Predictors for Treatment Outcome of Binge Eating With Obesity: A Naturalistic Study

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This study examines predictors of short-term treatment outcome for obese individuals with binge eating disorder (BED). A battery of assessment questionnaires was given to 212 patients on admission of a CBT day-treatment program for BED. Treatment outcome assessed by changes in eating disorder symptomatology was measured in 182 completers. Linear regression analyses indicated that a combination of variables at baseline predicted 26% of the variance in treatment outcome. High social embedding and higher scores on openness (NEO-PI-R) were significantly related to more improvement after treatment. Higher scores on depressive symptoms (BDI), agoraphobia (SCL-90) and extraversion (NEO-PI-R) were significantly related to less improvement. The analyses show that the level of social embedding and psychopathological comorbidity (state and trait) are predictors for treatment outcome. This study confirms the notion that social context and comorbidity need to be taken into account as described in treatment guidelines of NICE and APA for BED.
Predictors of Treatment Outcome for Binge Eating With Obesity

INTRODUCTION

Binge Eating Disorder (BED), a provisional eating disorder diagnosis included in the 4th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association [APA], 1994), is currently gaining empirical support as a distinct diagnosis in the DSM-V (Striegel-Moore & Franko, 2008; Wonderlich, Gordon, Mitchell, Crosby, & Engel, 2009). BED is characterized by repeated binge eating without the use of regular compensatory behaviour present in Bulimia Nervosa (BN) (DSM-IV; APA, 1994). Excessive food consumption without compensation increases the risk for development of obesity, in turn associated with numerous medical problems (Eckel, 2008). Patients who present for treatment of BED are usually obese. The World Health Organization (WHO, 2012) defines obesity as serious overweight when the body mass index (BMI) equals or is above 30. A BMI equal or above 40 is defined as morbid obesity. Patients with BED have higher rates of most major psychiatric disorders than individuals without (Cassin & von Ranson, 2005; Hudson, Hiripi, Pope, Jr., & Kessler, 2007; Javaras et al. 2008). Empirical studies show that obese individuals with BED have much more impairment in psychosocial aspects of quality of life (e.g., work, sexual life, self-esteem) than obese individuals without binge-eating problems (Hudson et al., 2007; Rieger, Wilfley, Stein, Marino, & Crow, 2005). The pathology of patients with BED and obesity is severe. They also use high levels of health care (Hudson et al., 2007; Javaras et al., 2008).

Cognitive Behavioural Therapy (CBT) is currently the treatment of choice for BED (APA, 2006; National Institute of Clinical Excellence [NICE], 2004). But even this most empirically supported treatment for BED fails to help a substantial number of patients. More knowledge of predictive pretreatment variables can help clinicians direct towards appropriate treatment.

According to the APA (2006) and NICE (2004) guidelines, the severity of the eating-pathology, somatic and psychopathological co-morbidity, and social context (involved family members/carers) should be taken into account in the choice of treatment for eating disorders. Recent studies specifically found that the severity of negative affect, eating disorder psychopathology, self-esteem, and interpersonal problems (Hilbert et al., 2007; Masheb & Grilo, 2008) were predictive for treatment outcome in BED. Clinical consensus supports the involvement of close family members and carers in the treatment of BED. Only one study examined the impact of spouse involvement, but did not find an additional benefit of CBT with spouse involvement over standard CBT (Gorin, Le Grange, & Stone, 2003). Comorbidity of a personality disorder, especially dramatic-erratic personality disorder (PD), borderline PD, and corresponding traits (e.g., impulsivity), are associated with adverse treatment outcome (Bruce & Steiger, 2004).

With the literature and guidelines in mind we hypothesized more eating disorder pathology (body attitude) together with more psychopathological...
characteristics (negative affect, personality traits), more somatic problems
and less social embedding to predict a less favourable short-term treatment
outcome. Because from the DSM-V onwards, (APA, 2010) personality is
investigated in a more dimensional way and the guidelines include the con-
cept of “trait-orientated” interventions to optimize treatment we especially
looked at personality traits in this study.

The purpose of the current study is to integrate recent findings and
corroborate the recommendations stated in the guidelines. Patients with BED
and obesity, as they presented in daily practice of mental health care, were
provided a number of self report questionnaires before and after a CBT day
treatment program.

METHOD

Participants

Participants were 212 adult female patients who met DSM-IV (APA,
1994) research criteria for BED. They were admitted consecutively to a
day CBT treatment from April 2006 to April 2008 at Amarum.1 Of the
212 patients, 182 patients completed the treatment and 30 patients stopped
treatment prematurely. The mean age of the 182 patients was 35.1 years
(\(SD = 8.5\), range = 18–57 years). The mean BMI was 42.0 kg/m\(^2\) (\(SD = 7.2\),
range = 30–66 kg/m\(^2\)).

Setting

Patients between 18 and 60 years presented for treatment and were assessed
by a psychiatrist or a clinical psychologist. Patients with BED and obesity
were offered a 1-day group intervention per week for 20 weeks. The maxi-
mum absence was 3 days out of 20 weeks. A 1 day intervention contained
3 blocks (each 75 minutes) namely cognitive therapy, food diary record-
ing, and psychomotor therapy. Alongside the main program all patients
attended 6 additional group meetings (each 90 minutes) with their partner or
closest relative. The maximum absence was 1 meeting out of 6. These meet-
ings offered information about BED and how to support the patient. The
exclusion criteria were: concurrent treatment for eating and weight prob-
lems; severe mental disorders requiring other treatment (psychosis, bipolar
disorder); and pregnancy.

The program is based on the cognitive behavioural therapy princi-
Hawker (2003). The main goal of treatment was to regain control over binge

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1 Amarum is a specialist centre for eating disorder in Zutphen, the Netherlands, which provide
care for a catchment’s area of approximately one million people.
eating and to establish structured eating behaviours. This was achieved by behavioural modification and cognitive restructuring. Weight loss was not a goal in this treatment. Prevention of weight gain was. Nine patients were included per therapy group. The treatment was described in a manual and was led by a clinical psychologist.

Procedure

Several self-report questionnaires were given prior to the program and at the end of treatment. A research assistant attended self-report measurements and measured height and weight of patients. The hospitals’ administrative database contained demographic variables sex, age, employment status, educational status, housing status, weight, and height. All patients provided written informed consent. The study was approved by the hospital’s ethical review board.

Subjects were divided in five basic demographic categories:

a) Age above or below 35 (cut-off for mean age),
b) Education level (high-low; above or below high school),
c) Social embedding (high-low; either or not involved in a steady partner relationship or living with parents),
d) Paid work (yes-no), and
e) BMI above or below 40 (cut-off for morbid obesity).

The majority of the sample 143 patients (78.6%), scored high on our definition of social embedding and 124 patients (68.1%) scored low on education level. Approximately half of the patients (56.6%) had paid work (Table 1).

Measures

All questionnaires translated into Dutch are scientifically tested and rated with sufficient reliability and construct validity by The Committee on Test Affairs Netherlands (COTAN).

**Body Mass Index (BMI)**

The BMI was calculated from heights and weights measured at baseline evaluation, and again at post-treatment (20 weeks).

**Eating Disorder Inventory (EDI-II)**

The EDI-II (Garner, 1991) monitors the presence of psychological and behavioural eating disorder symptoms. The subscales Drive for Thinness,
**TABLE 1** Demographics and Mean Scores of Completers and Dropouts

<table>
<thead>
<tr>
<th></th>
<th>Completers (n = 182)</th>
<th>Dropouts (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35</td>
<td>92 (50.5%)</td>
<td>14 (46.7%)</td>
</tr>
<tr>
<td>&gt;35</td>
<td>90 (49.5%)</td>
<td>16 (53.3%)</td>
</tr>
<tr>
<td>SES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>124 (68.1%)</td>
<td>21 (70.0%)</td>
</tr>
<tr>
<td>High</td>
<td>58 (31.9%)</td>
<td>9 (30.0%)</td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>39 (21.4%)</td>
<td>13 (43.3%)</td>
</tr>
<tr>
<td>Embedding*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>143 (78.6%)</td>
<td>17 (56.7%)</td>
</tr>
<tr>
<td>Paid work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>79 (43.4%)</td>
<td>16 (53.3%)</td>
</tr>
<tr>
<td>Yes</td>
<td>103 (56.6%)</td>
<td>14 (46.7%)</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40</td>
<td>83 (45.6%)</td>
<td>11 (36.7%)</td>
</tr>
<tr>
<td>&gt;40</td>
<td>99 (54.4%)</td>
<td>19 (63.3%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI*</td>
<td>19.2</td>
<td>8.7</td>
<td>22.7</td>
<td>7.9</td>
</tr>
<tr>
<td>SCL-90 Anxiety*</td>
<td>17.7</td>
<td>8.4</td>
<td>21.6</td>
<td>10.5</td>
</tr>
<tr>
<td>SCL-90 Agoraphobia</td>
<td>11.9</td>
<td>5.0</td>
<td>13.2</td>
<td>6.0</td>
</tr>
<tr>
<td>SCL-90 Depression</td>
<td>38.9</td>
<td>12.6</td>
<td>42.4</td>
<td>13.1</td>
</tr>
<tr>
<td>SCL-90 Somatic problems*</td>
<td>25.7</td>
<td>8.5</td>
<td>29.3</td>
<td>10.8</td>
</tr>
<tr>
<td>SCL-90 Insufficiency</td>
<td>20.9</td>
<td>6.7</td>
<td>22.4</td>
<td>8.4</td>
</tr>
<tr>
<td>SCL-90 Distrust</td>
<td>41.1</td>
<td>12.6</td>
<td>43.4</td>
<td>12.1</td>
</tr>
<tr>
<td>SCL-90 Hostility</td>
<td>10.3</td>
<td>3.8</td>
<td>10.6</td>
<td>3.6</td>
</tr>
<tr>
<td>SCL-90 Sleeping problems</td>
<td>6.6</td>
<td>2.8</td>
<td>6.5</td>
<td>3.1</td>
</tr>
<tr>
<td>SCL-90 Psycho neuroticism</td>
<td>194.2</td>
<td>54.0</td>
<td>210.7</td>
<td>61.6</td>
</tr>
<tr>
<td>NEO-PI-R Neuroticism</td>
<td>165.3</td>
<td>22.4</td>
<td>173.0</td>
<td>20.0</td>
</tr>
<tr>
<td>NEO-PI-R Extraversion</td>
<td>140.3</td>
<td>18.5</td>
<td>138.4</td>
<td>23.1</td>
</tr>
<tr>
<td>NEO-PI-R Openness</td>
<td>154.5</td>
<td>17.1</td>
<td>157.8</td>
<td>17.4</td>
</tr>
<tr>
<td>NEO-PI-R Altruism</td>
<td>175.3</td>
<td>13.9</td>
<td>174.1</td>
<td>17.5</td>
</tr>
<tr>
<td>NEO-PI-R Conscientiousness*</td>
<td>149.6</td>
<td>18.6</td>
<td>141.2</td>
<td>15.3</td>
</tr>
<tr>
<td>BAT</td>
<td>69.8</td>
<td>14.6</td>
<td>69.2</td>
<td>12.5</td>
</tr>
<tr>
<td>EDI Drive for thinness</td>
<td>10.6</td>
<td>5.3</td>
<td>11.7</td>
<td>5.4</td>
</tr>
<tr>
<td>EDI Interceptive awareness</td>
<td>7.1</td>
<td>4.8</td>
<td>8.6</td>
<td>5.2</td>
</tr>
<tr>
<td>EDI Bulimia</td>
<td>7.8</td>
<td>4.4</td>
<td>9.3</td>
<td>4.0</td>
</tr>
</tbody>
</table>

* M = mean, SD = standard deviation, *significant at p < .05, **significant at p < .01, ***significant at p < .001, (two-tailed).

Bulimia and Interoceptive awareness were used to represent treatment outcome. These scales were selected on account of their theoretical relevance for BED and strongest internal consistency. Our data confirmed this supposition, as the scales left out of the analyses all were skewed either being too low (Ineffectiveness, Perfectionism, Interpersonal distrust, Maturity fears) or far too high (Body dissatisfaction, median 26, maximum 27). Drive for thinness concerns preoccupation with weight. Bulimia represents the tendency of and admission to uncontrollable binge eating behaviour. Poor
Interoceptive awareness is associated with difficulties to recognise emotions and whether one is hungry or satisfied.

**The Beck Depression Inventory (BDI)**

The BDI (Beck & Steer, 1987) is a widely used inventory of somatic, affective, cognitive, and behavioural symptoms of depression. Higher scores reflect greater depressive symptoms.

**The Symptom Check List 90 (SCL-90)**


**Body Attitude Test (BAT)**

The BAT is originally developed in Dutch (Probst, Vandereycken, Van Coppenolle, & Vanderlinden, 1995) and is used to measure cognitive-attitudinal aspects of the patients’ body experience. The higher the score, the more disturbed the body experience. Factor analysis identifies four factors: the negative appreciation of body size; lack of familiarity with one’s own body; general body dissatisfaction; and a rest factor. Consistent with the literature, we did not use the fourth subscale because of its limited validity.

**NEO-PI-R Personality Inventory-Revised (NEO-PI-R)**

The NEO-PI-R (Costa & McCrae, 1992) is a 240-item measure of the Five-Factor-Model. It assesses five universal personality traits: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness.

**Statistical Analysis**

SPSS 15.0 was used for data analysis. To investigate whether the sample group of completers in this study was subject to a healthy patient selection, student t-tests were used to compare baseline measures on BDI, SCL-90, and NEO-PI-R between completers and drop-outs. Pearson r on age and BMI as well as independent samples t-tests were used to explore baseline differences between the demographic subgroups. Paired sample t-tests were used to explore raw gain or possible differences between the subgroups on the variables BDI, SCL-90, BAT, and NEO-PI-R. To take into account multiple testing, a significance level of \( p < .01 \) was used.
Treatment outcome was based on three sub-scales of the EDI-II. The internal consistency was reasonable to weak (Cronbach’s Alpha of 0.68; Jackson, 1979). Linear regression analysis was first used to determine the residual gain score (Steketee & Chambless, 1992). The residual gain score provides insight in relative change corrected for individual differences on pre-test measurements. This technique adjusts the post-test scores of patients by their pre-test scores. Each patient has a predicted score based on their pre-test score. The difference between predicted and actual scores is the residual gain score. This measure compares the individual patient’s gain with others in the group. Residual gains near 0 indicate average gain, positive scores indicate greater than average gain, and negative scores indicate less than average gain.

Multivariate analyses (linear regression analyses) were used to find predictors for treatment outcome as measured with residual gain with the baseline demographic variables and measurements. The model was produced through a staged process of backward selection, deselecting the least significant at each stage and leaving in variables with a significance of below 0.10 (Hosmer & Lemeshow, 2000).

RESULTS

Baseline demographic characteristics and measurements of 182 completers were compared to 30 dropouts (Table 1). The dropouts showed significantly less social embedding (chi-square: $\chi = 6.7, p = .010$). The dropouts tended ($p < .05$) to score higher on anxiety and somatic problems (SCL-90) and depressive symptoms (BDI), and lower on conscientiousness (NEO-PI-R). The assessment with questionnaires was implemented in clinical practice gradually. Pre measurements of the SCL-90, BDI, BAT, and EDI were collected from all patients, pre measurements of the NEO-PI-R were gathered from 138 patients.

As presented in Table 2 most of the measurements showed improvement in raw gain apart from anxiety (SCL-90), openness, and altruism (NEO-PI-R). Looking at baseline differences on demographic characteristics significant ($p < .010$) differences were observed on age, education level, and paid work. The BMI was as a continuous variable negatively correlated with depressive symptoms in the SCL-90 (Pearson $r = -.161, p = .030$) and neuroticism as measured in the NEO-PI-R (Pearson $r = .171, p = .046$). Taking Bonferroni’s correction (Dunnet, 1955) as well as sample size into account, the differences may be valued as not fully significant. Patients over 35 years old showed less binge eating episodes (EDI bulimia; $t = 2.6, p = .010$). Age taken into analysis as a continuous variable showed a negative correlation with binge eating episodes on the EDI (Pearson $r = -.195, p = .008$). Patients with high education level showed more openness (NEO-PI-R openness, $t = -4.1, p = .000$). Patients with paid work
showed less feelings of anxiety (SCL-90; $t = 2.7, p = .008$), less agoraphobia (SCL-90; $t = 3.2, p = .001$), less depression (SCL-90; $t = 3.0, p = .003$, BDI; $t = 3.3, p = .001$), less somatic problems (SCL-90; $t = 3.0, p = .003$), less feelings of distrust (SCL-90; $t = 2.7, p = .008$), less overall psychoneuroticism (SCL-90; $t = 3.3, p = .001$, NEO-PI-R $t = 3.3, p = .001$), and were more extraverted (NEO-PI-R; $t = 4.0, p = .000$).

After the multivariate analyses, the resulting significant ($p < .05$) predictors included in the backward regression showed that the best fitting linear regression model predicted 26% of the variance in residual gain (see Table 3). High social embedding and higher scores on openness showed a

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>B (SE B)</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.453</td>
<td>.636</td>
<td></td>
</tr>
<tr>
<td>Social embedding</td>
<td>.582</td>
<td>.312 (.142)</td>
<td>.000</td>
</tr>
<tr>
<td>BDI</td>
<td>-.025</td>
<td>-.276 (.010)</td>
<td>.017</td>
</tr>
<tr>
<td>SCL-90 Agoraphobia</td>
<td>-.056</td>
<td>-.318 (.017)</td>
<td>.001</td>
</tr>
<tr>
<td>NEO-PI-R Neuroticism</td>
<td>.007</td>
<td>.202 (.004)</td>
<td>.058</td>
</tr>
<tr>
<td>NEO-PI-R Extraversion</td>
<td>-.099</td>
<td>-.225 (.004)</td>
<td>.023</td>
</tr>
<tr>
<td>NEO-PI-R Openness</td>
<td>.008</td>
<td>.182 (.004)</td>
<td>.027</td>
</tr>
</tbody>
</table>

Method: Backward.
positive effect in residual gain. More agoraphobia, depressive symptoms, and extraversion had a negative effect on residual gain. Collinear diagnostics showed a high correlation between NEO-PI-R neuroticism and BDI ($R = .677$). However, leaving out the NEO-PI-R neuroticism lead to a lesser fit of the model.

**DISCUSSION**

The present study examined whether pre-treatment characteristics and self-report measures predicted treatment outcome of CBT in a large group of patients with BED and obesity. Our hypotheses are partially substantiated in linear regression analyses. The best fit model shows that social embedding, depressive symptoms (BDI), agoraphobia (SCL-90), the personality traits extraversion and openness, as well as neuroticism (NEO-PI-R), predict short-term treatment outcome. The combination of state and trait characteristics of patients as investigated seems to contribute to better prediction of treatment outcome.

High negative affect, measured with the BDI predicts poor treatment outcome in line with previous studies (Hilbert et al., 2007; Masheb & Grilo, 2008). This confirms the construct validity of the BDI as a practical and well-established measure.

Patients socially well embedded are more likely to benefit from treatment. They were offered 6 additional group meetings together with their partner or parent unlike the rest of the sample. Social embedding may be related to social support and consequently be a mediating factor for treatment outcome. In the same way positive family relationships seem to be protective for developing BED (Neumark-Sztainer, Wall, Story, & Sherwood, 2009).

We observed that anxiety (SCL-90) appeared unaffected after treatment while agoraphobic symptoms (SCL-90) improved. We can hypothesize that agoraphobic symptoms is related to a passive reacting coping strategy found to be predictive for less recovery in a mixed eating disordered sample (Bloks, van Furth, Callewaert, & Hoek, 2004).

Personality traits extraversion and openness (NEO-PI-R) appear to be of predictive value for treatment outcome. Higher scores in extraversion and lower scores in openness impedes improvement after treatment. This combination was not found in previous research with cluster-analyses of the Big Five on NEO-FFI scales, differentiating personality profiles into a resilient subtype opposite two less functioning subtypes (Claes, Vandereycken, Luyten, Soenens, Pieters, & Vertommen, 2006). As personality traits are of interest in future research on treatment outcome (APA, 2006; NICE, 2004) the NEO-FFI can be a practical questionnaire to assess the Big Five-traits.

Eating disorder pathology (BAT) and somatic problems (SCL-90) did not predict treatment outcome, which may be related to a healthy patient selection in the current study.
Although not the main issue in this study, comparison of completers and drop-outs shows interesting differences on several measures. Drop-outs show lower scores on social embedding, more depressive symptoms (BDI), and more anxiety and somatic problems (SCL-90). On conscientiousness (NEO-PI-R) drop-outs score lower than completers. We assume drop-outs to have poor treatment outcome, since patients who stop treatment prematurely are unlikely to recover on their own (Mahon, 2000). Our findings support social embedding and depressive symptoms to be prognostic indicators for treatment outcome. The level of experienced somatic problems can be associated with a higher chance to drop out of treatment.

This study has some limitations. The interpretation of the findings is limited by the choice of the questionnaires. We used Dutch translations and versions of questionnaires feasible for outpatient care. Treatment outcome is based on three sub-scales of the EDI-II, a self-report questionnaire. Although it measures eating pathologic items in binge eating disorder, it is not an objectively assessed criterion for recovery. We tried to get around the lack of consensus on the definition of recovery by using the residual gain score as an indication of relative change corrected for individual differences on pre-test measures. An additional consideration is the selection of the sample used in this study, consisting of female patients presenting for treatment in a specialized centre for eating disorders. The patients referred to this centre are considered to have severe eating pathology and are often non-responders to previous treatments. The naturalistic setting enhances clinical relevance but limits the comparability with previously performed research. Patients should also be followed-up longer after treatment and drop-outs should be compared more extensively to the treatment completers.

In summary, the present study found a combination of various base-line characteristics prognostic for treatment outcome related to the recommended (APA, 2006; NICE, 2004) domains in treatment indication. The predicted variance is relatively small, suggesting many more—not measured—predictors. Further investigation of social support and somatic problems, in combination with practicable instruments for clinical practice, is of interest in future studies into the prediction and application of appropriate treatment.

REFERENCES


