



Eating styles profiles in Chilean women: A latent Profile analysis

Berta Schnettler^{a,b,c,d,*}, Jossiana Robinovich^{d,e,f,g}, Ligia Orellana^{b,d},
 Edgardo Miranda-Zapata^{d,h}, Camila Oda-Montecinosⁱ, Clementina Hueche^d, Germán Lobos^j,
 Cristian Adasme-Berríos^k, María Lapo^c, Jaime Silva^l, Ximena Ossa^{e,f,l}, Sergio Muñoz^{e,f,l}

^a Universidad de La Frontera, Facultad de Ciencias Agropecuarias y Forestales, Temuco, Chile

^b Universidad de La Frontera, Scientific and Technological Bioresource Nucleus (BIOREN-UFRO), Chile

^c Universidad Católica de Santiago de Guayaquil, Guayaquil, Ecuador

^d Universidad de La Frontera, Centro de Excelencia en Psicología Economía y del Consumo, Núcleo Científico Tecnológico en Ciencias Sociales, Temuco, Chile

^e Universidad de La Frontera, Facultad de Medicina, Departamento de Salud Pública, Temuco, Chile

^f Universidad de La Frontera, Facultad de Medicina, Centro de Investigación en Epidemiología Cardiovascular y Nutricional (EPICYN), Temuco, Chile

^g Maastricht University, Faculty of Health, Medicine and Life Sciences, Department of Health Ethics and Society, Maastricht, the Netherlands

^h Universidad de La Frontera, Núcleo Científico Tecnológico en Ciencias Sociales, Laboratorio de Investigación en Ciencias Sociales Aplicadas (LICSA), Temuco, Chile

ⁱ Instituto de Ciencias Sociales, Universidad de O'Higgins, Rancagua, Chile

^j Universidad de Talca, Facultad de Economía y Negocios, Talca, Chile

^k Universidad Católica del Maule, Departamento de Economía y Administración, Talca, Chile

^l Universidad de La Frontera, Centro de Investigación y Gestión para la Salud Basada en la Evidencia (CIGES), Temuco, Chile

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ABSTRACT

The aims of this study were to identify profiles of women based on their levels of emotional, external and restraint eating, and to determine differences in these eating styles profiles based on nutritional status, socio-demographic characteristics, stress, social support, and satisfaction with the body image. Questionnaires were administered to 884 women aged 20 to 60 living in two Chilean cities. Questionnaires included the Dutch Eating Behavior Questionnaire (DEBQ), the Medical Outcomes Study-Social Support Survey, and the Perceived Stress Scale (PSS). Satisfaction with body image was assessed using a body-image-related single question. Nutritional status and sociodemographic characteristics were also assessed. Latent Profile Analysis (LPA) was used to identify profiles based on the three eating styles measured by the DEBQ. LPA allowed to distinguish four eating styles profiles: “women with medium emotional and external eating, high dietary restraint” (Profile 1, 36.64%); “women with low emotional, external and restraint eating” (Profile 2, 25.25%), “women with high emotional, external and restraint eating” (Profile 3, 21.85%); and “women with very low emotional and external eating, low dietary restraint” (Profile 4, 16.26%). Profile 1 had a greater proportion of women moderately satisfied with their body image. Profiles 2 and 4 scored higher in perceived social support and had greater proportions of women satisfied with their body image. Profile 4 had a higher proportion of married or cohabiting women. Profile 3 scored higher in the PSS and had higher proportion of obese and unsatisfied with their body image women. These results suggest that interventions to reduce emotional, external and restraint eating should not only involve the women, but also their family members.

1. Introduction

The accelerated increase of overweight and obesity rates poses a major challenge to current health policies. Worldwide, it is estimated that 39% of adults are overweight, and 13% are obese ([World Health Organization], WHO, 2020). In Chile, these numbers are higher, with 39.8% of the adult population being overweight, 31.2% with obesity,

and 3.2% with morbid obesity (Ministerio de Salud de Chile [Chilean Ministry of Health], MINSAL, 2018). The development of these conditions involves a complex interplay of metabolic, genetic, neuroendocrine, socio-cultural, environmental, socioeconomic, psychological and behavioral factors (Sharma and Padwal, 2010). Among these factors, food intake and eating behavior require special attention (Nagl et al., 2016).

* Corresponding author. Facultad de Ciencias Agropecuarias y Forestales, Universidad de La Frontera, PO Box 54-D, Temuco, Chile.
 E-mail address: berta.schnettler@ufrontera.cl (B. Schnettler).

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Eating styles play an important role in the study of eating behaviors linked to obesity. Since the 1960s, researchers have attempted to explain why people overeat (Bozan et al., 2011), presenting eating styles as food preferences and quantity of food intake influenced by physiological, psychological, social and genetic factors (Barrada et al., 2016). The three main psychological theories on overeating are Psychosomatic Theory (Bruch, 1973), Externality Theory (Schachter, 1971), and Restraint Theory (Polivy and Herman, 1985). Psychosomatic Theory focuses on *emotional eating* as an atypical response to distress, which entails eating in response to negative emotions. Externality Theory approaches *external eating*, eating in response to food-related stimuli, such as the sight, smell and taste of food, regardless of the internal state of hunger and satiety. Restraint Theory focuses on *dietary restraint* and the possible psychological side effects of dieting, specifically the disinhibition effect, that is, overeating by dieters when their cognitive resolve to eat less than desired is abandoned. In summary, these three eating styles involve overeating and are related to negative emotions or stressful situations (Chen et al., 2020; Herman and Polivy, 1975; Nijs et al., 2009; Oda-Montecinos, 2016). The above three theories on overeating are covered by the Dutch Eating Behaviour Questionnaire (DEBQ; van Strien et al., 1986).

Eating styles have been found to vary across gender. Studies conducted in different countries have shown that women tend to score higher than men in emotional eating, external eating (Barthels et al., 2019; Ohara et al., 2014, 2019), and dietary restraint (e.g., Adriaanse et al., 2016; Andrés et al., 2017; Barrada et al., 2016; Barthels et al., 2019; Brunault et al., 2015; Dakanalis et al., 2013; Nagl et al., 2016; Oda-Montecinos et al., 2018; Ohara et al., 2014, 2019). In the majority of countries, including Chile, it has been reported that women have a higher prevalence of obesity than men ([Organisation for Economic Co-operation and Development], OECD, 2017). Among the reasons for this difference is that women face additional stressors than men (Jayne et al., 2020; Ohara et al., 2019), related to the demands attributed to their gender role, as well as pressures to conform to societal weight and body standards (Nagl et al., 2016; Ohara et al., 2019; Schnettler et al., 2018). Certain patterns of food intake can be a way for some women to respond to or cope with these demands and pressures. Moreover, women's food behaviors have a strong influence in the family sphere. Studies in different populations have shown that mothers are the most important figure that shapes diet quality (Schnettler et al., 2017) and other food choices and behaviors, not only in their children but also in their partners (Rhodes et al., 2016). Considering the ramifications of women's food behaviors for their own well-being and for others, it is important to recognize the distinct eating styles that women may adopt, and psychological and sociodemographic features associated to these styles. Hence, the present study focuses on identifying such differences among women.

Although the DEBQ has been widely used worldwide, few studies have determined the factors associated to each DEBQ dimension (Brunault et al., 2015). Among these few studies, most of them have examined emotional eating, external eating and dietary restraint in terms of nutritional status and some sociodemographic characteristics, providing mixed results.

Earlier literature proposed that emotional eating (e.g., Bruch, 1973; Robbins and Fray, 1980) and external eating (e.g., Nijs et al., 2009) were only present in overweight people. However, it has now been established that both of these eating styles, as well as dietary restraint (Schnettler et al., 2014), can be associated with different body mass indices (Oda-Montecinos et al., 2018; van Strien et al., 1986). In addition, some studies have shown that emotional eating, external eating and dietary restraint scores increase with body mass index (BMI) (Barrada et al., 2016; Brunault et al., 2015; Dakanalis et al., 2013; Nagl et al., 2016), while other authors stressed that external eating is the dimension less related to BMI (Barrada et al., 2016). Other studies reported that only emotional eating and restraint are higher in overweight or obese individuals (Andrés et al., 2017; Barthels et al., 2019; Cebolla et al.,

2014; Dutton and Dovey, 2016; Oda-Montecinos et al., 2018).

Findings related to eating styles and sociodemographic characteristics are also mixed. For age, some authors have reported that emotional and external eating decrease with age (Barrada et al., 2016; Dakanalis et al., 2013; Nagl et al., 2016), whereas others did not find this relationship (Dutton and Dovey, 2016), or reported a positive relationship between external eating and age (Cebolla et al., 2014). Some authors have reported that dietary restraint tends to increase with age (Barrada et al., 2016; Dutton and Dovey, 2016), while others did not find significant differences in this regard (Dakanalis et al., 2013). There is also evidence indicating lack of relationship between the three eating styles and age (Barthels et al., 2019). A similar scenario is found for socioeconomic status (SES). Several studies have reported a negative relationship between SES and BMI in women (Claassen et al., 2019; Löffler et al., 2017; Spinosa et al., 2019). However, emotional eating has been shown as directly associated with BMI regardless of SES (Löffler et al., 2017), or as an indirect effect of SES on BMI via emotional eating (Spinosa et al., 2019). Similarly, it has been found that dietary restraint attenuates the association between SES and BMI, meaning that low restrained eating might explain higher BMI in low SES (Löffler et al., 2017). The association between SES and BMI, and other mixed findings mentioned above, may be better understood by examining mediating variables such as stress and social support (Claassen et al., 2019).

Stress has been related to weight gain and obesity (Jayne et al., 2020; Joseph et al., 2018; Richardson et al., 2015), and to failure to maintain weight loss in obese individuals (Järvelä-Reijonen et al., 2016). Stress has also been associated with increased energy intake due to higher snacking and consumption of palatable foods and, in particular, fat and sugar (Jayne et al., 2020; Joseph et al., 2018; Michels et al., 2020). Perceived stress has been related to higher emotional eating (Czepczor-Bernat and Brytek-Matera, 2020; Järvelä-Reijonen et al., 2016; Michels et al., 2020; Ohara et al., 2019; Richardson et al., 2015). Some authors have associated dietary restraint with perceived stress (Järvelä-Reijonen et al., 2016) and poor mental health outcomes (Schnettler et al., 2014) while others have not found these associations (Joseph et al., 2018; Michels et al., 2020; Ohara et al., 2019). The relation between stress and external eating has been less studied but there is evidence showing an increase in external eating in periods of increased stress (Michels et al., 2020; Ohara et al., 2019).

Another influencing factor on eating behavior is social support. Social support is defined as the resources provided by one's social network with the intention to increase one's coping ability (Cohen, 2004). Social support has been mainly related to healthy eating (Michels et al., 2020; Deliens et al., 2014; Schnettler et al., 2015), but researchers also report that women may use social support as a way to improve their body acceptance (Birmachu et al., 2019; Claassen et al., 2019), or as a stimulus to deal with stress and unhealthy eating behaviors (Deliens et al., 2014; Kwan and Gordon, 2016). Social support can be a buffer to modulate the effects of stress by promoting effective coping strategies and resulting in a less threatening interpretation of the stressor (Cohen, 2004). In this regard, social support has been related to lower dietary restraint (Birmachu et al., 2019; Kwan and Gordon, 2016). There is no available evidence which associates social support with emotional and external eating, but it is expected that the relationship between social support and stress (Cohen, 2004) may also influence these eating styles. Moreover, to the best of our knowledge, research has yet to address whether different eating styles may be associated with different types of support.

Appearance concerns are also linked to eating behavior, particularly in women (Adriaanse et al., 2016). Body image is defined as self-perception of weight, body shape or BMI (Bouzas et al., 2019), and dissatisfaction with one's body image can have serious health consequences. Some factors that contribute to dissatisfaction with body image include eating behaviors such as a high energy intake (Ginsberg et al., 2016; Lattimore and Hutchinson, 2010), high BMI (Hosseini et al., 2017; Lattimore and Hutchinson, 2010; Oda-Montecinos et al., 2018), appearance concerns (Bouzas et al., 2019; Lattimore and Hutchinson,

2010) and sociocultural pressures regarding appearance (Chen et al., 2020; Thompson et al., 2017). Dissatisfaction with the body has been associated with dietary restraint, as weight management strategy (Bouzas et al., 2019; Chen et al., 2020; Lattimore and Hutchinson, 2010; Oda-Montecinos et al., 2018; Ohara et al., 2014; Thompson et al., 2017), and it has also been associated with emotional eating (Chen et al., 2020; Oda-Montecinos et al., 2018; Ohara et al., 2014; Thompson et al., 2017). Chen et al. (2020) and Thompson et al. (2017) suggest that pressure to be thin in female adolescents may lead them to be dissatisfied with their body image, which in turn leads them to engage in overeating in response to feeling angry/frustrated or depressed (Chen et al., 2020; Thompson et al., 2017). Most of the available evidence on body dissatisfaction has focused on female adolescent and young adult populations, while research about its prevalence and correlates in older women is still limited (Ginsberg et al., 2016).

The research cited above examined relations between these variables but did not account for the way these variables related with one another within individuals. In contrast to this variable-centred approach, a person-centred approach identifies sub-groups of individuals according to similarities on a set of variables, allowing to better understand the heterogeneity within a population (Bourdier et al., 2018). Some studies have used this approach to distinguish profiles of individuals based on their eating behavior (Bourdier et al., 2018; Pentikäinen et al., 2018; Sultson and Akkermann, 2019). However, to the best of our knowledge, there are no available studies that distinguish profiles of individuals on the basis of the three aforementioned eating styles. The present study aims to fill this gap in the literature.

On the basis of the higher prevalence of obesity, emotional eating, external eating, and dietary restraint in women, this study focuses on these three eating styles in Chilean women with different nutritional statuses and social and psychological characteristics. Against this background, the aims of the present study were: a) To identify profiles of women based on their levels of emotional eating, external eating and dietary restraint; and b) To determine differences in these profiles based on nutritional status, sociodemographic characteristics, different types of stress and social support, and satisfaction with the body image.

2. Method

2.1. Sampling procedure

Using a stratified multistage cluster random sampling frame, data were collected between 2012 and 2013. Participants were 896 women, aged 20–60 years, living in households located in urban areas of two Chilean Municipalities: Macul, in the capital city of Santiago, and Temuco, in the Araucanía Region, 700 km south of the capital. In both areas, data was collected via home administered face-to-face surveys.

The estimated sample size aimed to study factors related to the observed educational inequalities in female obesity, with a significance level of 5% and a statistical power of 80%. A sample size of 1616 participants was estimated based on the detection of a statistically significant difference of morbid obesity between women with low educational level and high educational level of 7.3 versus 3.7%, taking as reference values of the 2010 Chilean National Health Survey (MINSAL, 2018). A 15% loss of data was estimated. The response rate was 54%. Locations were chosen based on their similarities in the distribution of the population by socioeconomic status (Adimark, 2004).

Within the urban Census Tracts (CT) of each Municipality, 36 blocks and 23 households per block were randomly selected. Only residential blocks were included; blocks corresponding to hospitals, educational facilities (schools/universities, etc.), department stores, supermarkets and shopping centres were excluded. For the purposes of this study, household was defined based on how meals were prepared, that is, if in one house two families cooked together, it was considered as one household, while if they did it separately, it was taken as two different households.

One participant was selected in each household to be invited to take part in the study. The Kish method (predetermined table to randomly select an individual considering the number of potential participants) was used if there were more than one woman who met the study criteria regarding age (20–60), capacity to answer the questions posed in the data collection instruments, absence of physical disability, and not being pregnant or postpartum. Exclusion criteria were defined taking into account the potential difficulties that physical disability might represent to directly measure height and weight, participants' incapacity to read self-administered questionnaires due to visual impairment or illiteracy, and the fact that pregnancy and postpartum may temporarily distort women's weight and body size dissatisfaction.

This study was submitted, approved, and monitored during its execution by the Ethics Committee of Universidad de La Frontera. Each participant voluntarily agreed to participate and signed an informed consent form. Other results of this study have been reported elsewhere (Robinovich et al., 2013).

Data was collected through direct interview by young professionals and senior students of Universidad de La Frontera (in Temuco) and Universidad de Chile (in Macul), who were trained as pollsters by three researchers. Standardized procedures were utilized for field work training and inter observer reliability was assessed for the final selection of the team of pollsters.

For this analysis, nine participants were excluded from the sample due to missing data, as well as three women who had a BMI over 60 (considered as outliers according to the sample BMI distribution). Therefore, this work was carried out in a sample composed by 884 women.

2.2. Measures

Emotional eating, external eating and dietary restraint were measured with the *Dutch Eating Behavior Questionnaire* (DEBQ), developed by van Strien et al. (1986). The instrument consists of 33 self-administered items that assess three eating styles based on psychological theories on overeating: emotional eating (13 items; e.g., "Do you have the desire to eat when you are irritated?"), external eating (10 items; e.g., "Do you eat more than usual when you see others eating?"), and dietary restraint (10 items, e.g., "Do you deliberately eat less in order to not become heavier?"). Responses are provided on a 5-point scale ranging from 1 = never to 5 = very often. In this study, the Spanish version validated by Silva et al., 2013 was used. In Chile, Andrés et al. (2017) reported adequate internal reliability (Cronbach's alpha: 0.87 to 0.97) and convergent validity in a mixed-gender sample.

Perceived social support was assessed with the Medical Outcomes Study-Social Support Survey (MOS-SSS), a self-administered instrument developed by Sherbourne and Stewart (1991). The 20-items scale validated in Spanish by Costa-Requena et al., 2007 in Chile was used in this study. Responses were scored on a 5-point scale from 1 = never to 5 = always. This instrument explores global support in its four dimensions: affective (love, affection and empathy) positive social interaction (persons to count on for communication); tangible (to count on help for domestic work), and emotional/informational (counseling, advice, information). Higher scores indicate higher perceived total social support. The scores of each dimension were standardized from 0 to 100 to facilitate its interpretation (higher scores indicate greater support in each dimension, but they cannot be interpreted linearly). In this study, the MOS-SSS overall support index showed good internal reliability (Cronbach's $\alpha = 0.958$). The dimensions affective (Cronbach's $\alpha = 0.843$), positive social interaction (Cronbach's $\alpha = 0.859$), tangible (Cronbach's $\alpha = 0.869$) and emotional/informational (Cronbach's $\alpha = 0.947$) also showed good levels of internal reliability.

Perceived stress was evaluated with the Perceived Stress Scale (PSS), developed by Cohen et al., 1983. This is a self-administered instrument that measures the overall perception of stress in the last month. PSS has two components within the global stress perception: something that

individuals can control (i.e., counter stress) and something that cannot be controlled (i.e., perceived stress). Thus, PSS global score indicates how hurtful a given situation can be, while separated scores indicate the extent to which it is perceived as controllable or uncontrollable. The 14-items scale validated in Spanish by [Tapia et al., 2007](#) in Chile was used in this study. Responses were scored on a 5-point scale from 0 = never to 4 = very often, on questions such as “In the last month, how often have you felt that you were unable to control the important things in your life?” Some questions received reverse scoring with a high score for “never,” such as “In the last month, how often have you felt confident in your ability to handle your personal problems?” Possible total scores for this version range from 0 to 56 points. However, in this study, scores were standardized from 0 to 100 to facilitate its interpretation (higher scores indicate greater stress, but they cannot be interpreted linearly). Since the PSS is not a diagnostic instrument, no predetermined cut-points qualify different levels of perceived stress, but comparisons can be made among individuals sampled within a given community ([Cohen, 1998](#)). In this study, the PSS showed good internal reliability (Cronbach's $\alpha = 0.861$). The dimensions counter stress (Cronbach's $\alpha = 0.821$) and perceived stress (Cronbach's $\alpha = 0.878$) also showed good levels of internal reliability.

Satisfaction with body image was assessed using a body-image-related single question (“How satisfied are you with your body image?”). Response options were presented as a five-point Likert-type scale that ranged from 1 = completely unsatisfied to 5 = completely satisfied. This is a simple but widely used method for addressing body-image satisfaction ([Pull and Aguayo, 2011](#)).

Nutritional status was estimated through body mass index (BMI), defined by the quotient of weight (kg)/height (m)². Body weight and height were assessed using a portable digital scale (Beurer; 0.1 kg accuracy) and a portable stadiometer (Seca 213; 0.1 cm precision).

Sociodemographic data was gathered using a structured survey designed for the purpose of this inquiry. Family Household income was estimated upon figures that are periodically reported by the Chilean Association of Market Research Companies to classify socioeconomic groups ([Asociación de Investigadores de Mercado \[AIM\], 2008](#)), which are commonly used for academic research purposes. Nine income ranges were presented to participants, who were asked to select the income category corresponding to the total earnings of the household in the last month. Among methods to measure income in surveys, this method offers very little net bias in reports ([Moore et al., 2000](#)). For this research, income categories were collapsed into four groups: High, medium, low and very low, taking as reference the income figures that characterized socioeconomic groups in 2015 ([AIM, 2015](#)), the report closest to the data collection period.

2.3. Data analysis

Given that the psychometric properties of the DEBQ have not been assessed previously in a sample of Chilean women, a confirmatory factor analysis (CFA) was conducted using MPlus 7.11. Parameters of the measurement model of the DEBQ was estimated using the unweighted least squares means and variance (ULSMV) estimator over the polychoric correlation matrix ([Forero et al., 2009](#)).

The Omega coefficient was used to examine the reliability as internal consistency of the scales ([McDonald, 1970](#)). Convergent validity was found by inspecting the standardized factor loadings of each scale (ideally > 0.5) as well as their significance ([Lévy et al., 2006](#)). The average variance extracted (AVE) measured the proportion of variance extracted by a latent factor compared to the total variance of that factor, including the variances of the measurement error of the factor items. When the AVE is less than 0.50, the variance due to measurement error is greater than the variance due to the construct ([Lévy et al., 2006](#)). Discriminant validity was obtained by comparing the AVE for each construct with the square of the correlation between the scales ([Lévy et al., 2006](#)).

The Tucker-Lewis index (TLI) and comparative fit index (CFI) were used to determine the model fit of the data. The TLI and CFI indicate a good fit with a value above 0.95, while 0.90 is considered a cut-off point for establishing an acceptable fit. In addition, the root mean square error of approximation (RMSEA) was considered. The RMSEA is a poorness of fit measurement. A good fit is found when the value of the RMSEA is below 0.06, whereas an acceptable fit corresponds to a value below 0.08 ([Hu and Bentler, 1999](#); [Marsh et al., 2005](#)).

A latent profile analysis (LPA) for continuous variables was used to estimate the number of profiles associated with Chilean female eating habits ([Vermunt and Magidson, 2002](#)). The LPA analysis was applied using LatenGold 5.1 statistical software (Statistical Innovations Inc.) using the z-scores of the three subscales of the DEBQ. Based on the Bayesian Information Criterion (BIC) and the Consistent Akaike's Information Criterion (CAIC), with lower scores indicating a better fit, the optimal number of profiles was selected ([Vermunt and Magidson, 2002](#)).

To describe the profiles, Pearson's Chi2 test was applied to the discrete variables and a one-factor analysis of variance (ANOVA) for the continuous variables. Given that the Levene's statistic indicated homogeneous and non-homogeneous variances in the continuous variables observed, the variables for the analysis of variance that resulted in significant differences ($p \leq 0.05$ or $p \leq 0.001$) were subjected to Dunnett's T3 or Tukey multiple comparisons test, according to the case. Descriptive analyses, Pearson's Chi2 test and ANOVA were conducted using the Statistical Package for Social Sciences (IBM SPSS) v. 23.

3. Results

3.1. Sample description

[Table 1](#) shows the demographic characteristics of the sample, as well as their weight status following the criteria of the World Health Organization ([WHO, 2004](#)). Most of the surveyed women were married or cohabiting. Most of them had secondary studies, while the head of their households had technical studies. Most of the surveyed women reported a low and medium level of monthly income in their households. Regarding body mass index data, there was a high proportion of overweight and obese women. Most of the sample reported being moderately satisfied with their body image. [Table 1](#) also includes the total average score of the MOSS-SSS and their components as well as the total average score of the PSS and their components.

3.2. Psychometric analysis of the DEBQ

Confirmatory factor analysis with the whole sample indicated that all standardized factor loadings were statistically significant; thus, it was concluded there was convergent validity. Standardized factor loadings of the emotional eating component of the DEBQ ranged from 0.74 to 0.86 (items 1, 3, 5, 8, 10, 13, 16, 20, 23, 25, 28, 30 and 32), standardized factor loadings of the dietary restraint component ranged from 0.40 to 0.78 (items 4, 7, 11, 14, 17, 19, 22, 26, 29 and 31), and standardized factor loadings of the external eating component ranged from 0.53 to 0.82 (items 2, 6, 9, 12, 15, 18, 21, 24, 27 and 33).

[Table 2](#) shows reliabilities of the three dimensions of the DEBQ, which were all good (Omega coefficients above 0.8). The three scales also satisfied the AVE values (close or above to 0.5). The value of the squared correlation between the emotional eating and external eating was lower than the AVE of the scales, which verified the discriminant validity between the constructs. The discriminant validity between emotional eating and dietary restraint and between external eating and dietary restraint were also verified. The model had an acceptable fit of the data (RMSEA = 0.056, CFI = 0.930, TLI = 0.925).

3.3. Latent profiles

An initial run of 1–7 clusters was analyzed with the z-scores from

Table 1
Sample characteristics (n = 884).

Characteristic	Total sample
Age [Mean (SD)]	40.8 (11.9)
Marital status (%)	
Single	32.5
Married or cohabiting	55.2
Widow	3.3
Divorced	9.0
Education of the surveyed woman (%)	
University	21.7
Technical	25.8
Secondary	39.8
Elementary	12.7
Education of the head of the household (%)	
University	14.0
Technical	36.8
Secondary	20.7
Elementary	28.5
Monthly income of the household (%)	
Very low	22.5
Low	34.3
Medium	33.0
High	20.2
Body mass index (%)	
Underweight	0.5
Normal	30.7
Overweight	40.0
Obese	28.8
Satisfaction with body image (%)	
Completely unsatisfied	5.9
Unsatisfied	20.0
Moderately satisfied	45.0
Satisfied	22.9
Completely satisfied	6.2
MOS-SSS Overall support index [Mean (SD)]	78.9 (11.9)
MOS-SSS Affective support [Mean (SD)]	87.7 (20.8)
MOS-SSS Positive social interaction support [Mean (SD)]	81.5 (24.0)
MOS-SSS Tangible support [Mean (SD)]	71.5 (29.3)
MOS Emotional/informational support [Mean (SD)]	78.5 (24.7)
Perceived Stress Scale (PSS) total score [Mean (SD)]	52.7 (23.8)
PSS Counter stress [Mean (SD)]	31.4 (21.3)
PSS Perceived Stress [Mean (SD)]	31.4 (21.3)
Dutch Eating Behavior Questionnaire (DEBQ) [Mean (SD)]	
Emotional eating	2.1 (0.9)
Dietary restraint	2.6 (0.8)
External eating	2.7 (0.9)

Table 2
Omega coefficient, average variance extracted (AVE) correlations and squared correlations between emotional eating, dietary restraint and external eating.

Subscale	Omega	AVE	Emotional eating	Dietary restraint	External eating
Emotional eating	0.960	0.623	–	0.286	0.650
Dietary restraint	0.885	0.441	0.081	–	0.223
External eating	0.887	0.445	0.442	0.049	–

Values over diagonal indicate squared correlations between constructs. Values under diagonal indicate correlations between constructs.

emotional eating, dietary restraint and external eating components of the DEBQ. The four-cluster model (Table 3) had the best fit because it has the lowest BIC and CAIC values (Vermunt and Magidson, 2002). This LPA solution with four latent profiles shows that the z-scores of the three components of the DEBQ made a significant contribution to the overall solution (Table 4), which is indicated by the information content value (robust Wald statistics and R²). Table 5 shows the latent profiles.

Latent Profile 1: Women with medium emotional and external eating,

high dietary restraint (36.64% of the sample). Women from this profile had average z-scores on emotional eating and on external eating significantly lower than Profile 3, but significantly higher than women from Profiles 2 and 4 ($p \leq 0.001$). Profile 1 had the highest average z-scores on dietary restraint, although it did not differ from Profile 3 ($p \leq 0.001$).

Latent Profile 2: Women with low emotional, external and restraint eating (25.25% of the sample). Women from this profile had average z-scores on emotional eating and on external eating significantly lower than profiles 1 and 3. Women from Profile 2 had an average z-score on dietary restraint significantly lower than women from profiles 1 and 3, although it did not differ from Profile 4.

Latent Profile 3: Women with high emotional, external and restraint eating (21.85% of the sample). Women from this profile had the highest average z-scores in the three components of the DEBQ, although it did not differ from Profile 1 in dietary restraint.

Latent Profile 4: Women with very low emotional and external eating, low dietary restraint (16.26% of the sample). Women from this profile had the lowest average z-scores in the three components of the DEBQ, although they did not differ from their Profile 2 counterparts in dietary restraint.

Women from Profiles 2 and 4 had the highest average scores on the MOS-SSS overall support index and affective support, significantly higher than Profiles 1 and 3 ($p \leq 0.05$). Women from Profiles 1, 2 and 4 had the highest average scores on positive social interaction support ($p \leq 0.05$), although the average score from Profile 1 did not differ from Profile 3 (Table 5). The latent profiles did not differ in their average scores on tangible support ($p > 0.1$) and emotional/informational support ($p > 0.05$).

Profile 3 had the highest average score on the PSS (total), counter stress and perceived stress, although it did not differ from Profiles 1 and 2 in the average scores on perceived stress. The significantly lowest average scores on the total PSS and counter stress corresponded to women from Profile 4. Although women from this profile had the lowest score on perceived stress, they did not differ from those in Profiles 1 and 2.

Regarding sociodemographic characteristics, women from Profile 4 had the highest average age, although it did not differ from Profile 2 ($p \leq 0.001$) (Table 5). Profile 2 had a lower proportion of married or cohabiting women, while Profile 4 showed the opposite trend ($p \leq 0.05$) (Table 6).

Finally, Profile 3 had a greater proportion of obese women and a lower presence of normal weight women, while Profile 2 had a lower proportion of obese women ($p \leq 0.05$). Profile 1 had a higher proportion of women moderately satisfied with their body image and a lower presence of women satisfied and completely satisfied. Profile 2 had a higher proportion of women satisfied and a lower percentage of women completely satisfied with their body image. Profile 3 had greater proportions of women completely unsatisfied and unsatisfied and a lower presence of women satisfied with their body image. Profile 4 had higher proportions of women satisfied and completely satisfied and lower presence of women unsatisfied and moderately satisfied with their body image ($p \leq 0.001$).

No significant differences between the profiles were found in the rest of the variables included in this study ($p > 0.05$).

4. Discussion

The present study focused on identifying profiles of women based on their levels of emotional, external and restraint eating, using the Dutch Eating Behaviour Questionnaire (DEBQ; van Strien et al., 1986). Results from a confirmatory factor analysis showed that the three-factor structure of DEBQ had an acceptable fit of the data, indicating that the Spanish version used in this study is a psychometrically valid and reliable instrument for assessing eating styles with Chilean woman. This finding is consistent with the original structure reported by van Strien

Table 3
Summary of latent profile cluster models.

	LL	BIC(LL)	CAIC(LL)	Npar	Classification Error
1-Cluster	-3761.5241	7563.7550	7569.7550	6	0.0000
2-Cluster	-3476.2394	7040.6767	7053.6767	13	0.0736
3-Cluster	-3370.1501	6875.9893	6895.9893	20	0.1343
4-Cluster	-3314.1066	6811.3936	6838.3936	27	0.1739
5-Cluster	-3302.7510	6836.1736	6870.1736	34	0.1588
6-Cluster	-3280.6474	6839.4575	6880.4575	41	0.2330
7-Cluster	-3271.5577	6868.7693	6916.7693	48	0.2218

LL = Log-likelihood; BIC(LL) = Bayesian information criterion base on the log-likelihood. CAIC(LL) = Consistent Akaike's Information Criterion. Npar = Number of parameters.

Table 4
Significance of the indicators for the five profiles.

	Robust Wald statistics	P-value	R ²
Emotional eating	591.8875	5.8e-128	0.6995
Dietary restraint	54.0920	1.1e-11	0.1025
External eating	233.8419	2.0e-50	0.4990

et al. (1986) and with studies carried out using the DEBQ in different languages in adult samples such as in Italy (Dakanalis et al., 2013), Malta (Duton and Dovey, 2016), Germany (Brunault et al., 2015; Nagl et al., 2016), and in a mixed-gender sample in Chile (Andrés et al., 2017), among others. Our findings also confirm that although emotional and external eating are independent constructs, they correlated higher to each other than emotional eating and dietary restraint, and higher than external eating and dietary restraint (Dakanalis et al., 2013; Nagl et al., 2016). This implies that both emotionality and food cues can act together and contribute to overeating regardless of internal hunger signals (Nagl et al., 2016).

The first aim of this study was to establish profiles of women based on their eating styles. Latent profile analysis resulted in four profiles: women with medium emotional and external eating, high dietary restraint (Profile 1, 36.64%); women with low emotional, external and restraint eating (Profile 2, 25.25%); women with high emotional, external and restraint eating (Profile 3, 21.85%); and women with very low emotional and external eating, low dietary restraint (Profile 4, 16.26%). The person-centred approach allowed to identify these subgroups of individuals based on their similarities in eating behaviors, as it has been reported in other studies in this field (Bourdier et al., 2018; Pentikäinen et al., 2018; Sultson and Akkermann, 2019). However, this is the first study in this line showing that the presence of the three eating styles can be heterogeneous among women.

Table 5
Differences between the four latent profiles according to the z-scores of the three components of the DEBQ in Chilean females.

	Profile 1	Profile 2	Profile 3	Profile 4	F	P-value
Profile size	0.3664	0.2525	0.2185	0.1626		
Emotional eating ^a	0.2421 b	-0.6858 c	1.5035 a	-1.1183 d	1086.666	0.000
Dietary restraint ^a	0.3441 a	-0.3275 b	0.1378 a	-0.4018 b	34.184	0.000
External eating ^a	0.0986 b	-0.3949 c	1.2977 a	-1.0238 d	348.364	0.000
Age ^b	39.93 b	41.56 ab	38.84 b	43.77 a	5.702	0.001
MOS-SSS Overall support index	77.97 b	80.92 a	76.81 b	80.31 a	2.680	0.046
MOS-SSS Affective support ^a	86.54 b	89.91 a	84.84 b	89.92 a	2.856	0.036
MOS-SSS Positive social interaction support ^b	80.71 ab	83.94 a	77.56 b	83.55 a	2.802	0.039
MOS-SSS Tangible support	70.33	73.68	68.90	73.53	1.286	0.278
MOS-SSS Emotional/informational support	77.03	81.39	75.96	79.92	2.216	0.085
Perceived Stress Scale (PSS) total score ^b	24.62 b	23.29 b	29.26 a	20.32 c	22.307	0.000
PSS Counter stress ^a	53.96 b	49.68 b	64.36 a	41.95 c	27.462	0.000
PSS Perceived stress ^a	30.64 ab	30.80 ab	36.09 a	28.73 b	3.715	0.011

Profile 1: "Women with medium emotional and external eating, high dietary restraint". Profile 2: "Women with low emotional, external and restraint eating" Profile 3: "Women with high emotional, external and restraint eating". Profile 4: "Women with very low emotional and external eating, low dietary restraint".

^a Different letters in the line indicate significant differences according to Dunnett's T3 multiple comparisons test.

^b Different letters in the line indicate significant differences according to Tukey multiple comparisons test.

Table 6

Differences (%) between the four latent profiles according to marital status, body mass index and the satisfaction with the body image.

	Profile 1	Profile 2	Profile 3	Profile 4
<i>Marital status</i>	<i>P = 0.014</i>			
Single	34.8	31.9	39.2	20.9
Married or cohabiting	50.8	58.2	48.2	68.0
Widow	4.2	2.2	4.2	2.0
Divorced	10.2	7.8	8.4	9.2
<i>Body mass index</i>	<i>P = 0.003</i>			
Underweight	0.3	0.4	1.2	0.6
Normal	29.4	35.3	21.1	36.6
Overweight	42.6	40.9	36.1	37.3
Obese	27.6	23.3	41.6	26.1
<i>Satisfaction with body image</i>	<i>P = 0.000</i>			
Completely unsatisfied	4.8	2.6	15.1	3.3
Unsatisfied	20.4	17.7	28.3	13.7
Moderately satisfied	53.2	42.7	39.8	36.6
Satisfied	18.3	28.9	12.7	34.6
Completely satisfied	3.3	8.2	4.2	11.8

P-value corresponds to the (bilateral) asymptotic significance obtained in Pearson's Chi-square Test.

Profile 1: "Women with medium emotional and external eating, high dietary restraint".

Profile 2: "Women with low emotional, external and restraint eating".

Profile 3: "Women with high emotional, external and restraint eating".

Profile 4: "Women with very low emotional and external eating, low dietary restraint".

Profile 1 appear to fall in this dieter type. The second type of restrained eaters is made up of unsuccessful dieters, who are characterized by high restraint and high tendency toward overeating, thus having a high susceptibility toward failure of restraint (van Strien, 1997), traits which may be present in women that make up Profile 3.

In examining sociodemographic characteristics for the four eating styles profiles, significant differences were found only in age and marital status, taking into account either married or cohabiting women. The differences between profiles regarding age and the three eating styles were not completely clear. The lower mean age of women from Profiles 1 and 3, compared to women from Profiles 2 and 4, are in line with studies reporting higher emotional and external eating among younger age groups compared to older ones (Barrada et al., 2016; Dakanalis et al., 2013; Nagl et al., 2016). Nevertheless, Profiles 1, 2 and 3 did not significantly differ in their age average scores, in agreement with authors who have not found association between emotional and internal eating and age (Dutton and Dovey, 2016). This mixed finding may be due to the gender composition of the samples. Of the studies cited here, the study by Dutton and Dovey (2016) was the only one that focused exclusively on women. It may be the case that when only women are studied, age as well as emotional and external eating are not highly related, but this is a hypothesis that should be further investigated.

Age also showed an unclear relationship with the third eating style, dietary restraint. Our findings partially contradict previous studies reporting that restraint tends to increase with age (Barrada et al., 2016; Dutton and Dovey, 2016). In fact, women in profiles with higher restraint (1 and 3) were younger than women in Profiles 2 and 4, which had low dietary restraint, although Profiles 1, 2 and 3 did not significantly differ in terms of age. Again, this result may be unclear due to the use of a mixed-gender sample in one of the previous studies (Barrada et al., 2016). Yet other studies reporting an increased restraint with age did have a women-only sample (e.g. Dutton and Dovey, 2016). These considerations and other literature (Schnettler et al., 2018) suggest that there may be cultural differences in the expression of dietary restraint (e.g. Dutton and Dovey's 2016 study was conducted in a Southern European country, while Schnettler et al., 's 2018 study was conducted in a Latin American country). Nevertheless, in this study, our results suggest that younger women may be more concerned about their appearance, and thus are more likely to engage in dietary restraint than older women.

Marital status was also examined as an associated variable in the

eating styles profiles. Profile 4, composed by women with very low emotional and external eating and low dietary restraint, had a significantly higher proportion of married or cohabiting women than the other three profiles. This result is consistent with previous findings showing that living with a partner is associated with healthy eating habits (Swan et al., 2015). Cohabitation, or living with others, may have a positive effect on food choices and meal preparation, since eating is a social practice (Schnettler et al., 2020). This result is also congruent with the fact that social support provided by family members is related to healthy eating habits and lower obesity risk (Schnettler et al., 2015; Swan et al., 2015).

Contrary to expectations, other sociodemographic variables showed no significant differences between profiles. Namely, profiles did not differ in terms of the average monthly income of participants' households, their education nor the education of the head of their households; these variables are highly related to the individuals' socioeconomic status (SES). These findings also contradict authors that have associated SES and BMI through emotional eating (Spinosa et al., 2019) and dietary restraint (Löffler et al., 2017), and also studies reporting a negative relationship between SES and BMI in women (Claassen et al., 2019; Löffler et al., 2017; Spinosa et al., 2019). Although further research is required to better understand the lack of differences between profiles according the variables used as proxy of SES, our results suggest that emotional, external and restraint eating as well as overweight and obesity are present in Chilean women regardless of their SES.

The variable of perceived stress (PSS total score) differed significantly among eating styles Profiles 2, 3 and 4. This difference was expected based on previous studies that have positively associated stress with emotional eating (Czepczor-Bernat and Brytek-Matera, 2020; Järvelä-Reijonen et al., 2016; Michels et al., 2020; Ohara et al., 2019; Richardson et al., 2015), external eating (Michels et al., 2020; Ohara et al., 2019) and dietary restraint (Järvelä-Reijonen et al., 2016). Research on emotional eating shows that those who engage in this eating style respond with greater distress and negative self-appraisals to daily hassles, and seek to avoid these negative emotional states by turning to high fat/sugar snacks and foods (Michels et al., 2020; Richardson et al., 2015). For external eating, it has been shown that stress can be an eating stimulus in response to external cues (Michels et al., 2020; Richardson et al., 2015), thus contributing to stress-induced snack intake (Michels et al., 2020). Another possible explanation for both internal and external eating is that stress may increase individuals' awareness of the immediate environment and diminish their awareness of the self, making people more sensitive to the immediate food environment (Cebolla et al., 2014; Nagl et al., 2016). Lastly, the theory for restraint eating explains that general overeating is the result of stress impairing cognitive control, and disruption of restrictive cognitive control (Järvelä-Reijonen et al., 2016; Nagl et al., 2016; Richardson et al., 2015). This stress has been related to failure to maintain weight loss among obese individuals (Järvelä-Reijonen et al., 2016).

These relationships between stress and eating styles shed light on the resulting profiles in this study. While women in Profile 1 had a similar score on dietary restraint as women in Profile 3, they had a significantly lower PSS score than this latter profile. These results suggest that high dietary restraint may be a response to different levels of stress and have different outcomes; that is, restraint may lead to overeating in response to stressful situations in some women, as it seems to occur in Profile 3, but not in Profile 1. In this regard, characteristics from women in Profile 1 are in line with previous studies reporting no relationship between stress and dietary restraint (Joseph et al., 2018; Michels et al., 2020). Nevertheless, women from Profiles 1 and 2 had similar scores on the PSS, whereas women in Profile 1 scored higher than women in Profile 2 in the three DEBQ's dimensions. This distinction can be explained by research showing that stress can be associated with either an increase or a decrease in food intake, which highlights the variability of emotion-induced changes across individuals (Macht, 2008). Furthermore, the higher PSS average score and the greater presence of obese

women in Profile 3 support findings showing that stress contributes to obesity (Jayne et al., 2020; Joseph et al., 2018; Richardson et al., 2015).

The effect of stress on dietary behaviors is complex (Richardson et al., 2015). While the dimension “counter stress” (something that individuals can control) showed similar results to the PSS total score, the eating styles of each profile showed a different trend regarding the dimension “perceived stress” (something that cannot be controlled) of the PSS. Although women in Profile 3 (high emotional, external and restraint eating) also scored higher in the dimension “perceived stress”, women from this profile did not differ from women in Profiles 1 (medium emotional and external eating, high dietary restraint) and 2 (low emotional, external and restraint eating), while these profiles did not differ from women in Profile 4 (very low emotional and external eating, low dietary restraint). These results show that different sources of stress are related to the three eating styles measured by the DEBQ, suggesting that situations that individuals can control are more difficult to cope with (which may lead to emotional, external or restraint eating) than those situations that cannot be controlled. Moreover, some authors have reported gender differences in how individuals cope with stress (Jayne et al., 2020), while our findings further suggest there are differences in how women vary in how they cope with stress, and also with counter stress and perceived stress. However, further research is needed to better understand the eating style response in particular to the dimension “perceived stress” by women.

Another relevant difference between eating styles profiles was found in social support. Specifically, consistent with previous studies showing a relationship between perceived social support and dietary restraint (Birmachu et al., 2019; Kwan and Gordon, 2016), the average scores in the MOS-SSS overall support index of each profile showed that women with higher perceived social support reported lower dietary restraint (Profiles 2 and 4) and vice versa (Profiles 1 and 3). Women in Profiles 2 and 4 also had lower internal and external eating scores than women in Profiles 1 and 3, suggesting that perceived social support also provides resources to cope with internal and external eating, probably acting as stimulus to deal with stress (Deliens et al., 2014; Kwan and Gordon, 2016). Our results also provide new insights about the types of perceived social support that may be more relevant to modify the three eating styles under study.

While the eating style profiles differed in the dimensions of affective support and positive social interaction support, they did not differ in tangible nor emotional/informational support. These results are congruent with evidence indicating that high perceived social support from family and friends may be more effective than support from significant others to reduce unhealthy eating behaviors (Birmachu et al., 2019). However, while the differences between the eating styles profiles in affective support showed a similar pattern compared to the overall MOSS scores, women in Profile 1 did not differ from the other profiles in the dimension positive social interaction support. The similar scores in this later dimension between Profiles 1, 2 and 4, while these profiles differ in dietary restraint, may be due to the outcomes of the social interaction support. Research shows that individuals may perceive their social support as adequate, and yet interactions with same-sex friends related to eating habits may promote behaviors such as weight and body comparison (Birmachu et al., 2019). These interactions may lead to engaging in dietary restraint behaviors, as it may be the case of women in Profile 1. Women in Profiles 1 and 3 also showed no differences in dietary restraint and in the dimension positive social interaction support, while Profile 3 had a higher proportion of obese women. This may be explained by previous research indicating that more obese individuals receive more support from their social relationships, instead of their weight being influenced by the amount of social support they receive (Claasen et al., 2019). Nevertheless, it can be suggested that increasing affective support is especially relevant to decrease internal, external and restraint eating in women.

Our results also provide new insights about satisfaction with body image and its correlates in an older population (Ginsberg et al., 2016).

Profile 3 had a higher presence of women completely unsatisfied or unsatisfied with their body image and a high dietary restraint average score; the opposite trend was observed in women in Profiles 2 and 4 (i.e. low restraint and higher proportions of women satisfied and completely satisfied with their body image). These results align with findings from previous studies conducted mainly with young women samples, which show that dietary restraint may be a weight management strategy the more an ideal body image does not match self-perceived body image (Bouzas et al., 2019; Chen et al., 2020; Lattimore and Hutchinson, 2010; Oda-Montecinos et al., 2018; Ohara et al., 2014; Thompson et al., 2017). The latter situation seems to be the case for women in Profile 3.

BMI and dissatisfaction with body image are also linked in these eating styles profiles. Profile 3 had more women reporting body dissatisfaction and also the higher proportion of obese women, which supports the previous finding that a high BMI contributes to dissatisfaction with body image (Hosseini et al., 2017; Lattimore and Hutchinson, 2010; Oda-Montecinos et al., 2018). Women in Profile 1 did not differ from the total sample in their BMI distribution, but they scored high in dietary restraint, while a significantly high proportion of these women was moderately satisfied with their body image. Although the overweight in women in Profile 1 may lead them to engage in dietary restraint and to be moderately satisfied with their body image, the proportion of overweight women in profiles 2 and 4 were similar to Profile 1. It can be thus suggested that other sources of body dissatisfaction may trigger dietary restraint in women from Profile 1, such as greater appearance concerns (Bouzas et al., 2019; Lattimore and Hutchinson, 2010) and sociocultural pressures regarding appearance (Chen et al., 2020; Thompson et al., 2017). Nevertheless, further research is needed to better understand the relationship between dietary restraint and satisfaction with body image in women who belong to Profile 1.

Profiles 2 and 4 had higher proportions of women satisfied or completely satisfied with their body image and who scored lower in emotional eating, compared to women in Profiles 1 and 3, who were moderately satisfied, unsatisfied or completely unsatisfied with their body image. These findings confirm results from previous studies carried out with female adolescents and young adults, which indicate a positive relationship between emotional eating and dissatisfaction with body image (Chen et al., 2020; Ohara et al., 2014; Thompson et al., 2017). Some authors have reported that this relationship between body dissatisfaction and emotional eating is set through depression or anger/frustration in female adolescents (Chen et al., 2020; Thompson et al., 2017). Our results suggest that this relationship may be also through perceived stress in some types of older women, given the significantly higher scores in the PSS and emotional eating in women from Profile 3 in particular. For external eating, although to the best of our knowledge there is no available literature that relates this eating style to satisfaction with body image, our results suggest that those women with higher external eating (Profiles 1 and 3) tend to show greater body dissatisfaction than those women with low external eating (Profiles 2 and 4). This finding is consistent with evidence showing that high energy intake (one characteristic of external eating) is one of the sources of dissatisfaction with body image (Ginsberg et al., 2016; Lattimore and Hutchinson, 2010).

The limitations of this study must be addressed to improve further research. The first limitation is that the study examined women from two cities in one Latin American country, which does not permit the generalization of our results to populations of women in other cultural contexts. Second, most data were self-reported, thus, responses may have been affected by social desirability. Another limitation is that the questionnaire did not include a series of questions that would have provided more information to further interpret the results, such as eating habits and the amount of food consumed, diet quality, the type of diets carried out by the participants, appearance concerns, and socio-cultural pressures regarding appearance. Future studies should account for these limitations and also assess other mental health problems such

as depression and anxiety, as well as to identify the main sources of stress among women.

Despite these limitations, this study contributes to further understanding the heterogeneity of emotional, external and restraint eating among women, allowing to detect characteristics that signal higher risk of harmful eating behaviors. These results can contribute to the development of intervention strategies aiming at those profiles at higher risk regarding weight management or other eating-related problems. This is relevant considering that obesity is not only associated with a high prevalence of chronic noncommunicable diseases, but it is also a risk factor for psychiatric and eating disorders, and it is associated with a decrease of more than five years in life expectancy (Brunault et al., 2015).

Taken together, our results suggest that perceived social support, and in particular affective support, may be a protective factor against the three eating styles measured by the DEBQ (profiles 2 and 4); therefore, strategies to increase affective support may decrease internal, external and restraint eating in profiles which show these behaviors (Profiles 1 and 3). Increasing affective support is especially relevant in single, widow or divorced women, and in married or cohabiting women whose male partners or family members may not be able to provide this type of support. By contrast, the level of perceived stress but in particular the dimension “counter stress” (something that individuals can control) may act as a high-risk factor in particular for those women more likely to engage in the three eating styles (Profile 3). Health practitioners and health policymakers should take this information into account to provide women with these characteristics adequate tools to cope with this type of stress. Given that some sources of counter stress may come from the family domain, interventions should not only involve the women, but also their family members. These specific interventions may not only reduce internal, external and restraint eating, they also may contribute to reducing the prevalence of overweight and obesity and decrease the levels of dissatisfaction with body image among women.

Author contributions

BSch conceived the study, performed data analyses. JR designed study and procedures, coordinated study and data collection. JS, XO, and SM collected data. BSch and LO drafted the manuscript. EMZ performed data analyses. COM, CH, GL, CAB, and ML provided feedback for the manuscript. All authors read and approved the final manuscript.

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Ethical statement

This study was submitted to, approved by, and monitored during its execution by the Ethics Committee of Universidad de La Frontera.

Declaration of competing interest

The authors declare no conflicts of interest.

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