Emotional intelligence, emotion regulation and affectivity in adults seeking treatment for obesity

Federica Andrei , Chiara Nuccitelli , Giacomo Mancini , Giulio Marchesini Reggiani , Elena Trombini

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Highlights

- The relation between obesity and affectivity is not fully understood.
- This study examined the differences in affect-related variables among BMI classes.
- Subjects with obesity class III had worse affectivity than normal weight individuals.
- Results were independent of gender, education level and work status.
- More attention should be paid to affectivity for comprehensive treatment of obesity.

Emotional intelligence, emotion regulation and affectivity in adults seeking treatment for obesity

Federica Andrei [a*], Chiara Nuccitelli [b], Giacomo Mancini [c], Giulio Marchesini Reggiani [b, d], Elena Trombini [a]

[a] Department of Psychology, University of Bologna, viale Berti Pichat 5, Bologna, Italy

[b] Unit of Metabolic Diseases, S. Orsola Malpighi Hospital, via Pietro Albertoni 15, Bologna, Italy

[c] Department of Education, University of Bologna, via Filippo Re 6, Bologna, Italy

[d] Department of Medicine and Gastroenterology, University of Bologna, via Pietro Albertoni 15, Bologna, Italy

[*] Correspondence concerning this paper should be addressed to Federica Andrei, Department of Psychology, University of Bologna, viale Berti Pichat 5, Bologna, 40127. Email: federica.andrei2@unibo.it

Abstract

Obesity has become an increasingly widespread endemic with social implications; however, the relationship between higher body mass index (BMI) and psychological functioning is still not fully understood. This study examined the differences in affect-related psychological variables among BMI classes. A total of 134 adults seeking treatment for obesity and 124 controls completed a set of questionnaires to assess: trait emotional intelligence, emotion regulation strategies, anxiety, depression, binge eating behaviors and happiness. Correlations and multivariate analysis of variance were run per each study variable controlling for BMI class (normal weight, overweight, or obesity class I, II, III). Individuals with obesity class III were characterized by reduced trait emotional intelligence and happiness, and a higher tendency to use emotion suppression compared to normal weight indi-

viduals. All individuals with obesity also showed higher levels of depression and binge eating behaviors compared to both normal weight and overweight adults. Depression and emotion suppression were the most relevant discriminant factors across BMI classes, while trait emotional intelligence resulted as an important psychological factor clustering individual differences between obese and non-obese individuals. These results suggest that more attention to the affective domain of psychological functioning is needed for proper and comprehensive treatment of obesity.

Keywords: obesity; trait emotional intelligence; happiness; binge eating; depression; anxiety; obesity classes; BMI; emotion regulation

1. Introduction

Prevalence of obesity (body mass index [BMI]≥30 kg/m^2) today has become a growing concern worldwide (WHO, 2016). In addition to the well-documented physical health risks, such as diabetes mellitus, coronary heart disease, hypertension and certain types of cancer (Mensink et al., 2013), obesity carries out several adverse effects on psychological well-being. For instance, adults with obesity experience poorer quality of life and more mental distress compared to the general population (e.g., Abilés et al., 2010; Kolotkin et al., 2012; Luppino et al., 2010), and individuals diagnosed with binge eating disorder (BED) are at even higher risk of psychological suffering, particularly in the form of depressive symptoms, compared to the non-eating disordered subjects with obesity (Dingemans et al., 2002; Fitzgibbon et al., 1993; Müller et al., 2012; Telch and Stice, 1998). Nevertheless, the literature shows inconsistencies with regards to the overall associations between BMI and mental health. A number of studies have indeed reported no association between BMI and psychological symptoms (e.g., Goldney et al., 2009; Grundy et al., 2014). These conflicting results might be related to the specific measurement settings, tools, and to the samples being used, as treatment-seeking subjects might differ from those who are not attending obesity centers.

The complexity of obesity as a disease, its association to serious health consequences, as well as the resulting large medical costs (e.g., Cawley and Meyerhoefer, 2012; Finkelstein et al., 2009), make the identification of specific factors which may be targeted by prevention and health promotion programs as a pivotal goal for both researchers and clinicians. With this respect, the attention on the affect-related domain of psychological functioning has increased, for example a growing number of studies have focused on the relationship between eating patterns and emotion regulation. Such an interest led to test the hypotheses that eating may be a strategy or an affective response to emotional distress (Evers et al., 2010; Gianini et al., 2013), and that the use of more adaptive emotion regulation strategies may act as protective agents against emotional eating even in children (Vandewalle et al., 2014). Particularly, a number of published articles stressed the importance of considering a multidisciplinary approach for obesity treatment in children and adolescents, where traditional weight-loss methods and nutritional recommendations are combined with interventions targeting emotion regulation (e.g., Aparicio et al., 2016). Yet, a recent study investigating obesity treatment in a sample of adolescents suggests that taking into account emotion regulation training may result in an improvement of the psychological wellbeing and health behavior of patients (Luca et al., 2015).

In this context, another relevant variable may be emotional intelligence (EI). The literature describes two predominant conceptualizations of EI: ability EI, which captures individuals' ability to perceive, use, understand and regulate emotion in oneself and others (Mayer and Salovey, 1993), and trait EI which relates to people's self perceptions of their emotional abilities (Petrides, 2011; Petrides and Furnham, 2003). Both ability and trait EI have been proven to act as protective factors in several life-domains, including job performance (e.g., Joseph et al., 2015), life satisfaction (e.g., Di Fabio and Saklofske, 2014), and social adjustment (Malouff et al., 2014). Along these lines, a growing number of systematic reviews and meta-analyses stress the relevance of EI, particularly the trait model (Martins et al., 2010), in health and subjective wellbeing (Andrei et al., 2014; Martins et al., 2010; Sánchez-Álvarez et al., 2016; Schutte et al., 2007). This relates to the evidence showing

that emotionally intelligent individuals, who are skilled at expressing, understanding, and managing their emotions, are more likely both to be capable of adaptively coping with the stressors of every-day life, and to maintain proactive self-care practices, including regular exercise and healthy diet (Fernández-Abascal and Martín-Díaz, 2015; Jacobs et al., 2016; Saklofske et al., 2007a). There is also emerging evidence showing that an increase in EI corresponds to a decrease in healthcare costs, particularly at low education levels (Mikolajczak and Van Bellegem, 2017). Emotional perceptions captured by trait EI seem to be especially pertinent in the case of obesity because of their strong relationship with psychological well-being, and because they are trainable (Kotsou et al., 2011; Vesely et al., 2014). Findings from studies on other medical conditions revealed that individuals who reported lower levels of trait EI were more likely to develop coronary heart disease (Kravvariti et al., 2010), and were related to specific behaviors that translated into worse glycemic control (Karahan and Yalcin, 2009). However, evidence for associations between EI and physical health indicators is under-researched and inconsistent. Yet, to our knowledge there is no study investigating EI in the context of obesity.

Differently from studies of BMI and mortality, which have increasingly used standard BMI classes placing emphasis on the higher health-related risks for class II and III obesity (e.g., Barte et al., 2014; Flegal et al., 2013), the psychological literature on obesity has generally neglected to differentiate among such categories. Although there is evidence of a close association between higher BMI class and a worse health-related quality of life, as also suggested by data from a large Italian cohort (Mannucci et al., 2010), the affective domains of psychological functioning and mental health have been rarely studied in relation to BMI categories (Ul-Haq et al., 2013). Yet, in a recent meta-analysis Baillot and colleagues (2015) suggest to take obesity class into account in order to better understand the factors characterizing this condition, as well as to promote the development of more specific interventions. As treatment for obesity is still challenging, classifying subjects according to BMI classes may improve clinical interpretation in studies addressing variables relevant to the affective domain, as well as help find potential group-specific treatment factors. Moreover,

the analysis of the differences among BMI classes may be relevant in a clinical context; being aware of the average psychological profile and emotion regulation strategies of treatment-seeking individuals with class I, II and III obesity at their first access to obesity clinics may ultimately contribute to tailor intervention programs to individual patients' needs (Braet and Beyers, 2009).

For such reasons, the main purpose of the present study is to compare variables having either a positive (i.e., trait EI, reappraisal as emotion regulation strategy, and happiness), or a negative (i.e., suppression as emotion regulation strategy, depression, and anxiety) affective content among men and women seeking treatment for obesity and controls, grouped according to BMI classes. Considering the potential role of psychological and emotional distress in obesity, the variables that could serve as general indicators of emotional health, such as anxiety, depression and happiness, were also investigated. Moreover, emotion regulation strategies might also be related to the misuse of food (Evers et al., 2010), further contributing to weight gain and obesity. Along this line, the construct of trait EI can provide a more comprehensive profile of the emotional dispositions of individuals seeking treatment for obesity. Notably, the association between variables is not expected to be similar across obesity classes, being also modulated by stigma with increasing severity grades. With regard to this, recent literature suggests that a higher prevalence of obesity may result in increased acceptance of moderately heavier body weights and in under-detection of this condition (Robinson, 2017; Robinson and Christiansen, 2014), which in turn may lead to higher stigma and more adverse psychological conditions when obesity is classified as grade II or III compared to grade I.

In light of all this, we expect group differences in the strength of association between psychological variables. Individuals with higher obesity class might exhibit much higher scores of variables with a negative affect content and lower scores of variables with a positive affect content, irrespectively of gender, compared to normal weight and overweight adults. Compared to normal weight and overweight individuals, subjects with obesity should be characterized by a psychological profile including higher levels of binge eating symptoms, depression and anxiety, lower levels

of trait EI and happiness, as well as greater tendency to use suppression as emotion regulation strategy rather than cognitive reappraisal. Moreover, we believe to find differences among obesity classes; particularly, individuals with more severe obesity grade (class III) are expected to show a worse psychological profile compared to individuals with milder obesity grades (class I and II).

2. Method

2.1 Participants

One hundred and sixty-four adults seeking treatment for their obesity in a medical center, and 156 controls participated in the study. Inclusion criteria for the clinical sample were: age between 18 and 65, proficiency in the Italian language, and BMI $\geq$ 30 kg/m^2. Subjects were excluded in case of pregnancy, serious medical conditions (e.g., severe diabetes, renal failure, thyroid problems) that might influence weight or eating, and severe psychiatric conditions (e.g., psychosis, bipolar disorder, substance abuse). Inclusion criteria for the control sample were: age between 18 and 65 and 18.50 $\leq$ BMI < 30 kg/m^2. Subjects were excluded if they reported a current or lifetime diagnoses of eating disorders, including obesity, anorexia nervosa, BED, and bulimia nervosa.

2.2 Measures

2.2.1. Demographics and clinical data

With regards to the clinical group, demographic (e.g., age, education level, ethnic background), and clinical data (e.g., comorbidities, current therapies, heights and weights for BMI computation) were recorded during an out-patient visit. The same variables were also recorded in the control group through a specific on-line questionnaire (see below), and BMI was calculated from self-reported heights and weights.

2.2.2. Trait EI

The Trait Emotional Intelligence Questionnaire–Short Form (TEIQue–SF; Petrides and Furnham, 2006) was used to measure global trait EI. It consists of 30 items rated on a 7-point Likert scale ranging from 1 (Completely Disagree) to7 (Completely Agree). A sample item for the TEIQue is “I’m normally able to get into someone’s shoes and experience their emotions”. The Italian ver-

sion of the TEIQue has proved to have good psychometric properties and to be a reliable measurement tool for trait EI (e.g., Di Fabio and Palazzeschi, 2011). The global TEIQue score had an internal consistency of 0.85 and of 0.86 in the sample with and without obesity, respectively.

2.2.3. Emotion regulation

The Emotion Regulation Questionnaire (ERQ; Gross and John, 2003) is a 10-item self-report measure of two emotion-regulation strategies: cognitive reappraisal (6 items) and expressive suppression (4 items). Each item is rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Sample items for the ERQ are "When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about" for the cognitive reappraisal dimension, and "I control my emotions by not expressing them" for the expressive suppression dimension. The Italian version of the ERQ has proved good reliability and validity (Balzarotti et al., 2010). The ERQ had an internal consistency of 0.78 and of 0.80 for cognitive reappraisal, and of 0.72 and 0.78 for emotional suppression, in the sample with and without obesity, respectively.

2.2.4. Binge eating

The Binge Eating Scale (BES; Gormally et al., 1982) was used to assess binge eating symptomatology and behaviors. The BES is a 16-item self-report measure created using a sample of treatment-seeking adults with obesity. Each item has three or four answer options of increasing severity regarding participants' eating behaviors and cognitions, with higher scores indicating more severe binge eating. A sample item for the BES is "I don't have any difficulty eating slowly in the proper manner". This measure also classifies participants based upon their scores into clinically meaningful categories, with scores higher than 17 indicating the presence of BED. The BES was already used to assess binge eating behaviors in a large sample of Italian individuals diagnosed with obesity (Mannucci et al., 2010). The BES had an internal consistency of 0.80 and of 0.82 in the sample with and without obesity, respectively.

2.2.5. Depression

The Beck Depression Inventory (BDI; Beck and Steer, 1987) was used to assess self-reported depression levels. The BDI consists of 21 items each rated from 0 (no symptom), to 3 (severe symptom). A sample item for the BDI is "I am not particularly discouraged about the future". The BDI was already used to assess depression in a study investigating quality of life in a sample of Italian obese adults (Mannucci et al., 1999). The BDI had an internal consistency of 0.81 and of 0.85 in the sample with and without obesity, respectively.

2.2.6. Anxiety

The State Trait Anxiety Inventory-Y (STAI-Y; Spielberger, 1983) was used for the assessment of anxious symptomatology. It consists of two sub-scales of 20 items each: state anxiety (STAI-Y1), the respondent' s level of anxiety at the present time, and trait anxiety (STAI-Y2), the usual level of the respondent' s anxiety in his/her everyday life. Sample items for the STAI-Y are "I am tense" for state anxiety, and "I am a steady person" for trait anxiety. Each item scores from 0 to 4, with higher scores indicating higher levels of anxious symptoms. The Italian adaptation of the STAI-Y was already used to assess state and trait anxiety in a sample of obese patients (Mannucci et al., 1999). The STAI-Y1 had an internal consistency of 0.80 and of 0.84, while the STAI-Y2 of 0.80 and 0.82 in the sample with and without obesity, respectively.

2.2.7. Happiness

The Oxford Happiness Inventory (OHI; Argyle et al., 1989) is a 29-item self-report measure. Each item has four options, and respondents are asked to pick the statement in each group which best describes the way they have been feeling over the past week. Each item scores from 0 to 3, with higher scores indicating higher happiness levels. A sample item for the OHI is "I don't feel happy". The OHI had a similar internal consistency of 0.83 in the presence and in the absence of obesity.

2.3 Procedure

The current study was approved by the Ethics Committee of S. Orsola Malpighi Hospital (Bologna, Italy), and utilized cross-sectional data collected from treatment seeking individuals at

their first access to the to the Unit of Clinical Dietetics and Metabolic Diseases of the Hospital, between September 2014 and February 2016. These data were collected as part of a larger study evaluating the efficacy of a lifestyle intervention program in individuals with overweight and obesity. Demographic and clinical information were recorded in all patients as part of routine clinical practice. Subjects willing to participate also received an envelope containing the questionnaires and were asked to return the completed material at the second access to hospital (approximately one week later). Subjects from the control group were recruited through advertisements on different social media platforms (i.e., Facebook and LinkedIn). The online questionnaire was hosted *via* Qualtrics Software and was posted together with brief information on the purpose of the study. BMI was calculated and classified into categories of normal weight (20.0–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), class I (30.0–34.9 kg/m^2), class II (35.0–39.9 kg/m^2), and class III obesity (≥ 40.0 kg/m^2), according to the WHO classification (WHO, 2000). Both clinical and control group participants signed informed consent before completing the questionnaires. There was no reimbursement for participation.

2.4 Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences Version 23 (IBM, Armonk, NY, USA). Pearson's Chi-Squared tests were performed to test for differences in demographics, while *t*-test for independent sample was adopted to compare BMI values. Pearson's correlations were used to assess bivariate associations among study variables. In order to assess the significance of the difference between *r* coefficients, Fisher *r*-to-*z* transformation was used for the comparison of significant correlations between groups. A multivariate analysis of variance (MANOVA) was used to test the differences between BMI classes in trait EI, emotion regulation, depression, anxiety, binge eating behaviors and happiness, controlling for gender. Such differences were further investigated by means of multiple comparisons per BMI class, by using Bonferroni post hoc test. The MANOVA was followed up with discriminant analysis to identify the most

important factors discriminating between groups. A *P* value < 0.05 was considered as statistically significant.

3. Results

A total of 164 individuals seeking treatment for obesity and 156 controls signed the informed consent. Of the 164 participants from the clinical group, 17 were removed for missing data, while 13 were excluded as they were over the age of 65. Regarding the control group, 14 participants were removed because of missing data either on weight or height, 11 participants were excluded as they reported a current or lifetime diagnosis of eating disorders, and further 7 participants were excluded as their BMI fell below the normal weight category (BMI < 17.50). After these exclusions, the final sample size was 134 for the clinical group (mean age = 49.70, SD = 10.28, age range 23–64; 69.4% female), and 124 for the control group (mean age = 40, SD = 10.3; 74.2% female). All participants of both groups were of Italian ancestry. With respect to other demographic variables, significant differences were found in education and work status, while no significant difference was found in relationship status (see Table 1).

With regards to BMI the mean for the clinical sample was 40.9 kg/m^2 (SD = 6.7; range 30–66): 14.9% (*n* = 20) had class I obesity, 37.3% (*n* = 50) class II obesity, and 47.8% (*n* = 64) class III obesity. In the control sample, the mean BMI was 23.5 kg/m^2 (SD = 2.72; range 18.6–29.7): 71% (*n* = 88) was in the normal weight range, while 29% (*n* = 36) were overweight.

Results from Pearson's bivariate correlations were similar for both groups (see Table 2). However, Fisher's *r*-to-*z* transformations showed a number of significant comparisons between correlation coefficients. Specifically, the association between BMI and TEIQue global score was significantly stronger for the clinical group (r = - 0.22, $p < 0.001$) compared to the control group (r = 0.07, p = n.s.; z = -2.33, $p < 0.01$). The correlation between BMI and BES total score was instead significantly stronger for the control group (r = 0.37, $p < 0.001$) compared to the clinical group (r = 0.10, p = n.s.; z = -2.33, $p < 0.01$), so was the association between BES and BDI total scores (r = 0.40, $p < 0.001$, and r = .19, $p < 0.01$, for the control and clinical group respectively; z = -1.83, p <

0.05), as well as that between TEIQue global scores and the reappraisal dimension of the ERQ (r = 0.38, $p < 0.001$, and r = 0.10, p = n.s., for the control and clinical group respectively; z = -2.38, $p <$ 0.01).

Using Pillai's trace, the MANOVA showed a significant main effect of gender (V = 0.12, F (8, 32) = 2.56, $p < 0.01$) as well as of BMI class (V = 0.91, F (8, 32) = 6.67, $p < 0.001$) on the pool of affect-related psychological outcomes. The interaction between gender and BMI class was non-significant (V = 0.13, F (8, 32) = 0.82, p = 0.75). Comparisons among outcome variables by BMI classifications and gender are presented in Table 3. Overall, significant differences among BMI classes were found with regards to trait EI, binge eating, depression, and suppression. Happiness almost reached significance (p = 0.50). No significant differences in anxiety levels, nor in cognitive reappraisal, were recorded. Particularly, individuals with class III obesity were characterized by significantly lower scores of trait EI and happiness, and with a higher tendency to use suppression as emotion regulation strategy compared to normal weight individuals. On the contrary, all subjects with obesity reported increased scores in the depression scale and binge eating behaviors compared to both normal weight and overweight groups. Results were significant irrespectively of gender.

The MANOVA was followed up with discriminant analysis, testing significant variables only (i.e., depression, happiness, binge eating, suppression and trait EI). Discriminant analysis revealed four discriminant functions. The first explained 96.7% of the variance, canonical R^2 = 0.88, whereas the second, the third and the fourth explained only 1.7% (canonical R^2 = 0.25), 1.5% (canonical R^2 = 0.23), and 0.1% (canonical R^2 = 0.05) respectively. The first (Λ = 0.19, χ^2 (20) = 318.6, $p < 0.001$) and the second (Λ = 0.88, χ^2 (12) = 22.9, $p < 0.05$) discriminant functions significantly differentiated among BMI classes, while the third (p = 0.09) and the fourth (p = 0.76) did not provide a significant contribution. Table 4 presents discriminant functions coefficients, while a plot of canonical discriminant functions 1 and 2 for all groups is shown in Figure 1. This analysis showed that function 1 discriminated the control group (normal weight and overweight) from the clinical group (adults seeking treatment for obesity). The clinical groups have higher negative val-

ues on discriminant function 1, and BDI has the highest discriminant ratio coefficient (0.98) on discriminant function 1, indicating that this is the most important differentiator between patients and controls. The other variables included in the model had relatively low coefficients which ranged in their values between |0.02| and |0.08| (see Table 4). Function 2 discriminates overweight and class III obesity respectively from normal weight and class I and II obesity. Both overweight and class III obesity have higher positive values on discriminant function 2, compared to the negative values of the remaining groups. ERQ suppression strategy has the highest discriminant ratio coefficient (0.77) on function 2, indicating that it is the most important discriminator. The other variables included in the model had relatively low coefficients which ranged in their values between |0.21| and |0.00| (see Table 4).

Given the significant differences in demographics, MANOVAs were rerun for each outcome by taking into account BMI classes together with either education or work status in place of gender. After controlling for these two variables, results did not change, namely, differences among BMI classes were maintained with regards to trait EI, happiness, binge eating, depression, and emotion suppression.

4. Discussion

Current literature and clinical evidence give emphasis to the importance of a better understanding of the relationship between psychological factors and obesity. This is the first study exploring the differences in EI, operationalized as trait EI, between men and women with clinically diagnosed obesity and non-obese controls. Our findings show that adults seeking treatment for obesity, irrespective of obesity class, suffer more emotional and affective difficulties compared to overweight and normal weight adults. Such difficulties are independent of gender and are progressively larger with increasing BMI class. Notably, after controlling for the effects of other relevant affective variables, depression and emotion suppression emerged as the strongest discriminant factors among groups.

With respect to bivariate associations, we found a significantly stronger relationship of the TEIQue global score with both BMI values and cognitive reappraisal for the clinical group compared to the control group. Such correlations confirm the already existing evidence on the relationship between obesity and emotional difficulties, particularly the use of more ineffective emotion regulation strategies, and contribute to the literature by taking into account the construct of trait EI. Trait EI, a construct developed within the domain of personality psychology, and which reflects emotion-related dispositions, may serve as a useful framework within which to organize our understanding of the interplay between cognitive, behavioral, and affective factors relevant to obesity, given its association with body dissatisfaction (Swami et al., 2010), exercise (e.g., Saklofske et al., 2007b), and mental health in general (Martins et al., 2010). Hence, these associations may be better understood if included within the frame of patients' global emotional functioning.

In line with our expectations, when BMI classes were taken into account, all patient groups, particularly subjects with obesity class III, were inclined to show lower trait EI and happiness, to report higher symptoms of depression and binge eating, as well as to suppress their emotions more strongly, than control women and men. More in depth, depression resulted as the psychological variable explaining the highest portion of variance between controls and obese patients, irrespectively of BMI subgroups and gender. Therefore, not only our results seem to reinforce the claim that obesity–depression associations may be strongest among individuals with a higher BMI (Faith et al., 2011), but they also place emphasis on the importance of depression as discriminant psychological factor between healthy and un-healthy weight conditions. Given the bidirectional association between obesity and depression (Luppino et al., 2010), our results seem to suggest once more that individuals with lower mood states may be considered at higher risk for the development, maintenance, and worsening of obesity. Interestingly, while depression resulted as the main discriminant variable between our clinical sample and controls, emotion suppression was the most important discriminator of overweight and class III obesity with normal weight, class I, and class II obesity, irrespectively of binge eating behaviors and other relevant psychological variables. In other words, it

seems that particularly individuals with overweight and class III obesity engage in suppression as emotion regulation strategy compared to normal weight, class I and class II obese individuals. The use of a more dysfunctional emotion regulation strategy such as emotion suppression may be related to a self-regulation failure in the experience of negative emotions and subsequently it might be a plausible explanation for overeating. Although further studies differentiating obesity classes with and without BED are needed, overall these considerations should be informative to early identify the ones at risk, as well as to develop prevention and conjoint treatment plans for obesity, depression and for an improvement of emotion regulation strategies, in order to reduce the social, economic, physical and psychic burden of both conditions.

Anxiety levels and the use of reappraisal as emotion regulation strategy did not differ between clinical and control groups. However, though differences were non-significant, patients showed a tendency to report more symptoms of both state and trait anxiety, as well as a less frequent use of cognitive reappraisal to regulate their emotions. Our data are in line with the evidence that worldwide obesity is common among those struggling with socioeconomic burden (WHO, 2016), as our clinical sample showed both a lower education level and a worse job status compared to the control group. Nevertheless, demographic variables did not affect the comparisons between obese and non-obese individuals on tested psychological factors, thus suggesting that differences may be group-specific. Particularly, although our results are in line with the literature on gender differences, as women showed more symptoms of depression, anxiety, and binge eating than men, such pattern was independent of BMI. For this reason, and given that the majority of studies on the psychological correlates of obesity included only female participants, future studies are needed to shed more light on this issue.

Overall, the observed differences speak about a greater psychological burden for individuals with class II and III obesity compared to the other groups with/without obesity included by the present study. Were such differences a consequence of obesity or did they develop as a response to the disease state? If the differences arose as a response to the medical condition, poor mental health

outcomes may be seen as the result of the recognition of the severity of obesity as well as of the stigma which is more frequently and intensely perceived by individuals with more extreme obesity (Robinson, 2017; Spahlholz et al., 2016). Such interpretation may be supported by the evidence that the number of individuals with severe obesity (i.e., obesity class II and class III) was higher compared to individuals with BMI < 35, reflecting a more critical evaluation of their weight status, leading to seek appropriate treatment. On the other hand, it may be that poor psychological wellbeing contributed *per se* to the development of more severe obesity. This explanation would be specifically supported by differences in trait EI, as trait EI is conceptualized as a personality dimension, and is believed to be stable across adulthood (Terracciano et al., 2006). Longitudinal studies are needed to explore these conflicting hypotheses. Nevertheless, these results emphasize the importance of affectivity as a crucial domain for this population, with implications for both research and clinical practice. Currently, interventions and treatment guidelines for obesity include multidisciplinary programs that use a cognitive behavioral approach comprising self-monitoring, problem solving, nutrition education, cognitive restructuring, and education to slow down the eating rate and increasing exercise (Wadden, 1993) are associated with the greatest weight loss (e.g., Powell et al., 2007; Shaw et al., 2005). The present findings promote the inclusion of specific interventions targeting depression, emotion regulation and emotional dispositions into more traditional prevention and treatment programs, as they may reduce the risk of adverse health outcomes associated with obesity, particularly in the case of obesity class III. Yet, more specific programs targeting affectivity and emotion not only may act as a protective factor against treatment dropout (La Grutta et al., 2013), but they may also have beneficial effects in terms of reduced healthcare expenditures (Mikolajczak and Van Bellegem, 2017).

Although the present study has several strengths, including the focus on both males and females in addition to providing new data on the relationship between obesity and emotion-related psychological factors, it is important to acknowledge a number of limitations. First, we used only well-validated measures, but, given the self-reporting nature of the survey, we relied on self-

evaluations of the participants. Factors such as social desirability could have contributed to the rating, especially in the control group, where BMI was computed from self-reported weight and height of participants, potentially biased by under- or over-reporting, respectively. Secondly, given that a casual relationship cannot be inferred by correlational analyses, it is important to design longitudinal studies using different strategies of data analysis to support these findings. Finally, we need to acknowledge that our study included individuals seeking intervention for obesity, and data cannot be extrapolated to individuals with obesity who do not seek interventions.

To conclude, our findings provide useful information regarding the difficulties in the affective domain of individuals with obesity, differentiating them by obesity class. Particularly, this is the first study investigating affect-related psychological variables in a clinical sample of patients seeking treatment for obesity differentiating for BMI classes. These data highlight the importance of considering the obesity class for a better understanding of the emotional and psychosocial complexities of the individuals with obesity, as it can inform psychological interventions and treatment approaches, as well as improve preventive and therapeutic strategies.

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Table 1

Demographic characteristics in obese and non-obese participants.

Sample characteristic	Cases (n = 134)	Controls (n = 124)	Statistic
Level of education, *n* (%)			$X^2 = 51.6$, $p < 0.001$
Primary school	5 (3.7)	0	
Secondary school	19 (14.2)	9 (12.5)	
High school	70 (52.2)	44 (35.5)	
University	40 (29.8)	70 (50)	
Work status, *n* (%)			$X^2 = 35.2$, $p < 0.001$
Student	2 (1.6)	17 (14.5)	
Employed	85 (63.4)	88 (71)	
Unemployed	24 (18)	19 (14.2)	
Retired	22 (16.4)	0	
Relationship status, *n* (%)			$X^2 = 4.9$, $p = 0.29$
In a stable relatioship	102 (76.1)	90 (72.6)	
Single	32 (23.9)	34 (27.4)	

Note. SD = Standard Deviation.

Table 2

Intercorrelations among the study variables.

Variable	BMI	State anxiety	Trait anx-iety	Trait EI	Binge eating	Reap-praisal	Suppres-sion	Happi-ness	Depres-sion
BMI	.	0.13	0.03	-0.22$^{*, a}$	0.10 ^{b}	-0.05	0.23**	0.11	0.04
State anxiety	-0.07	.	0.83**	-0.47**	0.26**	-0.21*	0.15	-0.58**	0.56**
Trait anxiety	-0.11	0.62**	.	-0.66**	0.27**	-0.28**	0.15	-0.74**	0.69**
Trait EI	0.07 ^{a}	-0.51**	-0.77**	.	-0.29**	0.10 ^{b}	-.37**	0.70**	-0.56**
Binge eating	0.37$^{**, b}$	0.25**	0.37**	-0.37**	.	-0.03	0.11	-0.31**	0.19$^{*, b}$
Reappraisal	0.09	-0.11	-0.28**	0.38$^{**, b}$	0.10	.	0.11	0.17	-0.20*
Suppression	0.18	0.04	0.04	-0.28**	0.09	-0.09	.	-0.28**	0.19*
Happiness	0.06	-0.57**	-0.76**	0.72**	-0.25*	0.36**	-0.28**	.	-0.56**
Depression	-0.04	0.57**	0.74**	-0.65**	0.40$^{**, b}$	-0.22*	0.10	-0.70**	.

Note. Correlations below the diagonal are for control group (N=124), whereas correlations above the diagonal are for clinical group (N =134).

$^{*}p < 0.01$; $^{**}p < 0.001$

[a] Significant stronger correlation for the clinical group compared to controls.

[b] Significant stronger correlation for controls compared to the clinical group.

Table 3

Means and standard deviations for study variables divided by BMI class (five levels: normal weight, overweight, I class, II class and III class obesity) and gender (two levels: male and female).

	Total (*N* = 258)					Males (*N* = 67)					Females (*N* = 191)				
	Nor-mal	Over weigh t	Obes e I class	Obes e II Class	Obese III class	Nor-mal	Over weigh t	Obes e I class	Obes e II Class	Obese III class	Nor-mal	Over weigh t	Obes e I class	Obes e II Class	Obese III class
STAI - S	38.9 (12.5)	38.1 (6.3)	38.4 (9.1)	41.9 (11.1)	43 (11.1)	38.2 (9.4)	36.6 (5.2)	39.5 (3.5)	39.2 (11.4)	40.6 (9.7)	39.1 (13)	39.6 (7.1)	38.3 (9.5)	42.7 (11)	44.7 (11.7)
STAI -T	40.8 (11.3)	39.6 (8.9)	42.7 (11.5)	45.6 (11.7)	44.1 (11.4)	35.7 (6.3)	37.2 (7.2)	34.5 (3.5)	39 (9.5)	41 (11)	41.8 (11.9)	41.9 (9.9)	43.7 (11.7)	47.5 (11.7)	46.1 (11.3)
TEIQue [a,b]	5.2 (0.78)	5.2 (0.77)	4.8 (0.78)	4.8 (0.62)	4.6 (0.94)	5.2 (0.67)	5.2 (0.81)	5.3 (0.94)	5.1 (0.57)	4.9 (0.94)	5.2 (0.81)	5.3 (0.76)	4.7 (0.75)	4.7 (0.62)	4.4 (0.92)
BES [c]	3.1 (3.2)	6.2 (4.3)	7.7 (5.5)	13.2 (5.1)	13.1 (6.8)	5.1 (5.6)	8.7 (6.3)	11.9 (7.5)	15.9 (9.3)	15.3 (8.6)	4.8 (5.3)	7.3 (5.3)	11.3 (7.3)	15.3 (8.5)	14.4 (7.9)
ERQ -R	28.4 (6.4)	28 (6.7)	28.3 (.6)	25.4 (7.2)	26.6 (7.1)	28.4 (6.1)	30.7 (4.1)	27.4 (8)	27.4 (7.5)	27.3 (7.2)	28.4 (6.1)	29.2 (5.7)	27.5 (7.4)	26.9 (7.4)	27 (7.4)
ERQ -S [a]	12.8 (4.4)	14.8 (3.2)	17.7 (5.1)	13.2 (2.2)	14.9 (4.6)	11.2 (4.3)	11.1 (4.8)	12.4 (5.6)	12.6 (5.2)	15.5 (5.9)	11.6 (4.3)	13.1 (4.3)	13.1 (5.7)	12.7 (5.4)	15.2 (5.4)
OHI	76.8 (9)	73.3 (13.6)	73.3 (9.1)	74.3 (10.4)	68.5 (14.7)	74.7 (14.2)	69.7 (9.5)	68.4 (9.4)	67.2 (10.2)	65.9 (12.7)	75.2 (13.2)	71.7 (11.8)	69.2 (9.2)	68.9 (10.6)	67 (13.5)
BDI [c]	7.9 (6.7)	8.4 (5.3)	30.3 (10.2)	32.6 (8.5)	32.8 (7.8)	6.07 (5.9)	7.3 (5.5)	22.7 (17)	30.1 (7.5)	30.9 (6.1)	8.3 (6.8)	9.7 (4.8)	31.6 (8.7)	33.5 (8.7)	34 (8.6)

Note. STAI - S = State Trait Anxiety Inventory - State; STAI - T = State Trait Anxiety Inventory - Trait; TEIQue = Trait Emotional Intelligence Questionnaire; BES = Binge Eating Scale; ERQ - R = Emotion Regulation Questionnaire - Reappraisal; ERQ - S = Emotion Regulation Questionnaire - Suppression; OHI = Oxford Happiness Inventory; BDI = Beck Depression Inventory.

Post-hoc test: multiple comparison among BMI classes: used Bonferroni.

[a] Significant difference between normal weight and III class obesity. The P values were 0.004 and 0.009 for the TEIQue and ERQ-S respectively.

[b] Significant difference between overweight and III class obesity. The P value for the TEIQue was 0.027.

[c] Normal weight and overweight groups resulted significantly different from class I, class II, and class III obesity. The P value for the BES were 0.055 and below 0.001, for the overweight/class I obesity comparison, and for the overweight/class II/class III obesity comparisons respectively.

Table 4

Coefficients resulting from discriminant analysis: Standardized Discriminant Coefficients, Structure Coefficients and Parallel Discriminant Ratio Coefficients

	TEIQue		BDI		BES		ERQ -S		OHI	
	Func-tion 1	Func-tion 2	Func-tion 1	Func-tion 2	Func-tion 1	Func-tion 2	Func-tion 1	Func-tion 2	Func-tion 1	Func-tion 2
Standardized discriminant coefficients	0.37	0.59	1.2	-0.21	0.26	0.25	0.15	0.9	0.46	-0.59
Structure coefficients	-0.14	-0.10	0.82	0.00	0.32	0.27	0.11	0.86	-0.13	-0.36
Parallel discriminant ratio coefficients	(0.37) (-0.14) =-0.05	(0.59) (-0.10) = -0.06	(1.2) (0.82) = 0.98	(-0.21) (0.00) = -0.00	(0.26) (0.32) = 0.08	(0.25) (0.27) = 0.08	(0.15) (0.11) = 0.02	(0.9) (0.86) = 0.77	(0.46) (-0.13) = -0.06	(-0.59) (-0.36) = -0.21

Figure 1

Plot of the two significant discriminant functions. Discriminant function 1 discriminates between controls (normal weight and overweight) and patients seeking treatment for obesity (class I, II and III). Discriminant function 2 discriminates between overweight and class III obesity and the remaining groups (normal weight, class I and class II obesity).