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A Comparative Inquiry on the Effect of Metacognitive Training and Decision-Making Strategies on Self-Management of Health Behavior among Overweight Middle-Aged People

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Abstract

Introduction: The prevalence of obesity has increased significantly in the last few decades, and with its increase, the risk of some diseases has increased. The present study aimed to compare the effect of metacognitive training and decision-making strategies on self-management of health behavior (SMHB) among overweight middle-aged people.

Method: A pre-test/post-test controlled quasi-experimental study was conducted with a follow-up period and two experimental groups. The population comprised overweight middle-aged individuals visiting weight loss clinics in Tehran in 2022. 75 individuals were selected via convenience sampling and randomly placed into two experimental groups and one control group. The experimental groups received training in either metacognitive or decision-making skills (eight 90-minute sessions). The control was not exposed to any intervention. The data were collected by using the Health Promotion Lifestyle Profile (HPLP). Three months later, the same questionnaire was administered to the three groups. SPSS-24 was employed to analyze the data utilizing repeated measures ANOVA.

Results: The findings revealed that metacognitive training and decision-making strategies improved SMHB ($P<0.001$). No major differences in effectiveness were found between the two intervention programs.

Conclusion: The findings of this study support the use of approaches to the third wave of cognitive-behavioral therapy for health-enhancing behaviors. It is suggested that metacognitive training and decision-making strategies be used to improve health behaviors in overweight people.

Keywords: Decision Making, Health Behavior, Metacognitive, Overweight

Introduction

Nutrition is one of the primary determinants of human health. Changes in people's lifestyles and eating habits toward consuming fatty and energy-producing foods and decreased physical activity have contributed to the ever-increasing rise in non-communicable diseases such as obesity [1]. In the past few decades, obesity prevalence has increased significantly and, with it, the risk of certain diseases [2]. As one of the most important nutritional diseases, obesity prevalence has risen considerably over the past two decades affecting people of all ages and of, any gender, race, and socioeconomic status [3]. Obesity contributes to impaired physical, mental, and social health and is regarded as the root cause of more serious diseases and disorders. As such, diagnosis of obesity and overweight is an important aspect of preventive medicine and social health [4]. Indeed, the available data indicates that nearly sixty percent of the Iranian population is obese or overweight [5]. Weight gain in middle age is a common problem, especially in urban society. Many people become

overweight as they age and may eventually become obese around 40 years old [6]. Several factors can be involved in being overweight in middle age, including hormonal changes, loss of muscle tissue, loss of metabolism or body metabolism, wrong behavior habits (such as insufficient physical activity), and stress [7].

Health behavior is a significant factor in preventing many diseases and promoting health [8]. It is evident that several diseases are largely attributable to lifestyle risk factors–dietary habits, physical activity, alcohol consumption, and smoking [9]. Health behavior is any action taken by a person, regardless of their actual or perceived health, for protecting and maintaining health, regardless of how effective that action may be from an objective standpoint [10]. As with any other human belief or behavior, people's beliefs concerning health and their health behaviors follow rules, and theories have been put forth for the various approaches in psychology about why and how these beliefs and behaviors change [11]. The health-promoting lifestyle includes six dimensions: nutrition, physical activity, stress management, health responsibility, interpersonal relationships, and spiritual growth [12]. Adopting a healthy lifestyle is crucial for reducing obesity and overweight. Likewise, individuals should adopt health-promoting behaviors in their daily activities to change their lifestyles [13]. The World Health Organization has emphasized health promotion behaviors as a key strategy for maintaining a high quality of life [14]. Afsahi and Kachooei [15] reported that health promoting lifestyle and health locus of control are two main psychological constructs related to hypertension.

Metacognitive therapy, a recent third-wave cognitive-behavioral therapy, is a multifaceted concept consisting of knowledge (belief), processing, and strategies responsible for cognitive appraisal, monitoring, and control [16]. The major metacognitive skills can be broken down into five subgroups: planning, monitoring, regulating, thinking, and taking responsibility. Metacognitive training skills increase self-efficacy (contemplation and focus on the goal, internal motivation, problem-solving skills, and self-evaluation) [17, 18]. Metacognition lays the foundation for designing a plan to guide thoughts and behavior in the face of threats and harm by teaching flexible emotional processing [19]. In all, self-control and self-learning are the primary objectives of teaching metacognition. Many unhealthy behaviors, such as bulimia nervosa, which are called avoidance behaviors, serve as coping behaviors against anxiety [20, 21].

Decision-making is a complex, multi-step process involving various functions of the human psychic apparatus such as mental and executive functions [22]. People employ two broad information processing strategies when making decisions: the intuitive strategy, in which the information is processed automatically, almost effortlessly, repetitively, swiftly, unconsciously, and often affectively. This behavior is typically difficult to control or modify. The second one is the rational strategy in which the information is processed in a controllable way and with considerable effort, deductively, slowly, and consciously [23, 24]. The dominant decision-making style in an individual is associated with their decision-making skills, personality traits, and cognitive abilities. Additionally, a person's attitude, profession, health status and experiences, cultural background, and the characteristics of the decisions influence how they make decisions [25]. In rational decision-making, the person knows the problem, is aware of all possible solutions, and chooses the best solution in a time-consuming process. Attempts are made in teaching decision-making skills to reinforce the rational decision-making style [23, 26].

In the cognitive-behavioral approach, people's thinking and perception shape their emotions and behavior. In health behavior theories, attitude, and mental and cognitive criteria are the main factors that determine whether a health behavior is performed or abandoned [27]. In the theories of the third wave of cognitive-behavioral therapies, the common principles include acceptance, attention, awareness, observation of emotion, and non-avoidance, which are expressed through various approaches and techniques including metacognition [28, 29]. Cognitive neuroscience, on the other hand, investigates the role of decision-making strategies in performing or abandoning a behavior [20].

Quite a few studies have investigated the role of reinforcing the processing of decision-making strategies and teaching them to individuals. As a behavior, health behavior is no exception to this rule. Consequently, it seems that the concepts behind the third wave of cognitive-behavioral therapies ought to play a more prominent role in the foundational theories of health behavior. Despite the high prevalence of obesity and overweight among middle-aged people, they show no inclination or motivation for losing weight and hence it is difficult to convince them to change their behavior. The need to stress lifestyle modification as a fundamental factor in determining the prognosis and complications of overweight and obesity is clear and justifiable in light of the considerable evidence that suggests there is a relationship between lifestyle and obesity. Accordingly, the present study aimed to compare the effectiveness of metacognitive training and decision-making strategies on self-management of health behavior (SMHB) among overweight middle-aged people.

Method

This was a pre-test/post-test, controlled quasi-experimental study with a three-month follow-up. The statistical population consisted of overweight individuals visiting weight loss clinics in the 3rd district of Tehran in 2022. Convenience sampling was used to select 75 individuals from the statistical population. They were then randomly assigned to two experimental groups and one control group (n=25 per group). The sample size was selected based on G-Power software with a test power of 0.90, a significance level of 0.05, and an effect size of 0.84. The inclusion criteria were as follows: age between 45 and 65, a high-school diploma or higher, and BMI values between 25 and 29, which correspond to the overweight range. The exclusion criteria included a history of visiting

neuropsychologists and taking neuropsychiatric drugs, a history of taking corticoid drugs, a history of drug and stimulant abuse, or addiction to sleeping pills, being overweight caused by physical diseases including diabetes, hypothyroidism, Cushing's syndrome, growth hormone disorder (nanism), polycystic ovary syndrome, and absence in more than two sessions of the intervention program.

Sample selection, grouping, and intervention processes were conducted in Tehran from November 2021 to February 2022. After assigning the participants to the study groups, a pretest on SMHB was administered to all three groups. The first experimental group participated in eight 90-minute metacognitive therapy sessions. It was done based on Wells [30] metacognitive therapy method. The second experimental group took part in eight 90-minute sessions on decision-making strategies according to the protocol of Modarres et al. [31]. Table 1 presents the most important objectives of the sessions on metacognitive and decision-making strategies. The intervention sessions were conducted once a week by the first author. He had previously attended specialized workshops on these training sessions. During this period, the participants in the control group did not receive any intervention program and remained on the waiting list. All three groups were given the SMHB post-test at the end of the interventions. Both the experimental groups and the control group underwent a three-month follow-up following the post-test.

Table 1. Objectives of the Sessions on Metacognitive and Decision-Making Strategies

Session	Metacognition group [30]	Decision-making strategies group [31]
1	Introduction and discussion about overweight issues and problems in life and acceptance of the problem as a natural but changeable phenomenon	Introduction and discussion about overweight issues and problems in life and acceptance of the problem as a natural but changeable phenomenon
2	Explanation about mindfulness techniques, teaching attention and postponing worry, discussion about positive metacognitive beliefs and negative metacognitive beliefs and their practice.	Discussing the importance of problem-solving and decision-making skills, identifying how people deal with problems, paying attention to internal dialogue, explaining negative automatic thoughts, and expressing the principle of stopping thoughts.
3	Receiving feedback from the previous session, challenging with positive and negative metacognitive beliefs, teaching the technique of postponing worry, training, and practicing the technique of metacognitive guidance.	Accurately defining the problem, dividing complex problems into simple parts and prioritizing them, clarifying ambiguous issues, and avoiding long-term and unattainable goals.
4	Getting feedback from the previous session, examining uncontrollable beliefs, challenging positive beliefs	Making a list of different solutions to solve a problem without judging its correctness or incorrectness, explaining the brainstorming technique.
5	Getting feedback from the previous session, teaching and practicing the technique of prescribing the wandering mind.	Evaluating and comparing the selected solutions, teaching how to analyze solutions, making overall decisions, and discarding weak solutions.
6	Teaching and practicing the technique of verbal circle, teaching and practicing the assignment of the rebellious child technique, presenting the assignment	Deciding to choose a solution and specifying the steps to implement it, explaining how people react to conflicts.
7	Examining negative beliefs and useless strategies, writing new plans from recurring fears	Cognitive organization of the steps that have been taught so far, describing the evaluation method after choosing a solution, returning to the previous step in case of failure.
8	Summarization and post-test	Summarization and post-test

The tool used in this study was as follows:

Health Promotion Lifestyle Profile (HPLP): This 52-item questionnaire was designed by Walker et al. [32]. It measures six dimensions of health-promoting behaviors, including nutrition, exercise, health responsibility, stress management, interpersonal support, and self-actualization. The items are organized on a 4-point Likert scale, and the mean score for each question falls between 1 and 4. The total score for health-promoting behavior ranges from 52 to 208. In this study, the total score of the questionnaire was used. A higher score in this questionnaire indicates an improvement in self-management of health behavior in the respondents. Mohamadian et al. [33] reported an alpha Cronbach coefficient of 0.86 for the questionnaire. In the current study, Cronbach's alpha coefficient was obtained to be 0.81.

In order to analyze the data, the mean and standard deviation values for the experimental and control groups have been presented separately. The Shapiro-Wilk test was used to evaluate the normality of the data distribution. In the inferential section, repeated measures ANOVA was used to examine the effectiveness of the interventions on the SMHB in overweight middle-aged individuals. Bonferroni post hoc test and Scheffe test were utilized to compare the means. The data were analyzed using SPSS 24.

Results

Based on the results of demographic variables, the mean and standard deviation (SD) of the age of participants in metacognition, decision-making,

and control groups were 51.21±7.12, 50.79±8.63, and 52.31±6.88, respectively. There were 15 (60.0%) female and 10 (40.0%) male participants in the metacognition group. There were 13 (52.0%) female and 12 (48.0%) male participants in the decision-making group. Also, there were 12 (48.0%) female and 13(52.0%) male participants in the control group. The mean and standard deviation (SD) of SMHB across the pretest, post-test, and follow-up periods for the experimental and control groups are presented in Table 2. Compared to the pretest phase, the post-test and follow-up phases revealed an increase in the mean scores for SMHB in the experimental groups. Moreover, the experimental groups received higher mean post-test and follow-up scores than the control group.

Shapiro-Wilk test results demonstrated that the data distribution was normal. Mauchly's test was used to verify the assumption of sphericity, indicating that the assumption held for the data. The results of repeated measures ANOVA for SMHB in the experimental groups are presented in Table 3. In the metacognition and decision-making strategies groups, there was a significant difference in the level of SMHB for the three stages of pretest, post-test, and follow-up, as determined by repeated measures ANOVA (P<0.001). The partial eta squared value in the metacognition group indicated that the metacognition-based training explained 85% of the variance in the SMHB variable for the metacognition group. In the decision-making strategies group, the partial eta squared value was 0.81, indicating that training based on decision-making strategies explained 82% of the variance in the self-management variable.

Bonferroni post hoc test was employed to determine which time points exhibited a significant difference. Table 4 displays the results of the pairwise comparison for the pretest, posttest, and follow-up. The results showed that the metacognition group exhibited a significant change from pretest to posttest and from pretest to follow-up in terms of SMHB (P<0.001). There was, however, no significant difference between the post-test and follow-up in this regard. These results demonstrated that the obtained results remained stable during the follow-up.

Scheffe post hoc test was utilized to compare mean values between groups. Table 5 displays the results of a pairwise comparison of experimental and control groups. The results indicated that there were statistically significant differences between the experimental and control groups in the mean scores for self-management (P<0.001). There was, however, no statistically significant difference between the two experimental groups in this respect. Figure 1 displays the mean scores for self-management for the three groups in the pretest, post-test, and follow-up stages.

Table 2. Mean and Standard Deviation (SD) of Components of Psychological Well-Being in Experimental and Control Groups in Pre-test, Post-test and Follow-up

Variable	Phases	Metacognitive training group	Decision-making strategies group	Control group
		Mean ± SD	Mean ± SD	Mean ± SD
Self-management of health behavior	Pretest	128.06 ± 6.55	128.33 ± 5.29	129.14 ± 6.82
	Post-test	154.06 ± 6.17	151.61 ± 6.63	131.38 ± 7.68
	Follow-up	152.83 ± 8.57	148.28 ± 8.46	128.45 ± 5.91

Table 3. The Results of the Repeated Measure ANOVA to Examine the Self-Management of Health Behavior Scores

Groups	SS	df	MS	F	P	η^2
Metacognitive training	7748.59	2	3874.29	98.98	0.001	0.85
Decision-making strategies group	5517.15	2	2758.57	75.10	0.001	0.82

Table 4. The Results of the Pairwise Comparison for the Pre-test, Post-test, and Follow-up

Groups	Phases	Mean difference	SE	P
Metacognitive training	Pre-test – Post-test	26.00	1.80	0.001
	Pre-test - Follow-up	24.77	2.16	0.001
	Post-test - Follow-up	-1.23	2.11	0.563
Decision-making strategies group	Pre-test – Post-test	23.28	1.70	0.001
	Pre-test - Follow-up	18.95	2.00	0.001
	Post-test - Follow-up	-3.33	2.15	0.128

Table 5. The Results of a Pairwise Comparison of Experimental and Control Groups in the Post-test Phase

Variable	Groups	Mean difference	SE	P
Self-management of health behavior	Metacognitive training - Control	-22.68	1.97	0.001
	Decision-making strategies - Control	-20.23	2.03	0.001
	Metacognitive training - Decision-making strategies	-2.45	1.81	0.183

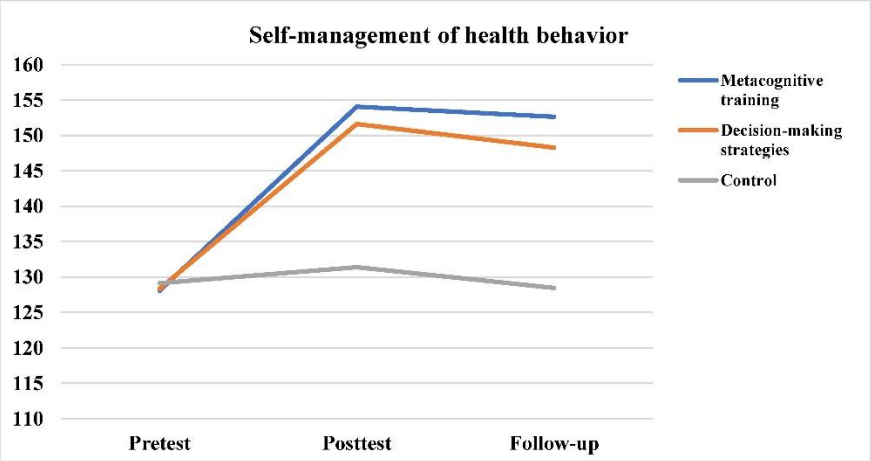

Figure 1. The trend of changes in self-management of health behavior scores between the three groups in three evaluation phases.

Discussion

The present study aimed to investigate the effect of metacognitive training and decision-making strategies on SMHB among overweight middle-aged people. The results indicated that the metacognitive training and decision-making strategies improved the SMHB of overweight middle-aged individuals and there were no significant differences between the two interventions in their effectiveness. This finding is consistent with the research results of previous studies [34-37]. Li et al. [34] reported that metacognition has a directly predictive effect on health-related behavior.

The results demonstrated that metacognitive training improved SMHB. Metacognition has three stages: planning, self-monitoring, and evaluating. Planning is the process through which an individual learns how to achieve their objectives, how to make decisions, and what strategies to employ. Self-monitoring is the stage in which the individual implements their plan and evaluates its success. If the plan is unsuccessful, they employ a different strategy. In the self-evaluation stage, the individual evaluates the effectiveness of their strategies in bringing them closer to their goals [34]. In all, metacognition helps clients to improve their health behaviors by consciously selecting appropriate strategies, monitoring their efficacy, correcting errors, and changing the strategies or substituting them with new ones. The self-regulatory executive function (S-REF) theory, also called the SREF model, considers multiple metacognitive factors to be the regulating components of information processing that influence the development and persistence of psychological disorders [38]. The S-REF allows people to develop an orientation of their goals in the learning process and provides opportunities for them to actively evaluate and monitor their thought processes [17]. Self-regulation is the process of keeping thoughts, behaviors, and emotions active in order to achieve goals. Self-regulated individuals set goals for themselves, select appropriate learning strategies, maintain their motivation, monitor themselves, and evaluate their progress. Teaching metacognition can improve self-regulation, and finally improve self-efficacy, by correcting metacognitive beliefs and influencing the cognitive-attentional syndrome [27, 29].

The modern decision-making theory may be able to help us explain the outcomes of teaching decision-making strategies. Behavioral decision-making is guided by two different cognitive processes. One of them (system 1) is the typical affective and emotional responses observed in interpersonal interactions. The other one (system 2) is an analytical process, such as the solution used to solve a mathematical problem. Both decision-making processes are usually used in our daily lives, and both have potential value. System 1 operates primarily unconsciously but naturally in situations where a person must choose between alternatives and speed of action is more important than precision and accuracy, or there is essentially little difference between the alternatives. System 2 requires more time for evaluation and uses conscious reasoning. It can yield more reliable and logical outcomes allowing for a planned and flexible lifestyle. If system 1 dominates one's lifestyle and lifestyle-related decision-making, the person will encounter two types of problems: harmful habitual behaviors, such as bulimia, in daily life, which are improper methods of emotion regulation, will increase [36]. To create and maintain a healthy lifestyle, we require intelligence and rational planning, which can be achieved through rational decision-making. In teaching the decision-making process, the participants were taught how to use the rational decision-making system when necessary and how to switch from system 1 to system 2 by regulating their emotions. The experimental group's lifestyle changed as a result of this shift in decision-making style, resulting in improved SMHB.

The cross-sectional nature of this study was one of its major limitations. Long-term studies are required to examine the stability of intervention effects over a longer

period of time, despite the fact that a 3-month follow-up was also conducted in this research. Self-reporting of the tools utilized is another limitation of this study that must be considered.

Conclusion

Metacognitive training and decision-making strategies improved the SMHB of overweight middle-aged individuals. This study demonstrated the significance of using third-wave cognitive-behavioral therapy approaches and decision-making strategies in promoting health behaviors. Therefore, it is possible to benefit from these treatment methods in specialized nutrition clinics in order to solve the psychological problems of overweight people.

Conflict of Interest

There was no conflict of interest to be declared.

Ethical Approval

The study was approved by the Research Ethics Committees of Tehran Islamic Azad University of Medical Sciences (code: IR.IAU.TMU.REC.1400.228).

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