

The Effect of Two Therapeutic Interventions on Self-Control: Weight Stabilization Cognitive Bias Modification Package and Internet-Based Cognitive Behavioral Therapy

Samira Tavakoli Kohpaei¹, Hajar Torkan^{2*}, Zahra Yousefi²

¹ PhD Student in Psychology, Department of Psychology, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

² Assistant Professor, Department of Psychology, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

* Corresponding author email address: h.torkan@khuif.ac.ir

Article Info

Article type:

Original Research

How to cite this article:

Tavakoli Kohpaei, S., Torkan, H., & Yousefi, Z. (2023). The Effect of Two Therapeutic Interventions on Self-Control: Weight Stabilization Cognitive Bias Modification Package and Internet-Based Cognitive Behavioral Therapy. *AI and Tech in Behavioral and Social Sciences*, 1(4), 19-25.

<https://doi.org/10.61838/kman.aitech.1.4.4>



© 2024 the authors. Published by KMAN Publication Inc. (KMANPUB), Ontario, Canada. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

ABSTRACT

This study aimed to investigate the efficacy of a cognitive bias modification (CBM) package in comparison with internet-based cognitive behavioral therapy (CBT) on self-control in individuals seeking sleeve gastrectomy surgery. This quasi-experimental study employed a pre-test, post-test, and follow-up design with a control group. The statistical population consisted of candidates for sleeve gastrectomy surgery who had undergone the procedure 18 months prior and resided in Isfahan. From this population, 45 individuals were selected through purposive sampling and randomly assigned to three groups: internet-based CBT, cognitive bias modification, and control (15 participants in each group). The CBM and internet-based CBT groups underwent 42 sessions of intervention over six weeks, while the control group received no treatment during this period. Participants were assessed using a self-control questionnaire before and after the intervention sessions, and again one month later. Data were analyzed using a one-way ANCOVA test. The results indicated that both the weight stabilization CBM package and internet-based CBT had positive effects on increasing self-control ($P < 0.05$). Additionally, internet-based CBT demonstrated significantly greater efficacy compared to the weight stabilization CBM package ($P < 0.05$). Based on the study's findings, both the CBM package and internet-based CBT were effective in enhancing self-control. Therefore, the use of these therapeutic interventions is recommended to help improve and promote self-control in obese individuals.

Keywords: *Self-control, Cognitive Bias Modification, Internet-Based Cognitive Behavioral Therapy, Sleeve Gastrectomy, Obesity, Weight Stabilization.*

1. Introduction

Obesity is considered one of the major public health crises of the current century. According to the latest report by the World Health Organization in 2022, over 1.9

billion adults aged 18 and above worldwide are overweight. Of these, approximately 650 million individuals fall into the severe obesity category (Heriseanu et al., 2023). The prevalence of obesity has nearly tripled since 1975 and today affects almost one-third of the world's adult population

(Pellegrini et al., 2021). In Iran, statistics indicate a 22.7% obesity rate among the general population (Chamani et al., 2021). Obesity is a major risk factor for type 2 diabetes, cardiovascular diseases, certain types of cancer, and respiratory problems. In addition to the physical and medical complications associated with obesity, this issue is often accompanied by psychological, behavioral, and emotional consequences, including stigma and social discrimination (Naserifar et al., 2022), which can also affect the mental health of obese individuals (Heriseanu et al., 2023).

Although obesity is a complex phenomenon with multiple genetic, socio-economic, and cultural factors (Heriseanu et al., 2023), surgery is considered one of the most effective methods for weight loss in severe obesity. However, evidence suggests that many patients regain lost weight after surgery (Mahmoodianfard & Haghghat, 2023), which is due to impulsivity and lack of self-control in response to food stimuli. One of the crucial components affecting these individuals is their level of self-control. It appears that obese individuals need self-control skills to manage their weight. Self-control refers to individuals' ability to appropriately regulate emotional responses when faced with internal and external stimuli (Lades et al., 2017). Individuals with low self-control often struggle with delaying gratification, restricting emotions, and controlling impulsive behaviors. Additionally, low self-control can predict current and future behavioral problems (Diamond et al., 2018). The self-control component is also related to social expectations. Since obese individuals have not succeeded in curbing cravings and related eating behaviors, it seems they possess low self-control skills. From this perspective, low self-control skills can be a factor in weight regain after surgery for these individuals.

Cognitive-behavioral therapy (CBT) is one of the main and widely used approaches in psychotherapy, combining cognitive techniques such as identifying cognitive distortions and cognitive restructuring with behavioral techniques such as exposure and coping skills training to modify maladaptive beliefs and behaviors (Papageorgiou & Wells, 1998). Findings suggest that enhancing self-control and self-efficacy skills through this approach can be effective in preventing obesity relapse after surgery (Fairburn & Murphy, 2015). One method of delivering CBT is through the internet, which has been reported to be effective for certain eating disorders, including bulimia nervosa (Fairburn & Murphy, 2015).

Another approach recently gaining attention in the treatment of eating disorders and obesity is cognitive bias modification (CBM). Cognitive theories suggest that bias in processing stimuli related to food/eating may play a role in the persistence of obesity (Brooks et al., 2011). Studies indicate that obese individuals have an attentional bias

towards food and a positive correlation between body mass index and this bias. Furthermore, body dissatisfaction mediates this relationship (Zhou et al., 2022). Various levels of explicit and implicit weight bias have also been reported in different individuals. This approach aims to modify cognitive biases, especially in the attention stage, to reduce individuals' sensitivity to food stimuli (Papageorgiou & Wells, 1998).

Despite the widespread prevalence of obesity and its physical and psychological consequences, previous studies have shown that many patients regain lost weight after weight loss surgery. One of the main reasons for this issue is the lack of self-control and behavioral management in response to food stimuli. This study aims to investigate and compare the effects of two approaches, cognitive bias modification and internet-based cognitive-behavioral therapy, on increasing self-control in these individuals. The objective is to determine the more effective method for enhancing self-control and thus preventing weight regain after surgery. Until the writing of this article, no published study in Iran had compared cognitive bias modification with cognitive-behavioral therapy in obese individuals after weight loss surgery. Therefore, the necessity of conducting such research in this field is highlighted. The results of such research would be beneficial and instructive for individuals undergoing sleeve gastrectomy and psychotherapists in the field of obesity and health. Thus, this study addresses the significant question: Is there a significant difference between cognitive bias modification for weight stabilization and cognitive-behavioral therapy on self-control in obese patients seeking sleeve gastrectomy?

2. Methods and Materials

2.1. Study Design and Participants

This study is applied in terms of its aim and is a quasi-experimental study with a pre-test, post-test, and follow-up design with a control group. Subjects were evaluated in pre-test, post-test, and two-month follow-up stages. The statistical population consisted of candidates for sleeve gastrectomy surgery who had undergone the procedure 18 months prior and resided in Isfahan. Using purposive sampling, 45 individuals meeting the inclusion criteria were selected and randomly assigned to three groups: cognitive-behavioral, cognitive bias modification, and control (15 participants in each group). Inclusion criteria included: a) informed written consent to participate in the study, b) literacy and ability to work with a computer system, c) not receiving concurrent therapeutic courses while participating in the study, d) ability to attend therapy sessions and complete the relevant questionnaires. Exclusion criteria

included: absence from more than one-third of the sessions, diagnosis of eating disorders and bulimia nervosa.

After sampling and determining the sample members based on the inclusion criteria and their allocation to the research groups, the cognitive bias modification and cognitive-behavioral groups underwent 42 intervention sessions based on Judith Beck's (2007) therapy over six weeks. The cognitive bias modification group received a computer-installable program and underwent 42 sessions of cognitive bias modification as instructed by the therapist. The cognitive-behavioral group received 42 sessions of cognitive-behavioral therapy in the form of 15-minute educational videos and exercises. The instructor answered each group's questions and checked their progress and assignments during a weekly group session. The control group did not receive any therapy during this period and remained on the waiting list. Subjects were assessed using the Self-Control Questionnaire before and after the intervention sessions, and again two months later.

2.2. Tools

2.2.1. Self-Control

The Self-Control Questionnaire was developed by Tangney (2004). This questionnaire measures an individual's level of self-control and consists of 13 items, each scored on a 5-point Likert scale (from never to very much). The score range for this questionnaire is 13 to 65; higher scores indicate higher self-control. This questionnaire has satisfactory validity and reliability. Its validity has been confirmed by evaluating the correlation with academic achievement, adjustment, positive relationships, and interpersonal skills. Additionally, its internal reliability has been reported with a Cronbach's alpha above 0.7 (Rezazadeh et al., 2023; Shoghi et al., 2023).

2.3. Interventions

2.3.1. Cognitive Bias Modification

Sessions 1-6: Introduction and Assessment

In the initial sessions, participants were introduced to the concept of cognitive biases and their influence on eating behaviors. An overview of cognitive bias modification (CBM) was provided, explaining how altering these biases could help with weight stabilization. Standardized questionnaires were used to assess participants' cognitive biases and establish baseline self-control levels.

Sessions 7-12: Attention Bias Modification

These sessions focused on reducing attentional bias towards unhealthy food cues. Participants engaged in

computer-based tasks designed to redirect their attention away from high-calorie foods. They practiced identifying healthy food options while ignoring unhealthy ones. Daily homework involved practicing attention bias tasks and logging their experiences.

Sessions 13-18: Interpretation Bias Modification

Participants learned techniques to change their interpretations of food-related situations. Cognitive restructuring exercises were used to help them develop healthier perspectives on food choices. Role-playing scenarios allowed them to practice responding to food-related cues with healthier interpretations. Daily reflections on these changes and their impact on food choices were assigned as homework.

Sessions 19-24: Memory Bias Modification

These sessions aimed to alter memory biases related to past eating experiences. Participants engaged in exercises to reinforce positive memories of healthy eating and diminish the salience of unhealthy eating memories. Guided imagery techniques helped them recall and emphasize positive eating experiences. Daily journaling of these positive experiences and their impact on current food choices was part of the homework.

Sessions 25-30: Integration and Practice

In these sessions, participants integrated the techniques of attention, interpretation, and memory bias modification. They participated in real-life simulations and practice scenarios to apply all the learned techniques. Group discussions provided a platform to share challenges and successes. Homework involved daily application of all techniques in real-life settings and logging outcomes.

Sessions 31-36: Maintenance and Relapse Prevention

Participants learned strategies to maintain their cognitive bias modifications over time. Personalized plans were developed for ongoing practice of CBM techniques, identifying potential relapse triggers, and creating coping strategies. Weekly reviews of these personalized plans and progress tracking were part of the homework.

Sessions 37-42: Review and Follow-Up

The final sessions provided a comprehensive review of all the techniques and their applications. Participants underwent a final assessment of their cognitive biases and self-control levels. Discussions focused on long-term goals and support mechanisms, with plans for follow-up sessions and continued support (Beck, 2007).

2.3.2. Internet-Based Cognitive Behavioral Therapy

Sessions 1-6: Introduction to CBT and Assessment

Participants were introduced to the principles of cognitive behavioral therapy (CBT) and the online platform used for the intervention. Initial assessments of their cognitive and

behavioral patterns related to eating were conducted to establish baseline self-control levels.

Sessions 7-12: Identifying Cognitive Distortions

These sessions focused on educating participants about common cognitive distortions related to eating behaviors, such as all-or-nothing thinking and overgeneralization. Participants learned to identify and challenge these distortions in their daily lives through interactive online modules and quizzes. Daily logs of identified cognitive distortions and alternative thoughts were assigned as homework.

Sessions 13-18: Behavioral Activation

Participants were taught techniques to increase engagement in healthy activities and reduce reliance on food for coping. They developed activity schedules to incorporate enjoyable, non-food-related activities and used online tracking tools to monitor their activity levels and mood changes. Daily implementation of activity schedules and reflections on their impact were assigned as homework.

Sessions 19-24: Coping Skills Training

These sessions involved training participants in specific coping skills to handle food cravings and emotional eating. Techniques such as mindfulness, deep breathing, and progressive muscle relaxation were introduced through interactive videos and guided practice sessions. Daily practice of coping skills and logging their effectiveness was part of the homework.

Sessions 25-30: Problem-Solving Skills

Participants learned problem-solving techniques to address barriers to healthy eating. They followed steps to identify problems, generate solutions, and evaluate outcomes using online problem-solving worksheets and exercises. Homework involved applying problem-solving techniques to real-life challenges.

Sessions 31-36: Relapse Prevention

In these sessions, participants developed strategies to prevent relapse and maintain progress in healthy eating and self-control. They identified high-risk situations and created coping strategies. Online forums and support groups provided additional peer support. Weekly reflections on potential relapse situations and coping strategies were assigned as homework.

Sessions 37-42: Review and Follow-Up

The final sessions offered a comprehensive review of all CBT techniques and their applications. Participants underwent a final assessment of their cognitive and behavioral changes. Discussions centered on long-term maintenance of self-control and healthy eating behaviors, with plans for follow-up sessions and continued online support.

2.4. Data Analysis

In this study, descriptive statistics such as mean and standard deviation were used for data analysis. In the inferential section, considering the research design, a one-way ANCOVA test and Bonferroni test with a significance level of 0.05 were used to compare the mean self-control in the research groups. Data analysis was performed using SPSS version 24.

3. Findings and Results

At the beginning of this study, 45 participants were randomly assigned to three groups of 15: the weight stabilization cognitive bias modification package group, the internet-based cognitive behavioral therapy group, and the control group. All participants remained in the study until the end. The majority of participants were aged 40 to 49, with most being women. The greatest weight loss was observed in the weight stabilization cognitive bias modification package group, ranging from 36 to 41 kg; in the cognitive behavioral therapy group, the range was 30 to 35 kg; and in the control group, the ranges were 31 to 35 kg and 36 to 41 kg. In terms of the time elapsed since surgery, most individuals in the weight stabilization cognitive bias modification package and cognitive behavioral therapy groups were in the 25 to 29 months range, while most individuals in the control group were in the 20 to 24 months range post-surgery. Data analysis showed no significant differences among the three groups regarding the distribution of demographic variables ($p > 0.05$).

Table 1 presents the mean and standard deviation for the pre-test, post-test, and follow-up stages of the self-control variable in the research groups.

Table 1

Means and Standard Deviations of the Self-Control Variable in Research Groups Across Three Time Points

Variable	Time	Weight Stabilization Cognitive Bias Modification Package	Internet-Based Cognitive Behavioral Therapy	Control
Self-Control	Pre-test	36.87 (2.88)	35.80 (3.34)	36.60 (2.53)
	Post-test	41.53 (3.14)	45.73 (2.15)	36.93 (2.60)
	Follow-up	41.80 (3.05)	46.00 (2.14)	36.47 (2.85)

As shown in Table 1, there were changes in the self-control variable in the intervention groups compared to the control group at the post-test and follow-up stages.

The results of the normality test for data distribution indicated a normal distribution ($p > 0.05$) for the self-control component. The equality of error variance was maintained

for all three stages of the test ($p > 0.05$). The equality of the variance-covariance matrix (via the M-Box test) was maintained ($p > 0.05$). The Mauchly test for the self-control variable was not significant ($p > 0.05$), indicating that the sphericity assumption for this variable was met.

Table 2

Repeated Measures ANOVA Data for Self-Control Variable

Variable	Source of Effect	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared	Power
Self-Control	Within-Group	Time	746.681	2	373.341	317.558	0.000	0.883
	Interaction Time × Group	499.896	4	124.974	106.301	0.000	0.835	1.000
	Error (Time)	98.756	84	1.176				
Between-Group	Group	775.393	2	387.696	18.744	0.000	0.472	1.000
	Error	868.711	42	20.684				

Repeated measures ANOVA data for the self-control variable are presented in Table 2. Given that the assumption of sphericity was not violated, the within-group effect, the time factor ($F = 317.558, df = 2, p < 0.01$), and the interaction of time and group ($F = 106.301, df = 4, p < 0.01$) indicate significant differences in self-control over time and the interaction of time with the group (three research groups). The eta squared for the time factor is 0.883, and for the interaction of time with the group, it is 0.835. The power for both factors is 1.000. This finding indicates that 88.3% of the variance in self-control related to the time factor and 83.5%

related to the interaction of time and group can be attributed to the application of the independent variable (one of the educational methods in the study), which is confirmed with 100% power. Furthermore, the between-group effect shows a significant difference ($p < 0.01$) in the group factor.

Due to the significance of the interaction between time and group in the self-control variable, Bonferroni post hoc tests were conducted to examine potential differences between the experimental and control groups in three stages: pre-test, post-test, and follow-up.

Table 3

Bonferroni Post Hoc Test Data for Pairwise Comparison of Research Groups in Self-Control Variable

Variable	Reference Group	Comparison Group	Mean Difference	Standard Error	Sig.
Time	Pre-test	Post-test	-4.978	0.247	0.000
	Pre-test	Follow-up	-5.000	0.271	0.000
	Post-test	Follow-up	-0.022	0.148	1.000
Self-Control	Weight Stabilization Cognitive Bias Modification Package	Internet-Based Cognitive Behavioral Therapy	2.444	0.959	0.044
	Weight Stabilization Cognitive Bias Modification Package	Control	5.844	0.959	0.000
	Internet-Based Cognitive Behavioral Therapy	Control	3.400	0.959	0.003

As seen in Table 3, there are significant differences in self-control between the pre-test and post-test, and between the pre-test and follow-up ($p < 0.01$). There is a significant difference between the weight stabilization cognitive bias modification package and internet-based cognitive behavioral therapy ($p < 0.05$). Additionally, there is a significant difference between the weight stabilization cognitive bias modification package and internet-based cognitive behavioral therapy with the control group ($p <$

0.01), indicating the effectiveness of these two treatments on the self-control variable. Therefore, it can be concluded that there is a significant difference in the effectiveness of these two treatments on self-control.

4. Discussion and Conclusion

This study aimed to evaluate the efficacy of the weight stabilization cognitive bias modification package in

comparison with internet-based cognitive behavioral therapy on self-control in individuals seeking sleeve gastrectomy surgery. The results indicate that both internet-based cognitive behavioral therapy and the weight stabilization cognitive bias modification package were effective in increasing self-control in individuals. Self-control scores in both therapeutic groups significantly increased compared to the control group. However, a comparison of post-test and follow-up means between the two therapeutic groups showed that internet-based cognitive behavioral therapy had greater efficacy in enhancing self-control compared to the weight stabilization cognitive bias modification package.

The findings of this study regarding the efficacy of internet-based cognitive behavioral therapy in enhancing self-control are consistent with previous evidence. The results of Heriseanu et al. (2023) have shown that the internet-based cognitive behavioral therapy approach can help individuals manage chronic conditions such as obesity, even without changes in body mass index (Heriseanu et al., 2023). Pellegrini et al. (2021) introduced cognitive behavioral therapy as a cornerstone in obesity treatment, facilitating effective obesity treatment through improved eating behaviors, increased motivation, and self-control (Pellegrini et al., 2021). Daansen (2003) described this approach as a combination of physical activity, healthy diet, and cognitive behavioral therapy that helps identify internal and external factors of overeating and enhances self-control (Daansen, 2003).

To explain this efficacy, it can be stated that based on the cognitive behavioral model, dysfunctional beliefs and attitudes towards oneself, the world, and the future in obese individuals lead to biased perceptions of events and maladaptive emotions and behaviors. Such individuals see themselves as incapable of self-control, which manifests in non-adherence to dietary regimens and a healthy lifestyle. Moreover, perfectionism and inflexibility in beliefs lead to avoidant behaviors and psychological harm. In cognitive behavioral therapy, negative beliefs, erroneous cognitions, and their emotional consequences are identified and corrected, enabling individuals to control their emotions and eating patterns by reconstructing negative thoughts, thus enhancing self-control (Kemps et al., 2014; Papageorgiou & Wells, 1998).

Additionally, the results of this study on the efficacy of the weight stabilization cognitive bias modification package in increasing self-control align with general findings that show improved self-control in various populations after receiving cognitive bias modification therapies. The cognitive bias modification approach is a novel technique for increasing self-control and weight management. This approach aims to modify thought patterns and cognitive biases that underlie maladaptive behaviors such as

overeating and inactivity (Kakoschke et al., 2014). Research evidence indicates that cognitive bias modification interventions focused on attentional, interpretive, and memory biases related to unhealthy food cues strengthen self-control capabilities and facilitate weight loss or maintenance (Boutelle et al., 2014; Kemps et al., 2014). Therefore, applying the cognitive bias modification approach to reduce reactivity to unhealthy food stimuli can enhance individuals' self-control in food choices and facilitate weight management. Obese individuals often face multiple challenges in controlling their desire to eat. The proposed therapeutic package in this study considered a comprehensive and multidimensional approach that included self-control exercises in various areas, such as attention, interpretation, and memory. This approach can help obese individuals overcome cognitive processes related to unhealthy eating behaviors and exert greater self-control over food consumption.

5. Limitations and Suggestions

However, it should be noted that the findings presented in this study have limitations that may affect the level of self-control in individuals, and a full understanding of the mechanisms of these methods requires a deeper examination of the role of self-control. Individuals with high levels of self-control participate more effectively in therapy, resist temptations, and have greater motivation for recovery. Conversely, individuals with low self-control may face challenges in the treatment process. Future research should specifically examine the role of self-control in the efficacy of internet-based cognitive behavioral therapy and cognitive bias modification methods and provide strategies to increase self-control levels in individuals with eating disorders. Selecting appropriate therapeutic methods, training therapists and patients on the role of self-control, and providing appropriate interventions to increase self-control levels are essential steps for enhancing the efficacy of eating disorder treatments.

Based on the findings of this study, both internet-based cognitive behavioral therapy and the weight stabilization cognitive bias modification package were effective in increasing self-control in individuals seeking sleeve gastrectomy surgery. Although internet-based cognitive behavioral therapy had significantly greater efficacy than the cognitive bias modification package, both methods showed substantial improvements in increasing self-control. Therefore, the use of these therapeutic methods is recommended as interventions to help enhance and improve self-control in obese individuals.

Authors' Contributions

S.T.K. conceptualized the study, designed the research methodology, and supervised the data collection process. H.T., the corresponding author, conducted the data analysis using SPSS version 27, interpreted the results, and led the drafting and revising of the manuscript. Z.Y. assisted with the recruitment of participants, supported the administration of the questionnaires, and contributed to the literature review. All authors participated in discussing the findings, critically reviewed the manuscript for important intellectual content, and approved the final version for publication.

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.

References

- Beck, J. S. (2007). The Beck diet solution: Weight loss workbook. (*No Title*). <https://cir.nii.ac.jp/crid/1130282271619299328>
- Boutelle, K. N., Kuckertz, J. M., Carlson, J., & Amir, N. (2014). A pilot study evaluating a one-session attention modification training to decrease overeating in obese children. *Appetite*, 76, 180-185. <https://www.sciencedirect.com/science/article/pii/S0195666314000841>
- Brooks, S., Prince, A., Stahl, D., Campbell, I. C., & Treasure, J. (2011). A systematic review and meta-analysis of cognitive bias to food stimuli in people with disordered eating behaviour. *Clinical psychology review*, 31(1), 37-51. <https://doi.org/10.1016/j.cpr.2010.09.006>
- Chamani, K., Hamedinia, M. R., Moeini Frad, M. R., & Amiri Parsa, t. (2021). The survey of prevalence of obesity and some factors of breeding and its related physical activities in females aged 30-50 years of the city of Bojnord. *Journal of Sabzevar University of Medical Sciences*, 28(1), 13-21. https://jsums.medsab.ac.ir/article_1378.html
- Daansen, P. J. (2003). Cognitieve gedragstherapie voor gewichtsreductie bij primaire obesitas. *Huisarts en Wetenschap*, 46(5), 669-673. <https://doi.org/10.1007/BF03083465>
- Diamond, B., Jennings, W. G., & Piquero, A. R. (2018). Scaling-up self-control: A macro-level investigation of self-control at the county level. *Journal of Criminal Justice*, 56, 81-85. <https://doi.org/10.1016/j.jcrimjus.2017.08.003>
- Fairburn, C. G., & Murphy, R. (2015). Treating eating disorders using the internet. *Current Opinion in Psychiatry*, 28(6). https://journals.lww.com/co-psychiatry/fulltext/2015/11000/treating_eating_disorders_using_the_internet.12.aspx
- Heriseanu, A. I., Karin, E., Walker, J., Scott, A. J., Bisby, M. A., Gandy, M., Dudeney, J., Fisher, A., Titov, N., & Dear, B. F. (2023). The impact of obesity and overweight on response to internet-delivered cognitive behavioural therapy for adults with chronic health conditions. *International Journal of Obesity*, 47(6), 487-495. <https://doi.org/10.1038/s41366-023-01285-6>
- Kakoschke, N., Kemps, E., & Tiggemann, M. (2014). Attentional bias modification encourages healthy eating. *Eating behaviors*, 15(1), 120-124. <https://doi.org/10.1016/j.eatbeh.2013.11.001>
- Kemps, E., Tiggemann, M., Orr, J., & Grear, J. (2014). Attentional retraining can reduce chocolate consumption. *Journal of Experimental Psychology: Applied*, 20(1), 94-102. <https://doi.org/10.1037/xap0000005>
- Lades, L. K., Egan, M., Delaney, L., & Daly, M. (2017). Childhood self-control and adult pension participation. *Economics Letters*, 161, 102-104. <https://doi.org/10.1016/j.econlet.2017.09.025>
- Mahmoodianfard, S., & Haghghat, N. (2023). The Psychosocial Determinants of Obesity Associated with Food Intake (Narrative Review). *Journal of Health Sciences & Surveillance System*, 11(1), 2-8. https://jhss.sums.ac.ir/article_48945.html
- Naserifar, M., Sarrajkhorrani, N., Safarzadeh, S., & Heydarei, A. (2022). The effectiveness of Cognitive behavioral therapy on Lifestyle based on self-efficacy and Body value in Women with obesity. *Journal of Applied Family Therapy*, 3(2), 467-481. <https://doi.org/10.22034/ajft.2022.333230.1460>
- Papageorgiou, C., & Wells, A. (1998). Effects of attention training on hypochondriasis: a brief case series. *Psychological medicine*, 28(1), 193-200. <https://doi.org/10.1017/S0033291797005825>
- Pellegrini, M., Carletto, S., Scumaci, E., Ponzio, V., Ostacoli, L., & Bo, S. (2021). The Use of Self-Help Strategies in Obesity Treatment. A Narrative Review Focused on Hypnosis and Mindfulness. *Current Obesity Reports*, 10(3), 351-364. <https://doi.org/10.1007/s13679-021-00443-z>
- Rezazadeh, M., Hosseinzadeh, B., & hosseini daroon kalaie, z. (2023). The Designing a Model of Effect of Research-Based Teaching Management on Metacognition Management with Mediating Role of Organizational Climate (Case Study: Mazandaran Education Department). *Sociology of Education*, 9(1), 215-230. <https://doi.org/10.22034/jjes.2023.560574.1345>
- Shoghi, B., Mohammadi, A., & Pirkhaefi, A. (2023). The Mediating Role of Mindfulness in the Relationship between Cognitive Abilities and Wisdom in Students. *Sociology of Education*, 8(2), 262-273. <https://doi.org/10.22034/jjes.2023.707076>
- Zhou, A., Xie, P., Ahmed, M. Z., Jobe, M. C., & Ahmed, O. (2022). Body mass index and attention bias of food cues in women: a mediation model of body weight dissatisfaction. *PeerJ*, 10, e13863.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

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 research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.