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Psychometric properties of the Eating Disorders in Obesity questionnaire: Validating against the Eating Disorder Examination interview

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ABSTRACT. *Inconclusive results of how weight-loss treatment (WLT) results are affected by participants' eating disorders and/or binge eating are partly due to the variation caused by the multitude of assessment instruments used. The objective of the present study was to evaluate the psychometric properties of a short DSM-IV-based assessment instrument designed to be used specifically in WLT settings, the Eating Disorders in Obesity (EDO) questionnaire. Participants were 97 patients seeking WLT at four surgical and one non-surgical clinics. Participants were assessed by the EDO and the Eating Disorder Examination (EDE) interview . The validity and reliability of the EDO was measured as concordance with the EDE, and test-retest agreement of the EDO, respectively. Validity as well as reliability was found to be good for both eating disorders diagnoses and binge eating as a distinct symptom. Results suggest that the EDO is a short, easily administered instrument with good psychometric properties which makes it a suitable, economical method of assessing eating disorders and binge eating in clinical WLT settings.*

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INTRODUCTION

Concurrent psychological problems, particularly eating disorders (EDs) (1-3) have been found to be common in weight-loss treatments (WLTs), but the clinically important knowledge of how these factors affect long-term treatment outcome is limited. Binge eating in obesity is known to be difficult to assess, as episodes of binge eating are not as distinct as in bulimia nervosa (BN), where binges are often terminated by purging (4). In addition to this difficulty, a contributing factor to the limited knowledge about the impact of EDs on the outcome of obesity treatment is the variation caused by wide variety of assessment instruments that have been used in previous research (5).

Interviews are considered to be the most valid method of assessment of EDs (6). The gold standard and most widely used instrument in ED research is the Eating Disorder Examination (EDE), which has psychometric properties that have been supported by extensive research (7-9). The EDE gives the interviewer the possibility of helping (the interviewee) to unambiguously understand the questions, to reconstruct details, as well as to make sure that the understanding of fundamental concepts is shared (7). Its main drawback is that the EDE is time-consuming and requires extensive training.

A frequently used, and more economical alternative (9), is the self-report questionnaire, which also has the advantage of eliminating interviewer bias (10) and of avoiding the reluctance patients may feel in reporting binge eating prior to WLT (11). A number of questionnaires have been used in assessing disordered eating in WLT [e.g. Bulimic Investigatory Test, Edinburgh (BITE) (12); Binge Eating Scale (BES) (13), Three Factor Eating Questionnaire (TFEQ) (14), Eating Disorder Inventory (EDI) (15), Questionnaire of Eating and Weight Patterns-R (QEWP-R) (3) and the Eating

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Disorder Examination-Questionnaire (EDE-Q) (16). However, there is an ongoing debate on the value of such questionnaires due to their questionable validity in assessing EDs and symptoms of binge eating in WLT settings (6, 9, 17-20). One major shortcoming of self-report assessments of disordered eating is that most questionnaires (all but the EDE-Q) fail to discriminate between different forms of overeating, which could lead to a number of false-positive diagnoses (10). A way of avoiding this problem could be to provide an unambiguous definition of binge eating to the respondent (9, 10). Furthermore, the use of some of these questionnaires in WLT settings may be questionable as they were originally constructed with low- or normal-weight patients in mind (e.g. EDI). Others assess eating-associated habits, attitudes and feelings (e.g. TFEQ and BES), rather than parameters that are relevant in weight loss settings (9). Assessing many constructs that are not clinically relevant in WLT settings also makes some of these questionnaires extensive and time-consuming, although still more economical than interviews.

To our knowledge, the full range of EDs and binge eating has been assessed only in few WLT studies. In a study by de Man Lapidoth et al. (2), approximately half of the ED participants were categorized as "eating disorders not otherwise specified" (EDNOS) (20), which implies that studies limited to assessing only binge eating disorder (BED)/no BED, like many WLT studies have done (21), may classify approximately half of the eating disordered participants as non-disordered (i.e. no BED). The findings from the study mentioned above were in line with other studies (22, 23) showing that those reporting symptoms of binge eating, without fulfilling criteria for an ED, had high concurrent psychopathology and low health-related quality of life. Such comorbid problems might have a negative impact on the long-term outcome of WLTs (24). The absence of reliable long-term data on the effect of binge eating and EDs in WLT emphasizes the importance of assessing the full range of EDs and binge eating symptoms in WLT.

More knowledge about the occurrence, course and impact of binge eating and EDs on the treatment of obesity would be attained by repeated use of an instrument that provides a clear and unambiguous definition of binge eating and that assesses the full range of disordered eating. A short questionnaire with ease of coding may be suitable because it can be administered more easily, coded directly and lead to higher compliance among the patients. The EDE-Q (16) is a viable option since it shows good concurrent validity with the four EDE subscales. However, one of the few studies comparing the EDE and the EDE-Q for assessment of binge eating symptoms in an obese subset (6) found a fair concurrent validity (kappa=0.45) but a high error rate of 41%. Furthermore, another study (19) found the correlation between the assessed frequencies of objective bulimic episodes to be significant, but low.

The Eating Disorders in Obesity (EDO) (see Appendix) is a self-report instrument based on the Diagnostic and Statistical manual of Mental Disorders - Fourth Edition (DSM-IV) criteria for EDs (20). The questionnaire has been developed specifically for being used among adult WLT patients. The aim of the present study was to assess the psychometric properties of the EDO by comparing it with the interviewer-based EDE.

MATERIALS AND METHODS

Participants

Participants were 97 adult men and women seeking surgical or non-surgical (behavioural) WLT at four surgical- and one non-surgical obesity clinics in Sweden. They were a subset of patients from the clinics above, consecutively included in a long-term study of weight loss and eating behaviour. Permission was granted by the local research Ethics Committees to conduct the study as here described.

Procedure

After obtaining informed consent, patients were asked to fill out the EDO. Having excluded those declining further contact (N=4), participants indicating at least one episode of binge eating during the last 3 months (question 1) were asked about being interviewed with the aim of interviewing 50 potential binge eaters. Also an equal number of patients indicating no binge eating were asked about being interviewed. In total 97 patients participated in the study.

Initially, all consecutive participants at the recruitment units were interviewed until six participants who indicated binge eating (question 1) had been interviewed at each unit. Interviewers in this first phase were blind to participants' results of the EDO. In Phase 2, one non-binging participant (question 1) was asked about being interviewed for every three binge eating participants. To be able to decide which participants to interview, interviewers in this

phase had knowledge of the participants' results of question 1.

Selected participants were asked about being interviewed within 1-4 weeks of inclusion. To increase the number of participants, they were also offered to conduct the interview at a suitable location of their choice, or to be interviewed at that present time, if an interviewer was available. For test-retest purposes participants were asked to complete the EDO again directly before the interview. In accordance with previous studies (4, 6, 11), the retest was done prior to the interview to minimize the possibility of the interview influencing the participants' response to the EDO. When the interview was conducted on the day of inclusion, retest data was collected by sending the EDO to the interviewee one week later.

Interviews were conducted by one of two trained interviewers (first and third authors: PhD student and PhD-level psychotherapist), both with good knowledge of EDs. The interviewers received training and instructions from the second author who had received training from the developers of the EDE. The research group discussed the scoring of ambiguous answers to the questions from the interviews until consensus emerged. A random sample of interviews were recorded for purposes of assessing the quality of the interviews.

Definitions

All participants who reported objective binge eating episodes out of control were classified as binge eaters (BEs) according to the EDO. In addition to indicating "yes" in question 1 of the EDO, BE participants were required to indicate at least "Sometimes" in questions 2B (loss of control) and 2E (objectively large amounts) (39 participants).

Participants were classified as having an ED if the DSM-IV (20) criteria for BN or BED were met (6 participants). This group will be called "ED". The ED group consisted of those who received an EDNOS diagnoses as well (i.e. participants who did not meet the full frequency or duration criteria for the BED or BN diagnoses, but reported binging at least 1 day/week during the last 3 months: 3 participants). Also, those indicating a "grazing" behaviour (continuously eating small amounts of food, while feeling out of control) (25) and thus failing to fulfill the criteria of objectively large amounts were placed in the ED group (as EDNOS, 1 participant). Note that all participants that were classified as ED participants were also BE participants.

Dropout

In total, 150 patients from the long-term study were eligible for participation according to the interview procedure. Twenty-five of these participants were not contacted because either they could not be reached (N=3), lived too far from the clinics (n=9), more than 3 months had passed since filling out the EDO (N=12), or their ED status could not be determined due to missing data (N=1). Out of the 125 patients who were contacted, 28 declined participation, leaving 97 participants to be interviewed. The 97 interviewed participants did not differ from the 28 who declined participation in neither age, sex, level of obesity [Body Mass Index (BMI)] nor prevalence of binge eating or EDs.

Instruments

Eating Disorders in Obesity (EDO)

The EDO (see Appendix) is a self-report questionnaire, assessing ED symptoms based on the DSM-IV criteria for EDs (21). The EDO was constructed to assess ED symptoms among patients in a WLT setting. Consequently questions referring to states of underweight (as in anorexia nervosa) were not included. The EDO has been constructed by modifying the diagnostic segments of the Survey for Eating Disorders (SEDs) (26). The modifications were made to avoid the ambiguities previously found when using the SEDs in a WLT setting (2). The EDO consists of 11 questions, eight of them applying only to persons who report binge eating. Binge eating is defined in the beginning of the questionnaire in accordance to the DSM-IV definition (20).

Eating Disorder Examination (EDE)

The EDE (7) is considered the gold standard for the assessment of EDs. The interview requires a trained interviewer with good knowledge of EDs. In this study only the diagnostic questions of the EDE were used, and the questions referring only to the diagnosis of anorexia nervosa were excluded from the interview. Questions about the associated features of BED that are described in the DSM-IV (20) have been added to the interview in accordance to suggestions by Wilfley et al. (27).

Statistics

Validity and reliability were tested using Cohen's Kappa. For group comparisons of categorical data (i.e. sex, occurrence and non-occurrence of ED and binge eating, respectively, χ^2-tests were used. Group comparisons of continuous data (level of obesity and age)

were analysed by means of the Student's t-test.

The sample size was regarded as too small for meaningfully analysing validity and reliability for men and women separately. Instead χ^2 analyses of differences between men and women in the misclassifications of ED and binge eating (EDE vs. EDO and EDO vs. EDO-retest) were performed to address the sex issue.

TABLE 1
Eating disorder (ED) diagnostic concordance using the Eating Disorder Examination (EDE) and the Eating Disorders in Obesity (EDO).

EDO	EDE		
	ED present	ED absent	
ED present	9 (9.3%)	1 (1.0%)	10 (10.3%)
ED absent	3 (3.1%)	84 (86.6%)	87 (89.7%)
	12 (12.4%)	85 (87.6%)	97 (100%)

TABLE 2
Binge eating (BE) diagnostic concordance using the Eating Disorder Examination (EDE) and the Eating Disorders in Obesity (EDO).

EDO	EDE		
	BE present	BE absent	
BE present	28 (28.9%)	11 (11.3%)	39 (40.2%)
BE absent	6 (6.2%)	52 (53.6%)	58 (59.8%)
	34 (35.1%)	63 (64.9%)	97 (100%)

TABLE 3
Test-retest concordance of the Eating Disorders in Obesity (EDO) regarding eating disorders (ED).

EDO	EDE		
	ED present	ED absent	
ED present	5 (6.0%)	3 (3.6%)	8 (9.6%)
ED absent	1 (1.2%)	74 (89.2%)	75 (90.4%)
	6 (7.2.1%)	77 (92.8.9%)	83 (100%)

EDE=Eating Disorder Examination.

TABLE 4
Test-retest concordance of the Eating Disorders in Obesity (EDO) regarding binge eating (BE).

EDO	EDE		
	BE present	BE absent	
BE present	25 (30.1%)	8 (9.7%)	33 (39.8%)
BE absent	5 (6.0%)	45 (54.2%)	50 (60.2%)
	30 (36.1%)	53 (63.9%)	83 (100%)

EDE=Eating Disorder Examination.

RESULTS

Out of 97 interviewed participants, 70 were women and 27 were men. Twenty participants were included at the non-surgical clinic and 77 at the surgical clinics. Ages ranged from 19 to 62 years with a mean age of 41.1 years [standard deviation (SD)=10.6]. Mean BMI was 44.2 kg/m^2 (SD=7.7) ranging from 31.0 to 76.8 kg/m^2.

Validity and reliability of the EDO was tested separately for assessments of EDs (ED) and assessments of binge eating as a distinct symptom (BE).

Validity

Table 1 shows concordance between the EDE and the EDO for identifying participants with EDs. The agreement between the two measures was shown to be good (kappa=0.67).

Table 2 shows concordance between the EDO and the EDE for identifying binge eating participants. A good agreement between assessments was shown (kappa=0.63).

Results further show that none of the 49 participants who indicated no binge eating in question 1 (EDO) were subsequently classified as BE (or ED) by the EDE. Of those answering "Yes" to question 1, 39 fulfilled criteria for BE according to the EDO. All ED participants (according to the EDE) were a subgroup of these 39 participants.

Reliability

The test-retest reliability of the EDO regarding ED is presented in Table 3. The test-retest comparison showed a good agreement between assessments (kappa=0.65).

Results of the test-retest reliability regarding binge eating are presented in Table 4. Results indicate a good test-retest agreement (kappa=0.65) regarding binge eating.

Post-hoc validity and reliability testing

Participants in the present study were drawn from a non-representative clinical sample of patients at the five WLT units. Procedural differences between the units have resulted in methodological differences when interviewing participants, which could affect validity: 1) time between assessments; 2) interviewer blindness to EDO results; 3) interview location. Methodological differences which could affect

reliability were: 1) time between assessments; 2) applying the EDO-retest after the EDE.

No difference in diagnostic agreement was found for either of the three methodological aspects that could affect validity. Regarding reliability though, there was a difference in agreement, in regard to time between the two EDO assessments. In the group where assessments were less than 2 weeks apart, 87% showed diagnostic agreement compared to 67% in the group with longer time between assessments [$\chi^2(1)=5.30$, $p=0.02$]. There was no difference in agreement due to the order of the EDO-retest and the EDE.

Data indicated no statistically significant differences between men and women regarding either validity or reliability.

DISCUSSION

Validity

The comparison between results of the self-report instrument EDO and the EDE has shown that the EDO possesses good psychometric properties regarding the ability to detect EDs and binge eating. Comparisons to previous studies are difficult, as methods differ widely and just a few other studies in WLT settings have assessed the full range of binge eating and EDs. Compared to studies of BED though (e.g. 11, 17, 18), results from the present study indicate a higher concordant validity, even if de Zwaan et al.'s (11) comparison [of the QEWP-questionnaire and the Structured Clinical Interview for DSM-IV (SCID)] showed only a slightly lower concurrence (kappa=0.59). Interestingly the study by de Zwaan et al. (11), as well as the present study, differs from most previous studies (e.g. 10, 15) by showing that diagnostic misclassifications run in both directions, thus self-report questionnaires do not always overestimate the occurrence of eating disorder symptoms. We believe that overestimation of BE and ED in the EDO was avoided by discriminating between different types of overeating, first through defining binge eating in the questionnaire (EDO question 1; see Appendix) and subsequently by asking the participants about each of the two binge eating criteria in separate questions (EDO questions 2B and 2E; see appendix). To be regarded as a BE, a subject had to confirm binge eating in question 1 by also indicating a reasonable frequency of loss of control as well as eating objectively large amounts of food in questions 2B and 2E, respectively.

Further, three of the 12 eating disordered participants (according to the EDE) were not correctly assessed by the EDO (Table 1). Even if this 25% error rate is lower than the 41% error rate in the EDE/EDE-Q comparison (of BE) by Kalarchian et al. (6), and comparable to the 28% error rate (in BED assessments) in the de Zwaan et al. study (11), this result raises the concern of failing to identify patients with EDs. However, ED participants misclassified by the EDO were all classified as BE by the EDE-Q. This misclassification is a less alarming result clinically, as there is insufficient information about the relevance of the difference between BE and ED in long-term WLTs. Until further is known, we recommend that patients indicating disordered eating should be assessed longitudinally to learn more about the long-term association between disordered eating and treatment outcome.

It should be noted that no participant indicating "no binge eating" in question 1 of the EDO were subsequently classified as BE or ED by the EDE. This means that participants that indicate no binge eating in this single question can accurately be classified as non-disordered and be enrolled in WLT with no further detailed assessment of EDs.

Post-hoc validity and reliability testing

Analyses indicated that the identified differences in data collection methods did not significantly affect concordance between EDO and EDE. Regarding the EDO test-retest comparison, concordance was found to be higher when less than 2 weeks passed between assessments, which is far from surprising. Beside the obvious possibility that this is attributable to memory bias, it may also show that the EDO is a good and stable instrument in the short run.

CONCLUSIONS

The EDO is a brief, easily administered self-report questionnaire with good reliability and validity for assessing binge eating and EDs in WLT. The bias shown in many other self-report questionnaires (i.e. overrating of binge eating and EDs) was avoided, perhaps as a result of presenting a clear definition of binge eating and by discriminating between different forms of overeating in the questionnaire. Until more is known about how disordered eating or EDs affect long-term WLT outcome, the full range of disordered eating and EDs should be assessed prior to WLT, to both study the outcome and provide adequate treatment.

APPENDIX 1
EATING DISORDERS IN OBESITY (EDO)

Instructions – In these pages, 11 questions are asked about your eating behaviour and associated feelings. We ask you to fill out the questionnaire in accordance to the instructions. Please observe the definition of binge eating described below as well as the time frames stated in **bold** text.

CODE:

DATE:

In several of the following questions the word ″binge eating″ will be used.

An episode of BINGE EATING is defined as, in a discrete period of time (e.g. within any 2-hour period);

1. eating an amount of food that is definitely larger than most people would eat in a similar period of time and under similar circumstances

furthermore

2. a sense of lack of control over eating during the episode (feeling that one cannot stop eating or control what and how much one is eating)

1. Have you, during the last three (3) months, experienced one or more episodes of binge eating, in accordance to the definition above?

   No ☐

   Yes ☐ Last time:_____

If you have answered ´No´ to question 1, please go on to question 10

If you have answered ´Yes´ to question 1, please continue below:

For those with one or more episodes of binge eating during the last ***three (3) months***

2. Please describe your binge eating episodes:

A. Do you eat rapidly while binging?	No ☐	Sometimes ☐	Often ☐	Always ☐
B. Do you feel that you loose control by not being able to stop eating, or that you cannot control what or how much you eat?	No ☐	Sometimes ☐	Often ☐	Always ☐
C. Do you eat alone while bingeing?	No ☐	Sometimes ☐	Often ☐	Always ☐
D. Do you eat definitely large amounts on such occasions?	No ☐	Sometimes ☐	Often ☐	Always ☐
E. Do other people think you eat very large amounts on such binge eating occasions?	No ☐	Sometimes ☐	Often ☐	Always ☐
F. Do you eat until you feel pain or uncomfortably full?	No ☐	Sometimes ☐	Often ☐	Always ☐
G. Have you been markedly distressed or upset after binge eating?	Not at all ☐	Slightly ☐	Moderately ☐	Greatly ☐	Extremely ☐
H. Have you felt disgust, felt depressed or felt guilty after binge eating?	No ☐	Sometimes ☐	Often ☐	Always ☐
I. Do you eat large amouts of food when you do not feel physically hungry during these binge episodes?	No ☐	Sometimes ☐	Often ☐	Always ☐

3. During periods of binge eating how often have you binged?

   Less than once a month ☐

   1-2 times a month ☐

   Once per week ☐

   2-3 times per week ☐

   Daily ☐

   More than once per day ☐

4. Have you, on an average, had at least **one (1) binge eating episode per week** during the last **three (3) months**?

   No ☐

   Yes ☐

5. Have you, on an average, binged at least **two (2) days a week** during the last **six (6) months**?

   No ☐

   Yes ☐

Continued

APPENDIX 1 - (Continued)
EATING DISORDERS IN OBESITY (EDO)

6. Below are different strategies to try to prevent weight gain:
   forcing oneself to throw up after some meals
   using laxatives, enema, or diuretics
   fasting or excessive, intensive exercise
   chewing and spitting out large amounts of food, but not swallowing

Have you used any of these strategies **during the last three (3) months**, mainly to control your weight (to lose weight or to avoid gaining weight)?

No ☐
Yes ☐ Which strategy/strategies?_____

If you have answered ´No´ to question 6, please go on to question 10
If you have answered ´Yes´ to question 6, please continue below:

*For those that during the **last three (3) months** have used any of the strategies described above to control weight.*

7. During the last three (3) months, how often have you used any of the described strategies to control weight (to lose weight or to avoid gaining weight)?
   Less than once a month ☐
   1-2 times a month ☐
   Once per week ☐
   2-3 times per week ☐
   Daily ☐
   More than once per day ☐

8. To what extent is your self-esteem influenced by your body shape and/or weight?
   Not at all ☐ Slightly ☐ Moderately ☐ Fairly much ☐ Greatly ☐ Extremely ☐

9. Compared to other things in your life, how important is your weight or shape for your self-esteem in general?
   Weight or shape is not more important than other things in my life for my self-esteem
   Weight or shape is a little more important than some other things in my life for my self-esteem
   Weight or shape is more important than most, but not all things in my life for my self-esteem
   Weight or shape is the most important thing in my life for my self-esteem

10. Have you, before the last **six (6) months**, had any periods of binge eating, where large amounts of food has been eating with a sense of loss of control?
    No ☐
    Yes ☐ When? _____

11. Have you, before the last **three (3) months**, had any periods of binge eating, followed by vomiting, fasting, using laxatives, using enema, using diuretics or exercising excessively to control your weight (to lose weight or to avoid gaining weight)?
    No ☐
    Yes ☐ When? _____

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