



Development of a scale to measure quality of life of overweight women

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Abstract

Purpose This study presents the results of methodological research that derives evaluation items and tests the validity and reliability of the scale to measure quality of life of the overweight women.

Methods The scale items were developed by the current researchers directly from the consultation data following a group interviewing process aiming to capture the women's experiences, who are currently receiving primary health care. Pretest interviews were used to ensure that the questions were understood correctly. Six experts determined items for content validity of the scale and the evaluations of experts were scored using a content validity index. The scale is a Likert-type scale, ranging from 1 to 5. The items were tested on a sample of 506 healthy women. The body mass indices of participants were 30 and above. Psychometric analyses included explanatory factor analysis (EFA) and item response theory. Parallel analysis was used to extract factors in EFA. Internal consistency and Spearman Brown split-half test correlation were used for testing reliability.

Results The scale was refined as four final dimensions, comprising 40 items as a whole. The result of Bartlett's Test of Sphericity was found sufficient ($\chi^2 = 14164.92$; $p < 0.001$) and the KMO value was 0.959. This statistically significant value ($p < 0.001$) indicates that the sampling was sufficient and data had normal distribution. Cronbach's alpha was 0.967. The Spearman Brown coefficient was found to be 0.884.

Conclusion It was found that the scale is a valid and reliable assessment tool that can be used to measure the quality of life of overweight women.

Level of evidence Methodological study, Level V.

Keywords Scale · Overweight women · Quality of life · Public health · Turkey

Introduction

Obesity is a serious public health issue which causes important health problems such as cardiovascular disease and diabetes, and affects quality of life negatively [1, 2]. It has become a global epidemic. In Europe, its prevalence is between 32–79% among adult men, and 28–78% among adult women [3]. Albania, Bosnia-Herzegovina, and

England are European countries where the prevalence of obesity is especially high [2].

According to a pre-study report of 'National Nutrition and Health Examination 2010', the prevalence of being overweight is 31.35%, while obesity prevalence is 12.02%. 28.93% of the women are overweight, but 14.49% of them are obese and in men 33.64% are overweight, 9.70% are obese in Turkey [4].

The main risk factors for obesity are low physical activity, eating habits, age, being a woman, number of births, marriage, quitting smoking, and drinking alcohol. The quality of life in obese women is lower than in obese men. For example, in obese women, stigmatization, anxiety, and depression are more prevalent [5–7]. Choo et al. found that women with increased body mass index had lower self-efficacy, more severe depressive symptoms and greater deterioration in quality of life [7].

Quality of life is the satisfaction of an individual with his/her own life [8–10]. One of the most important factors which

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influence satisfaction of an individual with life is being healthy. Protection and improvement of health would enable increased quality of life [9]. Obesity in adults is associated with impaired Health-Related Quality of Life (HRQoL). One of the most important factors which influence quality of life among women is being at a healthy weight [11]. Various studies support the relation between body mass index and quality of life. For women, being overweight influences physical wellbeing, self-esteem, social interactions, and family relations, sex life, and work life [10–12].

The World Health Organization (WHO) defines quality of life as “individuals’ perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns.” It is a comprehensive concept affected in a complex way by individuals’ physical health, psychological state, and their relationship to salient features of their environment [13]. Culture can be defined as the behaviors, beliefs, and characteristics of a particular social or age group. For social and ethnic groups, these behaviors, often learned during childhood, are values that represent unconscious factors in the motivation of individual behaviors [14, 15]. In prevalence studies conducted in Turkey, it was determined that the prevalence of obesity is higher in females compared to males [16–18]. A study reported that obesity among women is almost two times higher than men (41.0%, 20.5%). Studies from Europe reported obesity prevalence among men between 32 and 79% while among women between 28 and 78% [3].

There are some scales that are/can be used to measure quality of life [8, 13, 19], but there are few scales that can be used to measure quality of life in obese women [20]. The aim of the present study was to develop a scale to assess the quality of life of overweight women. It was thought that this scale would be useful to measure health status and evaluate the outcomes of interventions to improve health.

Methods

Study design

This study presents the results of methodological research that derives evaluation items and tests the validity and reliability of the scale to measure quality-of-life of overweight women.

Procedure

The present researcher conducted focus group interviews before this study, and developed an item pool which analyzes

the quality of life among women using focus group data, their experiences and the contents of interview covering all aspects of QOL based on detailed literature review [1, 10, 12, 18, 19]. The focus group study aimed to capture the experiences of women currently receiving primary health care. Three group interviews were conducted with 18 women. Scale items were developed to evaluate the relationship between obesity and physical health, psychological dimensions (self-perception), difficulties in performing and maintaining a job, social relations (spouse and important others) and relations with their surroundings. Thus, it should be ensured that the grading scale is a complete structure that includes the physical, spiritual, and social dimensions of health and communication with the environment. The semi-structured questions included: (1) Does obesity affect your physical activity and ability? If yes, How? (2) Does obesity affect your social relationships (with spouse, family and others)? If yes, How? (3) Does obesity affect your sex life? If yes, How? (4) What is your opinion about obesity? Does your weight affect your work life? When compared to others, how do you feel about yourself? Then women’s statements were converted to sentences. The following methods were used when creating items:

1. The words the women spoke were turned into smooth sentences,
2. All items were created so as not to include factual statements,
3. Expressions were written in simple present time and in plain language style,
4. Each item includes only one idea/opinion.

The statements about the quality of life of overweight women, comprising 56 items, were categorized into six sub-groups: (1) physical activity (12 items), (2) public distress (14 items), (3) sex life (9 items), (4) self-perception (9 items), (5) work life (9 items), and (6) self-esteem (5 items). Six experts determined the content validity of the scale. Of those five experts were professional academics at university, studying in this field. The other expert was an academic at the biostatistics department who took part in the scale development studies. The item pool was sent to the experts via e-mail by the authors. They were asked to answer the following two questions: (1) Do the items have the quality of an expression of question? (2) Do the items assess the criteria of quality of life? Content Validity Ratios (CVR) were calculated using Lawshe technique according to the views of the experts for each item as “appropriate or highly appropriate” using the following formula [20, 21].

$$\text{CVR} = \frac{\text{number of experts stating 'suitable' and 'quite suitable'}/\text{number of experts}}{\text{number of experts}}$$

It was stated that the scale had sufficient content validity since 80% of experts evaluated items with 3–4 points and the scale had 0.80 and above CVI. It is suggested that CVI values of items should not be below 0.80 [20, 21]. The CVI of 15 items was 0.80 and others were 1.00. The total CVI rate of the scale was 0.925 and since this CVI is higher than 0.80, it was accepted as suitable.

Sampling

Participants in the study were from public education centers in a city. The sample was composed of women whose body mass indices were 30 and above, and who had no disease associated with obesity.

Research eligibility criteria

The main eligibility criteria were being 18 years and older, overweight (BMI 30 and over), and willing to comply with the study. In addition, diseases related to obesity and non-pregnancy complaints were included.

Data collection

The data were collected between March and April 2014 through face-to-face interviews on weekdays at each center. The participants completed the data collection tools individually, and each participant spent about 15 min filling out the forms. There are 56 items in the item pool prepared for the Scale of Quality of Life of Overweight Women (SMQLOW). It is recommended that the sample size should be 5–10 times more than the number of items [22, 23]. We collected the data from 506 women in the research period, this number complies with the recommended sample size.

The measurements of height and weight were done in a room prepared by the public education centers with the same measurement instruments whose calibration was done before application. The measurement of height was done without shoes; heels leaned behind, and back stiff and head in a normal anatomic position. The measurement of weight was done by taking off extra clothes and shoes. The body mass index was calculated by dividing the body weight in kilograms per square of height in meters. All the measurements were done in the morning before breakfast.

Data analysis

The data were evaluated using SPSS 20 Package Program (SPSS, Statistical Package for the Social Science). The content validity index was calculated after expert views for content validity. Factor analysis was applied to reveal the factor structure to test the structure validity of the scale. Parallel analysis was used for determining the number of

components. Among many techniques proposed to determine the number of factors to retain, Horn's Parallel Analysis (PA) is the most strongly recommended one. The PA method is implemented by generating a large number of data matrices from random data. Each matrix is generated in parallel with the real data which means that matrices with the same number of cases and variables are created. The rationale underlying PA is that components from real data with a valid underlying factor structure should have larger Eigenvalues than those derived from random data having the same sample size and number of variables. Thus, researchers would not be interested in a factor that does not account for more variance than the parallel factor obtained from random numbers because meaningful components extracted from actual data should have larger eigenvalues than parallel eigenvalues obtained from random data factors are retained in the real data as long as they are greater than the mean eigenvalue generated from the random data matrices [24, 25].

The construct validity of the scale was examined by exploratory factor analysis using principal component with varimax rotation method and Kaiser Normalization. Factor analysis was performed in four stages: investigating whether the data were suitable for factor analysis (using Kaiser–Meyer–Olkin), designating factors, rotating factors, and labelling factors.

Cronbach alpha coefficient was used to determine internal consistency of items in the scale. Item analysis was applied to determine contribution of the items to the scale. To this aim all item-total correlation coefficients in the scale were calculated. Moreover, reliability coefficients were calculated again for the rest of the items when an item is deleted from the scale.

Results

The mean age of the participants was 44.9 ± 11 . The scale, made up of 56 items at first, was reduced into 40 in parallel with item analysis. Of the respondents, 0.8% was at normal weight, 22.3% of them were overweight, and 44.5% of them were obese at first grade. 30.2% of them were obese at second grade. The mean scores of the respondents according to BMI were 163 ± 8.87 ; 145 ± 3.05 ; 138 ± 2.32 ; 128 ± 2.72 , respectively. The difference between the groups was significant. $F = 6.101$; $p < 0.001$ and the differences between all groups were significant according to post hoc test.

There were 16 items with coefficients 0.30 which were deleted because of low correlation. Therefore, the final scale consisted of 40 items. The scale was structured as four factors based on the results of the parallel analysis (Table 1). Rotation sums of squared loading of factors and the percentage of the total variance explained by factors, respectively,

Table 1 Eigen values of actual and simulative data

Factor	Eigen values of actual data	Eigen values of simulative data
1	17,882455	1,718602
2	4,067184	1,637080
3	2,772813	1,560181
4	1,555313	1,516343
5	1,212134	1,464250

were 9706 (24.264%); 6751 (16.87%); 6463 (16.157%); 3359 (8.397%). Thus, total variance explained by four factors was determined as 65.694%. Factor loads of the items forming the scale varied between 0.546 and 0.840 (Table 2). KMO value was 0.959 and the result of Bartlett's Test of Sphericity analysis was found to be $\chi^2 = 14164.9$; $p < 0.001$.

Corrected item-total correlations ranged between 0.564 and .839. Cronbach's alpha values were determined as 0.967 for the whole scale, 772–961 for the subscales. While Cronbach's alpha value was 0.939 in the first half, Spearman Brown split-half test correlation of the SMQLOW was 0.951 in the second half and the Spearman Brown value was determined as 0.884.

Labelling and content of factors

The factors in the scale were labelled according to the items included in their sub-dimensions. Hence the first factor, composed of 16 items, was labelled as 'self-care and physical activity' since it included items relating to the status of respondents' self-care and physical activity and problems related to them. The second factor contained nine items which was labelled as 'sex life' since the items here reflected problems experienced by overweight women in relation to their sex life. The third factor contained 11 items because these items are related to the distress caused by the environment and this factor was labelled as 'public distresses'. The fourth factor, comprised four items, was labelled as 'self-perception' because the items of this factor are related with the individual's own perception.

Discussion

This study was carried out to develop a quality-of-life scale for overweight women, and to test validity and reliability of the scale. Three factors were defined in validity and reliability of the quality-of-life scale for overweight women. These factors are composed of 40 items and explain 65.694% of total variance.

Construct validity

Content and construct validity methods were used for the validity of SMQLOW.

Content validity was explained in the "Methods" section. The items whose CVI scores were three and four were included in the scale [20, 26]. Exploratory factor analysis (EFA) was used in construct validity. Exploratory factor analysis (EFA) is a multivariate statistical technique which aims to bring many variables related to each other and find new variables (factors/dimensions) which are few in number and conceptually meaningful [21, 27, 28]. Before was EFA done to determine construct validity, the Kaiser–Meyer–Olkin (KMO) coefficient and Bartlett test were done to evaluate the compatibility of the data. It is expected that the Bartlett test result should be meaningful ($p < 0.05$) and the KMO value should be more than 0.50 [8, 29]. If the KMO value is between 0.50 and 0.70 the sampling number is at medium level, if it is between 0.80 and 0.90, it is quite good and if it is 0.90 and above, it is accepted to be perfect. If the KMO value is below 0.50, it is stated that number of sampling is insufficient [23, 29]. KMO values in this interval show that the sample was large enough. The Bartlett test result is also meaningful which indicates the existence of a correlation between scale items and shows that the data set is suitable for EFA [30]. The analysis result of Bartlett's Test of Sphericity was found sufficient. This value which was found to be statistically significant ($\chi^2 = 141164.9$; $p < 0.001$) indicates that the data were normally distributed.

According to the EFA results in this study, the scale is composed of three factors. In EFA, correlation of an item with a factor and correlation of an item with the whole scale is observed; this process analyzes how much of the total variance can be explained by the factors. It is accepted as an important variable included in the analysis that should explain two-thirds of the total variance. However, it is difficult to reach this rate in social and behavioral sciences. The variance rates between 40 and 60% are acceptable for social sciences [28]. When the explained variance is high, it is regarded as an indicator that related terms or constructs measure what is to be measured well. In this study, the factors explain 65.69% of total variance and this rate is acceptable. Four factors obtained as a result of EFA, carried out with varimax rotation and factor loads of the items were collected. The factor loads point out the correlation between items and factors. If the factor load of an item is low, then it means that items do not have a powerful correlation. There are studies which adopt the idea that the factor of items should not be below 0.40 [30, 31] and those stating that load values should not be below 0.30 [20, 21, 32, 33]. Therefore, SMQLOW has construct validity (Table 2).

Table 2 Provision of the item names

Items	Factor 1	Factor 2	Factor 3	Factor 4	Item-total correlation	Cronbach's alpha if item is deleted
1. I have difficulty in getting on and off the bus	0.827				0.809	0.958
2. I have difficulty in walking short distances (one street farther)	0.817				0.827	0.957
3. I have difficulty in doing housework	0.813				0.839	0.957
4. I go out rarely since I have difficulty in moving	0.812				0.776	0.958
5. I have difficulty in climbing upstairs	0.806				0.763	0.958
6. I have difficulty in crouching and bending over	0.784				0.741	0.959
7. I have difficulty in climbing upstairs a few floors	0.771				0.733	0.959
8. I have difficulty in bathing on my own	0.751				0.739	0.959
9. I have difficulty in dressing on my own	0.730				0.748	0.959
10. I have difficulty in running and removing heavy goods	0.727				0.675	0.960
11. Completing works lasts longer due to my weight	0.676				0.817	0.957
12. I get exhausted easily while working due to my weight	0.656				0.796	0.958
13. I get tired easily compared to my peers	0.653				0.792	0.958
14. I feel difficulty in doing daily works due to my weight	0.640				0.771	0.958
15. I have difficulty in doing exercise program suggested for losing weight	0.639				0.655	0.960
16. I feel reluctant in starting and sustaining a work	0.612				0.738	0.959
17. My weight influence sexual satisfaction negatively		0.840			0.823	0.913
18. I often avoid sexual relation due to my weight		0.809			0.793	0.914
19. I think my weight decreases my sexual attraction		0.777			0.791	0.914
20. My partner states his distress during sexual relation		0.772			0.762	0.917
21. My partner is not content with our sexual life		0.763			0.710	0.920
22. I abstain from being naked to my partner due to my weight		0.758			0.754	0.917
23. I feel bad odor during sexual relation due to my weight		0.731			0.693	0.921
24. I am not content with my sexual life		0.673			0.649	0.924
25. My partner does not think I am attractive due to my weight		0.658			0.663	0.923
26. I receive warning about decreasing the amount of food I eat			0.765		0.808	0.927
27. The amount of food I eat disturbs people around me			0.700		0.704	0.931
28. People make me object of derision due to amount of food I eat			0.698		0.632	0.934
29. Friends give advice to me about losing giving			0.692		0.767	0.929
30. People frequently give me advice about losing weight			0.686		0.755	0.929
31. My family warns me about the food I eat			0.684		0.709	0.931
32. I receive negative criticism due to my physical appearance			0.636		0.752	0.929
33. People make me feel negative being overweight			0.615		0.773	0.928
34. I receive negative criticism about my weight from health personnel			0.598		0.727	0.930
35. I receive negative behaviors about my weight			0.578		0.657	0.933
36. I feel distress due to my weight in public			0.546		0.736	0.930
37. I believe I would look more beautiful if I lost weight				0.706	0.579	0.714
38. I feel regret when I eat much				0.670	0.574	0.717
39. I feel unsuccessful in controlling my weight				0.660	0.618	0.693
40. I think my clothes do not fit me				0.621	0.526	0.743
Eigen values	9706	6751	6463	3359		
Percent of total variance explained	24,264	16,876	16,157	8397		
Cumulative percent	24,264	41,141	57,298	65,694		

Extraction method: principal component analysis

Rotation method: Varimax with Kaiser Normalization

Reliability of scale

Reliability is the power of a measurement scale in giving compatible and coherent results [30]. It shows how well an instrument gives decisive and renewable results [32]. In testing the reliability of SMQLOW, item-total correlation coefficients, Cronbach's alpha internal consistency analysis, and split-half reliability methods were used. In a Likert-type scale, it is expected that the reliability coefficient should be as close as possible to one [27]. The reliability coefficient being around 0.90 is accepted as 'perfect', being 0.80 means 'very good' and being around 0.70 means 'sufficient' [22]. Consequently, the Cronbach's alpha coefficient of the scale obtained in this study is above 0.70 [20].

The reliability coefficient obtained by dividing a scale into two is referred as equivalent split-half reliability. If the scale has sub-dimensions, each sub-dimension is accepted as a whole in itself and the method can be applied for sub-dimensions as well, which is the most common method among scale reliability determination methods [22]. Internal consistency refers to the general agreement between multiple and scaled items. According to these results, the internal consistency of the SMQLOW was considered highly reliable.

The item-total score correlation is based on the calculation of the correlation between each item and the total score. If the total scale of an item and value of correlation coefficient is minus, zero or close to zero; then the item should be excluded. If the value is low, it means that the item measures a different quality from others [21, 27]. In this study, the item-total correlation coefficient of items in the final scale was between 0.564 and .839 (Table 3) If the items' total correlation is 0.30 and above, it means they can identify individuals well in the sense of measured characteristics [32]. Hence, each item in this scale generally serves to measure the expected quality and each item is distinctive at acceptable level. Also, the significant negative correlation between the BMI and SMQLOW scores of the participants (-0.114 ; $p < 0.05$) and significant difference in the mean SMQLOW scores according to BMI ($F = 6.101$; $p < 0.001$) show that the scale is distinctive.

Conclusion

Findings obtained in the study indicate that SMQLOW is valid and reliable. The scale can be used to identify the quality of life among overweight people and the evaluation of the effectiveness of activities for improving health. Developed in this way, SMQLOW could indirectly contribute to protecting and improving women's health.

Table 3 Descriptive statistics and reliability analysis of the scale

Items	Mean values	Std. dev.	Corrected item-total correlation	Cronbach's alpha if item is deleted
1.	2.3131	1.37762	0.697	0.966
2.	2.0275	1.34268	0.729	0.966
3.	2.3973	1.40333	0.721	0.966
4.	2.0822	1.37523	0.670	0.966
5.	2.3288	1.39239	0.627	0.966
6.	2.8004	1.45901	0.630	0.966
7.	3.1096	1.32684	0.620	0.966
8.	1.6358	1.35543	0.676	0.966
9.	1.6745	1.15070	0.691	0.966
10.	3.1761	1.29263	0.598	0.967
11.	2.4603	1.45523	0.806	0.966
12.	2.5356	1.44541	0.795	0.966
13.	2.6362	1.42713	0.786	0.966
14.	2.4058	1.38547	0.748	0.966
15.	2.7530	1.44311	0.626	0.966
16.	2.5229	1.47048	0.755	0.966
17.	1.5080	1.00825	0.616	0.967
18.	1.8535	1.25857	0.620	0.967
19.	2.0636	1.35180	0.634	0.966
20.	1.6142	1.08431	0.573	0.967
21.	1.8427	1.22013	0.515	0.967
22.	2.0705	1.37403	0.594	0.967
23.	1.5080	1.00825	0.536	0.967
24.	2.1370	1.37070	0.516	0.967
25.	1.8655	0.23791	0.525	0.967
26.	2.5835	1.45382	0.744	0.966
27.	2.6699	1.49708	0.704	0.966
28.	1.8498	1.27492	0.599	0.967
29.	2.6464	1.47747	0.710	0.966
30.	2.1375	1.33721	0.641	0.966
31.	1.7446	1.27884	0.570	0.967
32.	2.6850	1.41812	0.703	0.966
33.	2.8605	1.47625	0.665	0.966
34.	2.6686	1.49593	0.640	0.966
35.	2.0990	1.36934	0.734	0.966
36.	2.7022	1.46637	0.725	0.966
37.	3.5953	1.37942	0.424	0.967
38.	3.5897	1.32822	0.441	0.967
39.	3.1696	1.43737	0.551	0.967
40.	2.8725	1.44494	0.463	0.967

Compliance with ethical standards

Conflict of interest There was no conflict of interest.

Ethical approval The ethical consent that is required for the performance of the research was obtained from the Ethics Committee Gazi University; before the data were collected institutional permissions were obtained.

Informed consent The women were asked to read the explanations related to the study on the front page of the questionnaire and to complete the questionnaire if they wished to participate in the study. After that, verbal and written consent were obtained from participants.

Data availability The data used to generate the results of this manuscript are available on request from corresponding author.

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