

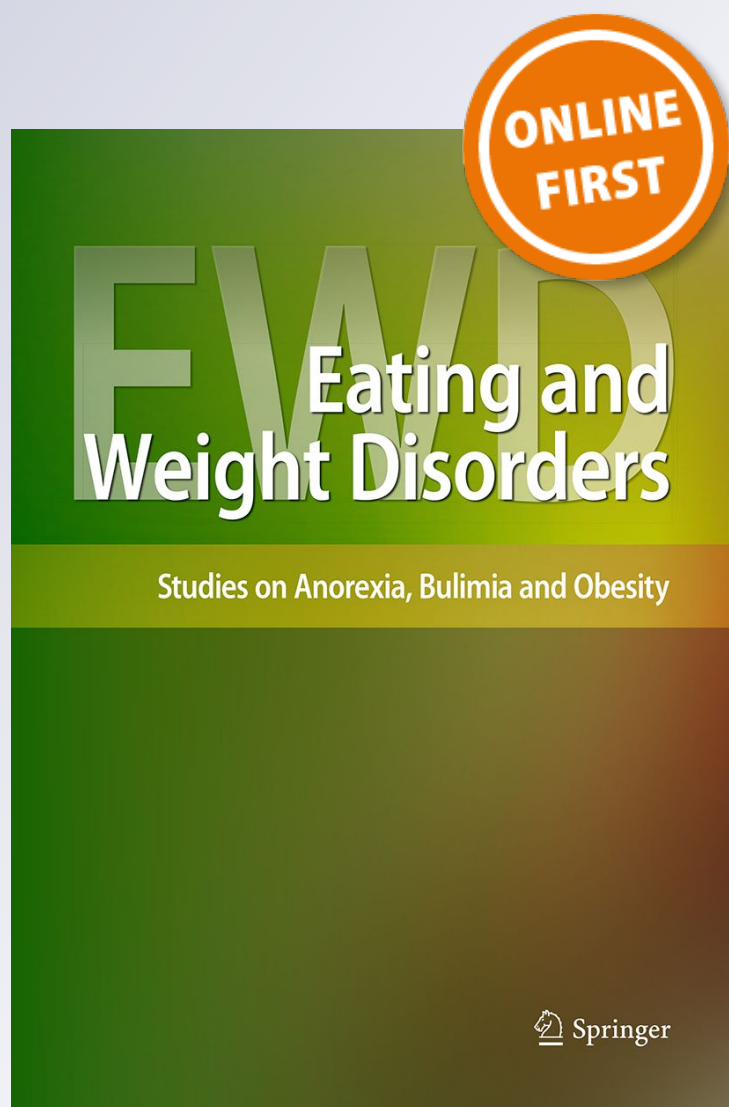
The behavioral pathway model to overweight and obesity: coping strategies, eating behaviors and body mass index

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**Eating and Weight Disorders -
Studies on Anorexia, Bulimia and
Obesity**

e-ISSN 1590-1262

Eat Weight Disord
DOI 10.1007/s40519-019-00760-2



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The behavioral pathway model to overweight and obesity: coping strategies, eating behaviors and body mass index

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Received: 12 March 2019 / Accepted: 24 July 2019
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Abstract

Purpose Obese and overweight people deal with more daily problems and stressful situations than normal-weight individuals, for example, discrimination and bias. The aims of the present study were twofold: to identify differences between overweight and normal-weight people in coping strategies and eating behaviors, and to examine the relationship between coping strategies, eating behaviors and BMI.

Methods Sample of the present study consisted of 473 participants, 76.7% women (mean age = 32.7; SD = 11.4). Participants completed an ad hoc sociodemographic data questionnaire, the Coping Strategies Inventory, and the Dutch Eating Behavior Questionnaire. Welch's *t* test and X^2 comparison analysis were used to identify differences in coping strategies and eating behaviors, according two BMI groups, normal weight and overweight. To analyze the relationship between coping strategies, eating behaviors and BMI, a structural equation modeling was conducted.

Results Overweight participants score significantly higher in passive coping strategies such as self-criticism, wishful thinking and social withdrawal, and unhealthy eating behaviors such as emotional eating and restrained eating. Structural equation modeling included these variables, coping strategies are more likely to conduct to unhealthy eating behaviors and these are more likely to promote and maintain a high BMI. The model showed an adequate data fit.

Conclusions This research proposes a relationship between the variables analyzed. It has been proved that passive coping strategies predict a high BMI via unhealthy eating behaviors, especially emotional eating. These results are promising to improve the current prevention obesity programs and weight control treatments.

Level of evidence Level III, case–control analytic study.

Keywords Obesity · Overweight · Coping strategies · Eating behaviors · Structural equation modeling

Introduction

Obesity is a public health major problem; its prevalence has nearly tripled since 1975 [1]. Research suggests that overweight and obesity are often comorbid with physical diseases such as diabetes or cancer [2], and demonstrate that

psychological problems, such as depression or anxiety, present a bidirectional link with obesity [3, 4].

Weight stigma and bias are daily stressors for overweight and obesity people [5], and have shown a relevant association with psychological problems [4, 5] and unhealthy eating behaviors [6, 7]. In fact, weight discrimination situations tend to lead to disengagement coping and this is likely to lead to poor psychological well-being [8] and quality of life [9]. This evidence suggests that discrimination and bias may create an environment plenty of barriers to current obesity prevention programs and interventions [10].

Many weight control programs present long-term success limitations [10, 11] because they are focused on nutrition and physical activity [12, 13]. Normally, failures on weight management interventions are attributed to the patient, even by healthcare professionals [10, 11, 13]. Previous studies have described the stereotypes of obese people as less

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self-disciplined, irresponsible, lazier, less intelligent, less self-confident [14, 15] and more impulsive [16]. Aforementioned reasons demonstrate that people with overweight and obesity must face stereotypes, bias and stress events day after day, and when they search for help they find an unsupportive and judgmental environment [11, 13]. Previous research showed that obese individuals who felt blame and shame by their close people, also tended to blame themselves for their weight [10, 13], internalizing weight bias [17, 18]. The response to stressful events with negative affect is associated with the presence of passive coping strategies [19] and maladaptive eating behaviors [7, 10, 17, 18, 20]; for instance, using food as a coping strategy to face psychological distress [9–11, 17–20] or social conflicts [21] is named emotional eating [22]. Besides emotional eating, the appearance or the smell of certain food could trigger overeating episodes; this is called external eating. Guilt and shame often appear after emotional and external eating; to remove these feelings, people could intake less amount of food to compensate the overeating during the following days, which is known as restrictive eating [22].

The lack of perceived social support, by overweight and obese people, triggers the appearance of avoidant and passive coping strategies [10]. Blaming themselves, wishful thinking or social withdrawal are common styles to cope with daily problems and stressful situations instead of proactive or problem-solved strategies such as physical activity or seeking social support [23, 24]. Previous research suggests that the use of passive coping strategies could anticipate the appearance of emotional eating, especially in young population [10, 17, 25]. However, this approach has not presented an evidence strong enough yet. Therefore, it is possible to confirm that passive coping strategies and unhealthy eating behaviors are associated with obesity [7–11, 23, 24], but the direction of this relationship and its repercussion in obesity and weight management need more research.

The improvement of rates of success in weight control programs requires the identification of those coping responses and eating behaviors [7–10] which could be barriers to lose weight and to acquire healthy habits. These barriers should actually be included as a treatment area beyond nutrition and exercise in weight management interventions [3, 11]. To design successful interventions of weight control, the relationship between coping strategies and eating behaviors with the body mass index (BMI) in adult populations should be examined. This study provides a more comprehensive approach compared to previous investigations. It presents the influence of coping strategies and eating behaviors in BMI jointly, and provides a clear model for a better understanding of this relationship.

The aims of the present study were twofold: to identify differences in coping strategies and eating behaviors between overweight and obese people (OW) and normal-weight

(NW) people, and to examine the relationship between coping strategies, eating behaviors and body mass index (BMI). The hypotheses of the present study were that people with OW will be more likely to show passive coping strategies and unhealthy eating behaviors compared to NW individuals, and that passive coping strategies may lead to unhealthy eating behaviors, which may explain a high BMI.

Methods

Participants

The initial sample comprised 1325 people non-randomly recruited from the community. After applying the inclusion criteria (aged between 18 and 70 years, BMI over 18.5 kg/m² and all questionnaires completed), the final sample consisted of 473 participants, 76.7% women. Two groups were formed according to BMI: 61.7% ($n=292$) were NW and 38.3% ($n=181$) were OW. The range age was 18–70 years and the average 32.7 (SD=0.53).

For the participation in the study, following exclusion criteria were applied: presence of an eating disorder (i.e., anorexia nervosa or binge-eating disorder), metabolic disease, several psychiatric or psychological problem, psychotropic drugs, being in treatment for weight control and being pregnant or planned pregnancy for the next 6 months.

Measures

An ad hoc sociodemographic data questionnaire was performed to obtain data on age, sex, level of education and income.

The Coping Strategies Inventory (CSI) [26, 27]: This instrument, used in its Spanish version, is a 40-item tool answered on a five-point Likert scale (0 = not at all; 4 = totally). It assesses eight coping styles: problem solving (five items), emotional expression (five items), social support (five items) and cognitive restructuring (five items) as active coping strategies; and self-criticism (five items), wishful thinking (five items), problem avoidance (five items) and social withdrawal (five items) as passive coping strategies. The Cronbach's alpha values of the Spanish version are between 0.69 and 0.83 for the eight factors [27].

The Dutch Eating Behavior Questionnaire (DEBQ) [22, 28]: This is a 33-item tool answered on a 5-point Likert scale (1 = never; 5 = very often) and used in its Spanish version. It evaluates eating behaviors and identifies three different types: emotional (13 items), external (10 items) and restrained eating (10 items). The Cronbach's alfa values of the Spanish version are 0.94 for emotional eating, 0.84 for external eating and 0.93 for restrained eating [28].

Procedure

The Bioethics Committee of the University of Barcelona approved the study, as a part of a broader project. Participants were asked to answer a summary of questionnaires via the website SurveyMonkey, the link was provided through social networks. Before answering the questionnaires, participants had to read the information about the study and they must give informed consent ticking the corresponding box. Participation was voluntary and there was no reward.

Statistical analysis

Analysis was performed using STATA/IC 14.2. To observe BMI differences in sociodemographic data, coping and eating behavior variables the Welch's t test [29] and χ^2 were used. Instead of Cohen's d , point-biserial correlation coefficient r [30, 31] was chosen for continuous variables and the Cramer's V for categorical variables to measure the effect size. To observe the relationship between coping strategies, eating behaviors and BMI, a structural equation modeling (SEM) was conducted using maximum-likelihood estimation method. The goodness-of-fit of the model was evaluated with the following indexes: Chi-square statistics, non-normed or Tucker–Lewis Index (TLI; 0.90 or greater), comparative fit index (CFI; 0.90 or greater), root mean square error of approximation (RMSEA; 0.08 or less) and standardized root mean square residual (SRMR; 0.08 or less) [32].

Results

Sociodemographic characteristics

Table 1 shows the sociodemographic variables assessed, grouped by BMI and also in the total sample. The prevalence of women is notable, representing the 76.7% of the total sample (63.9% NW, and 36.1% OW). Significant differences in sociodemographic variables were found in age ($t = -8.69$, $p < 0.001$; $r = 0.44$, $CI = [0.34-0.52]$), BMI ($t = -24.23$, $p < 0.001$; $r = 0.85$, $CI = [0.82-0.88]$), education level ($\chi^2 = 7.17$, $p < 0.01$; $V = 0.12$) and income ($\chi^2 = 15.83$, $p < 0.001$; $V = 0.18$) between NW and OW.

Coping strategies and eating behaviors

According to the responses to the CSI, participants with OW showed higher significant scores in three of the four passive coping strategies analyzed: self-criticism, wishful thinking and social withdrawal. These results are supported by medium effect sizes ($r = 0.10-0.50$). Cognitive restructuring is the only active coping style where NW people obtain a higher significant result than OW, accompanied by a low effect size ($r \leq 0.10$) (Table 2).

Regarding eating behaviors assessed by the DEBQ, participants with OW score significantly higher in emotional and restrained eating. Results were supported again by medium effect sizes ($r = 0.10-0.50$) (Table 2). However, no statistically significant differences were found in the external eating subscale.

Table 1 Demographic characteristics

Variables	NW ($n = 292$)	OW ($n = 181$)	Total ($n = 473$)
Age ^a	29.1 (9.4)	38.3 (12.2)	32.7 (11.4)
Sex (% of females) ^b	63.9	36.1	76.7
BMI (kg/m^2) ^a	21.8 (1.8)	30.2 (4.4)	25.0 (5.1)
Education level ^b			
Basic education completed	1.4	0.56	1.1
Secondary education completed	30.4	42.2	35.0
High education completed	68.2	57.2	63.9
Income ^b			
< 1 MW	57.5	39.2	50.5
1–2 MW	31.2	41.4	35.1
3–4 MW	9.3	15.5	11.6
≥ 5 MW	2.1	3.9	2.8

MW minimum wage

^aValues expressed as means and SDs

^bValues expressed as percentages

Table 2 Comparison of values for coping strategies and eating behaviors according to BMI

Variables	NW ^a (n = 292)	OW ^a (n = 181)	t	p	r (95% CI)
Coping strategies					
Problem-solving	12.8 (5.1)	12.6 (5.1)	0.366	0.357	0.02 (− 0.08 to 0.12)
Self-criticism	5.8 (5.4)	7.3 (6.2)	− 2.632**	0.004	0.14 (0.04 to 0.24)
Emotional expression	9.9 (5.3)	9.9 (5.3)	0.032	0.487	0.01 (− 0.09 to 0.10)
Wishful thinking	12.0 (5.6)	13.6 (5.5)	− 3.087**	0.001	0.16 (0.06 to 0.25)
Social support	12.3 (5.2)	11.4 (6.0)	1.615	0.054	0.09 (− 0.02 to 0.19)
Cognitive restructuring	10.7 (5.2)	9.8 (5.3)	1.750*	0.041	0.09 (− 0.11 to 0.19)
Problem avoidance	6.0 (4.1)	5.7 (4.6)	0.824	0.205	0.04 (− 0.60 to 0.15)
Social withdrawal	5.0 (4.1)	6.1 (4.4)	− 2.781**	0.003	0.14 (0.04 to 0.24)
Eating behaviors					
Emotional eating	2.3 (0.9)	2.7 (1.0)	− 4.437***	< 0.001	0.23 (0.13 to 0.33)
External eating	3.0 (0.7)	3.0 (0.8)	− 0.713	0.238	0.04 (0.07 to 0.14)
Restrained eating	2.3 (0.8)	2.6 (0.7)	− 3.519***	< 0.001	0.17 (0.08 to 0.26)

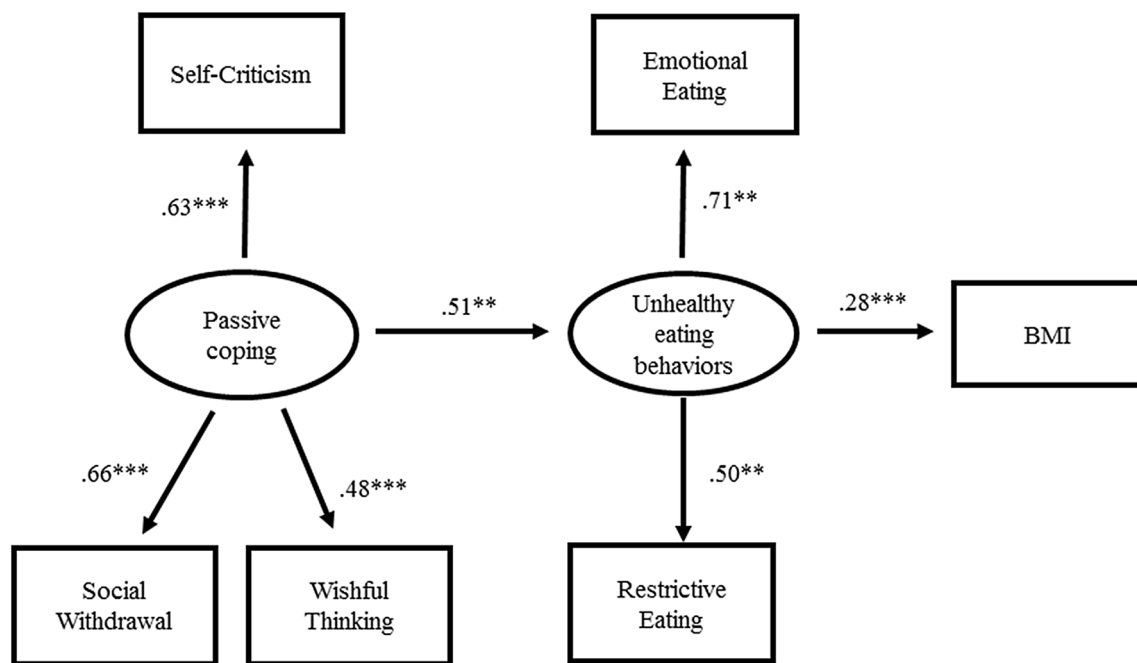
^aValues expressed as means and SDs

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Relationship between coping strategies, eating behaviors and BMI

The relationship between coping strategies, eating behaviors and BMI was analyzed by means of a SEM, which included passive coping and eating behaviors as latent variables (Fig. 1). Goodness-of-fit indices for the present model showed an adequate fit of data ($\chi^2_{(8)} = 15.37$,

$p = 0.052$; TLI = 0.953; CFI = 0.975; RMSEA = 0.044 and SRMR = 0.029). This model suggests that passive coping strategies used by OW participants in the present study (self-criticism, wishful thinking and social withdrawal) may lead to unhealthy eating behaviors (restrictive and emotional eating), which finally would be related to higher BMI. Therefore, people who adopt passive coping strategies are more likely to conduct to unhealthy eating



* $p < .05$, ** $p < .01$, *** $p < .001$

Fig. 1 SEM including passive coping and unhealthy eating behaviors as latent variables and standardized regression weights

behaviors and these are more likely to promote and maintain a high BMI.

Discussion

The present study is the first to assess both coping strategies and eating behaviors and their relationship with BMI. These factors have often been studied separately in previous research, but an increased knowledge about their relationship and their key role in the increase and maintenance of BMI can be useful to design weight management interventions.

Results of the present study showed that NW and OW participants had significant differences in some sociodemographic characteristics, being OW participants those who showed higher age, lower level of education and lower income compared with NW group. These results support finding from previous literature, which also reported and justified these differences [33, 34].

The first hypothesis has been supported by our results since OW participants obtain higher scores in self-criticism, wishful thinking and social withdrawal. In addition, a higher score of cognitive restructuring, an active coping strategy, has been reported by the NW group. These results are supported by past research findings [19, 23, 24], OW people tend to present passive coping strategies to deal with daily stressful situations [10, 19, 23, 24] and a society critical of being obese [11, 13, 21]. The use of food as a resource to face negative feelings, like anxiety or stress, use to be present in people with OW [11, 17–21]. These findings are corroborated by our results, where participants with OW score significantly higher in emotional eating. However, this group obtained higher and significant scores in restrained eating. At first sight, this result may seem contradictory because restrained eating involves the intake of less amount of food than necessary to lose or maintain the current weight [35]. OW people tend to appeal less often to this type of intake [35]. Emotional eating, normally, appears before a binge-eating episode, being followed by restrained eating as a compensatory behavior both in NW and OW people [36]. Not all OW people present binge-eating episodes, but the emotional eating could be associated with an overeating episode, a subjective feeling of binge eating [37], followed by blame and self-criticism [10, 13, 23, 24]. These feelings could justify the presence of restrained eating [36], and our results support that explanation since significantly higher scores in emotional and restrained eating were obtained by the OW group.

The identification of the coping strategies and the eating behaviors that are often present in OW people, provide us with key information to change the focus of traditional prevention and intervention programs for obesity [11, 12]. Some programs began to introduce more treatment areas

than nutrition and exercise, for example, the LEARN program [38]. However, the main focuses are still nutrition and physical activity. For these reasons, an identification of coping strategies and eating behavior is not enough to address the limitations of many weight control programs [10, 11]. The change to design better treatments begins with a better understanding and knowledge of people who will receive the interventions. The aim should not be to understand the obesity; it should be to know better the person who is suffering obesity [11, 13]. This idea has been the base for the second hypothesis of our study: the existence of a relevant relationship between passive coping strategies and unhealthy eating behaviors to explain the high BMI.

Previous studies present weight stigma and bias as relevant daily stressors to face for OW people [4–11, 13–15]. Observing the results of our study, it is possible to support that discrimination is a significant environmental factor to develop coping strategies. Self-criticism, social withdrawal and wishful thinking are strongly associated in the SEM, confirming a unique latent variable. These types of behaviors are characterized by blame yourself, isolation and escape from reality [26, 27]. The tendency of OW people to perform the behaviors aforementioned lies in the lack of perceived social support [10]. The society rewards thinness and criticizes obesity [11, 13, 21], and the family, friends and even healthcare professionals show judgmental attitudes when OW people begin a weight control program [10, 11, 13]. This unsupportive environment triggers the appearance to blame themselves for their failures in weight control programs and prefer to be alone [14, 15] or away from a society that marginalizes them [21].

In relation with the behaviors aforementioned, negative feelings such as anxiety or sadness used to appear [3–5]. The use of food, emotional eating, is very common as an alternative way to deal with these feelings because of the lack of effective coping strategies [6–10, 22]. The relief of emotional eating is short term; for this and the reasons previously explained, restrained eating appears as a compensatory behavior [36]. A possible association between passive coping strategies and emotional eating in OW population has been studied [7–11, 23–25]. However, this study with the results of the SEM not only confirms that association but also proposes a direction of the relationship. Considering the whole environment of OW people, the SEM confirms that passive coping strategies, chiefly those consequences of discrimination and bias, predict a high BMI via unhealthy eating behaviors, especially emotional eating.

The study presents certain limitations that need to be taken into account. First, the proportion of women was higher than the proportion of males. However, no statistically significant differences were found in the percentage of men and women in BMI groups. Second, data on height and weight were self-reported. However, previous

investigations have observed that self-reported data on weight and height highly correlate with directly measured data [39]. Finally, the relationship between variables involved in the proposed model can be discussed. It is difficult to establish the direction of the relationship between these variables since all variables implied in the model show complex behaviors that are interrelated to weight gain and weight management. In the present study, our conceptualization is that the way individuals face different situations could lead to a determinate eating behavior and ultimately influence BMI. Further research on this topic is needed for a better understanding of the relationship between these variables.

Finally, the results of this study highlight the influence of coping strategies and eating behaviors in the development and maintenance of a high BMI. According to the SEM performed in a large-community sample, unhealthy eating behaviors work as a mediator between passive coping styles and BMI. The findings of this investigation provide an empirical model to understand the person who is suffering from overweight and obesity. Following the cognitive-behavioral approach, the SEM could be understood as a general functional analysis; after that, the objectives and the treatment should be designed [40]. However, to design effective treatments, it is necessary to develop an attitude less judgmental and more open minded. This approach will help us to give more importance to the person than the disease, and to design treatments for people and not for symptoms.

Funding This study is part of the project PSI2013-45292-R funded by the Spanish Ministry of Economy and Competitiveness.

Compliance with ethical standard

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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