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**Personality and psychopathology differences between bariatric surgery candidates,
subjects with obesity not seeking surgery management and healthy subjects**

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Abstract

Purpose: To explore personological and psychopathological characteristics in individuals with obesity presenting for bariatric surgery compared with individuals with obesity not seeking bariatric surgery and healthy individuals to help clinician decision for surgical treatment.

Methods: 379 participants [160 candidates for bariatric surgery (B) vs 219 not seeking bariatric surgery (NB)] and 304 healthy subjects (HS) were assessed with a battery of well validated psychometric tests.

Results: the B group showed an intermediate personality profile between HS and NB. They also exhibited lower depressive and anxiety scores. Eating and attachment impairment were found lower in the B group with respect to the NB.

Conclusions: candidates for bariatric surgery display advantageous personality features and lower rates in psychopathology compared to other participants with obesity. These features may represent both traits facilitating the search for a bariatric treatment, and the preferred ones selected by the surgeon. Implications for clinicians addressing obese participants towards bariatric surgery **and limitations concerning “impression management”** are discussed.

Key words: *obesity, bariatric surgery, personality, psychopathology, treatment choice*

Level of evidence V: Opinions of respected authorities, based on clinical experience, **descriptive studies**, or reports of expert committees.

Introduction

Bariatric surgery is considered the most effective treatment for patients with severe obesity in case of failure of conservative weight loss therapies [1]. In the past, psychiatrists and surgeons thought that the surgical risk linked to this invasive type of surgery had to be reserved only for patients with severe obesity who would encounter an equally high risk of morbidity and mortality without surgical approach [2]. Recently, the concept of “last option” is completely exceeded: bariatric surgery is considered as one of the first-line treatments in patients with severe obesity because it is an effective treatment and, concerning long term weight loss, it reduces overall mortality and incidence of metabolic comorbidity [3]. Since the beginning of the new century there has been a significant increase in bariatric surgery request reaching the considerable number of half a million bariatric interventions carried out worldwide already in the 2013 [4]. There is a lot of interest in identifying which factors could be considered as predictors of good outcome with respect to bariatric surgery. General outcome predictors associated with bariatric surgery are demographic variables, preoperative weight, motivation and expectations, eating behavior, psychosocial functioning, personality and psychiatric comorbidities [5].

Concerning psychiatric comorbidity, some research shows that bariatric surgery candidates have higher rates of psychopathology compared to other individuals with obesity [6]. According to a recent meta-analysis, among patients that underwent bariatric surgery, the most common psychiatric diseases were depression (19%) and binge eating disorder (17%) [7]. Moreover, both depression and binge eating disorder have been associated with more frequent weight recovery following surgery [8]. Conversely, 1 and 3 years-follow up studies regarding weight outcomes, showed that neither depression nor binge eating disorder were

consistently associated with differences in weight outcomes and some research suggests that patients with bipolar disorder and schizophrenia achieve comparable weight loss to controls without mental illness [9]. Such opposite evidences suggest that a clear scientific model to address clinical choices in this area is still far from being defined. It seems that difficulty and opposite results in highlighting good outcome predictor factors is due to the limited kind of approach of current strategies, which use different scales and focus on mental health diagnoses according to DSM-5 rather than to psychosocial, personality and psychopathological features of these candidates [10].

Some studies suggest that personality traits should be included in the comprehensive assessment of individuals with obesity, since personality seems to be the strongest predictor for the development of Binge-Eating Disorder (BED) among subjects with obesity and some personality traits, as self-directedness, demonstrated lower scores in subjects with obesity compared to controls [11].

The Temperament and Character Inventory (TCI) may be one of the most important psychometric tests able to give information on the way in which people perceive themselves and the environment, providing possible personality patterns involved both in the onset of obesity and in the compliance with the post-bariatric surgery indications [12]. Sullivan and colleagues [13] showed that TCI dimensions are able to distinguish, within the subjects with obesity, those who will effectively enroll in a weight management program.

The aim of this study is to explore psychopathology traits, eating behavior, personality and attachment characteristics in a sample of participants with obesity that choose to undergo bariatric surgery, in participants with obesity that do not choose this approach and in healthy subjects. To find out differences in these measures could be useful for the management of these patients. A better knowledge of personality and psychopathology profile of these

patients may represent a guide for programming therapeutic interventions (eventually included psychiatric or psychological support) to favor the best possible outcomes.

Material and methods

Subjects

Two groups of participants with obesity have been enrolled between November 2011 and March 2016. All the patients consecutively admitted at the Outpatients Service who met inclusion criteria were enrolled in each branch of the study. In the first group they were included 160 subjects (M= 24; F=136) consecutively presented and requesting for bariatric surgery at the outpatients service of the Bariatric and General Surgery Service of the City of Health and Science of Turin. These participants were all those who had been found suitable for bariatric surgery after a consultation with an expert surgeon who selected and managed them on the basis of the 1992 US National Institutes of Health (NIH) consensus statement guidelines for bariatric surgery as revised in 2005 [14]. In particular, bariatric surgery candidates should have attempted to lose weight by nonoperative means, including self-directed dieting, nutritional counseling, and commercial and hospital-based weight loss programs, but should not be required to have completed formal nonoperative obesity therapy as a precondition for the operation. Requested BMI is 40 or at least 35 if accompanied by such comorbidities as diabetes, hypertension, arthritis limiting daily function, and cardiopulmonary failure. Other inclusion criteria include the patient's ability to understand the surgery and the consequences of the treatment, to comply with long-term follow-up, to agree to maintain vitamin and mineral supplementation, and to report problems promptly to specialists familiar with the complications of bariatric surgery. According to the present protocol the contraindications represented by uncontrolled emotional disorders and drug or alcohol abuse were demanded to the psychiatric evaluation. These did not exclude the subjects from the present research, but only from the surgical intervention. The obese participants referred to the psychiatric visit represented the 85% of all patients asking for a

surgical consultation (n = 188), since 28 subjects (15%) were judged inidoneous for the intervention by the surgeon, based on physical conditions.

The enrollment of the participants for the present study was done at the Outpatient Service of the Expert Centre for Eating Disorders of the City of Health and Science of Turin where the patients were sent by the surgeons to perform the psychiatric assessment after the first surgical visit. The psychiatric visit was meant to assert possible psychiatric disorders potentially interfering with bariatric surgery management (e.g. acute bulimia nervosa [BN], major depression, acute psychosis, drug or alcohol dependence etc.) and to establish adequate treatments (e.g. prescription of a drug treatment or psychotherapy) or exclusion from surgery. For the aims of the study bariatric participants selection was made according to the following inclusion criteria: 1) age > 20 and < 50; 2) no intellectual disability or developmental or learning disorders; 3) no psychosis or neurological disorders (e.g., multiple sclerosis, stroke); 4) no history of dementia or sequelae of severe head trauma. The age limits (20-50 y) were chosen because of the high number (more than 95%) of requests for surgery within this age range and the need to produce a relatively homogeneous “adult” group for psychometric tests (in particular the personality tests display a progressive modification with age). The other criteria were chosen to grant the highest possible validity for personality and psychopathology self-assessment. The psychiatric visit included accurate anamnesis, SCID-I administration [15], and psychometric testing. According to the psychiatric evaluation 4 participants (2.5%, 1 with BN, 2 affected with severe cluster B personality disorder with alcohol abuse and one with schizotypal personality disorder) were excluded from bariatric surgery but included in the database of our Outpatients Service because eligible form a medical point of view. Instead, 32 participants (20%, 24 with BED and the others with mild to moderate depression or anxiety disorders) received a prescription of antidepressant drugs and/or psychotherapy for their symptoms, and then proposed for surgery after recovery from

psychiatric symptoms. These subjects were also included in the present database. Conversely, the participants that were not surgical candidates (i.e. not eligible from a medical point of view) were excluded from the present analyses.

The second group consisted of 219 (M =35; F=184) individuals with obesity coming from general population and searching for non-surgical obesity treatment and consecutively admitted for a psychiatric evaluation at the outpatients service of the Expert Centre for Eating Disorders of the City of Health and Science of the University of Turin. This group of participants with obesity may also include some subjects excluded from the bariatric surgery after the surgical examination (but not the subjects excluded from surgery after the psychiatric evaluation) who did not declare their previous surgical assessment. In fact this who would have been an exclusion criterion from this branch of the study. We applied the same psychopathological inclusion criteria for the study which were applied for the bariatric group to avoid a recruitment bias. A total of 11 subjects (7 subjects younger than 20, 3 subjects with intellectual disability, 1 subject with acute psychosis) were selected out of the initial group of 231 subjects admitted to the assessment procedure, and thus they were not included in the present study.

The control group was represented by 304 healthy subjects (M= 80; F= 224) selected on the basis of the above mentioned age range (20-50 y) from a database of the Neuroscience Department, Psychiatry Section including healthy subjects of both sexes, voluntarily enrolled at school lessons, medical or cultural meetings, or using personal contacts from general population, with an age range from 16 to 70 years-old. These subjects have been screened for psychiatric disorders, intellectual disability, developmental or learning disorders, or neurological disorders (e.g., multiple sclerosis, stroke), history of dementia or sequelae of severe head trauma at the moment of recruitment. These participants were selected in different time frames for different study purposes as “healthy subjects” (HS), this granted the

higher possible heterogeneity and representativeness of general population. According to DSM criteria, no specific selection was made as concerns body weight, nevertheless the screening for eating disorders avoided the inclusion of BN and BED or even **ED NOS (Eating Disorder not otherwise specified) overweight subjects; healthy controls were not included if they had an ED according to DSM.**

Procedure

All participants followed the same procedure. During the psychiatric evaluation the semi-structured interview with the SCID-I explored the presence of an eating disorder or other psychiatric disorders according to DSM IV-TR (2000). In order to collect clinical data of the sample during this first evaluation, anthropometric parameters were measured: weight, height and body mass index (BMI). A battery of specific tests were then administered to the participants and to the control group in order to collect psychopathological, personality and attachment characteristics of the sample; this battery includes:

- The Temperament and Character Inventory (TCI; [16]) is an instrument for the dimensional assessment of personality. It is divided into seven dimensions, four of which assess temperament: Novelty Seeking; Harm Avoidance; Reward Dependence and Persistence. The other three dimensions assess character: Self-directedness; Cooperativeness and Self-transcendence.
- The Attachment Style Questionnaire (ASQ; [17]) is a 40-item self-report questionnaire on attachment style. The measure includes 5 dimensions: confidence, discomfort with closeness, need for approval, preoccupation with relationships and relationships as secondary.
- The Beck Depression Inventory-II (BDI-II; [18]) is used to measure the presence and severity of depressive symptoms. Clinical cut off is generally fixed at 16.

- The Symptom Checklist-90 (SCL-90; [19]) is a multidimensional inventory designed to evaluate a wide spectrum of psychopathological symptoms. It is composed of 90 items organized into nine primary symptom subscales.: somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism.
- The Eating Disorder Inventory-2 (EDI-2; [20]) is a self-report inventory that measures disordered eating attitudes, behaviors and personality traits common to individuals diagnosed with Eating Disorders.
- The Binge Eating Scale (BES; [21]) investigates psychological variables related to binge eating. The cut off is generally fixed at 18 to discriminate the presence or the absence of a binge eating attitude.
- The Toronto Alexithymia Scale (TAS-20; [22]) is a measure of deficiency in understanding, processing, or describing emotions. The total score is the sum of three subscales: Difficulty Describing Feelings; Difficulty Identifying Feelings and Externally Oriented Thinking.

Ethics

All recruited participants and controls provided written informed consent to this study. All the procedures were conducted according to the 1995 Declaration of Helsinki as revised in Edinburgh in 2000. The self-administration of the psychometric tests used for this research is a routine assessment practice with patients affected with obesity, thus according to guidelines of the Ethical Committee of the AOU City of Health and Science of Turin the approval for this study was not requested.

Statistical Analysis

The ANOVA test was applied to continuous socio-demographical and clinical variables (e.g. age, BMI, BDI-II) while the χ^2 test was applied to categorical variables (e.g. gender distribution) to evaluate the difference between participants with obesity that choose to undergo bariatric surgery (B), participants with obesity that do not choose this approach (NB) and healthy subjects (HS). Bonferroni post hoc analysis was then applied. Due to the high number of variables considered, to avoid type II errors, it was considered significant a $p \leq .001$.

To discriminate the role of the age and depression on the differences between groups (since both have shown a significantly difference between groups), we applied a multivariate analysis (ANCOVA) using age and BDI as covariate on the analysis of the differences in psychometric indices between B, NB and HS. A post hoc analysis was applied to detect any differences between the three groups.

A logistic regression analysis between the two groups of participants with obesity was applied to the variables which significantly differentiated the groups to evidence the variable which independently predicted the belonging each group, thus reducing the variables for the regression analysis. The outcome variable was the searching of bariatric surgery or not.

Two separate multiple linear regression analysis were performed within each obese group looking for the relationship between the dimensions which predicted group membership and the variables which characterized each group.

All statistical analysis were performed using the Statistical Package for Social Sciences (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp). In consideration of the explorative nature of the study it was considered a $p < .05$ for significance threshold in the analysis following the ANOVA.

Results

Socio-demographical and clinical characteristics of the sample.

Table 1 displays the ANOVA comparison of socio-demographical and clinical characteristics between bariatric surgery candidates (B), participants with obesity not seeking for surgery (NB) and healthy subjects (HS). Concerning socio-demographical characteristics, B and NB showed higher age with respect to HS. Concerning clinical characteristics, NB showed intermediate BMI between B and HS. B showed an intermediate profile between NB and HS also with respect to BDI-II score.

[insert table 1 here]

Multivariate analysis (ANCOVA) of psychopathological, personality and attachment characteristics of the sample using age and BDI as covariates.

Table 2. displays differences in psychopathological, personality and attachment variables between the three subgroups using age and BDI as covariates.

Concerning personality, participants with obesity showed higher harm avoidance ($p < .001$) and lower self-directedness with respect to HS. At post hoc analysis, B showed an intermediate profile between B and HS and they showed an higher reward dependence with respect to HS ($p < .001$).

Concerning eating behavior, participants with obesity showed higher scores in bulimia ($p < .001$) and social insecurity ($p < .001$) with respect to HS **as measured by** EDI-II. Post hoc analysis showed that B have an intermediate profile between NB (higher score) and HS (lower score). Participants with obesity showed also higher BES score with respect to HS ($p < .001$). Post hoc analysis revealed an intermediate score of B with respect to NB (higher) and HS (lower).

Concerning psychopathology, participants with obesity showed higher scores **as measured by** SCL-90 total score ($p < .001$) with respect to HS. Post hoc analysis showed that B have an intermediate profile between NB (higher score) and HS (lower score).

Concerning attachment and alexithymia assessment, participants with obesity showed higher scores in need for approval ($p < .001$) and higher scores in all the subscales of TAS-20: difficulty describing feelings ($p < .001$), difficulty identifying feelings ($p < .001$) and Externally-Oriented Thinking ($p < .001$) and in TAS-20 total score ($p < .001$). **Post hoc analysis revealed no significant differences between NB and B. No intermediate profile been shown.**

[insert table 2 here]

Logistic regression analysis between B and NB obese groups

Logistic regression analysis allowed the identification of two variables as possible predictors for seeking bariatric surgery: harm avoidance ($p < .005$) and bulimia ($p < .049$). Statistical features and level of significance were reported in Table 3.

[insert table 3 here]

Multiple linear regression analysis within each obese group

In the NB group harm avoidance evidenced **an inverse association with the self-directedness, while bulimia displayed a direct association with BES and an inverse association with cooperativeness** (Table 4). No significant association was found between harm avoidance and bulimia for the B group.

[insert table 4 here]

Discussion

Differences between obese participants and HS.

Consistent with previous findings, participants with obesity of our study were characterized by psychopathological suffering and attachment troubles. Obesity itself, and not only the BED, results as a clinical condition carrying psychopathological problems that require a multimodal therapeutic approach including psychiatric and psychological care [6].

Obese participants, regardless from the clinical subgroup, differed from the healthy subjects for the higher need for approval, difficulty in describing and identifying feelings, and difficulty in externally oriented thinking, showing a possible impairment of emotional functioning. These evidences support the existence of a psychosomatic core for the obesity syndrome and possible common roots with the eating disorders. Obese subjects may be vulnerable because of unmet needs of approval which have been already evidenced as core elements of eating disorders [23]. On the other hand they display difficulties in managing their unpleasant emotions using thought and verbalization oriented towards others, possibly because of their high levels of alexithymia. So they may not express their requests explicitly but may somatize them as “concretized metaphors”, similarly to what happens in eating disorders [24].

The relationship between alexithymia and eating behavior in obesity have been sparsely studied and poorly understood. Nevertheless some empirical evidence suggest a relationship between alexithymia and obesity [25]. Although other studies do not support this hypothesis [26], some evidence suggest that alexithymia could be a primary factor involved in obesity, independent of mood factors and eating attitudes [27].

The above described interpretation connecting the core relational deficits (attachment and management of emotions) of participants with the obesity **is** not only consistent with recent literature [28] but also permits a correlation with some recent biological findings on obesity.

An altered attachment pattern in obesity may result in an alteration of physiologic and behavioral responses to psychological stress mediated by neuroendocrine pathways, such as those involving cortisol, insulin, leptin, and neuropeptide [29]. Recent findings sustain that people with a secure pattern of attachment are more easily comforted in stressful situations and are more able to regulate negative emotions [30]. Secure attachment may thus reduce the risk for obesity by preventing frequent or exaggerated stress responses from disrupting the normal functioning and development of physiologic systems that affect energy balance and body weight [31].

Taken together our results suggest that attachment and alexithymia represent distinctive features of subjects with obesity: their insecure attachment style and difficulty in emotional management could have a strong impact on the relationship with the therapist and the surgeons [32]. In the long-term a possible goal will be to identify how the attachment style and the quality of the patient-clinician relationship may be prognostic factors for weight reduction, either with nutritional or surgical approaches. These features may suggest more specific therapeutic indications for each patient. [33].

Differences between B and NB

From a psychiatric point of view a major issue for bariatric surgery is represented by the interference of psychiatric disorders with the management of the surgical intervention [5]. This issue can be viewed from two standpoints: “Do the motivations that drive subjects to choose bariatric surgery represent a signal of a worse psychopathological and clinical condition or, conversely, do they represent a marker of a greater awareness of the disease?” [34]. Some authors hypothesized that subjects who choose surgery are less willing to follow a dietary regimen and less aware of the risks associated with the surgical choice. Other authors hypothesized that these participants are more aware of their disease and of consequent physical complications, then their choice of surgery represents a way to start an effective

treatment with a self-conservative motivation instead of a self-punitive and aggressive attitude towards an unsatisfying body [35].

Our research gives a substantial support to the second hypothesis. The comparison between surgical and nonsurgical participants with obesity shows that participants seeking for bariatric surgery have intermediate personality features between participants with obesity not seeking for bariatric surgery and healthy subjects. This coincides with a lower degree of anxiety and avoidance of frustration, a greater self-determination and awareness about their own goals, and a greater capacity to rely on others in a mature and self-conservative way (e.g. better self-care, research of treatments, surgery choice) [36].

This “resilient” personality profile is **supported by** psychopathological indices and eating measures. In fact bariatric candidates appeared to be less affected by depressive and anxiety symptoms. They also showed less inclination towards uncontrolled eating behavior. These evidences together **support the idea that** our bariatric population is a healthier and well-functioning sub-population of participants with obesity thus presenting positive outcome indices which support the indication towards a bariatric intervention from a psychiatric point of view [5].

This evidence is in contrast to previous results that describe higher rates of psychiatric disorders and dysfunctional eating attitudes in candidates for bariatric surgery [7]. A possible interpretation of this discrepancy is that the high amount of psychopathology reported in earlier studies may not describe the current bariatric surgery population that may differ from the past also because of the current better perception of bariatric surgery [3-4]. Thus, bariatric candidates of our sample might have been more prone to the surgical option thanks to the minor influence of depressive thoughts (like pessimism, discouragement) and anxious symptoms (as worries about consequences of their choices). The lower harm avoidance (TCI) and bulimia (EDI-2), might influence participants’ attitudes towards the surgical choice

through different but convergent patterns. The first feature represents a genetic disposition towards lower anticipatory worry and pessimism and higher confidence with the unknown [36]. The other is a specific indicator of lower eating psychopathology and eating suffering. The clinical evaluation performed by the surgeon before addressing the subject to the psychiatric examination was explicitly not addressed to identify psychopathologic problems. Nevertheless the surgeons may have involuntarily selected the participants in the bariatric group on the basis of personality or other “presentation” features. Moreover the uncontrolled eating behaviors which are generally associated with concurrent psychopathology [9] might have involuntarily pushed the surgeons to discourage the surgical option for the obese participants with binge-eating, even though recent literature does not discourage, or even encourages, surgical treatment also for the obese subjects affected with the BED [10]. Alternatively, surgeons may have involuntarily excluded psychiatric subjects among those which they supposed to display lower ability to cooperate with post-surgical management [5]. This undeclared selective attitude reported by Fabricatore and coworkers [37] was described as prospective of “impression management” in bariatric surgery candidates, nevertheless due to the low rate of exclusion from surgery it should not have had a great influence in the final characteristics of the bariatric sample. On the other hand, it is more probable that the more anxious or depressed obese individuals adequately informed (e.g. by general practitioner or internet) about the surgical risks and requests for post-surgical management spontaneously refrained to ask for bariatric surgery visit.

Conclusion

Both surgery candidates and obese participants non searching for surgery display attachment troubles and high alexithymia **compared to healthy controls**. **These** may interfere in their relationship with caregivers and should be considered by treatment programs.

Nevertheless two separate populations of participants with obesity emerged from the present study. Our findings suggest that bariatric population is a subgroup which displays less personality or psychopathology disturbances with respect to non-bariatric participants. Thus in our sample the demand for bariatric surgery **may** represent a “marker of a greater awareness of the disease” in subjects with self-conservatives attitudes who do not display self-aggressive intentions [34].

Even though our methodology tried to reduce recruitment biases, the bariatric participants **may have undergone** some kind of selection as “impression management”. If so, our findings evidence that this impression widely corresponds with personality and psychopathology features identifying a “resilient” profile among subjects with obesity. **It would be important for future studies to consider assessing and controlling for a measure of underreporting in order to rule out potential impact on this point.**

According to the NIH guidelines, a pre-surgical psychometric evaluation coupled with a psychiatric assessment represent an easy, quick and more objective instrument to explore participants’ personality and psychopathological features, avoiding unduly exclusion from bariatric surgery [38].

Further follow-up research is needed to support the predictive value of the present finding of a “resilient” personality and psychopathology profile as a specific indication for bariatric surgery, to improve assessment targets and optimize treatments [7].

Limits

Limitations of this study include some methodological aspects. In the present investigation

the psychiatric interview and test administration follow the first surgical assessment and precede the admission to surgery. As discussed before, the surgeons may have involuntarily de-selected some participants asking for surgery because of their bad general functioning. The authors and the cooperating surgeons estimate that it should be low since the subjects excluded by the surgeons were few and only physical problems were considered. Nevertheless the high risk of comorbidity between physical and psychopathological problems may produce an underestimation of the bias. Some limits are consequent to the use of self-administered tests: the subjects with obesity requesting a surgical intervention may have answered in a more social desirable way given that their answers will be used to decide whether they can be operated or not. In fact studies with an independent evaluation interview show a higher prevalence of psychiatric disorders than studies that did not have an independent assessment process [34]. The assessment was conducted using the DSM IV criteria which do not completely overlap with current DSM 5 criteria. Moreover, the cross-sectional nature of the research and the limited number of males does not allow to generalize our findings to all population of subjects with obesity. Moreover, exclusion criteria may have impacted findings in terms of making this population appear healthier when compared to other literature.

Future longitudinal research is necessary to confirm the relevance of our findings for the good outcome of treatments on this surgical population.

Compliance with Ethical Standards

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (Protocol number: CEI/17 0028836)

Informed consent

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

Data availability

The datasets analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

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