Development and Psychometric Properties of Overeating Situations Scale (OSS)

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Obesity has become a problem that is too expensive to ignore. To overcome obesity, we need a precise tool to assess its causal factors. The objective of the study was to develop a scale that clearly explains situations responsible for obesity. For this purpose, we choose a sample of 350 obese women with the age range of 25 to 50 years (*M*= 31.98, *SD*= 6.11). Exploratory factor analysis was conducted on a list of 73 statements and found three factors: psychological, emotional, and cognitive. Confirmatory factor analysis validated the EFA findings. The proposed scale possesses good psychometric properties, with both convergent (*r*=.89) and discriminant validity (*r*= -.61). This study provides a valid tool to assess the underlying factors of obesity. This study also addresses the limitations of other tools of obesity. So, this scale will be helpful for both researchers and clinicians, to find out the situations which lead to obesity.

Keywords: causal factors, obesity, working women, psychological, emotional, cognitive [1]

Introduction

Obesity has become a significant public health problem in both developed and developing countries. It has become the fifth leading risk factor for death (Tanzil & Jamali, 2019). A global estimate revealed that in 2016 some 39% of adults aged 18 years and older were overweight (WHO, 2018). Obesity increases the risk of Type II diabetes, stroke, some cancers, and heart disease. There are now 671 million obese people in the world and 78 million of them are from the United States (Sherin, 2013). Pakistan has become the ninth most obese country in the world

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and, while all age groups are affected, the age group of 25 to 44 years has a 2.4 times greater prevalence (40% of men and 60% of women) (Muazzam, Waheed, Ahmed, & Muzaffar, 2019).

Nevertheless, the figures for 2013 show that it has increased to 38% in women and 28% for men. Sixty-seven percent of women and 56% of men are suffering from obesity in urban areas as compared to rural areas. Across the globe, obesity is a significant public health crisis. In Pakistan, the rise of obesity was between 2000 -2014. It is now endemic as it has increased three folds than before (Tanzil & Jamali, 2019). With its changing socioeconomic status and rapid urbanization, Pakistan is experiencing an increase in its rates of obesity, particularly in adults. In a recent national survey, an estimated 30 million people were found to be suffering from obesity, and the higher prevalence was seen in women.

Numerous factors for obesity and weight gain have been identified, including lifestyle and genetics. Others are recent weight loss, changes in social circumstances, disease, certain medical conditions, drug treatment, alcohol intake and smoking cessation. There are also some other important individual factors involved, such as age (obesity is age-dependent: more obese individuals are seen in old age), gender (women have a greater tendency than men), education (highly educated women are thinner than less educated), socioeconomic status (an inverse relationship has been found between obesity and socioeconomic status) and marital status (married women tend more suffer in obesity than unmarried women) (Agrawal, Gupta, Mishra &Agrawal, 2015). As far as the consequences of obesity are concerned, these may be both physical and psychological. The physical problems include diabetes, back pain, cardiovascular disease, joint trauma, hypertension, liver disease, osteoarthritis, sleep apnea, cancer, and infertility (Malik, & Muazzam, 2017). When it comes to psychological problems, people with obesity experience anxiety and depression at a higher rate (Smith, Hay, Campbell, & Trollor, 2011). Poor self-image and low self-esteem are the results of blame and self-attribution for their obesity (Muazzam, & Khalid, 2008). A study of 14,077 women showed a direct, linear relationship between their weight and their blood pressure, cholesterol, blood glucose, and heart disease (Ashton, Nanchahal, & Wood, 2001). Obese people are some of the most stigmatized people, considered to be weak-willed, lazy, less intelligent, unsuccessful, incompetent, undisciplined, unclean, and immoral. Obesity has several socially related

consequences in, such as lower wages, fewer marriage prospects, and less education (Iram, & Muazzam, 2016).

Numerous instruments have been developed to measure maladaptive eating patterns or to help in identifying the characteristics of eating disorders. Body Mass Index (BMI) is one of the most well-known tools to determine whether an individual is obese or not, taking into account their height and weight (Odgen, 2003). Stunkard and Messick (1985) developed the eating questionnaire, which provided three dimensions of people's food intake behaviour. It measured three stable characteristics: cognitive restraint in eating; disinhibition; and hunger. None of these scales assesses factors or causes of obesity. Therefore, developing a valid and reliable tool to assess the factors involved in obesity was the primary motivation to conduct this study. Social and cultural factors are also crucial to the pervasiveness of obesity. People in collectivistic societies such as Pakistan spend more time in activities that are dictated by role or context, such as resting, cooking, tending animals, gardening, being outdoors, sleeping and eating (Li et al., 2015). So, social and cultural factors were another motivation to develop a scale that can be used specifically for Pakistani culture.

Method

The study comprised four phases. In phase, I, focus group and semi-structured interview techniques were used for item generation that would feature on Overeating Situations Scale. In Phase II, EFA was conducted on a sample of 350 obese women those were having BMI more than ≥30.00, with the age range of 22 to 55 years (M = 31.98, SD = 6.11) to explore overeating situations. In Phase III, to validate the findings of the EFA, CFA was undertaken on a sample of 400 obese and married working women. Using a purposive sampling technique, this sample was recruited from five universities and five hospitals in Lahore, Pakistan. In Phase IV, the convergent and discriminant validity was established.

Phase I: Item Generation for the Overeating Situations Scale

For item generation, both inductive (focus group, semi-structured interviews) and deductive approaches (previous literature) were used. Three separate focus groups were held with obese working women having a BMI of more than ≥30.00. Each group was comprised of five (N=5) members which include doctors and teachers. A purposive sampling strategy was employed to recruit the groups' participants from public and private universities and hospitals in the age range of 22 to 45

years (*M* = 33.06, *SD* = 6.73). Participants were encouraged to share their experiences of situations that contributed to their weight increase.

For the semi-structured interviews, four participants in the age range of 36 to 48 years (*M* = 40, *SD* = 9.7) were selected from a public sector university and two from government hospitals (N = 4). The interviews focused on eliciting the situations in which they eat more than usual. Informed consent was taken from the participants. We recorded all interviews to facilitate the transcription and analysis of the interviews. The final 73 statements were assembled in list form, and the unclear, dubious or overlapping items were excluded.

Step II

Content Validity

The content validity was calculated to assess whether the components of the questionnaire are relevant to the concept. For this purpose, 73 items were evaluated by five experts (3 bariatric physicians and two psychologists). They were requested to rate each item on a four-point Likert scale ranging from 1 = not relevant to 4 = highly relevant (Davis, 1992). They were asked to add or suggest any other items with relevance to the construct. The ratings of the five experts were used to calculate the Content Validity Index (CVI). Items with the agreement of 5 were retained, after experts' judgment.

Table 1

Item CVI for overeating situation scale (N = 5)

Item	**E1**	**E2**	**E 3**	**E 4**	**E 5**	Agmt	**Item CVI**
1	2	2	4	2	4	2	0.4
2	4	2	4	3	4	3	0.6
3	4	4	4	2	4	4	0.8
4	4	4	4	2	4	4	0.8
5	2	4	4	4	4	4	0.8
6	4	4	4	1	4	4	0.8
7	4	4	0	4	4	4	0.8
8	2	4	4	0	4	3	0.6
9	4	4	4	3	4	4	0.8
10	4	4	4	0	4	4	0.8
11	4	4	4	4	4	5	1
12	4	1	4	4	4	4	0.8

13	4	4	4	4	4	5	1
14	4	2	4	4	4	4	0.8
15	4	4	4	4	4	5	1
16	4	4	4	4	4	5	1
17	4	4	4	4	4	5	1
18	4	4	4	4	4	5	1
19	4	4	4	4	4	5	1
20	4	4	4	4	2	4	0.8
21	4	4	4	4	4	5	1
22	2	4	4	4	4	4	0.8
23	2	4	3	4	4	3	0.8
24	2	4	4	4	2	3	0.6
25	4	4	4	1	4	4	0.8
26	4	4	4	4	4	5	1
27	4	4	4	4	4	5	1
28	4	4	4	4	4	5	1
29	1	4	4	4	4	4	0.8
30	1	4	4	4	4	4	0.8
31	2	4	4	4	2	3	0.6
32	2	4	4	2	2	2	0.4
33	4	4	4	4	4	5	1
34	1	4	4	2	4	3	0.6
35	4	4	4	2	1	3	0.6
36	4	2	4	2	4	3	0.6
37	4	4	4	4	4	5	1
38	4	4	4	4	4	5	1
39	2	4	4	2	4	3	0.6
40	4	4	4	2	4	4	0.8
41	2	4	4	1	4	3	0.6
42	1	4	4	1	4	3	0.6
43	4	4	4	4	4	5	1
44	4	4	2	4	4	4	0.8
45	4	4	4	4	4	5	1
46	4	4	4	4	4	5	1
47	4	4	4	4	4	5	1
48	1	4	4	2	4	4	0.6
49	4	4	4	4	4	5	1
50	4	4	1	4	4	4	0.8
51	4	4	4	2	4	4	0.8
52	4	4	4	2	4	4	0.8

53	4	4	4	4	4	5	1
54	4	4	4	1	4	4	0.8
55	4	4	4	3	4	4	0.8
56	4	4	4	4	4	5	1
57	4	4	4	4	4	5	1
58	4	4	4	4	4	5	1
59	4	4	4	1	4	4	0.8
60	4	4	4	1	4	4	0.8
61	1	4	4	2	4	3	0.8
62	4	1	4	3	4	3	0.6
63	1	4	4	2	4	3	0.6
64	2	4	4	2	4	3	0.8
65	4	1	4	3	4	3	0.6
66	2	1	4	2	4	2	0.6
67	4	4	4	3	4	4	0.8
68	2	1	4	2	4	2	0.6
69	4	4	4	2	4	4	0.8
70	4	4	4	2	4	4	0.8
71	4	4	4	3	4	4	0.8
72	4	4	4	2	2	3	0.6
73	4	4	4	2	4	4	0.8

Note. E1-5: Expert 1-5, Agmt: Expert Agreement

Thus, according to the criteria (Lynn, 1986) and expert ratings, only 23 items were selected. The scale content validity (S-CVI) is calculated as follows:

Scale CVI = total item CVIs/total no. of items: 58.8/73 = 0.80

According to Lynn (1986), the scale CVI with a value of 0.80 is acceptable.

Step III: Pilot Study. The items for the overeating situations scale were compiled into a five-point Likert rating scale (0 = never and 4 = always) and face validity was established by a pilot study (N = 50). Through purposive sampling, participants from various occupations were selected, in the age range of 25 to 54 years (M = 34.00, SD = 8.44). Participants did not report that there was any ambiguity in the items. Finally, 23 items were retained for the final version of the overeating situations scale. The pilot study tested the feasibility of the overeating situations scale to finalize the items for factor analysis.

Phase II: Establishing Construct Validity through Factor Analysis

The construct validity of the scale was established in this phase, and factor analysis using varimax rotation was applied. It is a technique

used at one level of factor analysis as an attempt to clarify the relationship among factors.

Sample

Using a purposive sampling technique, a sample of 350 obese working women having BMI more than ≥30.00 was selected from universities and hospitals in Lahore. Working women with a similar level of education, employment status, and social status were chosen to maintain the homogeneity of the sample. The age range of the sample was 20 to 50 years (M = 31.98, SD = 6.11). Women with any clinical problem were excluded from the study. The value of KMO (Kaiser – Mayer Olkin) is 0.89, which shows that sample is adequate and appropriate for factor analysis (Field, 2005). The value of approximate chi-square assessed the distribution of data. At 3,841 with 253 degrees of freedom, significant at the 0.05 level of significance, it was found that the items were evenly distributed, no item having any missing values or outliers (Coakes& Steed, 2003). High values of communalities confirmed further analysis (Yong, 2013).

Procedure

Participants from various ages, professions, years of both employment experience and marriage, and the number of children were included in the sample. After approval of the Ethics and Research Committee, permission to participate in this research was granted by the concerned departments, and written consent was obtained from the participants. Three hundred sixty-five respondents returned the questionnaire, yet only 350 of these were found to be complete in all aspects. Names of the participants were not asked to ensure the confidentiality of the information collected.

Exploratory Factor Analysis

Only 23 items met the assumptions of factor analysis. All factors were retained that had an Eigenvalue more significant than 1, and variance of 55.27% for the three factors emerged after EFA (Kaiser, 1960).

Table 3

Factor loading for exploratory factor analysis, with varimax rotation of factors for overeating situations scale (N = 350)

Sr.no.	Item	FI	FII	FIII	Item total correlation

1	OS11	**.68**	-.09	.13	.53**
2	OS13	**.73**	.05	.01	.60**
3	OS15	**.70**	.01	.03	.55**
4	OS16	**.72**	.21	.13	.58**
5	OS17	**.69**	.09	.00	.58**
6	OS18	**.70**	.13	.01	.64**
7	OS19	**.78**	.15	.00	.67**
8	OS21	**.73**	.09	.05	.53**
9	OS26	**.76**	.01	.02	.63**
10	OS27	**.72**	.18	.07	.60**
11	OS28	**.50**	.02	-.04	.42**
12	OS33	.04	**.75**	.08	.51**
13	OS36	-.10	**.77**	.03	.44**
14	OS38	.02	**.87**	**.**02	.56**
15	OS43	.07	**.87**	.10	.55**
16	OS45	.20	**.88**	.09	.53**
17	OS46	**.**17	**.73**	.50	.49**
18	OS47	.00	**.77**	.11	.50**
19	OS49	.13	**.73**	.08	.45**
20	OS53	.02	.-01	**.50**	.30**
21	OS56	.02	.10	**.71**	.31**
22	OS57	.70	.04	**.69**	.32**
23	OS58	.03	.01	**.73**	.30**
Eigenvalues			5.59	5.25	1.87
Cumulative percentage of variance			24.30	47.13	55.27

Note: *p***<0.01*. Items with a loading of 0.35 or above are shown in bold.

Table 4

Inter-correlation and alpha coefficients for factors and total scores for the overeating situation scale (N = 350)

Factor	**1**	**2**	**3**	**4**
1		.12*	.16**	.81**
2			.12*	.63**
3				.41**
4				
Alpha	.90	.92	.59	.86

coefficient

***p<0.01 . Note 1= psychological. 2= emotional, 3= cognitive, 4: Overeating Situation Scale*

Phase III

Confirmatory Factor Analysis (CFA)

Twenty-three items of the OSS retained through EFA were conformed using CFA (AMOS-22). For this purpose, a sample of 400 women in the age range of 25 to 55 years (M = 32.23, SD = 6.47) was selected from several universities and hospitals.

Instrument

The OSS developed in the first phase of the study was used.

Procedure

The universities and hospital authorities were informed about study objectives. The participants were briefly informed about its objectives by the researcher and signed a consent form to show their willingness to take part. They were given demographics form and the obesity questionnaire. Special consideration was given to maintaining the privacy and confidentiality of the data.

Results

CFA was used to confirm the factor structure that emerged from the CFA. The values of Chi square = 367.37, df = 225, Chi square/df = 1.63, CFI = 0.96, GFI = 0.92, TLI = 0.95, ECVI = 1.34, NFI = 0.90, IFI = 0.96 and RMSEA = 0.04, $p < 0.05$ show a good model fit, in line with the indices recommended by such as CFI, TLI, ECVI and RMSEA. The ratio ≤ 3 also confirmed the model fit (Klin, 2013).

Figure: Measurement model of OS to confirm the factor structure

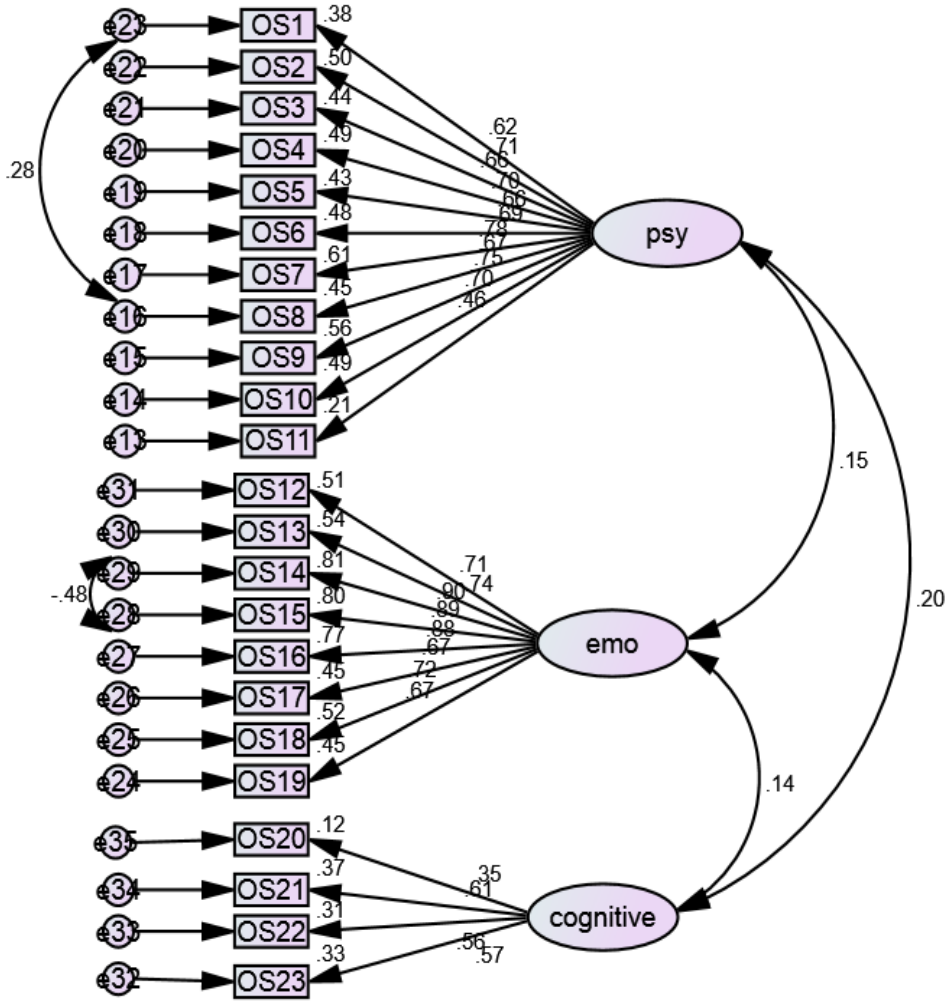

Figure 1. Final model to confirm the factor structure of the factors for overeating situations scale

Phase. IV–Convergent and Discriminant Validity of Factors for Overeating Situations Scale: Establishment of Convergent Validity of Overeating Situations Scale

To establish the convergent validity of the overeating situations scale, the disordered eating behaviour scale was used (Muazzam & Khalid, 2011). Both of them measure abnormal eating patterns, therefore both measure the same construct. It was hypothesized that there is a

positive correlation between the overeating situations scale and the three sub-scales of the disordered eating behaviour scale, namely social pressure, overeating, and eating choices and habits.

Sample

A sample of 100 obese married working women with a mean age of 35.68 years (SD = 5.79) was selected from several universities and hospitals in Lahore. Participants without physical or psychological problems, a minimum of one child, an intact marriage, and at least a year of employment experience were included.

Overeating Situations Scale (OSS)

The overeating situations scale developed in the first phase was used. It consists of 23 items and three factors: psychological (11 items); emotional (8 items); and cognitive (4 items). It is a five-point Likert-scale self-report measure, where '0' represents 'never', and '4' represents 'always'. The alpha coefficient for the overeating situations scale is 0.86, and the three factors are: psychological $\alpha = 0.90$; emotional $\alpha = 0.92$; and cognitive $\alpha = 0.59$.

Disordered Eating Behavior Scale

The disordered eating behaviour scale was developed by Muazzam and Khalid (2011). This scale has 26 items on four subscales: social pressures; eating choices and habits; eating withdrawal; and overeating. It is a five-point scale, where '0' represents 'never', and '4' represents 'always'. For convergent validity, it had only three sub-scales: 'eating withdrawal' was not used. This scale has high reliability of 0.86, and the scale has moderate convergent validity (r =.64) and significant discriminant validity (r =-.19).

Procedure

After seeking permission from the authorities of the universities and hospitals, participants were contacted individually and approached through their workplace. The disordered eating behaviour scale and the overeating situations scale were administered to the sample. Participants were assured that all the information collected would be kept confidential. They were instructed to rate the most appropriate response and not to skip any statements, and were thanked for their time, interest, and cooperation. The correlation between the scales was calculated to establish the convergent validity of the newly developed scale.

Results

Pearson's correlation coefficient was calculated to test the hypothesis. The findings are that the overeating situations scale is

positively and significantly correlated to the three sub-scales of the disordered eating behaviour scale.

Table 5
Convergent Validity of Factors for Overeating Situations Scale (N = 100)

Variable	Factors for Obesity Scale	Disordered Eating Behavior Scale
Overeating situations Scale		.89**
Disordered Eating Behavior Scale		-

*Note.****p*<.01.

Establishment of Discriminant Validity of Factors for Overeating Situations Scale

The discriminant validity of the overeating situations scale was established, but, beforehand, it was vital to check that the latent constructs being used to measure the causal relationship were clearly distinct from each other. In other words, they should not measure the same construct, or it would raise the issue of multi co-linearity (Hamid, Sami, & Sidek, 2017). For the sake of establishing the discriminant validity of the obesity scale, a body-image scale was used (Moeen, Muazzam, & Zubair, 2013).

A sample of 100 married working women with obesity, with a mean age of 38.70 years (SD = 6.89), was selected from several universities and hospitals. Participants who had any physical or psychological problems were excluded.

Overeating Situations Scale (OSS)

The overeating situations scale developed in the first phase was used.

Body Image Scale

The body image scale was developed by Moeen, Muazzam, and Zubair (2013). The scale has 35 items on three subscales: physical components (15 items); psychological components (13 items); and strategies for body image (7 items). Only two of these sub-scales were adopted, as the factor of strategies for body image was not used. The Body Image Scale uses a five-point scale where '0' represents 'never 'and '4' represents 'always'. The scale has good reliability of 0.83. The alpha coefficient for the three subscales was: physical components, $\alpha = 0.90$;

psychological components, α = 0.90; and strategies for body image, α = 0.83. The scale has a high convergent validity (*r* = 0.64) and significant discriminant validity (*r* = -0.19). It was found that there was high internal consistency within the scale (*r* = 0.95).

Results

Pearson's correlation coefficient was calculated, and the findings showed that OSS is negatively and significantly correlated to the body image scale.

Table 6

Discriminant validity of factors for overeating situations scale (N = 100)

Variable	**Overeating Situations Scale**	**Body Image Scale**
Overeating Situations Scale		-0.61**
Body Image Scale		-

Note: ***p*<.01.

Discussion

Many instruments and methods are there which measure obesity, but Overeating Situation Scale (OSS) is the first scale of its kind that highlights explicitly the situations leading to the development of obesity in women. The current study had four phases. In the first, through focus groups and semi-structured interviews, a list of statements was generated. Twenty-three items were selected after CVI. These were subject to EFA in Phase II, and three factors - psychological, emotional, and cognitive - emerged. The psychological factors include statements like 'When it reminds me of some unpleasant event from my childhood, craving for food increases. Nierenberg (2007) found a clear relationship between unpleasant and stressful life events and obesity. A study conducted by Stroebe (2008) also found similar results that anxiety; stress and rejection play a vital role in the development of eating food uncontrollably and off course of obesity. This indigenously developed tool includes statements like 'in depression' and 'in stress' and 'When someone rejects me' to establish the role that psychological factors play in the development of obesity. Emotional factors included statements like 'When I miss my friends or 'When I miss my parents'. To overcome loneliness, people go out, e.g. food restaurants and eat. The feeling of loneliness has been directly connected with obesity and has been confirmed by Koski and Naukkarinen's (2017) study, which concluded that loneliness could lead

to obesity. Schulte, Avena, and Gearhardt (2015) found in their study that uncontrollable desire for food leads to obesity. The reason being, cognitive factors include statements such as 'When I cannot resist the temptation to eat food'. Three subscales psychological, emotional and cognitive, can collectively or separately help in case management in such a way that which situations put a high cost on women and they eat more than their usual routine.

All the factors are independent, but they are correlated. The alpha coefficient for the overeating situations scale was 0.86. Cronbach's alpha for the three factors showed a high internal consistency, a high inter-correlation among them, and a significant item correlation (the total correlation of most of the items was > 0.3). CFA was undertaken on a sample of 400 obese women to confirm the factor structure. Twenty-three items were confirmed, and the final model showed excellent fit indices.

Pearson's product-moment correlation was used to establish convergent validity. The scores of the respondents on the overeating situations scale and the disordered eating behaviour scale are correlated. A significant and positive correlation can be observed between the overeating situations scale and the sub-scales of the disordered eating behaviour scale. This significant positive correlation shows that the newly developed overeating situations scale has strong convergent validity.

In order to develop the discriminant validity of the obesity scale, Pearson product-correlation method was used. Respondents' scores on both the overeating situations scale and the body image scale are correlated, and the results show a significant negative correlation between the overeating situations scale and the sub-scales of the body image scale. A significant negative correlation shows that the overeating situations scale has strong discriminant validity. The scale is a self-report measure that is simple to administer. The instrument is contextually relevant reasonably valid, as it deals separately with the psychological, emotional, and cognitive factors. The scale can be used to find out the situations in which women eat more than the usual. Clinicians can use this scale in the same context. High scores show that women are more influenced by that particular situation, i.e. psychological, emotional, or cognitive. The scale can be used in diverse cultures.

Limitations and Suggestions

The subjects of the study were only employed women; the sample did not include homemakers. Homemakers would provide a comparison and more generalizability of the results. Sample for the development of

this scale was chosen from only two fields. In future research, more and diverse professions should be taken to make the findings more generalizable.

Conclusion

Obesity and being overweight are significant public health problem issues. The main objective of the current study was to develop a tool to measures the situations in which women eat more than the usual. It comprises three factors: psychological; emotional; and cognitive. The scale has important implications for women's physical and psychological health, as well as for gynecologists, obstetricians, and health practitioners. All can benefit from this study by exploring the situations in which women eat more than the usual that leads to obesity. This study will help to prevent the obesity problem.

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