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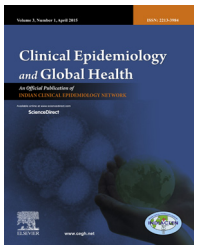

Original Article

Development and initial validation of a brief scale for assessing psychological distress in obese adults

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ABSTRACT

Objectives: The aim of this study was to develop a brief measure of psychological distress related to obesity, intended specifically for use among the Arab adult populations, and to test its psychometric properties.

Methods: Items of the scale were identified through examination of relevant literature, discussions with obese adults, and expert panel feedback. Validity and reliability of the scale were tested using two convenience samples of Lebanese obese adults ($n = 380$). The scale was also administered to a third sample of obese depressed patients ($n = 50$) for clinical validation. Internal consistency, test-retest reliability, and construct validity were assessed.

Results: Exploratory factor analysis revealed two factors reflecting "Social functioning" and "Psychological functioning" that explained 78.2% of the total variance. Confirmatory factor analysis confirmed the two-factor model with good data fit. The scale demonstrated high internal consistency (Cronbach's $\alpha = 0.96$ and 0.95 for samples 1 and 2, respectively) and test-retest reliability (Intraclass coefficient = 0.91). Significant correlations were found between Obesity specific Distress total score and constructs measuring the impact of weight on quality of life ($r = -0.73$), body shape dissatisfaction ($r = 0.76$), and psychological distress ($r = 0.66$) suggesting good convergent validity. Our results also provide some evidence of the discriminant validity of the scale.

Conclusions: Our findings suggest that the Obesity-specific Distress scale is a valid and reliable measure of distress in the obese adult population.

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1. Introduction

Obesity is a complex prevalent condition emerging as a major risk factor for several chronic diseases.[1] Besides its detrimental consequences on physical health, obesity may affect psychological health.[2] However, it has been reported that excess weight is not distressing per se.[3] Instead, social factors[4] and mass media[5] play an essential role in shaping people's perception on how they view their own body shape, praising the slender figure while condemning the obese body. This reflects a strong antifat bias that often results in stigma and discrimination toward obese population,[6] who may internalize negative messages that provoke psychological distress.[7]

In the past few decades, subjective measures of distress have been widely used as an indicator of mental health in population surveys,[8] in epidemiologic studies,[9] and as an outcome in clinical trials.[10] These self-reported measures have been found to be reasonably correlated with clinical presentations.[11] Although they can provide important information on broad dimensions of psychological health, it is often recommended that they be accompanied by disease-specific instruments for the condition under study. In response to this need, a number of obesity-specific tools have been introduced focusing mainly on the assessment of health related quality of life and the psychosocial functioning of obese individuals.[12–15] These tools have been developed and validated in Western societies and may therefore be susceptible to the influence of local culture or the local context. To the best of our knowledge, no valid measure of distress in obese adult was founded and adapted to the sociocultural characteristics of the Arab population. Our aim is to develop a brief self-reported measure of psychological distress related to obesity in the Arabic language suitable for screening in the obese adult populations and to test its psychometric properties.

2. Methods and materials

2.1. *Item generation and development of the Obesity-Specific Distress questionnaire (OSD)*

The questionnaire was designed to cover important aspects of distress related to obesity in young adults. Core dimensions and items content were identified through a review of the published literature,[12–15] examination of existing inventories designed to measure quality of life or distress related to obesity, discussions with obese adults, as well as expert advice from one psychologist and three independent sociologists in Lebanon. A set of 24 items was initially generated, which covered categories of physical functioning, social functioning, psychological functioning, body image disturbances, and sexual difficulties. All items included the phrase ''Because of my weight'' or the word ''weight'' to orient the responses to be weight-specific. Items of the scale were translated and adapted to the Arabic language by three independent professional translators. Backward translation procedures were applied to all items of the scale. Translators were asked to avoid literal translation and to use a simple and acceptable language for the Lebanese adults. Translation inconsistencies were resolved by consensus in collaboration with the investigators. The initially proposed version of the OSD questionnaire was designed to be self-completed with a 5-point Likert-type response format ranging initially from ''never'' to ''yes''. Content validity of the resulting version was assessed by a panel of three experts who were not involved in the initial item development (two researchers with experience in development and validation of instruments and one psychiatrist). Experts were asked to rate the relevance of each item on a 4-point Likert scale from 1 ''not relevant'' to 4 ''very relevant''. Content validity for each item (CVI) was calculated as the proportion of experts rating either three or four (quite relevant and very relevant, respectively), divided by the total number of experts. All items with a CVI rating of 8.0 or above were retained.[16] Consequently, 6 items were discarded.

2.2. *Pilot study*

The questionnaire was pilot tested in a sample of 10 obese adults to check the clarity and readability of all items. On average, the questionnaire was completed by participants within approximately 10 min. After the participants completed the 18 items of the OSD scale individually, we conducted face-to-face interviews to determine if they felt difficulties or ambiguity in responding to the items. Our participants did not report any problems in understanding the scale.

2.3. *Study design and participants*

The factor structure of the OSD scale was initially tested using a convenience sample of adult obese individuals (Sample 1, $n = 180$) visiting fitness centers and obesity private clinics in Beirut between January and August 2013. Following the scale set up, the OSD scale structure was further tested using another convenience sample of obese individual (Sample 2, $n = 200$) between June and August 2014. The participants were students recruited from public and private Lebanese universities, and subjects with diverse professions recruited in different public and private institutions. In both samples, eligible subjects were at least 18 years of age, could speak and read the Arabic language fluently, and had a BMI ≥ 30 kg/m^2. Pregnant or lactating women, as well as individuals with chronic diseases, such as hypertension, diabetes mellitus, adrenal glands disorders, and thyroid diseases were excluded from the study. The scale was also administered to a third sample of obese patients for clinical validation ($n = 50$). Since the study was observational and respected participants' anonymity and confidentiality, the Internal Review Board (IRB) of the Lebanese university waived the need for an official approval; however, researchers and the field worker conducted the study according to the research ethics guidelines laid down in the Declaration of Helsinki.

2.4. *Sample size calculation*

Sample size guidance indicated that 200–300 or 5–10 participants per scale item would be adequate for establishing sufficient evidence of scale validity and reliability.[17,18] Thus, considering that the last version of the scale has 18 items, the

number of participants required would be at least 90–180. In the present study, the sample size was 180 in the exploratory phase and 200 in the confirmatory phase.

2.5. Procedure

Participants were informed in writing and orally that participation was voluntary and they had the right to refuse to participate. In the exploratory phase, participants (n = 180) were asked to complete a questionnaire that included questions regarding demographic characteristics (age, gender), body weight and height, and the 18-item OSD draft questionnaire.

In the confirmatory phase, participants (n = 200) completed another questionnaire including information regarding demographic characteristics (age, gender), body weight and height, the constructed scale, and a battery of self-report questionnaires that assess impact of weight on quality of life (IWQOL-Lite),[19] body image dissatisfaction (BSQ),[20] and psychological distress (Beirut Distress Scale, BDS-22)[21] for convergent validation.

For clinical validation, two psychotherapists orally administered the scale to their patients (n = 50) suffering from depressive disorders due to their obesity status.

To assess test-retest reliability of the scale, 54 obese individuals of the first sample answered the questionnaire twice. The time between test and re-test reproducibility examination averaged approximately 14 days.

3. Assessment measures

3.1. Impact of weight on quality of life (IWQOL-Lite)

The IWQOL-Lite is a 31-item self-report instrument that assesses the perceived effect of weight on quality of life. The 31 items are answerable on a Likert scale from 0 ''never true'' to 4 ''always true''. All IWQOL-Lite scores are based on 0 to 100 scoring, with 100 representing the best and 0 the worst quality of life.[22]

3.2. Body Shape Questionnaire (BSQ)

The BSQ is a 34-item self-report questionnaire measuring body shape dissatisfaction. It is a useful measure for assessing preoccupation and distress with body shape and size in clinical samples of obese individuals. The 34 items are answerable on a 6-point Likert scale ranging from 0 ''never'' to ''always''. The score is obtained by adding the 34 items. Higher scores indicate greater degree of body shape dissatisfaction.[20]

3.3. Beirut Distress Scale (BDS-22)

BDS-22 is a validated tool designated to measure psychological distress for the Lebanese young population. The 22 items are answerable on a Likert scale from 0 to 3 (0 – never, 1 – sometimes, 2 – often, and 3 – always). The score was summed up by adding all the items on the scale. Higher scores indicated greater risk of psychological distress.[21]

3.4. Anthropometric measurements

Weight and height were self-reported. Body mass index (BMI) was calculated using weight (in kilograms) divided by the square of height (in meters).

3.5. Statistical analysis

Descriptive statistics, exploratory factor analysis, and reliability analysis were performed using IBM SPSS Statistics version 20.0. The Amos software version 22.0 was used in the confirmatory factor analysis process to determine the factor structure of the OSD scale. Exploratory factor analysis was conducted on the first sample using the principal components analysis with Varimax rotation. Sampling adequacy was assessed by the Kaiser–Meyer–Olkin (KMO) measure and Barlett's test of sphericity. The number of factors retained in the scale was determined based on Eigenvalues greater than 1[23] and visual inspection of the scree plot.[24] Items with low factor loadings (<0.40), low communalities ($h^2 < 0.5$), or high cross-loadings were considered for elimination.[25]

A Confirmatory Factor Analysis using the maximum likelihood method was further conducted to confirm the structure of the OSD scale. Goodness-of-fit was determined by commonly used fit indices, including the relative $\chi^2/df < 5$, root-mean-square error of approximation (RMSEA) < 0.06, comparative Fit Index (CFI) > 0.90, the Goodness-of-Fit Index (GFI) > 0.90, and the Adjusted Goodness-of-Fit Index (AGFI) > 0.90.[26] Cronbach's alphas were calculated to assess internal consistency. A coefficient of above 0.7 indicated a good internal consistency.[27]

The total OSD scale was obtained by adding up the scores of individual items. Higher OSD score reflects greater level of distress. Scores for each dimension of the scale were also calculated by adding their constituent items.

Test-retest reliability was assessed through the intraclass correlation coefficient (ICC; average measure) for the global scale and its subscales. A good reproducibility was noted when ICC > 0.7.[28]

Convergent validity using Spearman correlation was assessed to evaluate whether total OSD scale and its subscales were associated with BSQ, IWQOL-Lite, and BDS-22 scores.

Clinical validity was also tested by comparing the means of the clinical sample (n = 50) to those of functioning individuals (Sample 1), using Student's *t*-test for comparing means of two independent samples.

4. Results

4.1. Samples characteristics

Table 1 presents demographic and BMI characteristics of the three samples. The first sample included 180 participants. The majority were females (64.4%) with an average age of 27.4 years (SD = 7). Their mean BMI was 31.9 kg/m^2 (SD = 6.3). Sample 2 included 200 individuals with 118 (59%) females and 82 (41%) males. Their mean age and BMI were 27.6 years (SD = 6.7) and 35.1 kg/m^2 (SD = 4.8), respectively. There were no significant differences in terms of age and gender between samples 1 and

Table 1 – Demographic and BMI information by samples.

	Sample 1 (n = 180)	Sample 2 (n = 200)	Sample 3 (n = 50)
Age[a] (years)	27.4 (7.0)	27.6 (6.7)	29.4 ± 8.2
Gender, n (%)			
Male	64 (35.6)	82 (41)	17 (34)
Female	116 (64.4)	118 (59)	33 (66)
BMI[b] (kg/m^2)	31.9 ± 6.3	35.1 ± 4.8	38.6 ± 6.7

[a] Mean and standard deviation.
[b] Body mass index.

2 (p-value >0.05). The mean age of participants in the clinical sample was 29.4 ± 8.2. The majority were females (66%) and their BMI was 38.6 kg/m^2 (SD = 6.7).

4.2. *Exploratory factor analysis*

Exploratory factor analysis was performed including the 18 items of the OSD scale. The KMO test (0.96) showed adequate sampling adequacy, and Bartlett's test was significant (χ^2 = 4412.94, df = 253, p-value <0.001). Preliminary analyses produced a three-factor model. A total of 8 items that either failed to load substantially on one factor (factor loading less than 0.40), or loaded strongly on two or more factors, were removed from the scale with the remaining 10 items retained for further exploratory factor analysis. The KMO measure of sampling adequacy of 0.95 and the highly statistically significant (χ^2 = 1822.47, df = 45, p-value <0.001). Bartlett Test of Sphericity indicated that the data were adequate for factor analysis.

With regard to the dimensionality of the OSD scale, the inspection of the scree plot and Eigen values suggested a two-factor solution for the scale that explained 78.2% of the total variance. The 2-factor solution reflected the following latent constructs: Social/emotional functioning (factor I) and psychological functioning (factor II). Factor I contained seven items (feeling embarrassed in communication, social life impairment, being teased by others, feeling disliked by other, feeling undesired by the opposite sex, hating oneself, and being rejected during games), and accounted for 65.6% of the variance. Factor 2 contained three items (feeling anxious most of the time, affected self-esteem, and feeling depressed most of the time), and accounted for 12.2% of the variance. Table 2 displays the factor loadings for each item.

4.3. *Confirmatory factor analysis*

Using the structure obtained in phase 1, a confirmatory factor analysis was performed on Sample 2 using the maximum likelihood estimation. Results of the two-factor model showed a good data fit with χ^2/df = 1.70, RMSEA = 0.06 (95% CI of 0.03 to 0.08), CFI = 0.99, GFI = 0.94 and AGFI = 0.91. The standardized regression coefficients, as shown in Fig. 1, ranged from 0.80 to 0.91 for Factor 1 and from 0.79 to 0.93 for Factor 2. Furthermore, all parameters were found to be significantly correlated with subscales, which indicated that each item contributes significantly to the corresponding factor. The subscale scores range from 0 to 28 for the social/emotional functioning subscale and from 0 to 12 for the psychological functioning subscale. The OSD total score ranges from 0 to 40. The instrument is available in the Online Appendix.

Table 2 – Exploratory factor analysis[a] of the OSD scale in sample 1 (n = 180).

Items	Factor 1	Factor 2	Communality
Feeling embarrassed in communication	0.85		0.84
Social life impairment	0.84		0.85
Feeling disliked by others	0.84		0.84
Being teased by others	0.83		0.82
Feeling undesired by the opposite sex	0.83		0.84
Hating oneself	0.78		0.74
Being rejected during activities or games	0.75		0.81
Feeling anxious most of the time		0.86	0.83
Affected self-esteem		0.83	0.83
Feeling depressed most of the time		0.81	0.87
Eigenvalue	7.42	1.01	
Percentage of explained variance	65.6%	12.2%	

Factor 1: Social functioning; Factor 2: Psychological functioning, Extraction method: principal component analysis; Rotation method: Varimax with Kaiser normalization.

4.4. *Internal consistency*

Internal consistency of the OSD scale and its two subscales was calculated using Cronbach's alpha. The OSD total scale demonstrated excellent internal consistency with an alpha coefficient of 0.96 for sample 1 and 0.95 for sample 2. In addition, the two subscales demonstrated high internal consistency in both samples (Table 3).

4.5. *Test-retest reliability*

The results of the test-retest reliability assessment demonstrated strong reproducibility of the OSD scales and sub-scales [Intraclass correlation (95% CI): overall scale, ICC = 0.91 (0.84, 0.95), p < 0.001; social/emotional functioning, ICC = 0.90 (0.84, 0.94), p < 0.001; psychological functioning, ICC = 0.92 (0.86, 0.95), p < 0.001] (Table 4).

4.6. *Convergent validity*

Table 5 displays correlations of the OSD factors and total scale with other well-established predictors of the weight impact on quality of life, body shape dissatisfaction, and psychological distress in sample 2. Statistically significant correlations were found between OSD-total scale and both IWQOL-Lite (r = −0.73, p-value <0.001) and BSQ scale (r = 0.76, p-value <0.001). Furthermore, a moderate correlation was found between OSD total scale and BDS-22 (r = 0.66, p-value <0.001). Finally, significant correlations were also found between OSD total scale and its domains with IWQOL-Lite, BSQ, and BDS-22 scales. The magnitude of correlations ranged from 0.55 to 0.81.

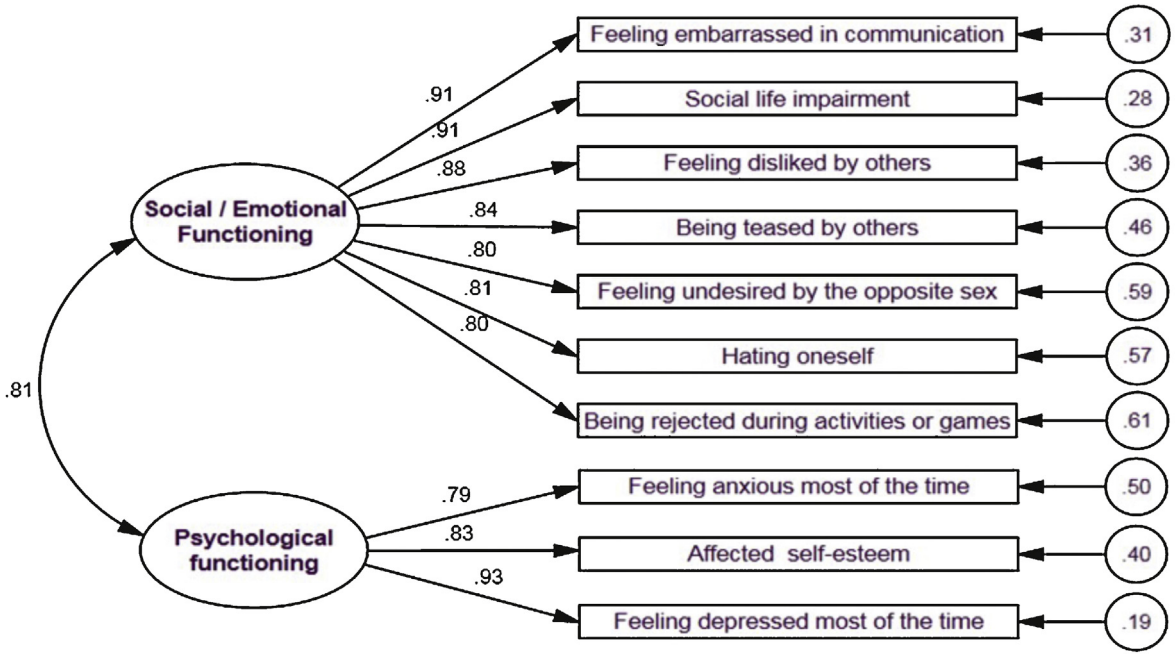

Fig. 1 – Confirmatory factor analysis for the Obesity Specific Distress scale (n = 200).
***Note*: The two-way arrows between factors stand for correlations. The one-way arrows from the two factors to each item stand for factor loadings or standardized regression coefficients. The values in the circles represent the error variables that influence each item. All parameter estimates in this two-factor model are significant at the p-value <0.05.**

4.7. *Discriminant validity*

Results were clinically validated on a sample of 50 obese patients diagnosed with clinical disease. Their mean OSD total score was 25.9 (SD = 3.2). They showed a statistical significant difference (p-value <0.001) with 180 functional individuals (Mean = 5.7; SD = 5.8). Moreover, mean scores for OSD subscales differed significantly (p-value <0.001) between samples 1 and 3 (3.05 ± 3.7 versus 18.7 ± 2.2 and 1.48 ± 2.32 versus 7.16 ± 1.4 for social/emotional and psychological functioning subscales respectively).

5. Discussion

The aim of the present study was to develop and validate a brief self-reported measure of distress related to obesity intended specifically for use among the Arab adult populations. Through a rigorous psychometric procedure, an obesity-specific distress questionnaire in Arabic language has been created. Results provide initial evidence supporting the reliability and validity of the OSD scale as a screening instrument for psychological distress in obese adult population.

The content validity of the OSD scale was strengthened by incorporation of expert feedback in all aspects of scale development and validation. The exploratory factor analysis extracted two psychometrically robust sub-domains reflecting dimensions of ''Social/emotional functioning'' and ''psychological functioning'' that jointly explained 78.2% of variances. The confirmatory factor analysis confirmed the EFA two-factor model, with goodness-of-fit indices meeting all the recommended cut-off criteria. The two identified factors of the OSD demonstrated good psychometric properties, with excellent internal consistency in both samples. Furthermore, test-retest reliability with a 2-week interval was excellent reflecting stability over time.

This study provides evidence for the construct validity of the OSD, with total score and its subscales showing significant association with other similar instruments measuring the

Table 3 – Comparison of internal consistency reliabilities of OSD scale from two samples.

Factor	Internal consistency (Cronbach's alpha Sample 1)	Internal consistency (Cronbach's alpha Sample 2)
Factor 1: Social/emotional functioning	0.96	0.94
Factor 2: Psychological distress	0.91	0.89
OSD total scale	0.96	0.95

OSD, obesity specific distress.

Table 4 – Test-retest reliability of the OSD (n = 54).

Item	Intra class correlation coefficient (95% CI)	p-value
Factor 1: Social/emotional functioning	0.90 (0.84–0.94)	<0.001
Factor 2: Psychological functioning	0.92 (0.86–0.95)	<0.001
OSD total scale	0.91 (0.84–0.95)	<0.001

OSD, obesity specific distress; p-value <0.05 significant.

Table 5 – Inter-factors correlations and convergent construct validity of the OSD scale (Sample 2).

Factors and scores correlation	Factor 1	Factor 2	OSD total scale
Factor 1: Social/emotional functioning	1.00		
Factor 2: Psychological distress	0.65	1.00	
OSD total scale	0.91	0.89	1.00
IWQOL-Lite	−0.70	−0.59	−0.73
BSQ	0.60	0.81	0.76
BDS-22	0.55	0.69	0.66

Notes: Spearman correlation r and $p < 0.001$ for all correlations; OSD, Obesity Specific Distress, IWQOL-Lite, Impact of weight on quality of life, BSQ, Body shape questionnaire, BDS-22, Beirut Distress Scale.

impact of weight on quality of life and body shape dissatisfaction. Our results indicate that obese adults with higher score on the OSD scale, and thus with higher level of distress, also report lower quality of life and higher degree of body shape dissatisfaction. These findings are consistent with previous studies in which measures of psychopathology, such as depression and eating disorders, were found to be inversely correlated with quality of life and positively associated with body dissatisfaction in obese individuals.[29–32] Moreover, a positive correlation with moderate strength was found between OSD total scale, particularly the psychological functioning subscale, and BDS-22, which is a validated generic measure of psychological distress in Lebanese adult population.[21] Our study also provides some evidence of the clinical validity through its ability to discriminate obese community volunteers with presumed low level of distress from another of obese patients with diagnosed depression and therefore with higher level of distress. Taken together, our findings provide strong evidence in support of the fact that the OSD is a valid measure of psychological distress related to obesity status in the adult population.

Some limitations of this study need to be mentioned. The risk of selection bias due to the lack of randomization might have restricted the capacity to generalize our findings among the adult population. Another limitation is the validation of the new scale (OSD) against two sets of measures (IWQOL-Lite and BSQ questionnaire) that have not been validated in Lebanon. To overcome this disadvantage, we employed the Beirut Distress scale (BDS-22) which is validated among Lebanese adults population. Further studies would be required to evaluate the predictive validity of the scale and its sensitivity to change over time as a function of clinical intervention. Finally, testing the reliability and validity of the OSD scale in other Arabic countries would ensure that the psychometric properties of our scale are well established and replicable.

Medical personnel and experts should acknowledge the effect of psychological distress on obese adult population and devise ways to unveil it. Screening instrument, such as the Arabic OSD can be easily administered by clinicians and help promote a better understanding of the association between distress and obesity. This might improve the outcome and provide the patients with more efficient treatment.

6. Conclusion

The 10-item OSD scale to measure distress in obese adult population demonstrated good psychometric properties regarding internal consistency, test-retest reliability, and construct validity. Since this is the first study to test the OSD scale, continued investigation is needed to evaluate its clinical validity. With further evaluation, the OSD should prove useful to healthcare providers wishing to screen for distress in obese adults in epidemiological studies as well in clinical and research settings.

Conflicts of interest

The authors have none to declare.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.cegh.2015.08.001.

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