

## **The role of emotional eating and BMI in the context of chocolate consumption and avoiding situations related to body exposure in women of normal weight**

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### **Summary**

**Aim.** The aim of the study was to determine the role of emotional eating and body mass index (BMI) in the relationship between the desire to consume chocolate and avoiding social situations related to food and body exposure in women with normal weight.

**Method.** The direct effect, the indirect effect, the buffer effect, and the moderated mediation model were tested. The study involved 311 women. The mean age was 25.56 years (SD = 8.99), and the BMI was 23.19 kg/m<sup>2</sup> (SD = 1.80). The Three-Factor Eating Questionnaire, the Attitude to Chocolate Questionnaire and the Body Image Avoidance Questionnaire were used in the study.

**Results.** The results show that a significant weak positive relationships exist between: (1) emotional eating and BMI, (2) emotional eating, BMI and avoiding social situations related to food and body exposure, (3) avoiding social situations and the desire to eat chocolate. However, a significant moderate positive correlation is observed in the relationship between emotional eating and the desire to consume chocolate. The relationship between body mass index and the desire to consume chocolate is insignificant. Emotional eating is also an important complete mediator of the relationship between avoiding social situations related to food and body exposure and the desire to consume chocolate. However, it does not moderate the relationship between these variables. With reference to the moderated mediation model, BMI at the statistically significant level interacts with the avoidance of situations related to food and body exposure and the proposed model proves to be significant.

**Conclusions.** Our results prove that emotional eating is significantly associated with chocolate consumption and avoiding situations related to eating and body exposure.

**Key words:** emotional eating, attitudes towards chocolate, body image

## Introduction

In recent years, there has been an increasing number of publications demonstrating the key role of psychosocial factors in the development and maintenance of eating habits [1, 2]. Particular attention is paid to cognitive functions [3, 4], family relations [5], socio-cultural impact (including in particular the impact of the media) [6, 7], and the emotional functioning of a human being [8–11]. Next to psychological functions (falling into the category of “individual functioning”), the following factors are also mentioned: (1) socio-cultural (including values, body image), (2) external influences (agricultural policy and economic situation in a particular country) and (3) environment (including family, school) [1, 2].

Based on the results of many research [11–13] it can be stated that eating (during the individual person development) can become a strategy for managing emotions and stress [14, 15], and the main goal of eating can be both to reduce negative emotions and to raise or maintain the level of positive emotions [16, 17]. Regulation of affective state is usually carried out with the help of products belonging to the category of food associated with relaxation and pleasure (comfort food), which mainly includes fast food, sweets, snacks, and the common cause of the development of this remedial strategy is the low level of interoceptive awareness as well as (related to) the inability to distinguish signals of experienced emotions from symptoms of hunger-satiety [18–20]. Research has shown that women, compared to men, eat sweets more often when experiencing negative emotions (less often when they feel joy) [21, 22].

Due to the important role of food associated with relaxation and pleasure (comfort food) for the development of abnormal eating habits, the presented study focuses on the attitude towards chocolate [23]. Based on a questionnaire measuring this attitude, along with emotional nutrition and feeling guilty related to chocolate consumption, there is also the desire to consume chocolate accompanied by a maladaptive, unconstructive and persistent thoughts and feelings [24, 25], and one of the symptoms of the desire to consume chocolate is the feeling that a person cannot stop thinking about wanting to eat chocolate [24]. At the base of the desire to eat chocolate is the belief that its consumption will reduce existing distress (eating under the influence of emotions) [2, 24]. It can be assumed that the persistence of such beliefs and, therefore, regular attempts to reduce the emotional state using a high-calorie product, which is chocolate, may be conducive to weight gain.

The research results have indicated that the existing eating habits are related to the body attitude [1, 11, 26]. The body image contains three components: affective (emotions), cognitive (beliefs and thoughts) and behavioral (behavior) [27]. The existence of the belief that it is necessary to have a leaner and more slender body leads to the fear of weight gain and shame in relation to the body (and its weight) as well as the use of (often maladaptive) behaviors to reduce body weight and the occurrence of negative emotions associated with them [6]. In addition to compensatory behaviors (e.g., inducing vomiting, excessive physical activity), one of such behaviors is to avoid social situations related to body exposure and eating food [27, 28]. These situations are perceived as threatening and are associated with the experience of shame and anxiety,

which in turn may lead to a tendency to binge eating under the influence of emotions. Research results prove that people with excessive body weight are characterized by a stronger tendency to eat under the influence of experienced emotions than people with normal body weight [29]. It is worth emphasizing, however, that there are reports according to which emotional eating can be an important factor influencing the undertaken nutritional behavior also by people with normal body weight [17]. Therefore, it can be assumed that in this group of patients the tendency to emotional eating will be conducive to weight gain [2]. Therefore, its level should be monitored as a risk factor for the development of overweight and obesity in order to implement interventions to counteract weight gain at an early stage of adverse changes.

In the era of continuous exposure of unrealistic (idealized) silhouettes, the tendency to feel ashamed about their appearance is characteristic not only for people with excessive body weight, but is also often present in people with normal body weight [6, 7]. Lack of having a 'perfect' body strengthens the tendency to avoid social situations in which the body is exposed and evaluated, while situations associated with food are associated with the need to control it in order to prevent weight gain [6, 7].

Due to the greater prevalence of eating disorders in the group of women [30], and therefore the existence of a greater risk for the development of a wrong attitude towards the body and eating in this group, the study focused only on a group of women [31]. The aim of the study was to assess the role of emotional eating and body mass index in the relationship between the desire to consume chocolate and avoiding social situations related to eating and body exposure. The research tested the direct (Figure 1), indirect (Figure 2) and buffer effect (Figure 2). The analysis of moderated mediation (Figure 3) was also performed. It was assumed that emotional eating: (1) would be significantly (positively) correlated with BMI, the desire to consume chocolate and avoiding social situations related to eating and body exposure, and (2) would be an important mediator and moderator of the relationship between the desire to consume chocolate and avoiding social situations related to eating and body exposure. In addition, it was hypothesized that in the context of the analysis of moderated mediation, avoiding social situations related to eating and body exposure will interact with the body mass index, and this relationship will affect the connection between avoiding social situations, the desire to ingest chocolate and emotional eating (as mediator).

In the absence of previous research results, it was decided to scientifically verify the common assumption that a strong desire to consume chocolate may be associated with a higher BMI, incorrect attitude towards one's body, and a high intensity of the tendency to regulate one's emotional state with food (Figure 1). It should be emphasized that the research carried out so far did not verify the relationship between the above-mentioned variables within one model (Figure 2, 3). The basis for assuming such hypotheses are previous research that show that the tendency to avoid social situations related to food consumption and body exposure is a strong source of distress, which promotes the intensification of the tendency to regulate the emotional state with food [27, 28]. Sweets (comfort food) are a group of products often chosen by women to change their mood [18, 21, 22]. In addition, it should be emphasized that the results of the research indicate that the higher body mass index of the respondents, the stronger

their negative attitude towards their own body, and the stronger the tendency to eat under the influence of emotions [2]. Therefore, this variable should be included in the analyzed relations (Figure 3).

## Material

### Description of the group of respondents

The inclusion criteria for the study were as follows: a body mass index  $18.5 \text{ kg/m}^2 \leq \text{BMI} \leq 24.99 \text{ kg/m}^2$  and female gender. The body mass index was calculated on the basis of a self-report regarding body weight and height of the examined women (personal questionnaire completed at the beginning of the study). So it was declarative.

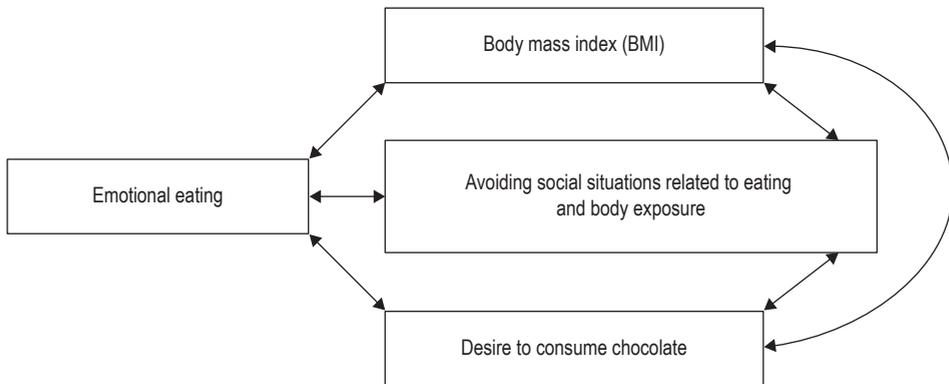


Figure 1. Direct effect

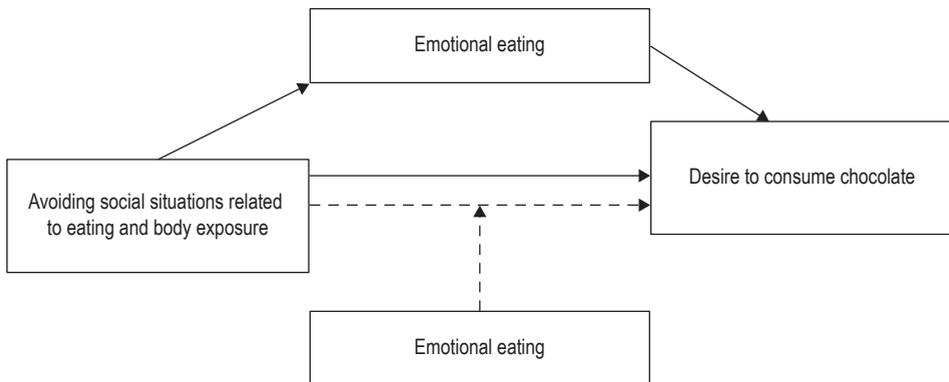


Figure 2. Indirect effect (solid line) and buffer effect (dotted line)

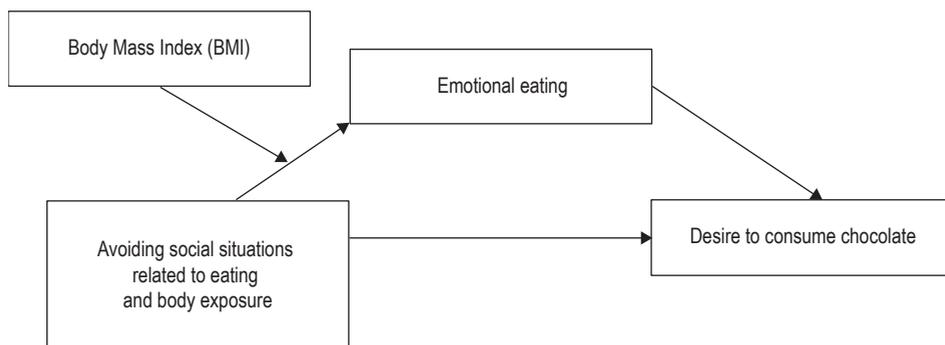


Figure 3. **Model of moderated mediation**

311 women took part in the study. The mean age was 25.56 years ( $SD = 8.99$ ; min. = 18; max. = 63) and the BMI was 23.19 kg/m<sup>2</sup> ( $SD = 1.80$ ; min = 18.56; max. = 24.99). With regard to the level of education, 22.51% of respondents ( $N = 70$ ) had secondary education, 48.55% ( $N = 151$ ) were in the course of higher education and 27.97% ( $N = 87$ ) had full higher education (three surveyed women did not answer this question).

Prior to the start of the research, the consent of the Faculty Ethics Committee was obtained (SWPS University of Social Sciences and Humanities, Department in Katowice, WKEB31/01/2016). The subjects were recruited by means of an advertisement that was distributed at universities and many workplaces in Silesia and Mazovia.

## Methods

The Three-Factor Eating Questionnaire (TFEQ-R18) was used in the present study [32]. It contains 18 items and three subscales: emotional eating (e.g., “When I feel blue, I often overeat”), uncontrolled eating (e.g., “Sometimes when I start eating, I just can’t seem to stop”), restrictive eating (e.g., “I consciously hold back at meals in order not to weight gain”). In the research the Polish version of the tool was used [33]. Due to the objective of the study (related to the variables presented in Figures 1, 2 and 3), only the “emotional eating” subscale was included in the analysis, for which Cronbach’s *alpha* reliability ratio in current studies was 0.87.

The tool used to measure attitudes towards chocolate was the Attitude to Chocolate Questionnaire [24]. It includes 22 items and three subscales: a sense of guilt (e.g., “I feel guilty after eating chocolate”), emotional eating (e.g., “I often eat chocolate when I am bored”), chocolate craving (e.g., “I like to indulge in chocolate”). In the research we used the Polish adaptation of the tool [25]. Due to the objective of the study (related to the variables presented in Figures 1, 2 and 3), only the “chocolate craving” subscale was included in the analysis, for which Cronbach’s *alpha* reliability ratio in current studies was 0.55.

The Body Image Avoidance Questionnaire (BIAQ) [28] in the Polish adaptation of Brytek-Matera and Rogoza [34] was used in the present study. It consists of four

subscales: clothing and appearance (e.g., “I wear baggy clothes”), preoccupation with physical appearance (e.g., “I wear clothes that will divert attention from my weight”), social activities (e.g., “I do not go out socially if the people I am with will discuss weight”), food and weight preoccupation (e.g., “I restrict the amount of food I eat”). Due to the objective of the study (related to the variables shown in Figures 1, 2 and 3), only the “social activity” subscale (avoiding social situations related to eating and body exposure) was included in the analysis, for which Cronbach’s *alpha* reliability ratio in current studies was 0.88. This subscale includes attempts to avoid such social situations in which there is a high probability that: (a) a person will be observed by others and assessed in terms of body shape and weight, (b) other people with whom the respondent may meet will be leaner, (c) conversations with the people they meet will concern weight and diet [28, 34].

### Statistical analysis

The Statistical Package for the Social Sciences (version 22.0) was used for statistical analysis of collected data. The assessment of dependencies between emotional eating, BMI, the desire to consume chocolate, and avoiding social situations related to eating and body exposure were based on Pearson’s *r* correlation coefficient. For the analysis of the effect of mediation, moderation and moderated mediation we used MACRO “PROCESS” [35] with bootstrap  $N = 1000$ . The table below contains statistics described for the analyzed variables (Table 1).

Table 1. **Descriptive statistics**

	M	SD	Min.	Max.
Emotional eating	6.76	2.70	3.00	12.00
Body mass index (BMI)	23.19	1.80	18.56	24.99
Desire to consume chocolate	15.47	10.12	0	60.00
Avoiding social situations	5.27	3.00	4.00	24.00

## Results

### Direct effect

The analysis shows that a significant weak positive correlation exists between: (1) emotional eating and body mass index, (2) emotional eating and avoiding social situations related to food and exposure, (3) BMI and avoiding social situations, (4) avoiding social situations and the desire to eat chocolate. However, a significant moderate positive correlation is observed in relation to the connection between emotional eating and the desire to eat chocolate. The relationship between body mass index and the desire to eat chocolate is irrelevant (Table 2).

**Table 2. Correlation analysis: Emotional eating and BMI, the desire to consume chocolate and avoiding social situations related to eating and body exposure among women**

	1. Emotional eating	2. BMI	3. Avoiding	4
1. Emotional eating		0.189**	0.276***	0.443***
2. Body mass index (BMI)			0.268***	-0.008
3. Avoiding social situations				0.166**
4. Desire to consume chocolate				

Note: \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

### Indirect effect and buffer effect

Emotional eating is an important complete mediator of the relationship between avoiding social situations related to eating and body exposure and the desire to eat chocolate (Figure 4). However, it does not moderate the relationship between these variables (Figure 5; Table 3).

**Table 3. Emotional eating as a moderator of the relationship between avoiding situations related to eating and body exposure and the desire to consume chocolate**

	Effect	SE	t	LLCI (95%)	ULCI (95%)
-1 SD	-0.31	0.40	-0.78	-1.09	0.47
M	-0.07	0.25	-0.28	-0.56	0.42
+1 SD	0.17	0.21	0.80	-0.25	0.60

SE – standard error; t – test statistics; confidence interval: LLCI – lower value, ULCI – upper value

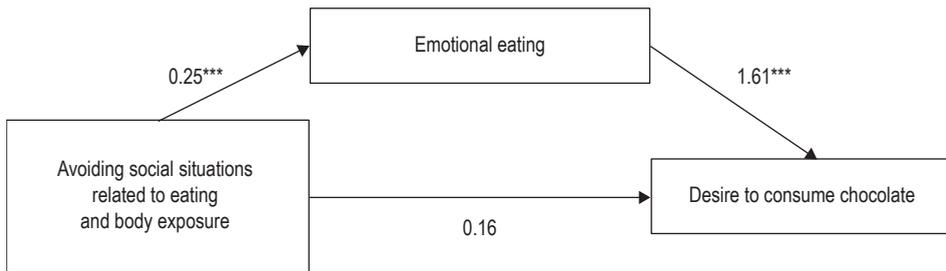
### Model of moderated mediation

The obtained results suggest that the created model of moderated mediation is significant,  $R = 0.46$ ;  $F(2.308) = 38.13$ ;  $p < 0.001$ ;  $MSE = 82.59$ ; index of moderated mediation: 0.16; [0.02; 0.32]; direct effect:  $B = 0.16$ , (ns) (Figure 6; Table 4).

**Table 4. Body mass index as a moderator of the relationship between avoiding situations related to eating and body exposure and emotional eating**

	Effect	SE	t	LLCI	ULCI
-1 SD	-0.82	0.16	-0.51	-0.40	0.24
M	0.06	0.10	0.64	-0.13	0.26
+1 SD	0.21	0.09	2.33	0.03	0.38

SE – standard error; t – test statistics; confidence interval: LLCI – lower value, ULCI – upper value



Direct effect:  $\beta = 0.16$ ,  $SE = 0.18$ ,  $t = 0.90$ ,  $p = 0.366$

Indirect effect:  $\beta = 0.40$ ,  $SE = 0.09$ ,  $LL\ BCA = 0.23$ ,  $UL\ BCA = 0.60$

Note: \*\*\* $p < 0.001$ .

Figure 4. Emotional eating as a mediator of the relationship between avoiding situations related to eating and body exposure and the desire to consume chocolate among women

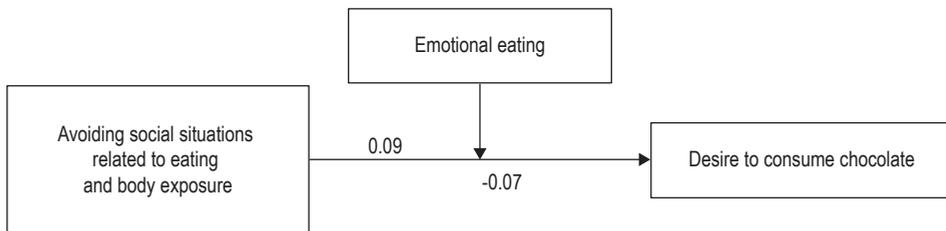


Figure 5. Buffer effect of emotional eating

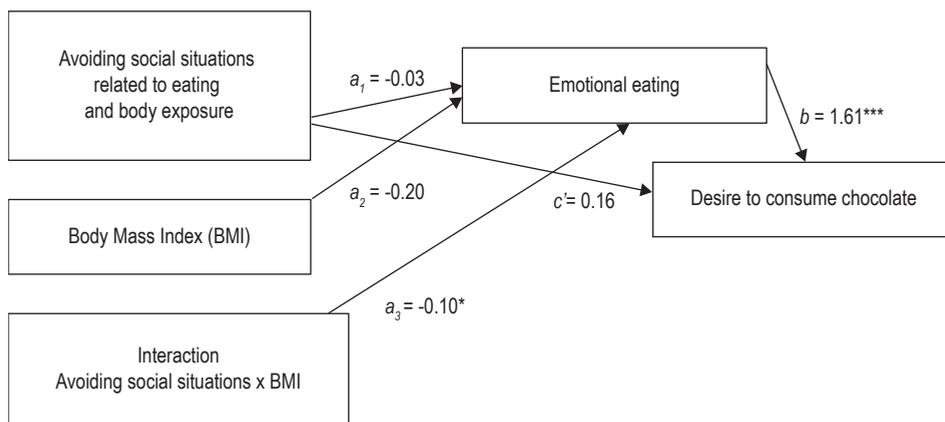
## Discussion

The aim of the study was to assess the role of emotional eating and body mass index in the relationship between the desire to consume chocolate and avoiding social situations related to eating and body exposure. The results of the presented research confirm the assumptions related to the direct and indirect effects and the model of moderated mediation (no confirmation regarding the buffer effect of emotional eating).

In the studied group of women with normal body weight, the stronger tendency to eat under the influence of emotions, the higher body mass index, desire to eat chocolate and the avoidance of social situations related to eating and body exposure. Moreover, the more the BMI increases, the more strongly the subjects avoid situations related to eating and body exposure. In turn, as the tendency to avoid social situations increases, the desire to eat chocolate increases.

Emotional eating is a total mediator of the relationship between avoiding social situations related to food consumption, the need for body exposure and the desire to consume chocolate. This implies that avoiding social situations intensifies the tendency to emotional eating, which in turn strengthens the desire to eat chocolate.

A similar significant effect was not obtained in relation to the buffer effect. This means that emotional eating is not a variable whose value would determine the direc-



\* $p < 0.05$ ; \*\*\* $p < 0.001$

Figure 6. Statistical model of moderated mediation among women

tion or strength of the relationship between avoiding eating-related social situations and the desire to eat chocolate. It was not possible to determine the level of emotional eating in relation to which the relation between the above-mentioned variables would change or disappear.

The body mass index is an important moderator of the relationship between avoiding social situations related to body exposure and eating food, and emotional eating (BMI interacts with avoiding social situations). Importantly, only at a high level of body mass index does the relationship exist between avoiding social situations and emotional eating. This means that even among people with a normal body weight, the tendency to eat emotionally under the influence of avoiding social situations related to eating and body exposure increases the most significantly at the upper limit of the weight norm. Therapeutic work should therefore focus on changing inadequate attitudes towards own body and acceptance of appearance and learning how to regulate own emotional state differently than using food (especially high-calorie products from the comfort food group). This will reduce the risk of excessive weight and the development of eating disorders (in which the two basic components are distorted body image and non-adaptive eating behavior).

Based on the above-described dependencies, it can be concluded that in order to make changes in the scope of body image and eating habits, it is important to consider the level of emotional eating that modifies the severity of these variables and the direct relationships between them. Confirmation of this conclusion are the results of studies that show that the use of emotional eating as a strategy for coping with emotions and stress can be predicted based on the level of emotional eating as a permanent feature of human functioning [36]. In practice, this means both the need to measure the level of emotional eating as a permanent element modifying eating behavior and the attitude towards the body, as well as observation of daily food intake under the influence of experienced distress and emotion (using a classic table in which patients describe their

meal schedule along with the accompanying emotions and thoughts). In addition, in a situation where the provided diagnosis will show evidence of the existing difficulties in the field of emotional regulation, it would be necessary to implement the techniques of learning adaptive coping with emotions and stress to work with the patient [37].

The obtained results can be interpreted in the light of the mechanism describing the relationship between food and mood (food-mood connection) [38–40]. Undertaking attempts to avoid situations related to eating and body exposure is associated with an additional source of stress and negative emotions (among others due to the need for continuous self-observation), which promotes the activation of the tendency to eating under the influence of emotions. In situation like that, an individual reaches for food which she/he associates with relaxation and safety (and the association according to the food-mood connection mechanism was based on previous experience) [38–40]. As already mentioned, often this group of products includes sweets and fast foods (comfort food), which are considered “prohibited” by individuals using diet. Although on the one hand, they make a temporary reduction of negative experiences, on the other hand, however, in the long-term they are a source of growing negative emotions and stress (related to fear of weight gain) and further lead to avoiding situations related to body exposure and eating [39, 41].

The obtained research results prove that eating under the influence of emotions is an important element associated with eating habits and attitude towards own corporeality in individuals with excessive body mass. Hilda Bruch [42, 43], the author of the concept of ‘emotional eating’ as well as many contemporary researchers [12, 18–20] assumed that excessive eating under the influence of emotions results from the lack of adequate discrimination between signals of physiological hunger and emotional hunger. The result is eating excessive amounts of food (to reduce negative emotions) and weight gain [44, 45]. Another explanation is the mechanism of the vicious circle of emotion regulation with the use of eating according to which negative emotions are a source of physiological arousal incorrectly identified as a feeling of hunger. These stimuli contribute to the immediate consumption of food, which in return lead to a temporary reduction of negative emotions. Then, the level of negative emotions increases again, which is associated with further food intake and progressive weight gain [2, 14, 15]. Thus, incorrect eating habits and a negative attitude towards one’s body are the basis for weight gain.

The significance of body mass for the relationship between the intensity of the tendency to eating under the influence of emotions and the body mass index is confirmed by the research of Baños et al. [46], according to which only in overweight individuals there is a positive correlation between emotional eating and BMI (among people with normal body weight this correlation is insignificant). The explanation of this dependence may be the depletion of cognitive resources as a result of the compulsory control of body weight and the need to monitor eating in people seeking a change in body weight [47]. As a result of promoting the ideal of a slim figure among women, especially in people with excessive body mass, there is a strong dissatisfaction with body shape and weight [6, 48]. In order to change their body weight, women monitor food intake and apply numerous restrictions in this area. The necessity of continuous

monitoring significantly encumbers the level of existing cognitive resources, which in the situation of experience of negative emotions results in the total loss of resources responsible for eating control and in excessive overeating (especially products from the comfort food group) [18, 47].

Another theory, referring to the relationship between eating habits and the experience of negative emotions and the attitude towards one's body, is the Homeostatic Theory of Obesity based on the Homeostatic Theory of Health [26]. Based on the conducted meta-analysis, Marks proposes factors involved in the emergence and persistence of obesity: (1) high level of negative emotions, (2) strong dissatisfaction with the body, (3) frequent consumption of high-calorie dishes. The author emphasizes that in the mechanism of the vicious circle of discontent these variables interact with each other – a high level of negative emotions results in an increase in consumption of high energy products, which in return leads to greater dissatisfaction with one's own body and the emergence and maintenance of obesity. The theory confirms the assumption that, especially in people with excessive body weight, eating can become a strategy for regulating the emotional state, leading to a worsening of emotional and somatic functioning [26]. The obtained research results show that also in the group of people with normal body weight, the tendency to eat food under the influence of emotions is associated with a deterioration of functioning in this area (negative attitude towards one's own body and an increase in BMI).

Modern research shows that a large number of individuals with a BMI above 25 kg/m<sup>2</sup> (indicative of overweight) are people suffering from eating disorders, especially binge eating disorder and bulimia nervosa [49–52]. However, it is highly probable that these people already at an early stage of the disease (i.e., when their body mass index was normal) were characterized by incorrect strategies for dealing with emotions through food, which promoted weight gain over time. This involves the implementation of assistance measures as soon as possible (and not only after exceeding the norm threshold). The latest therapeutic trends may be a clue how to conduct such interventions that help individuals with eating disorders and which take into account the particular significance of experienced emotions and the ability to regulate them in the context of the existing disorder. This group includes integrative cognitive-affective therapy (ICAT) [53, 54]. It is based, *inter alia*, on the assumptions of the Emotional Reward Theory and the Emotion Avoidance Model [55, 56] and thus assumes that emotional dysregulation is an important element in the development of eating disorders and excessive body weight. Factors such as low level of awareness of experienced emotions, lack of flexibility in their proper regulation and lack of control skills in situations of experiencing severe stress increase the risk of binge-eating, which acts as a regulator of experienced emotions and stress [53, 54]. Therefore, it is important to recognize and learn adaptive strategies of coping with emotions and stress among individuals seeking to reduce own body weight [11, 13].

In conclusion, it should be mentioned that in clinical practice there is a significant discrepancy between body weight within the medical norm and body weight perceived as normal in social space. The ideal that patients set for themselves is often associated with having a body weight below the clinical standards. Therefore, the therapist's main

task is to work on the acceptance of one's own body image and thus the change of the ideal to a more adaptive one.

### **Limitations and further directions of research**

The research has several limitations. The first one is the relatively low level of reliability of the "desire to eat chocolate" subscale in relation to the level designated as optimal (Cronbach's  $\alpha \geq 0.80$ ) in the works of Gliem and Gliem [57]. In addition, all of the methods used belong to the group of self-report tools, thus giving only the possibility of measuring the subjective assessment of the respondents. The present study is also selective and requires further exploration of other relationships between eating habits and attitudes towards the body, expanding research into a group of men.

Moreover, subsequent research should include an assessment of the mental health of the subjects (among others with regard to the incidence of eating disorders) to check whether the analyzed relationships occur in both the clinical group and people who do not meet the criteria for any mental disorder. Another variable that would allow for a broader insight into the analyzed relationships is being in a relationship (previous research have shown that this variable can have a significant impact on experiencing one's body and attitude towards it) [among others 58]. In future research, it is also worth using objective methods to assess body mass index (devices that measure electrical bioimpedance analysis – body composition analyzers). Further studies should also take into account (in addition to the objective method of assessing normal body weight) both the subjective and objective (e.g., expressed by loved ones) perception of the surveyed women's body weight.

It is worth adding that the results of cross-sectional studies may become the basis for designing longitudinal studies, in which the real impact of the analyzed attitudes and eating behaviors as well as abnormal behavior towards one's body on the BMI (including the development of overweight and obesity) will be verified.

### **Conclusions**

The presented results prove that emotional eating is significantly associated with the BMI, attitudes towards chocolate and body attitudes in examined women of normal weight. An important element is also the BMI itself, which interacts with the body attitude and eating. The obtained research results give grounds to conclude that emotional eating and body mass index are significant elements that should be noted in changing nutritional attitudes and work on changing body image in women of normal weight.

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