



Relationship among obesity, depression, and emotional eating in young adults



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ABSTRACT

Depressive symptoms are often associated with obesity, and emotional eating may play a considerable role in weight gain. This study aimed to examine the association among depression symptoms, emotional eating, and body mass index (BMI) in Mexican college students; and to assess emotional eating as mediator between depressive symptoms and BMI. A total of 1453 students at a public university in Mexico City completed the scale Self-Efficacy in Emotion- and Stress- Related Eating of the Eating and Appraisal Due to Emotions and Stress Questionnaire (EADES) to assess emotional eating, and the scale created by the Center for Epidemiologic Studies (CES-D) to identify depressive symptoms. Weight and height were measured to calculate BMI. Structural equation models (SEM) were used to assess emotional eating as mediator between depressive symptoms and BMI by sex. Depressive symptoms were associated with emotional eating in both men (Beta = -0.33 , $p < 0.001$) and women (Beta = -0.46 , $p < 0.001$). Emotional eating, in turn, was associated with BMI in men (Beta = -0.08 , $p < 0.001$) as well as in women (Beta = -0.09 , $p < 0.001$). Emotional eating was a mediator between depression and BMI, adjusted for age in both sexes. This finding suggests that emotion management should be taken into consideration in obesity prevention and treatment strategies applied to young adults.

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1. Introduction

Psychological factors play an important role in the etiology of obesity, and a considerable number of studies have shown that depression can be both a cause and a consequence of obesity with a bidirectional relationship (De Wit et al., 2010; Luppino et al., 2010).

Previous studies have shown an association between a lifetime diagnosis of mood disorders and overweight or obesity in populations of the United States (Anderson, Cohen, Naumova, & Must, 2006; Garipey, Nitka, & Schmitz, 2010; Scott et al., 2008; Simon et al., 2006; Strine et al., 2008). A meta-analysis of longitudinal studies performed in 16 countries provides the empirical support for the direct effect of adolescent depression on weight gain in adulthood. Depressive symptoms were significantly associated with increased risk of subsequent obesity in participants (Blaine, 2008). Nevertheless, another meta-analysis examining the

longitudinal studies showed a reciprocal relationship between depression and obesity. It was found that obesity increases the risk of onset of depression, and in turn, depression increases the risk of developing obesity (Luppino et al., 2010).

Obesity is a health problem frequently accompanied by depression and anxiety, as well as psychological eating styles such as emotional eating, addictive eating behaviors, and binge eating. In contrast to depressive disorders accompanied by loss of appetite, depression with atypical features is characterized by increased appetite that subsequently may lead to weight gain (American Psychiatric Association, 2013).

In depression with atypical features, individuals are prone to developing abnormal eating behaviors, such as emotional eating, i.e. overeating in response to negative emotions. These patterns include eating to cope with stress, anxiety, frustration, sadness and anger, among others, and are often related to difficulty in controlling the quantity of one's food intake (Ozier et al., 2008). According to prior studies (Spoor, Bekker, Van Strien, & Van Heck, 2007; Van Strien, Herman, & Verheijden, 2009), emotional eaters have difficulty in recognizing and managing their mood and substitute effective emotional regulation for eating.

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During the past decades, a number of psychological models have tried to explain the relationship between emotional states and eating behavior, taking into consideration not only frequency of eating, but also food choice and portion size. According to affecting theories, increased food intake in response to negative emotions may be considered a coping mechanism, which can temporarily diminish negative mood (Canetti, Bachar, & Berry, 2002). Additionally, in describing the bidirectional relationship between emotions and eating behavior, Macht (2008) proposed a five-way model which includes aspects such as emotional control of food choice, emotional suppression of eating and impairment of cognitive eating control, eating in order to regulate negative emotions, and finally, emotional modulation of eating in congruence with their features (i.e., positive or negative).

Several studies have shown that emotional eating moderated the relationship between distress and food intake (O'Connor, Jones, Conner, McMillan, & Ferguson, 2008; Van Strien, Herman, Anschutz, Engels, & de Weerth, 2012; Van Strien et al., 2013). Additionally, depression and emotional eating have been associated with consumption of more calorie-dense food, "comfort foods" in population-based and other nonclinical samples (Dallman, Pecoraro, & la Fleur, 2005; Konttinen, Mannisto, Sarlio-Lahteenkorva, Silventoinen, & Haukkala, 2010b; Mooreville et al., 2014; Van Strien et al., 2013). If these episodes occur frequently, it may consequently lead to weight gain and obesity. As previous studies indicated, individuals with high levels of emotional eating had higher body mass index than those with low ones (Bennett, Greene, & Schwartz-Barcott, 2013; Garaulet et al., 2012; Greene et al., 2011; Laitinen, Ek, & Sovio, 2002; Ozier et al., 2008; Spoor et al., 2007; Van Strien, Konttinen, & Homberg, 2009).

Emotional eating was found to mediate the relationship between depressive symptoms and body weight (Clum, Rice, Broussard, Johnson, & Webber, 2014; Goldschmidt et al., 2014; Konttinen, Silventoinen, Sarlio-Lahteenkorva, Mannisto, & Haukkala, 2010a; Van Strien, Konttinen, Homberg, Engels, & Winkens, 2016). In a recent longitudinal study (Van Strien et al., 2016), in a sample of Dutch adults, depressive symptoms were related to higher levels emotional eating, and greater emotional eating predicted higher BMI in women.

The prevalence of obesity and depressive symptoms has been increasing in the last decade in Mexico and in other countries (Balanza, Morales, & Guerrero, 2009; Gutierrez et al., 2012; Lazarevich, Irigoyen-Camacho, Mora-Carrasco, & Martinez-Gonzalez, 2012). Additionally, it is worth mentioning that there are only few studies on emotional eating in Mexico (Lazarevich, Irigoyen-Camacho, Velazquez-Alva, & Salinas-Avila, 2015). Due to a complex etiology of obesity and its high resistance to treatment, it is very important to address factors such as depression and emotional eating, especially in young adults. Altered eating behavior acquired at a young age can persist into adulthood and lead to weight gain and other chronic medical conditions. Based on previous reports, which have documented an association between depression and obesity, we hypothesized that participants with depressive symptomatology are prone to emotional eating. We also hypothesized that higher levels of emotional eating behavior are associated with higher BMI. Therefore, the aims of the study were: 1) to examine the association between depression symptoms, emotional eating, and BMI in Mexican college students; 2) to assess emotional eating as a mediating variable between depression and obesity.

2. Material and methods

2.1. Study design

A cross-sectional study was carried out in a public university in

Mexico City based on direct anthropometric evaluation and self-administered questionnaires.

2.2. Participants

First-year-students attending the Autonomous Metropolitan University, Xochimilco Campus, in Mexico City were requested to fill out a health survey questionnaire in 2015. From a total of 1665 registered students, 1469 actually filled out a questionnaire. This was online during the first week of term. Those who did not complete the full questionnaire were excluded and 1453 students were included for data analysis. The average time for completing the questionnaire was 20 min. The response rate was 88.2%.

2.3. Ethics

The questionnaire was completed anonymously, and the participants were assured of data confidentiality. The students participated on a voluntary basis, and they acknowledged informed consent online. The University Review Board approved the project, where the ethical aspects were considered. This study has been carried out in accordance with The Code of Ethics of the World Medical Association, Declaration of Helsinki (WMA Declaration of Helsinki, 2013).

2.4. Instruments

The scale Self-Efficacy in Emotion- and Stress- Related Eating of the Spanish version of the Eating and Appraisal Due to Emotions and Stress Questionnaire (EADES) was applied to assess emotional eating. This instrument was previously validated in a similar population in Mexico (Lazarevich et al., 2015). Cronbach's alpha reliability coefficient was 0.87 for the scale Self-Efficacy in Emotion- and Stress- Related Eating, which contains 12 questions (e.g., *I use food to cope with my emotions, I eat when I am upset with myself, I comfort myself with food, I eat when I am sad, I overeat when I am stressed*, among others). The Cronbach's alpha in the present study was 0.90. Individuals responded to the questionnaire in accordance with their level of agreement from strongly agree to strongly disagree, on a scale of 1–5. According to the original questionnaire, the lower the score, the more compromised is eating behavior (Ozier et al., 2007).

A Spanish-language version of the 20-item depression scale created by the Center for Epidemiologic Studies (CES-D) was used to measure depressive symptoms. The instrument has been validated and utilized in various studies with non-clinical Mexican populations. Twenty Likert-type items assessed the frequency of depressive symptomatology in the previous week, including depressed mood, feelings of guilt and worthlessness, psychomotor retardation, and sleep difficulties. This scale had shown a good internal consistency in Mexico's student population, Cronbach's alpha was 0.87. In this study, a cut-off point of 16 was used to determine the presence of depressive symptomatology (Bojorquez Chapela & Salgado de Snyder, 2009; Gonzalez-Forteza et al., 2011).

2.5. Anthropometry

Health professional students recorded weight and height using a SECA scale (model 813) and SECA stadiometer (model 213). Body mass index (BMI weight/height²) was calculated. Based on World Health Organization (WHO) criteria, the cutoff point for being overweight was BMI ≥ 25 kg/m², for being obese ≥ 30 kg/m² and for being underweight < 18.5 kg/m² (WHO, 2000).

2.6. Statistical analysis

The description of variables was performed using percentages for categorical variables; means and standard deviations for continuous variables. Associations between variables were evaluated using bivariate and multivariate analysis. The non-parametric method (Kruskal-Wallis χ^2 test) was applied to compare categorical with continuous variables. The analysis was stratified by sex. Linear regression models with robust standard errors were used to study the bivariate association between depression symptoms and BMI, depression and EADES, as well as between EADES and BMI in men and women. Additionally, mediation analysis by sex was performed using BMI as a dependent variable, depression symptoms as an independent variable, and emotional eating as a mediator variable. Structural equation models (SEM) were applied for mediation analysis, controlled by age. The ADF (Asymptotic distribution free) method was applied. This method makes no assumption of joint normality of the variables included in the model. The bootstrapping technique (500 iterations) was used to construct bias-corrected 95% confidence intervals of the effect coefficients (Rucker, Preacher, Tormala, & Petty, 2011). The goodness-of-fit tests were: discrepancy chi-square (reports the model versus saturated test); RMSEA (root mean squared error of approximation); SRMR (standardized root mean squared residual); CFI (comparative fit index) and CD (coefficient of determination).

Underweight students ($n = 81$) were excluded from these analyses. In addition, three items of EADES related to loss of control (*I feel out of control when I eat, It is hard to stop eating when I am full, I do not have control over how much I eat* because it is not directly related to emotional eating). Similarly, the item on loss of appetite of CES-D was excluded from analysis.

The statistically significant value was set at $p < 0.05$. Data analysis was performed using the STATA V12 (4905 Lakeway Drive, College Station, Texas 77845-4512 USA).

3. Results

A total of 1453 freshmen were evaluated, of which 664 (45.7%) were men and 789 (54.3%) were women. The mean age of participants was 20.6 ($SD = 2.5$). Descriptive characteristics of the participants are presented in Table 1. Most of the students, 1399 (96.3%), were single and the rest of them were married or living with a partner.

About 17% for the students answered that they had prior psychological treatment, without significant difference by sex ($\chi^2(1) = 0.840, p = 0.359$). Additionally, 269 of the students (18.5%) presented depressive symptoms (cutoff point of 16, full questionnaire), more women (20.8%) than men (15.8%), ($\chi^2(1) = 5.9, p = 0.015$).

Approximately, one third of the participants, 456 (31.4%), responded positively to the general question: Do you overeat in response to emotions? A higher percentage of this behavioral pattern was found in women (41.4%) compared with men (19.4%), ($\chi^2(1) = 81.2, p < 0.0001$). Regarding emotional eating evaluated with the EADES, women showed lower scores (35.2, $SD = 6.9$) than men (36.2, $SD = 6.8$), ($\chi^2(1) = 8.64, p = 0.003$), which indicated more emotional eating problems in women. The mean CES-D score was similar in women (10.8, $SD = 6.6$) and in men (10.2, $SD = 6.0$), ($\chi^2(1) = 2.32, p = 0.128$).

Considering BMI, approximately one quarter of participants were overweight and 119 (8.2%) were obese (Table 1). A significant difference was found in the BMI between males (24.5, $SD = 4.0$) and females (23.5, $SD = 4.0$), ($\chi^2(1) = 26.40, p < 0.0001$).

Table 1
Characteristics of study participants ($n = 1453$).

Variables	Mean (SD)/n (%)
Age	
Mean (SD)	20.6 (2.5)
Sex	
Men	664 (45.7%)
Women	789 (54.3%)
Marital status	
Single	1399 (96.3%)
Married or living with a partner	54 (3.7%)
Prior psychological treatment	
Yes	244 (16.8%)
No	1209 (83.2%)
Emotional eating (EADES) ^a	
Mean (SD)	35.7 (6.8)
Depressive symptoms (CES-D) ^b	
Mean (SD)	10.5 (6.3)
Body mass index	
Mean (SD)	23.9 (4.0)
Underweight	81 (5.6%)
Normal	884 (60.8%)
Overweight	369 (25.4%)
Obesity	119 (8.2%)

^a EADES: Scale Self-Efficacy in Emotion-and Stress- Related Eating of the Eating and Appraisal Due to Emotions and Stress Questionnaire (the items related with loss of control were excluded).

^b CES-D: Center for Epidemiologic Studies-Depression (the item related with loss of appetite was excluded).

3.1. Associations among depression, emotional eating, and body mass index

The bivariate analysis showed an association between BMI and depression ($p < 0.001$); BMI and emotional eating ($p < 0.001$) and between emotional eating and depression ($p < 0.001$), in both men and women (Table 2).

Fig. 1 shows a graphical representation of the mediation model and the regression coefficients. An association between depression and BMI (path c') was found in men ($p = 0.002$) and women ($p < 0.001$); depression and emotional eating (path a) was also significant in both groups ($p < 0.001$, for both sexes), as well as between emotional eating and BMI (path b), ($p < 0.0001$ for both sexes), controlled by age. Higher BMI was associated with higher depression score, and with lower EADES scores, which indicates that students with more depressive symptoms and more emotional eating problems had higher BMI. The CD was 0.11 in men and 0.19 in women.

Table 3 presents the effects of the mediation analysis with the corresponding bias-corrected 95% confidence interval (bootstrapping technique) by sex. The direct, indirect, and total effects of depression on BMI were significant in men and women. In males, indirect effect of depression via emotional eating on BMI represented 23.1% of the total effect, and it represented 25.0% in females.

4. Discussion

We hypothesized that participants with depressive symptoms were prone to developing emotional eating that could lead to weight gain. In this study, depressive symptoms were associated with higher BMI. Additionally, significant associations were found between depressive symptoms and emotional eating, as well as between emotional eating and BMI. Moreover, according to the results of the mediation analysis, emotional eating was a mediator between depression and BMI. The indirect effect of depression through emotional eating on BMI represented a considerable proportion of the total effect, men (23.1%) and women (25.0%).

The association between emotional eating and BMI found in the

Table 2
Results of the bivariate analysis between body mass index, emotional eating and depression.

	Men n = 640		Women n = 732	
	β (SE) ^a	(95% CI)	β (SE) ^a	(95% CI)
Body mass index				
Depression	0.14 (0.04) ^b	(0.06, 0.21)	0.16 (0.03) ^e	(0.10, 0.23)
Emotional eating	-0.11 (0.02) ^c	(-0.16, -0.07)	-0.13 (0.03) ^f	(-0.18, -0.08)
Emotional eating				
Depression	-0.33 (0.04) ^d	(-0.42, -0.25)	-0.45 (0.05) ^g	(-0.55, -0.37)

^a β regression coefficient and (SE) robust standard error.

^b $F(1, 638) = 13.17, p = 0.0003$.

^c $F(1, 638) = 22.91, p < 0.0001$.

^d $F(1, 638) = 60.29, p < 0.0001$.

^e $F(1, 730) = 25.57, p < 0.0001$.

^f $F(1, 730) = 24.79, p < 0.0001$.

^g $F(1, 730) = 102.07, p < 0.0001$.

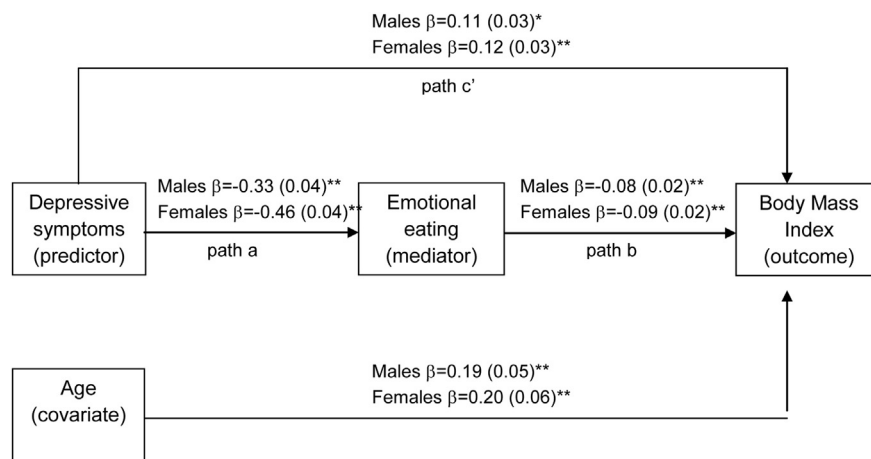


Fig. 1. Graphical representation of the mediation model. Results from structural equation modeling, unstandardized regression coefficients (β) and standard errors (SE) by sex. (* $p = 0.002$, ** $p < 0.001$). CFI: Comparative Fit Index; RMSEA Root Mean Squared Error Approximation; SRMR: Standardized Root Mean Squared Residual; CD: Coefficient of Determination.

Table 3
Results from structural equation modeling (unstandardized regression coefficient): the total, direct, and indirect via emotional eating effects of depressive symptoms on body mass index (BMI), adjusted for age.^a

	Males β (SE) ^b n = 640	(95% CI) ^c	Females β (SE) ^b n = 732	(95% CI) ^c
Mediator: emotional eating				
Indirect effect (via emotional eating) of depression on BMI (Indirect effect = ab in Fig. 1)	0.03 (0.01)	(0.02, 0.05)	0.04 (0.01)	(0.02, 0.06)
Direct effect of depression on BMI (Direct effect = c' in Fig. 1)	0.11 (0.04)	(0.04, 0.18)	0.12 (0.03)	(0.06, 0.18)
Total effect of depression on BMI (Total effect = $c' + ab$ in Fig. 1)	0.13 (0.04)	(0.06, 0.21)	0.16 (0.03)	(0.10, 0.22)
Indirect effect (%)	23.1%		25.0%	

^a Underweight individuals were excluded from analysis ($n = 81$) (sample $n = 1372$).

^b Bootstrap standard error.

^c Bias-corrected confidence interval.

present study is consistent with previous investigations, where the Emotion- and Stress-Related Eating questionnaire (EADES) was applied in nonclinical populations (Lazarevich et al., 2015; Ozier et al., 2007). Furthermore, applying different instruments to measure emotional eating, a number of studies also revealed an association between overeating in response to negative emotions and weight gain (Bennett et al., 2013; Garaulet et al., 2012; Greene et al., 2011; Laitinen et al., 2002).

Our findings support the hypothesis of the study that individuals with depressive symptoms often have dysfunctional coping strategies and are prone to developing abnormal eating behaviors, accompanied by periods of overeating in order to diminish negative mood states. Food can be considered a natural

reward or gratification habit in order to cope with negative emotions in the absence of alternative behaviors. The emotional eating mediation effect identified in the present study coincides with previous findings that reveal that emotional eating acts as mediator between depression and future body weight gain (Clum et al., 2014; Goldschmidt et al., 2014). Kontinen et al. (2010a) suggest that there is no single pathway between depression and BMI; however, behavior-specific psychological factors, such as emotional eating and physical activity self-efficacy, significantly mediated the effects of depression on adiposity indicators. Moreover, in a longitudinal study of Van Strien et al. (2016), the indirect effect (via emotional eating) of depression on BMI was significant in women.

Although mixed results have been obtained in assessing the

moderator effects of self-reported emotional eating on the relationship between stress and food intake (Adriaanse, de Ridder, & Evers, 2011; Evers, De Ridder, & Adriaanse, 2009; O'Connor et al., 2008), it has been suggested that null results can be explained by misclassification of participants due to the use of the median splits to classify low and high emotional eaters. Additionally, it has been proposed that selection of participants with extreme emotional eating score is a better strategy to identify emotional eating behavior. Another possible explanation of null results could be the low statistical power in data analysis related to insufficient number of participants (Van Strien et al., 2012).

Our findings also emphasize the importance of relating emotional overeating with negative mood characteristics such as anxiety, sadness, uneasiness, anger, apathy, frustration, and stress. In addition, the results agree with previous studies where a moderator effect of self-reported emotional eating on the relationship between distress and actual food intake has been found (Konttinen et al., 2010b; Mooreville et al. 2014; O'Connor et al., 2008; Van Strien et al., 2012; Van Strien et al., 2013). Additionally, it was suggested that individual vulnerability is involved in emotion and stress-induced eating (Konttinen et al., 2010b; Rutters, Nieuwenhuizen, Lemmens, Born, & Westtererp-Plantenga, 2009), and mechanisms of emotional eating in neuronal levels have been documented (Blechert, Goltsche, Herbert, & Wilhelm, 2014; Bohon & Stice, 2012; Volkow & Wise, 2005). Therefore, it is crucial to gain a thorough understanding of the relationship between emotions (in this case sad mood condition) and inadequate eating behavior in order to prevent not only obesity but also more serious eating disorders (Eddy et al., 2007; Goossens, Braet, & Decaluwe, 2007; Stice, Killen, Hayward, & Taylor, 1998).

The prevalence of depressive symptoms (18.5%) was high in the study group. This is consistent with information from other Mexican studies, as well as worldwide (Balanza et al., 2009; Benjet, Borges, Medina-Mora, Fleiz-Bautista, & Zambrano-Ruiz, 2004; Lazarevich et al., 2012). Moreover, a considerable number of students evaluated in the present study (16.8%) answered that they had already had psychological treatment. It is important to note that the response to depression could be associated with both decreased and increased motivation to eat. Therefore, a distinction between melancholic depression (accompanied by decrease or loss of appetite) and depression with atypical features (increased appetite) should be made.

The detection of emotional eating is essential not only in the prevention and treatment of excess body weight but also other medical related conditions, especially in young populations. Teaching effective coping strategies along with nutrition education is particularly important at young age, and universities provide a good environment for developing health education programs.

4.1. Limitations

The present study was carried out with a specific non-clinical student population; therefore, it is difficult to extrapolate the results to other population groups. Additionally, the self-reported questionnaires, applied in the study, for assessing emotional eating and depression only identify tendencies and symptoms and do not diagnose clinical conditions.

In spite of the limitations, one of the strengths of the study is that weight and height were measured in each participant, which provides more accurate information than self-reported methods. The study adds to the evidence of the mediating role of emotional eating in the relationship between depressive symptoms and BMI in a young educated population, in one of the countries with the highest obesity rates in the world. Further research in different population groups is required to assess the consistency of this

finding. Finally, longitudinal studies are needed to evaluate the long-term effect of depression and emotional eating on body weight.

5. Conclusions

In the present study, emotional eating was identified as a mediator variable between depression and BMI in young men and women. However, other factors that contribute to weight gain should also be taken into consideration.

An integral approach in preventing and managing obesity should include the detection of depression and emotional eating among other obesity risk factors. Nutritional education, adequate emotion management, and detection of individuals vulnerable to depression are crucial in young groups to reduce the high risk of obesity.

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References

- Adriaanse, M. A., de Ridder, D. T., & Evers, C. (2011). Emotional eating: Eating when emotional or emotional about eating? *Psychology and Health*, 26(1), 23–39. <http://dx.doi.org/10.1080/08870440903207627>.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Pub.
- Anderson, S. E., Cohen, P., Naumova, E. N., & Must, A. (2006). Association of depression and anxiety disorders with weight change in a prospective community-based study of children followed up into adulthood. *Archives of Pediatrics and Adolescent Medicine*, 160(3), 285–291. <http://dx.doi.org/10.1001/archpedi.160.3.285>.
- Balanza, G. S., Morales, M. I., & Guerrero, M. J. (2009). Prevalence of anxiety and depressive disorders in university students: Associated academic and socio-family factors. *Clínica y Salud*, 20(2), 177–187.
- Benjet, C., Borges, G., Medina-Mora, M., Fleiz-Bautista, C., & Zambrano-Ruiz, J. (2004). Early onset depression: Prevalence, course, and treatment seeking delay. *Salud Pública de México*, 46, 417–424.
- Bennett, J., Greene, G., & Schwartz-Barcott, D. (2013). Perceptions of emotional eating behavior. A qualitative study of college students. *Appetite*, 60(1), 187–192. <http://dx.doi.org/10.1016/j.appet.2012.09.023>.
- Blaine, B. (2008). Does depression cause obesity? A meta-analysis of longitudinal studies of depression and weight control. *Journal of Health Psychology*, 13(8), 1190–1197. <http://dx.doi.org/10.1177/1359105308095977>.
- Blechert, J., Goltsche, J. E., Herbert, B. M., & Wilhelm, F. H. (2014). Eat your troubles away: Electroocutaneous and experiential correlates of food image processing are related to emotional eating style and emotional state. *Biological Psychology*, 96, 94–101. <http://dx.doi.org/10.1016/j.biopsycho.2013.12.007>.
- Bohon, C., & Stice, E. (2012). Negative affect and neural response to palatable food intake in bulimia nervosa. *Appetite*, 58(3), 964–970. <http://dx.doi.org/10.1016/j.appet.2012.02.051>.
- Bojorquez Chapela, I., & Salgado de Snyder, N. (2009). Psychometric characteristics of the center for epidemiological studies-depression scale (CES-D), 20 and 10-item versions, in women from a Mexican rural area. *Salud Mental*, 32, 299–307.
- Canetti, L., Bachar, E., & Berry, E. M. (2002). Food and emotion. *Behavioural Processes*, 60, 157–164. [http://dx.doi.org/10.1016/S0376-6357\(02\)00082-7](http://dx.doi.org/10.1016/S0376-6357(02)00082-7).
- Clum, G. A., Rice, J. C., Broussard, M., Johnson, C. C., & Webber, L. S. (2014). Associations between depressive symptoms, self-efficacy, eating styles, exercise and body mass index in women. *Journal of Behavioral Medicine*, 37, 577–586. <http://dx.doi.org/10.1007/s10865-013-9526-5>.
- Dallman, M. F., Pecoraro, N. C., & la Fleur, S. E. (2005). Chronic stress and comfort foods: Self-medication and abdominal obesity. *Brain, Behavior, and Immunity*, 19(4), 275–280. <http://dx.doi.org/10.1016/j.bbi.2004.11.004>.
- De Wit, L., Luppino, F., van Straten, A., Penninx, B., Zitman, F., & Cuijpers, P. (2010). Depression and obesity: A meta-analysis of community-based studies. *Psychiatry Research*, 178(2), 230–235. <http://dx.doi.org/10.1016/j.psychres.2009.04.015>.
- Eddy, K. T., Tanofsky-Kraff, M., Thompson-Brenner, H., Herzog, D. B., Brown, T. A., & Ludwig, D. S. (2007). Eating disorder pathology among overweight treatment-seeking youth: Clinical correlates and cross-sectional risk modeling. *Behaviour Research and Therapy*, 45(10), 2360–2371. <http://dx.doi.org/10.1016/j.brat.2007.03.017>.
- Evers, C., De Ridder, D. T., & Adriaanse, M. A. (2009). Assessing yourself as an emotional eater: Mission impossible? *Health Psychology*, 28(6), 717–725. <http://dx.doi.org/10.1037/a0016700>.

- Garaulet, M., Canteras, M., Morales, E., Lopez-Guimera, G., Sanchez-Carraced, D., & Corbalán-Tutau, M. D. (2012). Validation of a questionnaire on emotional eating for uses in cases of obesity; the Emotional Eater Questionnaire (EEQ). *Nutrición Hospitalaria*, 27(2). <http://dx.doi.org/10.3305/nh.2012.27.2.5659>, 645–651.
- Garipey, G., Nitka, D., & Schmitz, N. (2010). The association between obesity and anxiety disorders in the population: A systematic review and meta-analysis. *International Journal of Obesity London*, 34, 407–419. <http://dx.doi.org/10.1038/ijo.2009.252>.
- Goldschmidt, A. B., Crosby, R. D., Engel, S. T., Crow, S. J., Cao, L., Peterson, C. B., et al. (2014). Affect and eating behavior in obese adults with and without elevated depression symptoms. *International Journal of Eating Disorders*, 47(3), 281–286. <http://dx.doi.org/10.1002/eat.22188>.
- Gonzalez-Forzeza, C., Solís, T. C., Jimenez, T. A., Hernandez, F. I., Gonzalez-Gonzalez, A., Juarez, G. F., et al. (2011). Confiabilidad y validez de la escala de depresión CES-D en un censo de estudiantes de nivel medio superior y superior, en la Ciudad de México. *Salud Mental*, 34(1), 53–59.
- Goossens, L., Braet, C., & Decaluwe, V. (2007). Loss of control over eating in obese youngsters. *Behaviour Research and Therapy*, 45, 1–9. <http://dx.doi.org/10.1016/j.brat.2006.01.006>.
- Greene, G. W., Schembre, S. M., White, A. A., Hoerr, A. A., Lohse, S. L., Shoff, S., et al. (2011). Identifying clusters of college students at elevated health risk based on eating and exercise behaviors and psychosocial determinant of body weight. *Journal of American Dietetic Association*, 111(3), 394–400. <http://dx.doi.org/10.1016/j.jada.2010.11.011>.
- Gutierrez, J. P., Rivera, D. J., Shamah, L. T., Villalpando, H. S., Franco, A., Cuevas, N. L., et al. (2012). *National health and nutrition survey 2012. National data*. Mexico: National Institute of Public Health.
- Konttinen, H., Mannisto, S., Sarlio-Lahteenkorva, S., Silventoinen, K., & Haukka, A. (2010b). Emotional eating, depressive symptoms and self-reported food consumption. A population-based study. *Appetite*, 54(3), 473–479. <http://dx.doi.org/10.1016/j.appet.2010.01.014>.
- Konttinen, H., Silventoinen, K., Sarlio-Lahteenkorva, S., Mannisto, S., & Haukka, A. (2010a). Emotional eating and physical activity self-efficacy as pathways in the association between depressive symptoms and adiposity indicators. *American Journal of Clinical Nutrition*, 92, 1031–1039. <http://dx.doi.org/10.3945/ajcn.2010.29732>.
- Laitinen, J., Ek, E., & Sovio, U. (2002). Stress-related eating and drinking behavior and body mass index and predictors of this behavior. *Preventive Medicine*, 34, 29–39. <http://dx.doi.org/10.1006/pmed.2001.0948>.
- Lazarevich, I., Irigoyen-Camacho, M. E., Mora-Carrasco, F., & Martinez-Gonzalez, A. B. (2012). Depresión y características de personalidad en estudiantes de educación superior de la Ciudad de México y del Estado de Tabasco. *Revista de Ciencias Clínicas*, 13(1), 37–45.
- Lazarevich, I., Irigoyen-Camacho, M. E., Velazquez-Alva, M. C., & Salinas-Avila, J. (2015). Psychometric characteristics of the eating and appraisal due to emotions and stress questionnaire and obesity in Mexican university students. *Nutrición Hospitalaria*, 31(6), 2437–2444. <http://dx.doi.org/10.3305/nh.2015.31.6.8960>.
- Luppino, F. S., de Wit, L. M., Bouvy, P. F., Stijnen, T., Cuijpers, P., Penninx, B. W., et al. (2010). Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry*, 67(3), 220–229. <http://dx.doi.org/10.1001/archgenpsychiatry.2010.2>.
- Macht, M. (2008). How emotions affect eating: A five-way model. *Appetite*, 50(1), 1–11. <http://dx.doi.org/10.1016/j.appet.2007.07.002>.
- Mooreville, M., Shoemaker, L. B., Reina, S. A., Hannallah, L. M., Cohen, L. A., Courville, A. B., et al. (2014). Depressive symptoms and observed eating in youth. *Appetite*, 75, 141–149. <http://dx.doi.org/10.1016/j.appet.2013.12.024>.
- Ozier, A. D., Kendrick, O. W., Knol, L. L., Leeper, J. D., Perko, M., & Burnham, J. (2007). The eating and appraisal due to emotions and stress (EADES) Questionnaire: Development and validation. *Journal of the American Dietetic Association*, 107(4), 619–628. <http://dx.doi.org/10.1016/j.jada.2007.01.004>.
- Ozier, A. D., Kendrick, O. W., Knol, L. L., Leeper, J. D., Perko, M., & Burnham, J. (2008). Overweight and obesity are associated with emotion- and stress-related eating as measured by the eating and appraisal due to emotions and stress questionnaire. *Journal of the American Dietetic Association*, 108(1), 49–56. <http://dx.doi.org/10.1016/j.jada.2007.10.011>.
- O'Connor, D. B., Jones, F., Conner, M., McMillan, B., & Ferguson, E. (2008). Effects of daily hassles and eating style on eating behavior. *Health Psychology*, 27(1, Suppl), S20–S31. <http://dx.doi.org/10.1037/0278-6133.271.S20>.
- Rucker, D. D., Preacher, K. J., Tormala, Z. L., & Petty, R. E. (2011). Mediation analysis in social Psychology: Current practices and new recommendations. *Social and Personality Psychology Compass*, 5(6), 359–371. <http://dx.doi.org/10.1111/j.1751-9004.2011.00355.x>.
- Rutters, F., Nieuwenhuizen, A. G., Lemmens, S. G. T., Born, J. M., & Westerterp-Plantenga, M. S. (2009). Acute stress-related changes in the eating in absence of hunger. *Obesity*, 17(1), 72–77. <http://dx.doi.org/10.1038/oby.2008.493>.
- Scott, K. L., Bruffaerts, R., Simon, G. E., Alonso, J., Angermeyer, M., De Girolamo, G., et al. (2008). Obesity and mental disorders in the general population: Results from the world mental health surveys. *International Journal of Obesity*, 32(1), 192–200. <http://dx.doi.org/10.1038/sj.ijo.0803701>.
- Simon, G., Von Korff, M., Saunders, K., Miglioretti, D., Crane, P., & Van Belle, G. (2006). Association between obesity and psychiatric disorders in the US adult population. *Archives General Psychiatry*, 63(7), 824–830. <http://dx.doi.org/10.1001/archpsyc.63.7.824>.
- Spoor, S., Bekker, M., Van Strien, T., & Van Heck, G. (2007). Relation between negative affect, coping, and emotional eating. *Appetite*, 48(3), 368–376. <http://dx.doi.org/10.1016/j.appet.2006.10.005>.
- Stice, E., Killen, J. D., Hayward, C., & Taylor, C. B. (1998). Age of onset for binge eating and purging during late adolescence: A 4-year survival analysis. *Journal of Abnormal Psychology*, 107(4), 671–675.
- Strine, T., Mokdad, A., Dube, S., Balluz, L., González, O., Berry, J., et al. (2008). The association of depression and anxiety with unhealthy behaviors among community-dwelling US adults. *General Hospital Psychiatry*, 30(2), 127–137. <http://dx.doi.org/10.1016/j.genhosppsych.2007.12.008>.
- Van Strien, T., Cebolla, A., Etchemendy, E., Gutiérrez-Maldonado, J., Ferrer-García, M., Botella, C., et al. (2013). Emotional eating and food intake after sadness and joy. *Appetite*, 66, 20–25. <http://dx.doi.org/10.1016/j.appet.2013.02.016>.
- Van Strien, T., Herman, C. P., Anschutz, D. J., Engels, R., & de Weerth, C. (2012). Moderation of distress-induced eating by emotional eating scores. *Appetite*, 58, 277–284. <http://dx.doi.org/10.1016/j.appet.2011.10.005>.
- Van Strien, T., Herman, C. P., & Verheijden, M. W. (2009). Eating style, overeating, and overweight in a representative Dutch sample. Does external eating play a role? *Appetite*, 52(2), 380–387. <http://dx.doi.org/10.1016/j.appet.2008.11.010>.
- Van Strien, T., Konttinen, H., Homborg, J. R., Engels, R. M., & Winkens, L. H. (2016). Emotional eating as a mediator between depression and weight gain. *Appetite*, 100, 216–224.
- Volkow, N. D., & Wise, R. A. (2005). How can drug addiction help us understand obesity? *Nature Neuroscience*, 8, 555–560. <http://dx.doi.org/10.1038/nn1452>.
- WMA Declaration of Helsinki. (2013). *Ethical principles for medical research involving human subjects*. Retrieved from <http://www.wma.net/en/30publications/10policies/b3/index.html>.
- World Health Organization. (2000). *Obesity: Preventing and managing the global epidemic*. Report of a WHO Consultation. WHO Technical Report Series 894. Geneva: World Health Organization.