Therapy ($p < .05$).

4. Discussion and Conclusion

The present study aimed to compare the effectiveness of Cognitive-Behavioral Therapy (CBT) and Mindfulness Therapy on the craving of methamphetamine-addicted patients. The results showed that both group interventions were effective in reducing the craving in methamphetamine-addicted patients, with Mindfulness Therapy being more effective than CBT.

In the first part of the findings, the results align with previous studies (27, 28). In mindfulness therapy, the key aspect is the sense of freedom in understanding that most thoughts are merely thoughts and not reality. The simple act of recognizing thoughts as just thoughts can free the patient from distorted realities, often leading to greater insight and a sense of control over their life. Mindfulness-based techniques teach individuals to identify involuntary and ruminative patterns of thought and transform them into conscious and intentional ones, treating negative thoughts and emotions as mere transient mental events. Through mindfulness exercises, addicts learn to deliberately focus on their emotional, cognitive, and physical discomfort and accept it (29). Thus, due to the skills taught during mindfulness practice, addicted individuals learn to accept their inner experiences without judgment while avoiding strategies such as distraction or suppression. Given its innovative and creative approach, mindfulness appears to be more effective in managing craving compared to CBT. Furthermore, patients who have undergone mindfulness training were able to perceive internal and external realities freely and without distortion, exhibiting greater capacity to confront a broad range of thoughts, emotions, and experiences (both pleasant and unpleasant). Addicted individuals with higher mindfulness skills were able to manage their thoughts and impulses better, showing greater self-acceptance, which reduced the intensity of their cravings.

The findings also revealed that CBT was effective in reducing the craving in methamphetamine-addicted patients. These results are consistent with previous studies (7, 30-32). The cognitive model emphasizes the recognition of

Health Nexus
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automatic thoughts individuals have about themselves, particularly regarding their relationships. Automatic thoughts are those that spontaneously occur in individuals' minds in response to various life situations, often negative in conflicting situations. Once individuals learn to address their thinking patterns, they develop the skill to recognize automatic thoughts that arise. These automatic thoughts are cognitions that can reinforce emotional responses and reactions that often lead to conflict (7). Since many of these automatic thoughts stem from underlying beliefs or schemas formed over time, they can be identified and reconstructed through recognition and practice. This process allows individuals to think about "what they tell themselves or suggest to themselves" and learn new or alternative ways of processing situations and circumstances. Addicted individuals, by learning how to challenge and cope with automatic thoughts, can apply this skill to confront craving-related thoughts and impulses, improving their ability to manage their cravings after completing the training. Finally, CBT, through techniques such as lifestyle changes, discussions about stress and negative emotions, discussions of alternative methods for handling negative emotions and stress, identifying high-risk situations, recognizing negative thought patterns and replacing them with positive ones, and providing alternative behaviors for reducing negative emotions, enabled the participants to better manage their cravings.

The study's findings also indicated a difference in the effectiveness of mindfulness therapy and CBT on executive function, with mindfulness therapy being more effective. These results align with previous research (7, 27, 28, 30-32). The effectiveness of mindfulness can be explained by its ability to increase metacognitive awareness, allowing individuals to become aware of their stream of consciousness. This heightened cognitive awareness facilitates better monitoring of emotional and automatic cognitive processes. Mindfulness also enhances the acceptance of thoughts and emotions without judgment. When individuals practice mindfulness, they experience their thoughts in the present moment instead of being preoccupied with the past or future. Therefore, it can be said that this intervention, by increasing focus, precision, flexibility, and problem-solving ability, has contributed to reducing individuals' cravings.

The limitations of this study include the use of purposive sampling from methamphetamine-addicted patients in a specific city, which reduced the external validity of the study. Additionally, not addressing certain psychological variables (such as psychological mindset, client insight, client motivation, symmetrical events with the research, and concurrent stress during the research) is another limitation that may have impacted the internal validity of the study. Future research is recommended to reduce potential biases and control for confounding variables by using larger samples from various cities and groups to allow for more generalizable results.

Authors' Contributions

S. B. conceptualized the study, designed the research framework, and led data collection. T. T. contributed to the implementation of interventions, statistical analysis, and manuscript writing. H. A. supervised the research process, ensured methodological rigor, and revised the manuscript for intellectual content. All authors reviewed and approved the final version of the manuscript.

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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Ethics Considerations

Health Nexus
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The study placed a high emphasis on ethical considerations. Informed consent obtained from all participants, ensuring they are fully aware of the nature of the study and their role in it. Confidentiality strictly maintained, with data anonymized to protect individual privacy. The study adhered to the ethical guidelines for research with human subjects as outlined in the Declaration of Helsinki.

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