

## The Effects of Mindfulness Training on Psychological Flexibility and Self-Regulation Behavior in Overweight Adolescents

Nazanin Fahimi<sup>1</sup>, \*Azar Kiamarsi<sup>2</sup>, Reza Kazemi<sup>3</sup>, Mohammad Narimani<sup>4</sup>

<sup>1</sup> PhD student , General Psychology, Department of Psychology, Ardabil Branch , Islamic Azad University, Ardabil ,Iran.

<sup>2</sup> Assistant Professor, Department of Psychology, Ardabil Branch, Islamic Azad University, Ardabil, Iran.

<sup>3</sup> Assistant Professor, Department of Psychology, Ardabil Branch, Islamic Azad University, Ardabil, Iran.

<sup>4</sup> Professor, Department of Psychology, Ardabil Branch, Islamic Azad University, Ardabil, Iran.

<sup>4</sup> Professor, Department of Psychology, University of Mohaghegh Ardabili, Ardabil, Iran.

### Abstract

**Background:** Emotional eating has already been linked to certain predictors. So, the aim of this study was to determine the effects of mindfulness and diet training on psychological flexibility and self-regulation behavior in overweight adolescents.

**Methods:** The present study followed a semi-experimental pretest-posttest design with control group. The statistical population of the study consists of all female teenagers studying in jounior highschoools of Tonekabon, during the 2018-2019 academic year. 30 students were selected from the population by multistage cluster sampling method; and they were devided into two groups of mindfulness training (n=15), and control group (n=15) by the use of random sampling method. Data were collected using the Brawan et al.'s Self-Regulation Questionnaire (1991), Bond et al.'s The Acceptance and Action Questionnaire (2011) before and after the mindfulness intervention. Data were analysed using SPSS software version 22.0.

**Results:** The results of covariance analysis of mindfulness training maifested that mindfulness training was effective on mental flexibility of overweight adolescent girls with  $F = 161.47$ ,  $P < 0.005$ . Moreover, it was revealed that mindfulness training was effective on mental flexibility of overweight adolescents with  $F = 376.28$ ,  $P < 0.005$ .

**Conclusion:** According to the results, mindfulness training is effective in improving mental flexibility and self-regulatory behavior of overweight adolescents in the first year of high school with a body mass index above 21.5 ( $BMI \geq 21.5$ ) in Tonekabon. Therefore, mindfulness training method is an efficient, practical and potent method in improving mental flexibility and self-regulatory behavior and can be used by counselors and therapists for this purpose.

**Key Words:** Adolescents, Diet, Flexibility, Mindfulness, Self-regulation behavior.

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### \* Corresponding Author:

Azar Kiamarsi, Assistant Professor Department of Psychology , Ardabil Branch, Islamic Azad University, Ardabil, Iran. Email: [A.Kiamarsi@iauardabil.ac.ir](mailto:A.Kiamarsi@iauardabil.ac.ir)

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## 1- INTRODUCTION

In recent years, the prevalence of obesity and overweight in adolescents has grown significantly and is now a new problem worldwide. Overweight is an excessive or abnormal accumulation of fat that can be detrimental to health (1). Simply put, obesity is a result of eating too much and too little mobility. Obesity is a chronic disease caused by an unbalanced amount of food consumption and energy consumption through physical activities. The prevalence of overweight and obesity in adults and adolescents has reached alarming proportions. This trend in the prevalence of overweight and obesity has been steadily increasing for protracted years (2). Today, the prevalence of obesity is, similarly, growing; despite, there are various ways to reduce obesity. This is due to the difficulty in finding a way that fits the needs of various individuals. In recent years, developments in the treatment of psychological disorders and obesity reduction have led to the introduction of new methods by clinical psychologists, to solve this problem (3).

Attitudes and behaviors towards eating are determined by multiple factors such as psychological factors including self-regulation and psychological flexibility; and these variables play a very important role in the formation of overweight and obesity (4). Also, neuro-biological processes in self-regulation, including the control of eating behaviors, show that eating is strongly influenced by self-regulation. Therefore, if self-regulation is impaired, regulation in different areas such as controlling eating behaviors can be affected (5). Self-regulation is defined as psychological efforts to control one's inner state, processes, and functions to achieve higher goals (6).

One of the components that have been less emphasized in mental health studies and mental health assessment tools is the concept of mental resilience, which has

been specifically addressed by the acceptance and commitment therapy approach (7). Some researchers have defined mental flexibility as the individual's ability to fully communicate with the present situation as an alert and conscious person; and his or her ability to change or continue behavior in the direction of his or her values (8). Flexible people are curious about both the inner world and the outer world, and their lives are rich in experience, because they like new experiences and want to experience them. Not only do they not avoid encountering internal and external experiences, but they sometimes even seek out experiences themselves and try to have different types of new experiences (9)

Due to the problem of obesity and comorbid disorders, a wide range of psychological therapies such as cognitive-behavioral therapy, self-efficacy training, relaxation training, and hypnotherapy have been effective in reducing psychological symptoms and weight loss in overweight adolescents (10). The goal of psychological treatments for obesity is to teach clients to distinguish between emotional hunger and physiological hunger, not to respond to their emotional impulses and rumination through eating, but to Replace such a response with other more appropriate ones and consider the underlying emotional issues (11).

One of the treatment methods that can be effective in improving the pathological symptoms of obese patients and has received less attention from researchers, especially in Iran, is mindfulness training. Mindfulness means paying special, purposeful attention in the present time, free from prejudice and judgment. Mindfulness also involves keeping one's consciousness alive for the present reality (12). Bishop (13) believes that mindfulness in contemporary psychology can act as an approach to increase the individual's awareness in responding to the mental-

emotional processes causing new disorders.

In general, the reason behind the effectiveness of mindfulness method in obese people is that educating the patient in the mindfulness method leads to cognitive change in his/her way of thinking and actions; and s/he can benefit from the principles of conditional reinforcement (14). Mindfulness provides base on emotional processing provides an opportunity for people to be able to non-judgmentally observe their thoughts, cognitions, perceptions, and emotions; they can care about their thought and feelings while considering that they do not necessarily correspond to reality (15).

According to what mentioned, in the present century, the problem of obesity /overweight is one of the complex and multidimensional issues of health care systems in all countries of the world; and imposes heavy costs and a large number of visits to individuals. In addition, the lack of a complete and comprehensive look at all aspects of obesity, including the psychological problems of these people, has led to the failure of most treatment efforts to reduce and control overweight and obesity. Adolescents with obesity and their family may, ergo, become desperate from solving this problem and lose their therapeutic adherence. Furthermore, considering the sensitivity of the role of children in family and their impact on other family members and consequently in society, it is necessary to recognize more and more factors that improve the health of adolescents with obesity; therefore, the aim of this study was to evaluate the effects of mindfulness training on psychological flexibility and self-regulatory behavior of overweight adolescents.

## **2- METHOD**

### **2-1. Study design and population**

The present study was a quantitative study following a semi-experimental pre-test and post-test with control design. The statistical population of the study consists of all female teenagers studying in junior highschools of Tonekabon during the 2018-2019 academic year. The whole population consists of 286 people. The sample of this study includes 30 people from the mentioned community who were selected by multi-stage cluster sampling. The required number of samples was calculated based on similar studies, taking into account the effect size of 0.40, confidence level of 0.95, test power of 0.80 and the rate of loss of 10% for each group of 15 people.

### **2-2. Methods**

The sample size selection process was as follows: out of 27 public schools, 12 primary school girls of Tonekabon city were selected and 6 classes were selected from each school and their students were evaluated in terms of Body Mass Index and After the students were identified with a Body Mass Index above 21.5, 30 of them were randomly selected and randomly divided into two groups of 15 experiments and a control group.

### **2-3. Measuring tools: validity and reliability**

**2-3.1. The Self-Regulation Questionnaire (SRQ):** Brown et al. (16) created this scale, which has 63 items and seven subscales (acceptance, evaluation, commissioning, review, planning, implementation, and assessment). This survey is graded on a 5-point Likert scale, with 1 being strongly agree and 5 being strongly disagree, based on which the total score can range from 63 to 315. Brown et al. (16) recommend the following ranges for interpreting SRQ total scores: > 239 High (intact) self-regulation capacity (top quartile); 214-238 Intermediate (moderate) self-regulation capacity (middle quartiles); < 213 Low (impaired) self-regulation

capacity (bottom quartile). Brown et al. (16) calculated the scale's reliability coefficient as 0.91. In Iran, the questionnaire's reliability has been estimated as 0.74. (17). All 63 items are answered on a 5-point Likert scale with the following scale points: 1 Strongly disagree 2 Disagree 3 Uncertain or Unsure 4 Agree 5 Strongly Agree **Table 1** presents the 63 items, the subscales to which they were logically assigned, and the items that are to be reverse-scaled (R). For reverse-scaled items, 1=5, 2=4, 3=3, 4=2, and 5=1.

**2-3.2. The Acceptance and Action Questionnaires-II (AAQ-II):** In order to develop a context-specific measure (18), the PFSS was inspired by the AAQ-II developed by Bond et al., (18) and adapted to the sport context to measure the construct of psychological flexibility and the degree to which a person avoids distressing thoughts, emotions, behaviors, or memories. The items were discussed amongst five researchers, who have expertise in ACT. To increase face validity and conduct an initial feasibility check, the items were sent to an invited group of five elite athletes from different sports (swimming, ice hockey, and soccer), who were asked to answer each item and then participate in a semi-structured interview between the last author and the individual athletes to further understand the feasibility of each item. Items are rated on a Likert-type scale ranging from 1 (never true) to 7 (always true). Exploratory Factor Analysis identified two factors of Avoidance of Emotional Experiences and Be in Control of Life. Internal consistency was satisfactory (0.71 to 0.89) (19). The reliability of this questionnaire in this study was reported to be 0.76 using Cronbach's alpha.

**2-3.3. Body Mass Index:** Body Mass Index (BMI) is a person's weight in kilograms divided by the square of height in meters. A high BMI can be an indicator of high body fatness. BMI can be used to

screen for weight categories that may lead to health problems but it is not diagnostic of the body fatness or health of an individual (18).

BMI Categories:

Underweight = <18.5

Normal weight = 18.5–24.9

Overweight = 25–29.9

Obesity = BMI of 30 or greater

## 2-4. Intervention

After preparing research tools, i.e., questionnaires of self-regulation (SRQ), acceptance and action (AAQ-II for mental flexibility) and calculating body mass index, and the educational package (training of mindfulness skills), the sample selection phase was initiated. In this phase, 45 participants were selected from the 12 schools included in the population of the research. The participants were selected by multi-stage cluster sampling, among the obese students identified according to the inclusion and exclusion criteria. They were, then, randomly divided into experimental and control groups. Subjects in the experimental group received mindfulness skills training, while subjects in the control group did not receive any intervention.

The method of holding training sessions of mindfulness skills for the experimental group was 8 sessions, 90 minutes and one session per week in Mehr Clinic with the consent and support of the students' parents. It should be noted that before starting the training sessions, the group's first completed the self-regulatory questionnaire, acceptance and action questionnaire (psychological flexibility). Body mass index was measured by the researcher in schools and their weights were recorded (pre-test). At the end of the training sessions, SRQ AAQ-II (mental flexibility) were again distributed to the participants, and their body mass index

was re-calculated (post-test scores) to evaluate the effectiveness of the

intervention. The trainings were conducted by the first author of this study.

**Table-1:** Summary of the content of the training sessions of mindfulness-based stress reduction (MBSR; 20)

Content of Sessions Once a week for 90 minutes each session / Mehr, Tehran Counseling Center
Session 1: Introduction, description of training sessions, familiarity with mindfulness, homework
Session 2: Meditation and body scan, mindfulness in a daily activity
Session 3: Mindfulness and the use of different senses, deep breathing, mindfulness in an unpleasant event
Session 4: Sitting meditation with emphasis on breathing, body sounds and thoughts, stress management
Session 5: Sitting meditation, practicing mindfulness in unpleasant events
Session 6: Three-minute breathing space exercise, four meditation exercises
Session 7: Four-dimensional meditation and awareness of everything that comes to consciousness in the moment
Session 8: Review sessions and assignments

## 2-5. Ethical consideration

The ethical considerations of the present study were as follows: All overweight junior high school girls received written information about the study and participated in the study if they wished. All overweight junior high school girls were assured that all personal information, including students' first and last names, would be confidential and would not be used for research purposes. Also, after the end of the research, two session of mindfulness intervention were performed for the participants in the control group, in order to maintain the research ethics.

## 2-6. Inclusion and exclusion criteria

Body mass index above 21.5 ( $BMI \geq 21.5$ ), junior high school female adolescents, willingness to participate in the study were considered as the inclusion criteria. The exclusion criteria included unwillingness to continue participating in the research, having another program for weight loss and body mass index above 29 ( $BMI \geq 29$ ).

## 2-7. Data Analyses

To describe the data, frequency tables, central indices and dispersion indices such as mean and standard deviation were calculated. Multivariate analysis of variance was used to analyze the data. It is worth mentioning that Levene's test was used to check the homogeneity of variances, Kolmogorov-Smirnov test to normalize the distribution of data, and eventually Mbox test and Mocheli Smirnov sphericity test were also applied. The above statistical analyses were performed using SPSS.22 software. Significance level of tests was considered as  $P = 0.05$ .

## 3- RESULTS

According to the results reported in **Table 2**, it can be seen that the highest percentage of the participants in the mindfulness training group was 40%, comprised of the students aged 12-13 years, and students aged 14-15 years (26.67%) formed the lowest percentage of

students in the mindfulness training group. As can be seen in **Table 2**, most of the participants in the control group were students aged 12-13 years (40%), and students in the age group of 13-14 years (26.67%) formed the lowest percentage of individuals in this group.

As the results in **Table 2** demonstrate, most of the mothers in the experimental group had postgraduate education (40%), but the mothers with postgraduate education had the lowest percentage (20%) in the control group.

**Table-2:** Frequency distribution in the sample according to the age status of students and educational status of mothers in the experimental and control group

Variables	Variable Levels	n	%
status of femals Age in mindfulness training group	12-13 years	6	40
	13-14 years	5	33.33
	14-15 years	4	26.67
status of mothers Education in mindfulness training group	Diploma and post-diploma	10	33.33
	Bachelor	8	26.67
	Master's degree and higher	12	40
Age status of control group	12-13 years	6	40
	13-14 years	4	26.67
	14-15 years	5	33.33
status of mothers Education in control group	Diploma and post-diploma	10	33.33
	Bachelor	14	46.67
	Master's degree and higher	6	20

**Table-3:** Analysis of covariance (ANCOVA) for the effects of mindfulness training on self-regulation

Variables	Source	SS	df	MS	F	P	Eta
Psychological Flexibility	Flexibility	328.94	1	941.32	161.47	0.005	0.857
	Error	55.001	27	2.37			
Self-Regulation Behavior	Acceptance	71.105	1	71.105	80.47	0.005	0.793
	Error	0.884	21	18.55			
	Evaluation	85.81	1	85.81	25.13	0.005	0.547
	Error	3.390	21	71.18			
	Commissioning	107.16	1	107.16	150.47	0.005	0.878
	Error	0.712	21	0.712		0.005	
	Review	36.42	1	36.42	52.87	0.005	0.716
	Error	0.689	21	14.46			
	Planning	51.40	1	51.40	169.95	0.005	0.890
	Error	0.302	21	6.35			
	Implementation	95.39	1	95.39	178.82	0.005	0.895
	Error	0.533	21	11.20			
	Assessment	90.84	1	90.84	171.59	0.005	0.891
	Error	0.529		11.11			
Weight Loss	group	297.18	1	297.18	376.28	0.005	0.933
	Error	21.32	27	0.790			

According to **Table 3**, the results of covariance analysis show that the mindfulness training has been effective on mental flexibility of overweight adolescents with  $F = 161.47$  and  $P < 0.005$ . Furthermore, these results reveal that mindfulness training has been effective on mental flexibility of overweight adolescents with  $F = 376.28$  and  $P < 0.005$ .

#### 4- DISCUSSION

The aim of this study was to investigate the effects of mindfulness training on mental flexibility and self-regulatory behavior of overweight adolescents. Based on the findings, it is confirmed that mindfulness training is effective on psychological flexibility of overweight adolescents. The findings of this study are consistent with those of some previously research studies conducted by Kamran et al. (21), Miller et al. (20), and Siranen et al. (22).

Explaining the findings, it can be said that changing consciousness and concentration while eating can lead to real weight loss. It can be said that in overweight people, due to the negative emotions caused by being overweight, there is a slight change in mood and it affects psychological flexibility. At the core of mindfulness training along with diet are mindfulness meditation experiences (23).

In this regard, it seems that mindfulness training is effective on experiencing emotions and emotional deprivation by creating conscious cognition, reviewing and changing emotions and feelings. Emphasis on emotions, cognition and thinking will have significant compensatory effects on emotional inhibition. Conscious attention helps dealing with negative and avoidant emotions and causes the experience of positive mental events; and is effective in redressing distrust. In addition, the presence of the mind improves physical condition and general health by increasing

physical self-monitoring and awareness of the roots of the disorder (24). Also, mindfulness training with emphasis on the present moment increases the capacity for consistent and intelligent attention and awareness (which is beyond thought) and affects the capacity and ability of the cognitive and information processing system. Moreover, it abandons unhealthy patterns of behavior, and is associated with emotions and improves the mental flexibility of overweight adolescents through understanding and re-receiving information arising from emotional states (25).

According to the findings, it can be seen that mindfulness training is effective on the self-regulatory behavior of overweight adolescents. This finding is in line with that of Skinner et al. (26), and Bahia et al. (27). Explaining this finding, it can be mentioned that the automatic processing of negative thoughts, in overweight people, activates self-regulatory behavior. In these cases, treatment can adversely affect processing. In states of conscious attention, provoked through mindfulness meditations, information dissemination shifts from faulty two-way cycles to current immediate experience and neutral goals, which in turn prevents the downward spiral of negative mood, negative thinking, and the tendency to anxious reactions. And it leads to pleasant thoughts and emotions in overweight people (28).

Finally, mindfulness training as a way of life, through meditation exercises that are integrated into everyday life, helps people to become consciously aware of the dual states of mind; and consciously apply their awareness for having cohesive mind activities. In this way, people realize that they not only think, but can observe their thinking. Through formal meditation, as well as informal meditation and habit-forming exercises, one learns to be present in the here and now (29).

The results of the present study have also manifested that mindfulness training is effective in reducing the weight of overweight adolescents. This is consistent with the results of De Olivia et al. (30).

Explaining this finding, it can be said that mindfulness techniques are effective in increasing muscle relaxation and reducing anxiety, and consequently in weight loss. Previous research has shown that mindfulness training can be effective in weight loss. In the meantime, the position of mindfulness training focuses on encouraging overweight people to find a new way to be and replace their thoughts and feelings with specific non-judgmental cognitions (31). Overweight people's being involved in a vicious cycle of rumination about overweight is an important factor in the persistence and recurrence of anxiety. Therefore, it can be said that mindfulness training along with diet affects the cognitive system and information processing by increasing people's awareness of the present. Thus, through techniques such as paying attention to breathing and body, and turning consciousness to the here and now, it can Cause weight loss in obese people.

## 5- STUDY LIMITATIONS

The main limitation of this study is related to external validity because the statistical population of the study was a special group of society, namely the first grade, high school girls in Tonekabon, so the possibility of generalizing the results to the whole society is limited. Also, the small number of samples and the use of self-report questionnaires were among the other limitations of this study.

## 6- CONCLUSION

The results of this study showed that mindfulness training is effective in improving mental flexibility and self-regulatory behavior regarding the tendency to overeat, among the overweight

adolescent girls, studying in the first year of high school with a body mass index above 21.5 ( $BMI \geq 21.5$ ), in Tonekabon. Therefore, mindfulness training method is an efficient, practical and potent method in improving mental flexibility and self-regulatory behavior, and can be used by counselors and therapists for this purpose.

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