Original article

Association of mindfulness and impulsivity with obesity

Ufuk Bal[1], Zekiye Çelikbaş[2], Sedat Batmaz[3]

[1] Psychiatry Clinic, Seyhan State Hospital, Adana, Turkey.
[2] Psychiatry Clinic, Dr. Cevdet Aykan Mental Health Hospital, Tokat, Turkey.
[3] Department of Psychiatry, School of Medicine, Gaziosmanpasa University, Tokat, Turkey.

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Abstract

Background: The prevalence of obesity has more than doubled over the past three decades. Impulsivity is a multidimensional personality trait that potentially contributes to the development and maintenance of obesity. Mindful awareness can potentially minimize the automatic and inattentive reactions around food. **Objectives:** In our study, we aimed to research the relationship between impulsivity and mindful attention. **Methods:** The study population consisted of 60 outpatients aged 18 and older, with a body mass index (BMI) of at least 30 kg/m^2 presenting to the psychiatry clinics of a secondary health care facility. The participants completed the Barratt Impulsiveness Scale (BIS), and the Mindful Attention Awareness Scale (MAAS). **Results:** The average age of participants was 39 years, BMI was 35.70 ± 4.54 kg/m^2. BMI was not statistically significantly correlated with any of the scales, and the MAAS total score was negatively correlated with the impulsiveness scores, except for the motor impulsiveness subscale score. Dispositional mindfulness was negatively associated with impulsiveness scores, except for motor impulsiveness. **Discussion:** This study showed that there was a negative relationship between impulsivity and mindfulness. Therefore, using mindfulness techniques may decrease impulsivity, and may be extremely helpful in promoting better eating behaviors and weight regulation.

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Keywords: Impulsivity, mindfulness, obesity.

Introduction

Obesity, which is most commonly defined as a body mass index (BMI) ≥30 kg/m^2, is a public health problem in both developed and developing countries, with the global age-standardized obesity prevalence estimated to be 25.7%[1]. Obesity and its associated disease outcomes such as type 2 diabetes mellitus, cancer, and cardiovascular disease pose an individual and economic burden worldwide[2].

The prevalence of obesity has more than doubled over the past three decades, and recent evidence indicates that this trend could continue if weight control interventions do not become consistently successful[3]. The gravity of this problem is underscored by the fact that obesity is linked with chronic diseases and decreased life expectancy[4].

Another component of the current study is impulsivity which is a multidimensional personality trait that potentially contributes to the development and maintenance of obesity as it may cause uncontrolled and excessive food intake[5,6]. A specific subgroup of obese individuals suffers from binge eating disorder, which has also been associated with impulsivity due to its main characteristic: experiencing loss of control while eating an unusually large amount of food[7].

Concerning impulsivity as a general personality trait, there have been a number of influential theories over the last decades, each suggesting slightly different definitions. For example, with the behavioral inhibition system and activation system, Gray delivered a biological foundation for the impulsivity construct and current obesity research adopts primarily to the addiction associated brain reward system as neuronal correlate of impulsivity. Dawe and Loxton also analyzed the different impulsivity definitions, and based on several factor analyses, suggest that impulsivity consists of two main components. One component is "reward sensitivity", which "reflects a purposeful drive to obtain rewarding stimuli". The second component is "rash-spontaneous impulsiveness", which means the "tendency to act rashly and without consideration of consequences" and to show "disinhibited behavior and loss of control"[8]. In a review, it was found that impulsivity in response to food stimuli in obese people and individuals with binge eating disorder increased in comparison with the normal weight controls. On top of that impulsivity in this individuals compared with obese people without binge eating disorder seems to be more pronounced[9]. Similarly, in a recent review, it was found that rash-spontaneous behavior in general, and specifically towards food, is increased in binge eating disorder, while food-specific reward sensitivity is also increased in obese individuals without binge eating disorder, but potentially to a lesser degree[10].

There is some evidence of increased trait impulsivity independent of food cues in obese people and those with binge eating disorder. For example, a wide variety of behavioral patterns and comorbid mental disorders associated with impulsivity such as substance abuse or attention deficit/hyperactivity disorder have been reported to be more prevalent in people with both obesity and binge eating disorder[8]. Moreover, several studies show that people with obesity and binge eating disorder have elevated scores in self-report instruments assessing trait impulsivity[11]. Legenbauer *et al.* found that there was a direct, negative effect of self-reported impulsivity on baseline BMI indicating that those individuals with higher levels of impulsivity had lower BMI, whereas high impulsivity at baseline also came along with higher eating disinhibition at baseline which in turn was associated with a higher BMI[12].

Based on a bio-social-ecological systems model of the development and maintenance of obesity, there has been in the last few years a growing research interest in the association of obesity and personality traits. Personality traits play an important role both as risk as well as protective factors in the development of overweight and obesity. The majority of population-based studies suggest a positive association of neuroticism and impulsivity with overweight/obesity. Conscientiousness stands for self-discipline and thoroughness. Most of the population-based studies show conscientiousness as a protective factor against development of overweight[13]. In a recent review, it has been found that food addiction shares personality traits with substance-related disorders (regarding neuroticism, conscientiousness, impulsivity, alexithymia), and one distinctive trait (low extraversion)[14].

The rising number of overweight and obese individuals and the related health risks have become a pressing issue for most western societies. Current proposals suggest that mindfulness may be a way of aiding weight regulation, and preliminary findings are optimistic[15]. In a recent review its found that the practice of mindful eating has

Address for correspondence: Zekiye Çelikbas. E-mail: zekiyecelikbas@gmail.com

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been applied to the reduction of food cravings, portion control, body mass index, and body weight[16].

Mindfulness described as an awareness that emerges through purposely paying attention in the present moment, non-judgmentally[17]. Bishop and others similarly described mindfulness as the self-regulation of attention to achieve a non-elaborative awareness of the current experience[18]. As a result, mindfulness is a state, but to develop such a state of awareness requires practice and consists of consciously and purposely practicing to attend non-judgmentally to the present moment. Mindful awareness can potentially minimize the automatic and inattentive reactions around food, as well as reduce emotional triggers which lead to emotional eating and unnecessary consumption of food[15].

Automatic (or inattentive) eating is unavoidable, because eating is an overlearned behavior that often becomes secondary to other tasks of everyday life[19]. Bargh identified four characteristics of automatic behaviors: 1) they take place without awareness, 2) they begin without intention, 3) they carry on once started without control, and 4) they function with little effort[20]. In a research it's demonstrated that automatic eating is common, whereby people eat because it is mealtime and not because of any awareness of hunger[21]. However, mindful awareness brings the eater's focus back to what one is eating. Indeed, findings show that mindfulness de-automatizes eating, and improves reactions to cravings and thus, supports better weight regulation[22]. Similar to automaticity, impulsivity is an inclination towards quick, unintentional reactions to stimuli without considering the negative consequences of those actions[23]. An impulsive person has trouble controlling attention, and hence, can be powerless in delaying gratification. Recent preliminary findings suggested a negative relationship between measures of mindfulness and impulsivity, which supports the assumption that using mindfulness techniques may decrease impulsivity and once again be beneficial in lowering food consumption[24].

There is also strong evidence that obese individuals engage in more emotional eating than non-obese individuals[25]. Emotional eating is hypothesized to arise from a maladaptive emotion-regulation strategy that involves indulging in immediate impulses to eat in order to suppress negative feelings[26-28]. Mindfulness training affords the skills to attend to negative feelings and accept them instead of acting on the impulse to immediately suppress them by eating, ultimately leading to decreased urges leading to emotionally over-eating. In a review, moderate support for the use of mindfulness based interventions to mitigate emotional eating urges and decrease the frequency of occurrence was found[15].

In our study, we aimed to research the relationship between impulsivity and mindful attention. We hypothesized that there would be a negative correlation between mindful attention and awareness and non-planning impulsiveness, motor impulsiveness and attentional impulsiveness.

Methods

Participants

The study population consisted of 60 outpatients [49 (81.7%) women] aged 18 and older [mean (M) age = 39.00 years, standard deviation (SD) = 11.69, range: 18-60 years] with a body mass index (BMI) of at least 30 kg/m^2 presenting to the outpatient psychiatry clinics of a secondary health care facility (Cukurova State Hopsital, Adana, Turkey). Patients presenting with comorbid psychotic, bipolar, major neurocognitive, or substance use disorders were excluded from the study. Consecutively presenting obese patients for routine psychiatric care were recruited to the study with no specific selection method.

Measures

The interviewer was an experienced psychiatrist. The interviewer completed a demographic and clinical data form, onto which the age, sex, BMI, marital status, and level of education of the participants were recorded.

The participants completed the Barratt Impulsiveness Scale (BIS)[29], and the Mindful Attention Awareness Scale (MAAS)[30]. The BIS is a 30-item self-report measure of impulsivity, and consists of three second-order factors, i.e. attentional impulsiveness, motor impulsiveness, non-planning impulsiveness. Along with these factor scores, a total score of the BIS are reported. The higher the score, the higher the impulsiveness level. The MAAS is a 15-item self-report scale, which is used to assess the core characteristics of mindfulness. Higher scores reflect higher levels of dispositional mindfulness. It took about 20-30 minutes for the participants to complete these scales. The Turkish versions of both of these scales were used in this study[31,32].

Procedure

All participants were interviewed face-to-face, and the measures were completed after the interviews at the outpatient clinic. The anthropometric measurements were recorded by the interviewer during the interview. The intake period lasted from March 2015 to September 2015. No compensation was offered to the participants.

Statistical analyses

All analyses were performed using IBM SPSS for Windows, Version 22.0 (IBM Corp., 2013). Demographic and clinical data of the participants were analyzed by descriptive statistics. Bivariate Pearson product-moment correlations were computed between the age, and BMI of the participants and their psychometric scale scores. To examine the unique associations between dispositional mindfulness and impulsivity, hierarchical linear regression analyses were performed. The outcome variable was the total score, and the subscale scores of the BIS. To determine the unique additional variance of dispositional mindfulness after the variance of demographic and clinical variables, i.e. age, sex, marital status, level of education, and the BMI of the participants, has been controlled for, the total score of the MAAS was entered in the second step. Statistical significance was set at a p value of < 0.05.

Ethics statement

After having been debriefed about the requirements of the study, only participants who consented were eligible for recruitment. The study was approved by the local research ethics committee (Date: December 24, 2014; Number: ANEAH.EK.2014/106).

Results

Participant characteristics

The participant characteristics, and the mean scores of the participants on the psychometric scales are presented in Table 1.

Table 1. Participant characteristics and psychometric scale scores

	Mean ± SD	n (%)
Age (years)	39.00 ± 11.69	
Sex, female		49 (81.7)
Marital status, married		43 (71.7)
Level of education, ≥ 8 years		39 (65.0)
BMI (kg/m^2)	35.70 ± 4.54	
MAAS total	4.04 ± 0.76	
BIS – motor	18.82 ± 3.68	
BIS – attention	26.60 ± 5.19	
BIS – non-planning	17.15 ± 3.41	
BIS total	62.55 ± 9.40	

BMI: body mass index; BIS: Barratt Impulsiveness Scale; NP: non-planning impulsiveness; M: motor impulsiveness; A: attentional impulsiveness; MAAS: Mindful Attention Awareness Scale.

Bivariate correlational analyses

Table 2 presents the correlation matrix of the demographic and clinical variables, and the psychometric scale scores. BMI was not statistically significantly correlated with any of the scales, and the MAAS total score was negatively correlated with the impulsiveness scores (moderately correlated), except for the motor impulsiveness subscale score.

Table 2. Correlation matrix of the demographic and clinical variables, and psychometric scale scores

	Age	BMI	BIS-NP	BIS-M	BIS-A	BIS	MAAS
Age	1						
BMI	0.20	1					
BIS-NP	-0.11	0.20	1				
BIS-M	-0.31*	-0.11	0.33*	1			
BIS-A	0.16	0.24	0.53**	0.25	1		
BIS	-0.08	0.17	0.78**	0.65**	0.84**	1	
MAAS	0.03	-0.10	-0.48**	-0.01	-0.41**	-0.40**	1

*$p < 0.05$, **$p < 0.01$.

BMI: body mass index; BIS: Barratt Impulsiveness Scale; NP: non-planning impulsiveness; M: motor impulsiveness; A: attentional impulsiveness; MAAS: Mindful Attention Awareness Scale.

Association of mindfulness with impulsiveness

Hierarchical linear regression analyses revealed that after controlling for demographic and clinical variables, dispositional mindfulness was negatively associated with impulsiveness scores, except for motor impulsiveness ($R^2 = 0.11$, $F(6, 59) = 1.13$, $p = 0.361$). Results of the analyses are presented in Tables 3, 4, and 5. Only for the non-planning impulsiveness score, level of education was also found to be a negatively associated variable.

Discussion

In the current study, we aimed to research the relationship between BMI-impulsivity and impulsivity-mindful attention. Our hypotheses were that there would be a positive correlation between BMI and impulsivity, and that there would be a negative relationship between mindful attention and impulsivity.

Table 3. Hierarchical linear regression analyses for the BIS-A score

Outcome	Predictors	Step 1					Step 2					R^2	Adj R^2	SE	F	df_n, df_d
		B	SE	β	t	p	B	SE	β	t	p					
BIS-A	Constant	23.94	7.76		3.09	0.003	34.68	8.21		4.22	< 0.001	0.15	0.07	5.00	1.89	5, 59
	Sex	1.90	1.77	0.14	1.07	0.287	0.43	1.74	0.03	0.25	0.806					
	Age	0.11	0.06	0.03	0.18	0.861	0.03	0.06	0.06	0.42	0.680					
	Level of education	-1.08	0.64	-0.25	-1.68	0.099	-0.84	0.61	-0.20	-1.37	0.176					
	Marital status	-1.16	1.59	-0.10	-0.73	0.470	-0.94	1.49	-0.08	-0.63	0.534					
	BMI	0.09	0.17	0.08	0.51	0.614	0.10	0.16	0.09	0.61	0.546					
	MAAS	-	-	-	-	-	-2.45	0.86	-0.36	-2.85	0.006	0.26	0.18	4.70	3.13*	6, 59

*$p < 0.05$.

Table 4. Hierarchical linear regression analyses for the BIS-NP score

Outcome	Predictors	Step 1					Step 2					R^2	Adj R^2	SE	F	df_n, df_d
		B	SE	β	t	p	B	SE	β	t	p					
BIS-NP	Constant	16.43	4.95		3.32	0.002	24.32	5.11		4.76	< 0.001	0.20	0.12	3.19	2.65*	5, 59
	Sex	2.31	1.13	0.27	2.05	0.046	1.23	1.09	0.14	1.14	0.261					
	Age	-0.06	0.04	-0.20	-1.43	0.159	-0.05	0.04	-0.16	-1.29	0.204					
	Level of education	-0.96	0.41	-0.34	-2.34	0.023	-0.78	0.38	-0.28	-2.06	0.044					
	Marital status	0.57	1.01	0.08	0.56	0.579	0.73	0.93	0.10	0.78	0.437					
	BMI	0.02	0.11	0.02	0.14	0.890	0.02	0.10	0.03	0.23	0.818					
	MAAS	-	-	-	-	-	-1.80	0.54	-0.40	-3.36	0.001	0.34	0.26	2.93	4.52**	6, 59

*$p < 0.05$, **$p < 0.01$.

Table 5. Hierarchical linear regression analyses for the BIS score

Outcome	Predictors	Step 1					Step 2					R^2	Adj R^2	SE	F	df_n, df_d
		B	SE	β	t	p	B	SE	β	t	p					
BIS	Constant	67.37	14.12		4.77	< 0.001	85.71	15.08		5.68	< 0.001	0.14	0.06	9.11	1.77	5, 59
	Sex	4.09	3.22	0.17	1.27	0.211	1.57	3.20	0.07	0.49	0.626					
	Age	-0.15	0.11	-0.19	-1.32	0.191	-0.13	0.11	-0.16	-1.18	0.244					
	Level of education	-2.53	0.17	-0.33	-2.16	0.035	-2.12	1.12	-0.27	-1.89	0.065					
	Marital status	-0.37	2.89	-0.02	-0.13	0.898	0.01	2.74	0.01	0.01	0.999					
	BMI	0.02	0.31	0.01	0.07	0.945	0.04	0.29	0.02	0.14	0.893					
	MAAS	-	-	-	-	-	-4.18	1.58	-0.34	-2.65	0.011	0.24	0.16	8.64	2.81*	6, 59

*$p < 0.05$.

BMI was not statistically significantly correlated with any of the scales, and the MAAS total score was negatively correlated with the impulsiveness scores (moderately correlated), except for the motor impulsiveness subscale score. Dispositional mindfulness was negatively associated with impulsiveness scores, except for motor impulsiveness ($R^2 = 0.11$, $F(6, 59) = 1.13$, $p = 0.361$). Only for the non-planning impulsiveness score, level of education was also found to be a negatively associated variable.

Recent preliminary findings suggested a negative relationship between measures of mindfulness and impulsivity. Mindfulness was strongly related to different facets of impulsivity after controlling for negative affect and psychological distress[24]. Additionally, in non-clinical individuals, lower dispositional mindfulness was related to greater emotional eating associated with eating disorders. Yet, this relationship was mediated by impulsivity[33]. Another study showed that higher mindfulness and self-compassion were positively correlated, and both were related negatively to worry and impulsivity, which were also positively interrelated[34]. These results were similar to our study.

On the other hand, in the current study, BMI was not statistically correlated with any of the impulsiveness scores. In the literature, contrary to our research, it was found that impulsivity in response to food stimuli in obese people, and in individuals with binge eating disorder increased in comparison with the normal weight controls, whereas impulsivity in these individuals compared with obese people without binge eating disorder seemed to be more pronounced[9]. Similarly, several studies showed that people with obesity and binge eating disorder had elevated scores in self-report instruments assessing trait impulsivity[11]. Legenbauer *et al.* found that there was a direct, negative effect of baseline self-reported impulsivity on baseline BMI, indicating that those individuals who reported high levels showed lower BMI, whereas high impulsivity at baseline also came along with higher eating disinhibition at baseline, which in turn was associated with a higher BMI[12]. All participants in the current study had high BMI (> 30 kg/m^2) values. Therefore, classification of the BMI values could possibly affect the results.

Impulsivity is unintentional reactions to stimuli without considering the negative consequences of those actions[23]. An impulsive person has trouble controlling attention, and hence, can be powerless in delaying gratification. The current study's results showed that there was a negative relationship between impulsivity and mindfulness. This finding suggests that using mindfulness techniques may decrease impulsivity, and via with lowering impulsivity, may further lower food consumption. Mindfulness training provides the skills to attend to negative feelings and accept them, instead of acting on the impulse to immediately suppress them by eating, ultimately leading to decreased urges to emotionally over-eating. In a previous review, moderate support for the use of mindfulness-based interventions to improve emotional eating urges and occurrence was found[15].

Potential clinical implications of the study are various. First, these results suggest that mindfulness-based interventions may help in reducing impulsivity, which has repeatedly been reported as a risk factor for dysfunctional eating behaviors. Second, clinicians focusing on improving mindful eating patterns might regulate body weight changes by restricting impulsive over-eating behaviors. Last, further clinical observations which incorporate mindfulness practices into the routine care of obese patients might clarify how effective and practical these interventions may be, which might encourage the wider dissemination of mindfulness-based approaches for the treatment of impulsive eating behaviors and obesity.

Although the present findings are promising, some limitations need to be pointed out. First, it has to be noted that the sample size was relatively small. Second, the research included only participants with BMI > 30 kg/m^2, therefore this selection may be affecting the results. Grouping the BMI values according to the World Health Organization classification might possibly give more accurate results. Third, the detection of eating disorders could affect the results associated with impulsivity and mindful attention. Fourth, eating disorder diagnoses, which might as well have influenced the results of the current study, were not determined by using validated scales.

Further studies should be conducted in larger groups. Such studies with a prospective design, comparing an experimental group to whom mindfulness-based interventions are offered, and a control group to whom only treatment as usual is offered might provide much more reliable results about the effectiveness of mindfulness on impulsivity and obesity. Further, studies should include detailed evaluations for various eating disorder diagnoses as well as using additional scales.

Taking the results of the current study into consideration, it may be safe to conclude that mindfulness-based interventions that focus on dysfunctional eating behaviors may be extremely helpful in promoting better eating behaviors and weight regulation, and that there may be a promising future benefit in conducting mindfulness-based interventions within the obesity treatment context.

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