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Article

Psychosocial resources and diet-related lifestyle in overweight and obesity: A cluster-based study

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Abstract: This study explored intraindividual multidimensional profiles integrating psychosocial factors, namely, body image and satisfaction, weight-related self-stigma, positivity, and happiness, and behavioural-lifestyle factors, namely, adherence to a healthy diet, among Spanish adults with overweight or obesity. We further aimed to investigate the association of excess weight (i.e., measured body mass index, BMI) with the abovementioned multidimensional configurations. A convenience sample of adult individuals with excessive weight completed self-reports regarding the study variables, and their weight and height were measured. With a perspective centered on the individual, a cluster analysis established three distinct intraindividual psychosocial and diet-related profiles: a group of healthy individuals with excess weight; a group of individuals who were negatively affected by their excessive weight and showed the most distressed profile; and a group of dysfunctional individuals who seemed to be excessively unrealistic and optimistic regarding their excessive weight and unhealthy lifestyles. Furthermore, individuals in the affected cluster had higher obesity. The results showed that there are specific psychosocial and lifestyle profiles in the adult population with excess weight and that there are relationships among psychological, behavioural, and body-composition factors. For clinical application purposes, it is important to account for the heterogeneity within individuals who are obese and to individualize the interventions, with a focus from weight change to individual's overall well-being.

Keywords: body image; healthy diet; weight-related stigma; subjective well-being; excessive weight; cluster analysis

1. Introduction

Overweight (body mass index, BMI≥25 kg/m2) and obesity (BMI≥30 kg/m2) are recognized as major public health concerns, as they are associated with a higher risk for chronic or severe somatic, mental, and social co-morbidities. Individuals with overweight and obesity form a heterogeneous population in terms of etiological factors, the ways in which being obese impacts an individual's health, how the individual sees himself or herself, and how he or she is seen by the world (Perdue et al., 2018), as well as the dif-

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ferent needs of these individuals. Thus, a better conceptualization of particular subgroups among overweight/obese individuals will lead to more specific and tailored interventions and body weight management strategies (Gagnon-Girouard et al., 2010).

Obesity is categorized based on weight/BMI level and related morbid conditions; however, such a distinction fails to account for the variation within this group across other factors, such as demographic factors, health-related variables, and behavioural characteristics (Green et al., 2015). Despite the multidimensional nature of obesity and weight-related experience, there has been little work that has categorized multidimensional patterns, which might allow for the tailoring of interventions. Contrary to considering obesity as a single discrete factor and analyzing its relationship with a single outcome variable treated in isolation from other factors (Green et al., 2015), the exploration of how a variety of demographic, lifestyle, behavioural, and well-being factors are interrelated among and between groups of individuals will allow for the understanding of the heterogeneity of obese individuals and the derivation of customized interventions. Thus, analytical procedures for clustering individuals based on their commonalities provide a novel integrated investigation of weight-, behaviour-, and psychosocial-related factor patterns and offer guidance for intervention designing, tailoring, and targeting (Olson et al., 2016).

The research focused on subtyping overweight and obese individuals in clinical and nonclinical samples based on psychological, lifestyle, and sociocultural factors was initially conducted to explore psychopathological factors (i.e., vulnerability), including temperament and personality traits, mood disorders, and behavioural-impulse control factors that contribute to overeating and obesity, treatment seeking, adherence to treatment, motivation, accomplishment of recommendations (e.g., behavioural changes), and postintervention weight loss, as well as eating, psychosocial, and psychiatric disorders (Allison & Heshka, 1991, 1993; Barrash et al., 1987; Blankmeyer et al., 1990; Ryden & Johnsson, 1989; Webb et al., 1990). In general, these and more recent similar studies have identified three typologies, two of which—namely, internalizing/distressed/emotionally dysregulated and externalizing/impulsive/ undercontrolled subgroups—were characterized by maladaptive combinations of psychological factors, and the third of which was characterized by a more adaptive/resilient, high-functioning profile. These profiles were also different in terms of validation, external variables of psychosocial functioning, mental health, and eating disturbance reflecting adverse correlates of obesity, including psychological distress, mood disorders, obesity-related quality of life, coping mechanisms, interpersonal problems, weight and appearance concerns, and eating behaviour symptoms, for instance; contrarily, no differences emerged due to age, socioeconomic status, and BMI, whereas for sex-gender[i] the findings are contradictory (Claes et al., 2013; Gullo et al., 2013; Müller et al., 2014; Pérez Martínez et al., 2013).

The above research on the empirically derived "typologies" of persons with excessive weight is focused on risk factors and offers limited guidance for addressing modifiable obesity-related factors; consequently, this line of inquiry has more recently been substituted by that focused on a range of psychological features distinguishing between more adaptive profiles and less positive other ones.

This new research has explored individual subtypes based on shared features in identity statuses (e.g., Claes et al., 2019; Perdue et al., 2018), weight-gain behaviours (e.g., Olson et al., 2016), body image concerns (e.g., Perdue et al., 2018), eating disorder symptoms (e.g., Caroleo et al., 2018), negative mood states (e.g., Jansen et al., 2008), and a combination of negative affect and dietary restraint based on body concerns (e.g., Gagnon-Girouard et al., 2010). Nevertheless, this research has been restricted mainly to high-risk or morbid female samples and has focused on a limited number of configuration variables. Research on multidimensional psychosocial profiles among a broad range of excessive BMIs is

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scarce (e.g., Green et al., 2015), which is based on a variety of demographic-, behavioural-, health-, and well-being-related variables). Overall, this research supports the heterogeneity of individuals with excess weight. In general, two to three clusters have been found: one containing individuals with excessive caloric intake and unhealthy diet and no evidence of relevant psychopathology, including disturbed eating, and two composed of individuals with increased body dissatisfaction, disordered eating, and general psychopathology (e.g., depression), where more maladaptive patterns of body concerns and eating-related disturbances are associated with poorer mental health status.

Given the scarcity of evidence on multidimensional profiles in overweight and obesity, the heterogeneity of individuals with excessive weight, and the necessity of tailoring interventions to the features of each of the subgroups within this population, the aim of the study was to investigate an empirically based categorization of individuals with excess weight based on several psychosocial and lifestyle variables, including body image and body satisfaction, weight-related stigma, healthy diet, positive orientation, and happiness, and to further validate these configurations by exploring possible differences due to BMI levels.

Previous research has stressed the relevance of body image (Grogan, 2017) among individuals with overweight and obesity (Chao, 2015; Latner & Wilson, 2011; Weinberger et al., 2016). Most people with excess weight perceive themselves as such, even when they do not have completely accurate perceptions of their weight (Bibiloni et al., 2017; Godoy-Izquierdo et al., 2019, 2020a; Ibáñez-Zamacona et al., 2020; Varela et al., 2019). A considerable number of persons, particularly females, with overweight and obesity have negative body self-perceptions, are dissatisfied with their bodies, and wish they were thinner (Bibiloni et al., 2017; Chao, 2015; Ibáñez-Zamacona et al., 2020; Silva et al., 2019; Varela et al., 2019; Weinberger et al., 2016). In addition, body dissatisfaction increases as the BMI levels of individuals (Bibiloni et al., 2017; Ibáñez-Zamacona et al., 2020; Varela et al., 2019).

Body weight is associated with psychosocial well-being in overweight and obese individuals. For instance, it has been found that people with obesity experience weight-related prejudice, discrimination, and stigma in many social areas, including education, employment, and healthcare contexts; interpersonal and intimate relations; and mass media presentation (Rubino et al., 2020; Spahlholz et al., 2016). As a consequence of weight stigma, they also experience numerous and pervasive outcomes in terms of functioning, quality of life, and well-being (Pearl & Puhl, 2018; Wu & Berry, 2018), including unsuccessful efforts to manage their excess weight, weight gain, and obesity maintenance. Even though lower stigma and self-stigma have been reported for Spanish individuals (Luna & Jáuregui-Lobera, 2017; Magallares, de Valle et al., 2014; Magallares, Morales et al., 2014; Magallares et al., 2016, 2017), stigma can have pervasive effects. Women are more affected by weight stigmatization (Rubino et al., 2020) and group discrimination (Magallares et al., 2016), yet this finding has not been previously found among Spanish individuals with obesity seeking or undergoing treatment for weight loss (Luna & Jáuregui-Lobera, 2017; Magallares, de Valle et al., 2014; Magallares et al., 2016, 2017). While some studies have not identified an influence of BMI on stigma among individuals with excess weight (Luna & Jáuregui-Lobera, 2017; Magallares, de Valle et al., 2014; Magallares et al., 2016), other studies have found a positive relationship between weight and weight self-stigma (Magallares et al., 2017).

Shape-weight concerns, weight-related stigma, and psychological distress have been found to define, in combination, a psychosocial profile of experiences with obesity among individuals with excessive weight (Calugi & Dalle Grave, 2020). In addition to psychopathological characteristics, unhealthy attitudes and behaviours, the risk of disease and eating disorders, weight loss failure, and diminished quality of life, research on

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the positive states of well-being and protective factors configuring alternative psychosocial profiles is unfortunately scarce (Godoy-Izquierdo et al., 2020b).

It has been observed that happiness is diminished among people with obesity (Böckerman et al., 2014; Katsaiti, 2010; Kuroki, 2016; Oswald & Powdthavee, 2007). It is well established that subjective well-being (SWB) exhibits an inverse relationship with BMI (Böckerman et al., 2014; Katsaiti, 2010; Luna & Jáuregui-Lobera, 2017; Magallares, de Valle et al., 2014; Magallares, Morales et al., 2014; Magallares et al., 2016; Robertson et al., 2015; Ul-Haq et al., 2014; Wadsworth & Pendergast, 2014). Obese participants demonstrate significantly lower SWB than do overweight individuals (Luna & Jáuregui-Lobera, 2017). It has also been found that BMI is related to decreased happiness among obese individuals but not among overweight and normal-weight individuals (Böckerman et al., 2014; Robertson et al., 2015). Moreover, the association between obesity and decreased happiness affects females more than males (Blanchflower et al., 2009; Latif, 2014; Ul-Haq et al., 2014; Wadsworth & Pendergast, 2014). Nevertheless, some authors have not found any effects of age, sex-gender, and BMI on psychological well-being (i.e., self-stigma, happiness) among individuals with obesity (Luna & Jáuregui-Lobera, 2017; Magallares, de Valle et al., 2014; Magallares, Morales et al., 2014; Magallares et al., 2016). Indeed, many individuals with obesity are happy (e.g., Green et al., 2015; Jansen et al., 2008) and pursue the highest possible hedonic well-being and life satisfaction. Other studies have found that Spanish individuals with obesity are, on average, happy (Luna & Jáuregui-Lobera, 2017), whereas other findings have shown decreased SWB in these individuals (Magallares, de Valle et al., 2014; Magallares, Morales et al., 2014).

Positivity (Caprara et al., 2010), a "trait-like basic disposition" characterized by a positive cognitive orientation towards self, life, and the future, lies at the core of self-esteem, life satisfaction, and optimism (Caprara et al., 2019, p. 127). As such, positivity has beneficial effects for optimal human functioning, achievement, and adaptation across life domains and may act as a protective factor against mental illness. Moreover, positivity has been proposed as a dispositional component of SWB (Caprara et al., 2017, 2019). The "positive cognitive triad" on the self, life, and the future is an important variable in terms of well-being, as it makes people capable of facing life despite adversity, failure, loss, or serious illness (Caprara et al., 2019). Moreover, no differences in positivity have been found between women and men (Caprara et al., 2012; Heikamp et al., 2014). In Spanish samples, positivity has been scarcely investigated. To the best of our knowledge, positivity has previously been studied among people with excess weight in only one study, where it was confirmed to be a protective factor (Godoy-Izquierdo et al., 2020b).

Given that overnutrition and malnutrition are considered the most significant causes of obesity, along with a sedentary lifestyle, a healthy and diverse eating pattern is a widely accepted recommendation for promoting a nutritionally adequate diet and general health and for reducing the risk of major chronic diseases, including obesity (de Oliveira et al., 2018). A Mediterranean diet (MedDiet) is characterized, among other features, by an adequate intake of minimally processed plant foods, such as fruits and vegetables, which are associated with a healthy body weight and the prevention and management of obesity and other chronic and fatal diseases, including cardiovascular disease and cancer (Alissa & Ferns, 2017; Aune et al., 2017; Carlos et al., 2018; de Oliveira et al., 2018; Kwan et al., 2017; Schwingshackl et al., 2017). In addition, increased vegetable intake has been associated with a reduced risk of weight gain and overweight or obesity, with an odds ratio up to 0.88 (Nour et al., 2018). The protective mechanisms of fruit and vegetables are becoming increasingly better known (Alissa & Ferns, 2017; Castro-Barquero et al., 2018). The benefits of fruit and vegetable intake on health endpoints seem to be associated with an optimal daily intake of five portions/servings or greater (Alissa & Ferns, 2017; Nour et al., 2018; Rodriguez-Rodriguez et al., 2017). Although Spain is considered to follow a MedDiet eating pattern, the reality is that the adherence to recommendations among

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Spanish individuals is far from ideal, and there is low consumption of fruits and vegetables, which is also associated with the increasing national rates of overweight and obesity (Benhammou et al., 2016; Blas et al., 2019; Gomez-Donoso et al., 2019; Olmedo-Requena et al., 2019; Rodriguez-Rodriguez et al., 2017). Recent studies have suggested that the percentage of individuals who report that they never consume or consume less than 5 servings per day of fresh fruits and vegetables is significantly higher in those with obesity than in those with normal weight (Lecube et al., 2020; Rodriguez-Rodriguez et al., 2017). Moreover, in other Mediterranean nations, where populations' adherence to the MedDiet has been analyzed, it has been found that the consumption of fruits and vegetables is notably lower than recommended, and three clusters of eating patterns have been identified, namely, the MedDiet, the Westernized diet, and the low-fruits/vegetables diet, with the last two being related to a higher risk of obesity (Denoth et al., 2016).

In sum, in the present study, we aim to explore possible configurations that are differentially associated with psychological functioning and lifestyle among Spanish adults with overweight and obesity. This approach will allow for the identification of patterns in the relationships between these psychosocial and behavioural factors, which can then be used to design adapted interventions. Given that negative body image, body dissatisfaction, and self-stigma have been consistently found to be related to decreased functioning and well-being, we introduce these variables into the configurational analysis. In addition, whereas the extant research has mostly focused on the harmful consequences of obesity in terms of psychological well-being, our aim is to contribute by exploring happiness and other protective factors, such as positivity and healthy diet, in individuals with excessive weight. To the best of our knowledge, this is the first study integrating protective elements into the configuration of psychosocial profiles among individuals with excess weight. We further aim to validate such profiles by BMI level. Based on previous research (e.g., Gagnon-Girouard et al., 2010; Gullo et al., 2013; Pérez Martínez et al., 2013), we expect to find three different profiles, including a subgroup of individuals with more positive body perceptions, higher body satisfaction, lower self-stigma, healthier diet, positive orientation, and higher levels of happiness, and two distinct profiles of maladaptive combinations of such psychosocial and lifestyle factors, one revealing higher body- and social-related concerns (i.e., characterized by elevated body dissatisfaction, higher self-stigma, and healthier diet for weight control) and another revealing increased weight-related distress (i.e., characterized in addition by lower positivity and happiness).

2. Materials and Methods

2.1. Participants and Procedure

A total of 100 adults from 19 to 57 years old (average age: 42.03±10.74 years, 60% women) residing in southern Spain voluntarily participated in the study. All participants had a BMI≥25 (69% overweight: 45% overweight I and 24% overweight II; 31% obesity: 22% obesity I and 9% obesity II). No differences were found in terms of age between women and men or between overweight and obese participants. All participants were white and had an average socioeconomic status (social class was determined by combining education level, job status, and income. Following the definition of the Health Determinants Taskforce of the Spanish Epidemiology Society, six categories were established and regrouped into three categories: high (Classes I-II), middle (Classes III-IV), and low (Classes V-VI) social classes; Godoy-Izquierdo et al., 2020b). Recruitment was conducted through a convenient, nonprobabilistic procedure according to the inclusion criteria (i.e., having overweight or obesity, not suffering from severe physical and mental diseases, and being 18-65 years old) in local medical settings.

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Specifically, recruitment was conducted in two primary healthcare centers among individuals who consulted in terms of their weight and health during March 2019. After inviting individuals to voluntarily participate and informing them about a study on well-being and health in obese and overweight adults, the anonymous nature of the data, and their rights, we obtained their written informed consent. Then, an assessment was conducted in a medical examination room. First, sociodemographic data and self-reported weight and height were collected in an interview format. Then, participants' self-reported data on body perceptions, self-stigma, positivity, happiness, and adherence to the MedDiet were collected. The order of the questionnaires was counterbalanced to avoid order bias. Finally, objective measures of weight and height were obtained.

Approval was obtained from the ethics committee of authors' university (CIEB-2018-1-36). The procedures used in this study adhere to the tenets of the Declaration of Helsinki of 1975-2013.

2.2. Study Variables and Measures

Sociodemographic data were collected from participants. Based on their self-reported weights and heights, we calculated their subjective BMIs in kg/m2. We also measured weight and height with a mobile anthropometer (Aicok Weight Scale, mod. CF398BLE, USA), which uses bioelectrical impedance analysis technology to monitor multiple physical indexes, including body weight (weight range up to 400 pounds/180 kg and indexing value accurate up to 0.2 pounds/0.1 kg) and BMI. Participants were weighed while erect, with their arms along their body, in bare feet and light clothes. BMI based on measured parameters was categorized according to international standards for nutritional status in the adult population (Lecube et al., 2016; WHO, 2019); i.e., <18.5 kg/m2 denotes low weight, 18.5-24.9 kg/m2 denotes normal weight, 25.0-29.9 kg/m2 denotes overweight (25.0-26.9 kg/m2 denotes overweight type I, and 27.0-29.9 kg/m2 overweight type II), and ≥30.0 kg/m2 denotes obesity (30.0-34.9 kg/m2 denotes obesity type I, 35.0-39.9 kg/m2 obesity type II, and ≥40.0 kg/m2 obesity type III). For the analyses, measured BMI was used.

The perceptual component of body image (Grogan, 2017) was explored by using silhouettes corresponding to different BMI ranges (Godoy-Izquierdo et al., 2019). A total of 15 male or female body figures were presented to individuals to assess their perceptions of their own bodies (perceived body image, PBI) and ideal body (ideal body image, IBI) (in both cases, 1=excessively obese, 8=excessively thin and flaccid, and 15=excessively muscular). In addition, body dissatisfaction was assessed by a single face-valid item ("How satisfied are you with your current body weight and appearance?" Response options ranged from 1=extremely dissatisfied to 7=extremely satisfied) (Godoy-Izquierdo et al., 2019). Body satisfaction is considered a key dimension in the evaluative-subjective component of body image (Grogan, 2017).

The stigma associated with overweight and obesity was assessed with the Spanish version (Gómez & Baile, 2015) of the 11-item Weight Bias Internalization Scale (M-WBIS) (Durso & Latner, 2008). Weight-related stigma was assessed with respect to personal competence and self-worth, attractiveness, judgments by others, desire to lose weight, weight-related distress, sexual opportunities, and so forth (1=completely disagree, 7=completely agree). A global score was obtained by adding response values and then dividing by the number of items, with higher scores indicating greater self-stigma (two items were reverse-scored). The Cronbach's α value was 0.83 in the present study.

Positive functioning was assessed with the Spanish version (Heikamp et al., 2014) of the 8-item Positivity Scale (Caprara et al., 2012). Positivity is defined as the tendency to view

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life and personal experiences from a constructive perspective, i.e., life satisfaction, personal confidence, self-pride, hope and enthusiasm for the future, social support, and so forth (1=completely disagree, 5=completely agree). A global score was obtained by adding response values and then dividing by the number of items, with higher scores indicating greater positivity (one item was reverse-scored). The Cronbach's α value was 0.87 in the present study.

SWB was self-reported with the Happiness Scale (Godoy-Izquierdo et al., 2012). Only the single-item indicator of current happiness ("How happy are you at present, i.e., the last few days or weeks?" Scores ranged from 0=extremely unhappy to 10=extremely happy) was used. Single-item indicators of happiness are usually used in national surveys and individual research (Cheung & Lucas, 2014). Instead of specific indicators of satisfaction with life or hedonic balance (i.e., positive and negative affect) (Diener et al., 1999), we measured SWB at the molar level by assessing an individual's summary assessment of his/her subjective happiness as a more global psychological phenomenon.

Adherence to a healthy diet was assessed with the 14-point Mediterranean Diet Adherence Screener (MEDAS) (also known as PREDIMED) (Schröder et al., 2011), which assesses adherence to the MedDiet with 14 dichotomic items for different diet nutrients (0=no adherence to recommendations and 1=adherence to recommendations). However, the MEDAS scores for some items (e.g., wine, meat), some absences (e.g., cereal and dairy products), and some other limitations (e.g., not taking into account culinary practices, average intakes, serving sizes, combinations of foods, and total energy intake) raise questions about the scoring decisions and cutoff points used for computing scores and the categories of adequate, moderate, and poor adherence. Moreover, the MEDAS results show low-to-medium correlations with other accepted tools for assessing adherence to the MedDiet (García-Conesa et al., 2020; Hernandez-Ruiz et al., 2015; Olmedo-Requena et al., 2019). These limitations are only in part addressed by a new, nonvalidated, 17-item version of the MEDAS (Galilea-Zabalza et al., 2018). Thus, since criticisms have been expressed regarding the classification of individuals based on their dietary habits as measured by their global score (Martínez-González et al., 2019), we decided to use a single-nutrient approach and considered one of the most relevant or common indicators of adherence to a healthy diet, namely, the daily consumption of vegetables and fruits, foods at the base of the MedDiet pyramid (Aune et al., 2017; Onvani et al., 2017; Schwingshackl et al., 2017; USDA & USDHHS, 2010). Thus, we classified participants into two profiles: healthy eaters were those reporting the consumption of at least 5 units/serving of both fruits and vegetables per day (MEDAS items 3 and 4), whereas unhealthier eaters were those not consuming at least 5 units/serving of vegetables and fruits per day. A total of 54% of participants were classified as healthy eaters, while 46% were classified as unhealthy eaters.

2.3. Statistical Analyses

This research was a cross-sectional descriptive study. The nature and adequacy of the data were checked, and parametric assumptions were confirmed before conducting analyses. Descriptive and other inferential results are reported elsewhere (Godoy-Izquierdo et al., 2020a,b). For the present study, a two-step cluster analysis was performed, combining hierarchical agglomerative preclustering, and then, for replication, a nonhierarchical iterative k-means cluster analysis to identify the psychosocial and diet-related profiles maximizing intraconglomerate homogeneity and between-conglomerate heterogeneity, complemented by a discriminant analysis to further validate the classification. In this analysis, body image dimensions (PBI, IBI, and body satisfaction), self-stigma, adherence to a healthy diet, positivity, and happiness were included to form the intraindividual profiles. The optimal number of clusters was determined by the Bayesian information criterion (BIC) and confirmed by means of the

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pseudo-F (PSF) criterion or variance ratio. In addition, Goodman and Kruskal's λ value and the percentage of cases correctly classified were also considered. To establish possible differences between groups, analyses of variance (ANOVA) with post hoc pairwise comparisons were conducted (Bonferroni's or Games-Howell's comparisons were calculated based on Levene's F test for homogeneity of variance). One-way ANOVA was then run to explore the possible differences among the clusters due to objective BMI (as a continuous variable). Z scores were calculated for all the variables, except the indicator of a healthy diet. The significance level for all analyses was set at $p<.05$. Statistical analyses for the current study were conducted using SPSS 25.0 (SPSS Inc., Chicago, IL, USA, 2017).

3. Results

A k-means cluster analysis was conducted for fixed solutions from two to four clusters to examine possible intraindividual configurations of body perceptions, body satisfaction, self-stigma, healthy diet, positivity, and SWB indicators, as well as to explore the between-cluster differences in measured BMI. A three-cluster solution was chosen because this was the solution with the highest percentage of participants correctly clustered in each group, it has greater parsimony and replicability, and can be more readily interpreted in a meaningful way than can other solutions. An initial ANOVA revealed significant differences among clusters for all configuration variables, and consequently, all the variables were included for the final cluster formation.

Three definitive clusters were identified, a result supported by the PSF and λ values ($p<.01$), which reached optimal values for the three-cluster solution. Each configuration was characterized by different psychosocial profiles: Cluster 1, composed of 46% of participants, was characterized by average perceptions of overweight and less exigent body ideals, which were slightly lower in weight and size compared to the participants' current figures; individuals in this cluster reported the lowest weight-related self-stigma and the highest levels of body satisfaction, positivity, happiness, and adherence to a healthy diet (i.e., fruit and vegetable consumption). This cluster was therefore named the *healthy* group. Cluster 2, composed of 18% of participants, was characterized by showing higher perceived weight and more realistic body ideals, i.e., thinner yet closer to their actual weight; they reported the lowest levels of body satisfaction and happiness and the highest self-stigma. In terms of their diet, this cluster reported some level of adherence to healthy eating. This cluster was therefore referred to as the *affected* group, containing individuals with obesity who were aware of their weight, unhappiness, and unhealthy lifestyle. Cluster 3, composed of 36% of participants, was characterized by the most positive self-perceptions—probably unrealistic—and the most exigent body ideals in terms of thinness and muscularity; individuals in this cluster also reported a body satisfaction close to that of Cluster 1 but, at the same time, average self-stigma and, more importantly and resembling Cluster 2, lower happiness, the lowest positivity, and the poorest adherence to healthy eating. Given this profile, this group was referred to as the *dysfunctional* group. Discriminant analysis for the overall model indicated high discriminant power (Wilks' λ, X^2=84.252, p=.000), with 95% of the cases correctly classified. Based on these profiles, we observed different configurations associated with different body appreciations, weight-related stigma, healthy lifestyle, positivity, and SWB (see Figure 1).

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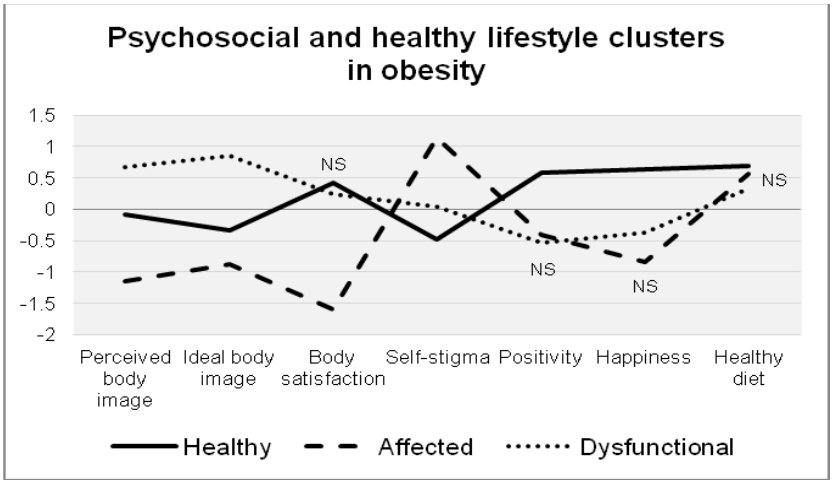

Figure 1. Graphical representation (centroids) of the psycho-social and healthy lifestyle profiles identified in the cluster analysis.

Furthermore, clusters were compared with respect to the configuration variables using one-factor ANOVA and pairwise comparisons (with corrections due to the homogeneity of variance) (Table 1). Significant differences were found between the clusters for all configuration variables (p<.05). However, Clusters 1 and 3 did not differ in terms of body satisfaction, and Clusters 2 and 3 did not differ in terms of positivity and happiness. Moreover, Cluster 2 did not differ from Clusters 1 and 3 in dietary habits, namely, fruit and vegetable intake (p>.05).

In addition, clusters were compared in terms of measured BMI (kg/m^2). Significant differences were found ($F_{(2, 97)}$=11.405, p=.000). While Clusters 1 and 3 showed similar BMIs (C1: M=28.00, SD=3.00; C3: M=28.06, SD=3.33; p>.05), Cluster 2 was composed of individuals with higher BMIs (M=32.07, SD=3.69) than Clusters 1 (p<.001) and 3 (p<.001).

Table 1. Means (centroids), standard deviations, and between-group comparisons for three clusters (Z scores). ** *p<.01*

Configurational Variables	Healthy N=46%		Affected N=18%		Dysfunctional N=36%		*F*	*p*
	M	SD	M	SD	M	SD		
Perceived body image	-.09	.62	-1.14	.48	.68	1.04	33.092	.000**
Ideal body image	-.33	.83	-.88	.64	.86	.66	41.895	.000**
Body satisfaction	.42	.58	-1.59	.82	.25	.69	62.701	.000**
Self-stigma	-.48	.62	1.15	1.00	.04	.93	25.637	.000**
Positivity	.58	.65	-.40	1.10	-.54	.93	20.046	.000**
Happiness	.63	.62	-.84	1.07	-.38	.86	27.933	.000**
Healthy diet	.70	.47	.56	.51	.33	.48	5.808	.004**

4. Discussion

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In the present study, we explored multidimensional profiles of experiences of excess weight, including perceptual and evaluative-subjective body image dimensions, self-stigma, healthy diet, positivity, and happiness in adults with overweight or obesity, as well as the association among clusters with a validating variable, namely BMI. Individuals with obesity are usually classified according to BMI as they were homogeneous, but far from this supposed homogeneity, there is large variability within the group, indicating that obesity management interventions must be tailored to individuals to be most effective (Green et al., 2015). Unfortunately, there has been relatively little consideration of the population-level heterogeneity of those individuals classified as obese; in addition, the extant research has focused on limited samples and risk or pathological factors. Since the psychosocial factors related to obesity are highly interrelated, it is inappropriate to study them independently from each other, and a profile-based approach combining various of such factors can be more adequate for understanding their overall impact. The present study contributes to the literature by exploring such configurations, including both risk and protective factors, in individuals with a wide range of BMIs in the categories of overweight and obesity. Moreover, the present study is in accordance with a shift from a weight-centered paradigm for body valuation and obesity management to an alternative paradigm based on self-acceptance, decreased body-related worry, enhancement of healthy habits (eating patterns, physical activity), and the pursuit of health and well-being.

Our findings support the existence of different profiles of individuals with excessive weight in terms of their psychosocial resources and lifestyle factors. Our findings confirm the key role of body image dimensions, weight-related stigma, positivity, happiness, and diet-related indicators for overall well-being in individuals with overweight and obesity. Individuals in the largest subtype (46% of participants) were characterized as having more realistic body perceptions and body ideals, the highest level of body satisfaction, the lowest weight-related self-stigma, and the highest levels of positivity and happiness. These individuals also adhered to a healthy diet in terms of fruit and vegetable intake. This cluster seems to support a healthy subgroup of individuals with excess weight who are conscientious of their weight, accept their body, take control of its management, and do not allow weight- and body-related pressures to make them feel unfortunate. We expected to find this more adaptive/high functioning subgroup based on the reviewed literature. The smallest subgroup (18%) contained affected individuals, indicating weight-related subjective distress, social disadvantage and, probably, being discriminated against due to obesity. This subtype was characterized by having higher perceived weight, the lowest level of body satisfaction and less exigent body ideals (closer to their actual weight); they reported the highest self-stigma, low positivity, and the lowest level of happiness. This cluster summed up the two maladaptive profiles that we expected to find, one of which was expected to be more weight-based distressed and the other of which was more concerned with the body. This profile indicates that these individuals are intimately "suffering" for being overweight and obese. In terms of their diet, individuals in this cluster do not fully adhere to healthy eating for weight and appearance control. Moreover, it would be of interest to explore the risk for eating disorders and general psychopathology in this subgroup in future research. Unexpectedly, there was a third profile (36%) containing dysfunctional individuals with apparently higher unawareness of their excessive weight and associated risks because they reported more positive, probably illusory, self-perceptions and high body satisfaction but, at the same time, more exigent body ideals. Nevertheless, these individuals also reported high self-stigma and low positivity and happiness as well as the poorest adherence to healthy eating. Contrary to the abovementioned maladaptive, internally focused subgroup, these individuals seem to have a more social, external focus regarding weight and appearance based on sociocultural beauty standards and social pressures concerning their body and weight. Tentatively, this profile could perhaps be attributed to weight preoccupation and body dissatisfaction related to more external factors (e.g., social pressure to be thin, de-

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sire for social acceptance), instead of internal feelings of eating control or negative mood, something that future research should explore.

Our findings support previous profiles of individuals with excessive weight with similar configuration variables. For instance, in one study, body image was used to cluster female postoperative bariatric surgery adult patients in the U.S. to understand their experiences, identities, and behaviours as they adjusted to their decreased weight (Perdue et al., 2018). Although the abovementioned study was restricted to morbidly obese females who received bariatric surgery, in addition to supporting the key role of body image concerns before and after weight reduction in patients' psychological adjustment to their past and new body reality, it supported the existence of a large subgroup of individuals with high body concerns and a smaller number of people with low body concerns, which is in line with our findings. In another study, identity statuses were explored in morbidly obese prebariatric adult patients from Belgium (69% females), and these cluster-based identities were compared in terms of eating (weight, body, and eating concerns; restrained, emotional, and external eating), general psychopathology (anxiety, depression, etc.), and coping mechanisms (Claes et al., 2019). Although this study did not cluster participants based on their body image or dietary patterns, it supported that both females and males with high-level obesity experience their excessive weight in several ways, which is related to weight, body, and eating concerns, eating behaviours, and a variety of psychopathological symptoms, which is also in line with our findings.

Regarding eating habits, one study aimed to investigate patterns in behaviours affecting energy balance and body composition, namely, dietary, exercise, and sleep behaviours, among predominantly male overweight (14%) and obese (86%) commercial truck drivers in the U.S.—a population characterized by a mostly unhealthy lifestyle and the highest prevalence of obesity—who were interested in managing or losing weight, and then tested whether clusters with similar behaviour patterns differed across demographics, health, and psychosocial factors (i.e., BMI, occupational safety and health incidents, stress, and social support) (Olson et al., 2016). As we found, there were individuals with different degrees of adherence to nutritional recommendations, which was also associated with their distress and functioning. In another study, subtypes of Italian individuals (69% females) with obesity seeking weight reduction treatment were clustered according to abnormal and disturbed eating behaviours (i.e., grazing, emotional eating, binge eating, postdinner eating, night eating, carbohydrates craving, sweet eating, hyperphagia, and social eating) and then compared with regard to sociodemographics, anthropometric variables, personality/temperamental traits, eating pathology, mood psychopathology, neurocognitive functioning (impulsiveness and neuropsychological indicators), and genetic profiles (Caroleo et al., 2018). Our findings support the existence claimed in that study of a subgroup of individuals with excessive weight who seem to be obese due to overeating and do not "suffer" for being obese but are aware of their weight and try to manage it (healthy subgroup), paralleling the cluster of individuals with hyperphagia and no evidence of relevant psychopathology of that study. Our findings also support the existence of a subgroup of individuals who show higher weight-related distress, paralleling the subgroup of individuals with increased body image concerns, more altered eating behaviours, and higher levels of psychopathology, who, in our study, were further subclassified into a subgroup of highly distressed individuals, with abnormal psychological-related features (affected subgroup) and another subgroup of abnormal body- and eating-related features (dysfunctional subgroup). Future research should explore in depth the configuration of both maladaptive subgroups in terms of eating and general psychopathology.

Happiness, including global indicators of SWB and specific indicators, such as hedonic balance, positive and negative affect, and life satisfaction, has occasionally been included in previous configurations (e.g., Ryden & Johnsson, 1989). A more recent study (Jansen et

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al., 2008) explored configurations based on negative affect (a composite indicator of depression, positive and negative affect, and self-esteem) with Dutch female adults with excess weight (24.5% overweight, 75.5% obese; noneating disorder sample). Notably, the authors (Jansen et al., 2008) were not interested in happiness particularly but, instead, in the relationship between depression and obesity. As they stated, such a relationship was evident in previous research, but this research had been conducted mainly with samples of individuals seeking or undergoing treatment, and variables such as higher body weight, health problems, and disordered eating, frequently found in these samples, could, in part, explain these findings. In contrast, the evidence for such an association within community samples was less clear but also apparent based on meta-analytic research (Scott et al., 2008). Indeed, the above authors found that almost half of the females participating in their study obtained scores indicating mild to severe depression, although less than one in ten reported having received mental health care. In addition, the authors suspected that independent of BMI, body image distress caused by shape and weight concerns, negative self-evaluations, and body dissatisfaction, as derived from thinness-oriented beauty ideals, antifat social pressures, weight-related stigma, and so forth, could in turn have an influence. This study demonstrated that, in addition to negative affect, their worries and concerns related to their bodies, instead of actual body weight, eating pathology, or dieting behaviours, distinguished between the adaptive and maladaptive profiles of individuals with excessive weight, stressing the role of body image and associated emotional responses. "It would thus be of great value to disentangle the causal relationship between body-related worrying and high negative affect, and a third variable explaining the development of both excessive body-related worrying and increasing negative affect should not be ruled out. The present data exclude BMI and disordered eating from being this third variable" (Jansen et al., 2008, p. 639). Specifically, those authors claimed for investigating the role of variables such as positive affect and optimism as protective factors in the relationships among obesity, body-related concerns, and depression. We supported their classification with a molar indicator of happiness and found different combinations of body image indicators, eating habits, weight-related distress, and protective traits such as positivity with this global judgment of well-being.

In a subsequent study also focused on clustering individuals with excess weight in terms of negative affect (i.e., depression, self-esteem) and eating pathology (i.e., dietary restraint indicators), Canadian adult women with excess weight (percentages of overweight and obesity not reported; noneating disorder sample) participated (Gagnon-Girouard et al., 2010). These women were characterized by having a preoccupation about weight and eating, namely, exhibiting overconcern with their shape and weight, restrained eating, and having been unsuccessful in previous attempts to lose weight, and were involved in a health-centered intervention at the time of the study. The clusters were then compared in terms of personality traits, eating attitudes, and weight-related variables, including weight-related quality of life, body satisfaction, eating pathology (shape, weight, and eating concern; disinhibition, hunger, and binge eating), and coping with stress. Our results parallel in part the findings of the abovementioned study, with the healthy profile mirroring the low/low subgroup, with a more adaptive profile, and the dysfunctional and distressed profiles mirroring the restrained and depressive subgroups, respectively, both of which showed progressively more impaired profiles in terms of body, eating, mood, and overall psychopathology. We also contributed to the extant literature by including a global indicator of happiness and other psychosocial variables, such as positivity and self-stigma, which have never been included in such configurations.

More recently, subgroups of overweight and obese individuals in the U.K. (58% females), who were mostly middle-aged and elderly persons living in rural or deprived areas, were explored based on a variety of demographic-, behavioural- (i.e., smoking, alcohol intake, physical activity, and active management of weight by diet/exercise behaviours),

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health- (i.e., chronic diseases, health-related quality of life), and well-being-related variables (i.e., life satisfaction) (Green et al., 2015). Our findings also support these results, particularly those of two of the six clusters found, namely, the younger healthy females, who displayed the most positive health characteristics and healthy behaviours in terms of weight management, and the unhappy and anxious middle-aged individuals, who were primarily female reporting poor mental health, low quality of life, and low life satisfaction and who were most likely engaged in weight control. We also complemented such profiles with other psychological features.

With respect to BMI, in some analyses BMI was included among the configuration variables (e.g., Allison & Heshka, 1991), but it was generally used as an external variable for validation. Previous empirically based classifications have not supported that profiles of obesity differ according to weight-related factors (e.g., Claes et al., 2019; Gagnon-Girouard et al., 2010; Gullo et al., 2013; Jansen et al., 2008; Olson et al., 2016; Perdue et al., 2018). This finding tends to support that typologies appear to be more closely associated with multidimensional psychosocial functioning than with the overweight level per se. Such research has, however, been conducted with samples limited to high-risk populations and bariatric candidates/patients, mainly high-level obesity and female participants, which can be seen as more homogeneous compared to community-based samples comprising a wide range of BMIs, like the sample in the present study. When such wider samples are used, contrary findings are obtained. In support of previous findings pointing out that subtypes of individuals with worse psychosocial features also have higher BMIs (e.g., Caroleo et al., 2018; Green et al., 2015), we found differences across the three subgroups, also indicating that those with the highest obesity level reported the poorest psychosocial profile.

Our findings have theoretical and clinical utility, guiding both research and treatment. One advantage of the present work is a novel approach integrating protective factors into the configuration of psychosocial profiles of individuals with excess weight. This may facilitate a paradigm shift from weight and BMI oriented targets to a focus on patients' well-being. The clustering of individuals into different profiles and the identification of the underlying psychological mechanisms for each distinct subgroup of individuals with overweight and obesity would foster more suited, individualized counseling and a more effective treatment approach. Individualized care in accordance with each profile can improve our understanding and management of obesity, and both functioning- and dieting-related factors should be monitored and targeted for their possible role in the maintenance of overweight. Interventions for overweight and obese individuals should be focused on addressing body-related perceptions and weight and shape concerns as well as overall well-being profiles. A focus on enhancing protective resources (Caprara et al., 2019) and eradicating the ubiquitous social weight stigma and mitigating the deleterious influence of self-stigma on well-being (Rubino et al., 2020) should also be promoted. Moreover, instead of only focusing on restrained and eating disorder symptoms (e.g., Allison & Heshka, 1993; Caroleo et al., 2018; Claes et al., 2019; Gagnon-Girouard et al., 2010; Jansen et al., 2008), a focus on adherence to healthy diet recommendations can be adopted. We encourage the promotion of healthier, positive, and realistic body images (Tylka, 2011) and of healthy weight-control strategies for weight and appearance management (WHO, 2017). In addition, although previous evidence has suggested that happiness is lower among individuals with obesity, research on the correlates of SWB is warranted to increase our knowledge. This study contributes to the research on happiness and its correlates in obese individuals. Thus, our findings are expected to make a relevant contribution to the knowledge on the positive correlates or protective factors for overall well-being in obesity. Future research exploring the predictive validity of such subtyping-based interventions in terms of treatment type, prognostic course, outcome, weight loss success, personal satisfaction, and general well-being within each cluster is thus needed.

Moreover, our findings can be interpreted under the umbrella of the criticisms currently directed at the "weight-centred health paradigm", in which body weight is placed at the heart of the discourse about health, resulting in an enhanced adipophobicogenic environment and reduced health and quality of life among those with overweight and obesity (Godoy-Izquierdo et al., 2020b). This dominant paradigm has resulted in arguments from critical health promotion for a paradigm shift away from focusing on weight and focusing instead on health and well-being within a "healthy at every size", more salutogenic approach (Tylka et al., 2014; O'hara & Taylor, 2018), which supports individuals' health, well-being, and participation throughout life and promotes the inclusion and acceptance of all individuals, regardless of their body weight, shape, or size. In sum, interventions should not target obese individuals as a whole but tailor strategies depending upon the subgroup to which individuals belong. Our results may inform obesity management actions focused on inclusive, positive aesthetic models, combating social stigmatization, enhancing positivity, and promoting a healthy lifestyle for happiness in obesity.

Despite the contributions of the present study, which included the consideration of several dimensions of body perception, weight stigma, dietary habits, positivity, and happiness in men and women with overweight and obesity, our conclusions should be interpreted in light of some limitations. First, the sample was limited in size and constituted a nonrandom sample of individuals with excessive weight, which restricted the generalizability of our findings. Furthermore, as participants in this study were interested in managing or losing weight, we do not know whether these three clusters were unique to obese people interested in their health, and thus, these results may not be generalizable to other obese individuals. We should also take into account the sample characteristics. It is mainly composed of individuals with overweight who, in general terms, revealed an underestimation of their real weight and desired a slightly slimmer body. Participants also reported, on average, moderate body satisfaction, low self-stigma, high positivity, and high happiness. Thus, they are probably not fully representative of the heterogeneous obese population. Whether participants overrepresent a "positive" subgroup of obese individuals or a group with more adaptive and functional body self-perceptions is something that future research should explore. Thus, our findings need to be replicated with broader and more heterogeneous samples, including more individuals with obesity types II and III.

Second, our study relied on self-report measures that may be susceptible to various errors and biases. Further research using multimodal assessment is warranted. In addition, we dichotomized diet-related variables, which facilitated a parsimonious approach to cluster analyses; as other authors taking the same decision have stated (e.g., Caroleo et al., 2018; Green et al., 2015; Olson et al., 2016), this also means that our detected cluster solution and differences were driven by established standards as the selected criteria, namely, 5 or more servings/day of fruits and vegetables. Nevertheless, other criteria or nutritional decisions could have been made.

Third, other psychosocial variables were ignored in configurating the clusters (e.g., mental and physical health indicators, quality of life, stress, social support, eating pathology). Future research should include a wide range of personality, cognitive, motivational, emotional, behavioural, and psychosocial factors. Moreover, since contradictory findings have been obtained for age (e.g., Claes et al., 2019; Caroleo et al., 2018; Gagnon-Girouard et al., 2010 vs. Green et al., 2015; Jansen et al., 2008; Olson et al., 2016) and sex-gender (e.g., Claes et al., 2019 vs. Caroleo et al., 2018), future research should explore the contribution of such variables. Previous findings with the same sample (Godoy-Izquierdo et al., 2020b) have revealed sex-gender-based differences in terms of body perceptions and weight-related self-stigma, probably due to the higher sociocultural relevance imposed on the feminine body and females' higher internalization of beauty standards compared to males (Grogan, 2017). Further analyses on this sample revealed

no other influences of age or sex-gender, e.g., in terms of positivity and SWB. Nevertheless, differences in all the variables, except positivity, were found between individuals with obesity and with overweight. Thus, we decided to explore only BMI as an external criterion variable. In addition, only one previous study has explored socioeconomic factors (Jansen et al., 2008). Due to the socioeconomic characteristics of our sample, we discarded that analysis. In any case, future research needs to include a broader range of variables to validate individual subtypes.

Finally, due to the descriptive, correlational, and cross-sectional nature of the data, causal inferences could not be stated. Furthermore, the utility of our solution may best be determined through the testing of the generalizability of the solution to other samples or through future experimental and longitudinal analyses (e.g., whether cluster membership relates to intervention efficacy).

5. Conclusions

Despite these limitations, our results are pioneering and interesting. In summary, this investigation provides initial evidence that three psychosocial and eating-based groups can be identified in adults with overweight and obesity that differ in their configurations of body image dimensions, weight-related stigma, eating habits, positivity, and well-being (i.e., happiness). In support of the uniqueness of these groups, the profiles were validated with BMI as an external variable. Our findings highlight the relevance of addressing these parameters in the management of obesity due to the heterogeneity of individuals in such populations. The current study also offers new directions for the study of well-being in obesity. Future research should investigate the ways in which weight, body satisfaction, weight-related stigma, dietary patterns, positivity, and happiness may interact to affect functioning and well-being in individuals with excess weight and to explore how accumulated evidence may be used to inform health interventions for preventing and managing obesity in all its dimensions. The identified clusters may be used to tailor interventions to enhance their effectiveness. Studies exploring the results of different types of treatments according to these profiles may be useful for testing the clinical validity of the behavioural and psychosocial distinctions among individuals with obesity.

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[i] The term "sex-gender" is used herein to emphasize the interrelation and intersectionality between these concepts and the personal experiences of both sex and gender.