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Psychological characteristics and associations with weight outcomes two years after gastric bypass surgery: Postoperative eating disorder symptoms are associated with weight loss outcomes

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ABSTRACT

This study investigated symptoms of eating disorder, depression, and anxiety among Roux-en-Y gastric bypass patients two years after surgery, and the relationship between these characteristics and weight loss. Respondents completed assessment questionnaires including Eating Disorder Inventory-2 (EDI-2), Harvard Anxiety and Depression Scale (HADS), and questions related specifically to binge eating. Forty-five patients (8 men, 37 women) out of 65 (67%) responded. Scores were significant higher on impulse regulation, interoceptive awareness, ineffectiveness, maturity fears and interpersonal distrust in comparison with a Danish norm group ($p \leq 0.05$). The weight losses obtained after surgery varied from 12 to 60% of the starting weights. Binge eating and ineffectiveness were found to significantly correlate with weight loss variations after surgery ($p \leq 0.05$). The results of this study indicate that knowledge of the potential influence of eating disorder symptoms on outcomes after bariatric surgery is needed in order to optimize weight outcomes following surgery.

1. Introduction

Research has shown 20–30% of all bariatric surgery patients regain a significant amount of weight 18–24 months after surgery (Angrisani, Lorenzo, & Borrelli, 2007; Sjostrom et al., 2004). The reoccurrence of psychological problems and especially symptoms of binge eating (BED) (Larsen et al., 2004; Livhits et al., 2010; Scholtz et al., 2007) after surgery have been related to a poorer weight loss. However, based on a systematic literature review van Hout, Verschure, and Van Heck (2005) conclude that research concerning potential associations between psychological factors and weight loss after bariatric surgery has yielded different results and impedes the possibility to draw firm conclusions.

Therefore, more research is needed in order to understand the psychological characteristics of patients treated with bariatric surgery and potential associations between these characteristics and weight loss outcomes. On this background, the present study investigated associations between psychological characteristics and weight loss results, using a cross-sectional design in postsurgical patients treated with gastric bypass surgery app. two years previously. More specifically, symptoms of depression and anxiety, and eating disorder characteristics with particular interest in the nature of BED were explored in relation to weight loss.

2. Materials and methods

2.1. Subjects

The present sample included patients treated with Roux-en-Y gastric bypass surgery in 2008–2009 at Odense University Hospital in Denmark. The sample included 65 participants. Of these, 45 patients (67%) accepted to participate in the study. Patients had tried non-surgical interventions against obesity before undergoing surgery. Also, patients were informed that they were not guaranteed a successful weight loss, and had to lose 8% of their body weight through diet and exercise before surgery. Patients were obliged to participate in an extensive preparation programme, where they were given instructions in potential risks and complications, expectations to surgery, vitamin substitution and dumping symptoms. In accordance with the Danish guidelines (Assessment, D. C. f. H. T., 2007) the operation was not offered for patients with severe psychological problems, such as severe depression or personality disorder. Also, people with mental retardation or individuals with addiction to alcohol or illegal drugs were generally denied gastric bypass surgery. After the operation patients received a medical follow-up on vitamin status and potential medical complications.

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2.2. Procedure

Participants were identified through medical databases. Pre-surgery information regarding demographic variables and weight status were extracted from medical charts. Further information was gathered through questionnaire. Patients who did not return the questionnaire were contacted by phone to determine, whether they had received the questionnaire and/or did not want to participate in the survey.

2.3. Materials

Eating Disorder Inventory-2 (EDI-2) was used to assess eating disorder symptoms (Garner, Olmstead, & Polivy, 1983). EDI-2 contains 91 items related to 11 subscales (Eberenz & Gleaves, 1994). The subscales 'drive for thinness' and 'body dissatisfaction' were not included in the final survey, as it is expected that many patients have chosen to undergo surgery because of some degree of body dissatisfaction, and with the main goal to lose weight. In the current study, reliability analyses showed an acceptable internal consistency on the subscales of 'ineffectiveness' ($\alpha = 0.87$), 'perfectionism' ($\alpha = 0.68$), 'interpersonal distrust' ($\alpha = .84$), 'interoceptive awareness' ($\alpha = 0.68$), 'maturity fears' ($\alpha = 0.85$), 'asceticism' ($\alpha = 0.80$), 'impulse regulation' ($\alpha = 0.89$) and 'social insecurity' ($\alpha = 0.76$). Only the subscale of 'bulimia' ($\alpha = 0.44$) did not show an acceptable internal consistency.

BED was assessed with specific questions. Due to the restrictive properties of the surgery, patients treated with gastric bypass may not fulfil the original criteria of BED according to Diagnostic and Statistical Manual of Mental Disorders, DSM-IV (American Psychiatric Association, 1994). Therefore, a binge eating survey (BE) was developed that consisted of 6 items asking whether patients had experienced any of the following symptoms two times a week during the last six month: 1) eating a larger amount of food than normally expected from patients treated with gastric bypass surgery, 2) lack of control over eating, 3) feeling disgusted, depressed, or guilty after overeating, 4) continues eating despite feeling uncomfortable, 5) eating alone because of embarrassment, and 6) dumping. Reliability analysis showed an acceptable internal consistency for the short BE-scale ($\alpha = .75$).

The Hospital Anxiety and Depression Scale (HADS) was used to screen for mood disorders (Zigmond & Snaith, 1983). HADS contains 14 items on a four-point response scale, which are summed to separate scores on anxiety (HADS-A) and depression (HADS-B). A score of 8–10 points is considered a high level of symptoms of anxiety or depression, whilst a score above 11 points is indicative of a regular anxiety or depressive disorder (Zigmond & Snaith, 1983). In the current study, the internal consistency was good for the anxiety scale ($\alpha = 0.82$), and acceptable for the depression scale ($\alpha = 0.67$).

Age, gender, weight status (kg) and body mass index (bmi/kg/m^2) before surgery were extracted from medical databases. Patients were asked to report their current weight in the questionnaire. Weight loss is recommended to be reported as percent of excess body weight loss or change in BMI (Deitel & Greenstein, 2003). In the current study, change in BMI was chosen as the measure for weight loss. BMI change was calculated as %BMI loss ((highest BMI before surgery − follow-up BMI)/operative BMI × 100).

2.4. Analyses

All analyses were conducted using SPSS version 19, and $p \leq .05$ was set as the level of statistical significance. Following the procedure described in Schafer and Graham (2002) missing items in psychometric rating scales were substituted by the individual respondent's mean score on the respective scales, when missing items did not constitute more than half of the answered items. An independent-sample *t*-test was performed to investigate whether scores on the EDI-2 subscales were elevated compared to the Danish normal range and an eating disorder population. To investigate the relationship between psychological variables related to weight loss and weight increase after surgery, a multiple linear regressions analysis was performed. Assumptions of normality were checked for the dependent variable.

3. Results

3.1. Descriptives

The mean follow-up interval after surgery was 23.2 months (SD 4.35) (range 14–30 months). The group consisted of 37 females and 8 males with a mean age of 43.6 years (SD 9.16). The mean BMI before surgery was 46.06 (SD 5.76). Patients' mean BMI decreased from 46.06 pre-surgery to 35.3 post-surgery. Patients achieved and average decrease in BMI of 35.43% (SD 10.69), but considerable individual variation existed. Post-surgery BMI ranged from 18.04 to 43.55, and %BMI loss varied from 12.10 to 59.56%.

3.2. Mood and anxiety disorder

The mean score on HADS-A was 5.15 (SD 3.64) and 2.15 (SD 2.52) on HADS-D. Of the respondents, 20% scored nine points or higher on HADS-A, and 9% scored 12 points or higher. No participants scored higher than 11 points on HADS-D, and two patients scored 8–10 points.

3.3. Eating disorder behaviour

In relation to binge eating symptoms, 27% of the patients had experienced three or more symptoms of binge eating. The most frequent experience was eating portions of food larger than normally recommended (42%). Dumping (36%), lack of control when eating (35%) and feelings of guilt, shame and blame after eating (37%) were also quite common experiences. Experiences of continuing eating despite feeling uncomfortable was reported in 7% of the participants and 7% reported eating alone due to feelings of embarrassment.

Scores on EDI-2 subscales for the gastric bypass population were compared to a Danish normal range group and an eating disorder population (Fig. 1) (Clausen, Rokkedal, & Rosenvinge, 2009). The Danish control subjects were not matched in age and sex to the current gastric bypass population.

An independent-sample *t*-test was conducted to investigate whether gastric bypass patients' scores were significant higher compared to the Danish control group. Gastric bypass patients scored significantly higher on the scales of 'impulse regulation' ($t = 5.10$; $p \leq 0.0001$), 'interoceptive awareness' ($t = 4.07$, $p \leq 0.0001$), 'ineffectiveness' ($t = 2.32$, $p \leq 0.02$), 'maturity fears' ($t = 2.85$; $p = 0.004$), and 'social insecurity' ($t = 1.19$; $p = 0.05$) compared to the control group. The gastric bypass patients scored significant lower on seven of the nine EDI-2 scales compared to

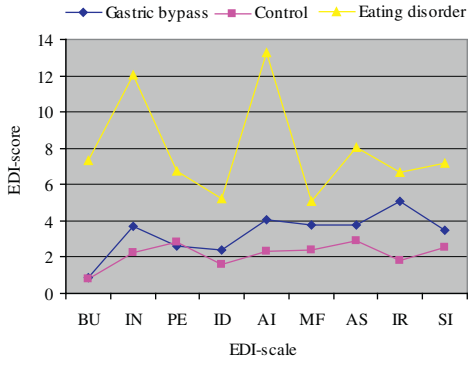

Fig. 1. EDI-2 scale scores. Gastric bypass patients, control subjects, and eating disorder patients.

the eating disorder population. On the scales of 'impulse regulation' and 'maturity fears' the difference between the gastric bypass population and eating disorder individuals was not statistical significant.

3.4. Associations between psychological variables and weight loss

To investigate whether eating behaviour and psychiatric symptoms affect weight loss after surgery, a multiple linear regression analysis was performed. %BMI loss was set as the dependent variable, and symptoms of binge eating, depression, and anxiety as the independent variables. The 'ineffective' subscale from EDI-2 was also included as an independent variable because of a significant correlation with %BMI loss ($r = 0.300$, $p \leq 0.05$). Age and BMI before surgery was entered as covariates.

Symptoms of binge eating ($\beta = -0.29$, $p \leq 0.05$) and ineffectiveness ($\beta = -0.37$, $p \leq 0.05$) were found to make significant independent contributions to %BMI loss. Symptoms of depression and anxiety, age, and BMI before surgery did not make a statistical significant contribution to %BMI loss (Table 1).

4. Discussion

In the present model binge eating symptoms and ineffectiveness were related to poorer weight loss results two years after gastric bypass surgery. These results are in concordance with other studies consistently showing that the presence of binge eating after surgery is related to a lower weight loss (Larsen et al., 2004; Livhits et al., 2010; Niego, Kofman, Weiss, & Geliebter, 2007; Scholtz et al., 2007), and authors advise against considering surgery a cure for pre-surgical eating pathology (Niego et al., 2007). Additionally, results showed that the gastric bypass patients had a poorer interoceptive awareness, impulse regulation and higher feelings of ineffectiveness, maturity fears, and social insecurity compared to a control group. Interoceptive awareness is supposed to reflect the person's lack of confidence in recognizing and accurately identifying emotions and sensations of hunger and satiety (Garner et al., 1983). The 'impulse regulation' scale assesses the individual's propensity towards impulsive acts such as substance abuse and self-destructiveness. Researchers have speculated whether there might be associations between poor impulse control and difficulties with regulation of food intake (Sansone, Schumacher, Wiederman, & Routsong-Weichers, 2008). A higher level of ineffectiveness compared to the control subjects was also found. Ineffectiveness measures feelings of inadequacy, insecurity, worthlessness and a feeling of not being in control in one's own life (Garner et al., 1983). Gastric bypass patients in this study also displayed more feelings of maturity fears and social insecurity. Maturity fears are described as a wish to retreat to the childhood because of the overwhelming demands of adulthood, and social insecurity is defined as the individuals feeling of alienation and reluctance to form close relationships with other (Spillane, Boerner, Anderson, & Smith, 2004). These findings indicate that although studies have shown a reduction in eating disorder symptoms after receiving gastric bypass surgery (Leombruni et al., 2007), the current findings indicate that increased dysfunctional eating habits and feelings of inadequacy persist up till two years after surgery compared to a control group. The gastric bypass population, however, did not show eating disorder symptoms to the same extent as those found in traditional eating disorder populations (e.g. bumilia nervosa and anorexia nervosa).

Table 1
Multiple regression analysis, %BMI loss.

	β	sig.
Binge eating	0.29	0.05
Ineffectiveness	0.37	0.05
Anxiety	0.30	0.16
Depression	0.39	0.11
Age	−0.26	0.08
BMI baseline	0.19	0.18

Adjusted R square: 0.186.

4.1. Strengths and limitations

The results of this study must be interpreted in the context of several limitations. First, the cross-sectional design limits the ability to examine causal relationships between psychological factors and weight loss. Second, EDI-2 is originally developed to assess common psychological and behavioural traits in anorexia nervosa and bulimia (Garner et al., 1983), and the current gastric bypass population were not matched in age and sex to the control groups. Third, binge eating symptoms were assessed in an explorative manner with questions developed specifically for this research purpose. In final, data on post-operative weight were obtained using self-report which could be biassed.

5. Conclusion

In the present study symptoms of binge eating and feelings of ineffectiveness after surgery were significantly associated with weight loss variations two years after gastric bypass. More knowledge of the potential negative influence of eating disorders symptoms and psychological factors on outcomes after bariatric surgery is needed in order to optimize weight outcomes following gastric bypass surgery.

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Contributors
Nina Beck, Mimi Mehlsen and Rene Støving designed the study and wrote the protocol. Rene Støving and Nina Beck included participants in the study. Mimi Mehlsen and Nina Beck conducted the statistical analyses. Nina Beck wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of interest
All authors declare that they have no conflicts of interest.

References

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington D.C.: American Psychiatric Association.
Angrisani, L., Lorenzo, M., & Borrelli, V. (2007). Laparoscopic adjustable gastric banding versus Roux-en-Y gastric bypass: 5-year results of a prospective randomized trial. *Surgery for Obesity and Related Diseases*, *3*(2), 127–132.
Assessment, D. C. f. H. T. (2007). Kirurgisk behandling af svær overvægt. *Medicinsk teknologi vurdering*, *9*(3) (Retrieved from: http://www.sst.dk/publ/Publ2007/MTV/Kirurgi_overvaegt/564215_indhold_nettet.pdf).
Clausen, L., Rokkedal, K., & Rosenvinge, J. H. (2009). Validating the eating disorder inventory (EDI-2) in two Danish samples: A comparison between female eating disorder patients and females from the general population. *European Eating Disorders Review*, *17*(6), 462–467. http://dx.doi.org/10.1002/erv.945.
Deitel, M., & Greenstein, R. (2003). Recommendations for reporting weight loss. *Obesity Surgery*, *13*(2), 159–160. http://dx.doi.org/10.1381/096089203764467117.
Eberenz, K. P., & Gleaves, D. H. (1994). An examination of the internal consistency and factor structure of the eating disorder inventory-2 in a clinical sample. *The International Journal of Eating Disorders*, *16*(4), 371–379.
Garner, D. M., Olmstead, M. P., & Polivy, J. (1983). Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *The International Journal of Eating Disorders*, *2*(2), 15–34. http://dx.doi.org/10.1002/1098-108x(198321)2:2<15::aid-eat2260020203>3.0.co;2-6.
Larsen, J., van Ramshorst, B., Geenen, R., Brand, N., Stroebe, W., & van Doornen, L. (2004). Binge eating and its relationship to outcome after laparoscopic adjustable gastric banding. *Obesity Surgery*, *14*(8), 1111–1117. http://dx.doi.org/10.1381/0960892041975587.
Leombruni, P., Piero, A., Dosio, D., Novelli, A., Abbate-Daga, G., Morino, M., et al. (2007). Psychological predictors of outcome in vertical banded gastroplasty: a 6 months prospective pilot study. *Obesity Surgery*, *17*(7), 941–948.
Livhits, M., Mercado, C., Yermilov, I., Parikh, J. A., Dutson, E., Mehran, A., et al. (2010). Behavioral factors associated with successful weight loss after gastric bypass. *The American Surgeon*, *76*(10), 1139–1142.

Niego, S. H., Kofman, M. D., Weiss, J. J., & Geliebter, A. (2007). Binge eating in the bariatric surgery population: A review of the literature. *The International Journal of Eating Disorders*, *40*(4), 349–359. http://dx.doi.org/10.1002/eat.20376.

Sansone, R. A., Schumacher, D., Wiederman, M. W., & Routsong-Weichers, L. (2008). The prevalence of binge eating disorder and borderline personality symptomatology among gastric surgery patients. *Eating Behaviors*, *9*(2), 197–202. http://dx.doi.org/10.1016/j.eatbeh.2007.08.002.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147–177.

Scholtz, S., Bidlake, L., Morgan, J., Fiennes, A., El-Etar, A., Lacey, J. H., et al. (2007). Long-term outcomes following laparoscopic adjustable gastric banding: Postoperative psychological sequelae predict outcome at 5-year follow-up. *Obesity Surgery*, *17*(9), 1220–1225.

Sjostrom, L., Lindroos, A. K., Peltonen, M., Torgerson, J., Bouchard, C., Carlsson, B., et al. (2004). Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. *The New England Journal of Medicine*, *351*(26), 2683–2693. http://dx.doi.org/10.1056/NEJMoa035622.

Spillane, N. S., Boerner, L. M., Anderson, K. G., & Smith, G. T. (2004). Comparability of the eating disorder inventory-2 between women and men. *Assessment*, *11*(1), 85–93.

van Hout, G., Verschure, S., & Van Heck, G. (2005). Psychosocial predictors of success following bariatric surgery. *Obesity Surgery*, *15*(4), 552–560. http://dx.doi.org/10.1381/0960892053723484.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, *67*(6), 361–370.