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Original Article

A Comparison of Activity Performance and Physical Activity Level of Obese Men and Women: A Cross-Sectional Study

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ABSTRACT

Objective: Physical activity levels may vary between obese men and women who have differences in terms of physiological and psychological factors. Limited data show that obese women have reduced motivation for exercise and lower levels of physical activity. Thus, the aim of this study was to examine gender differences in activity performance and physical activity level in Turkish individuals with obesity.

Methods: This study included 40 men and 51 women with obesity aged between 18 and 65 years. While the activity performance and satisfaction scores were obtained using the Canadian Occupational Performance Measure, physical activity level was determined using the step counts recorded for 2 weekdays and 1 weekend day in the Samsung S Health application.

Results: The most problematic activity performances were cleaning (50% for men and 90.2% for women), walking (89.7% for men and 72.5% for women), shopping (60% for men and 70.6% for women), climbing stairs (82.5% for men and 76.5% for women), and driving (52.5% for men and 17.6% for women). The mean Canadian Occupational Performance Measure-Performance score of obese men was significantly higher than those of obese women ($P < .05$). The mean number of step counts recorded during weekdays and weekend day was similar between obese men and women ($P > .05$).

Conclusion: This study demonstrated that the perception of performance in challenging activities is lower in women than men with obesity. Obese men and women have similar physical activity levels that are under the acceptable threshold. Gender-based approaches are needed for activity performance problems in obese individuals during rehabilitative interventions.

Keywords: Anxiety, fatigue, obesity, physical activity

Introduction

Obesity is one of the most important non-communicable diseases that leads to multiple medical comorbidities as its severity increases.[1] According to recent data, the prevalence of obesity was 42.4% between 2017 and 2018 in the United States, and it was similar across genders although the rate of severe obesity was higher in women.[2] According to The Turkish Epidemiology Survey of Diabetes, Hypertension, Obesity and Endocrine Disease (TURDEP-II) study, obesity prevalence was found to be 35% (female 44% and male 27%) in the general population of Turkey.[3]

Intermuscular adipose tissue was shown to be related to poor physical performance in individuals with obesity.[4] According to limited data, body mass index (BMI), age, and pain perceptions of obese women lead to difficulties in daily activities.[5] Social environment and body perceptions of obese individuals also limit their self-care, leisure, and productivity activities in addition to causing physical complaints such as dyspnea and musculoskeletal problems.[6]

Physical, psychological, and external barriers lead to a decline in physical activity (PA) in obese adults and have a negative impact on weight loss. The most pronounced barriers were excess weight, low fitness level, comorbidities, low mood, and motivation level due to obesity.[7] Whereas a higher level of stigma is associated with increased PA level in obese males, obese women's decreased motivation level due to the social stigma

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of weight is related to low PA level.[8] Although there are some findings supporting that women have healthier lifestyle habits and rather moderate–vigorous PA level than men in general, the data that compare obese men and women in terms of PA level are contradictory.[9,10]

Abdominal obesity was also found to be related to poor sleep quality.[11] Otherwise, the findings related to the role of sleep disturbance on obese men and women are inconsistent.[11,12] Obese women were shown to have higher perceived fatigue than their non-obese counterparts in a study with older adults, but this was not observed in men.[13] Obesity indicators, especially BMI and body fat percentage, were related to general fatigue. Higher physical, mental, vigor, and general fatigue perception are also related to depression that leads to a vicious cycle.[14] The close relationship between obesity and depression was shown to be affected by several variables such as educational level, perception of body image and general fatigue, physical health, psychological characteristics (stigmatization), and binge eating.[15] To the best of our knowledge, the impact of obesity on occupational performance and activity limitations based on gender has not been investigated. Although there are some studies with gender focus investigating PA level, fatigue, sleep quality, and psychosocial status in obese children and the elderly, the existing studies that compare PA level, sleep quality, and psychosocial status in adults of different genders are limited and have contradictory results. Therefore, the primary aim of the study was to compare activity performance and PA level of obese men and women. The secondary aim was to compare sleep quality, fatigue severity, and psychosocial status in obese men and women.

Materials and Methods

Participants

This cross-sectional study recruited 40 men and 51 women, aged 18-65 years, who meet the obesity criteria set by the World Health Organization between February 2020 and July 2020.[13,16] The inclusion criteria of participants were to have BMI $\geq$ 30 kg/m^2, to be aged between 18 and 65 years and willing to participate in the study, not to have any orthopedic and neurological problems that would interfere with PA, to be able to walk and cooperate with assessments. The exclusion criteria were to have a cardiovascular disorder, chronic heart failure, a pulmonary disorder, cognitive problems, and to be illiterate. The individuals selected from the proximity of the researchers, through simple random sampling, who volunteered to participate in the study and met the inclusion criteria were invited to participate in the study. The selected questionnaires were distributed and returned to the researchers in paper format. Ethical approval was obtained from Hacettepe University Non-Interventional Clinical Researches Ethics Board with GO 20/69 record number, and every participant was informed of written informed consent.

Assessments

The sociodemographic characteristics (age, gender, weight, height, marital status, alcohol and cigarette consumption, educational levels, employment status, and comorbidities) of every participant were recorded. Alcohol consumption was calculated as the number of glasses per year and cigarette consumption as packs/year. Body mass index, waist circumference, and hip circumference were measured, while waist/hip ratio and waist/height ratio were calculated. Anthropometric measurements were performed following the standardized protocol. Body mass index was calculated as the participant's weight in kilograms divided by the square of the height in meters. Waist and hip circumferences were measured using a tape measure. The waist circumference was considered the smallest circumference between the costal margin and the iliac crest. The hip circumference was measured at the level of the greater trochanters.[17] A waist circumference bigger than 90 cm and 100 cm for women and men respectively are associated with higher cardiovascular risk in the Turkish population.[18]

The Canadian Occupational Performance Measure (COPM) is a general outcome measure used to determine the activity performance problems critical for the individuals, the perception of performance, and satisfaction with regard to the daily activities from their perspective. The 5 most important activities in activity performance areas (personal care, functional mobility, community management) were determined. Then, the participants were asked to score how their performance was during these activities and how satisfied they were with their performance of these activities by grading it on a 10-point Likert scale based on a semi-structured interview. The COPM-P score indicates the performance of individuals in challenging activities, and the COPM-S indicates their satisfaction with this performance. The performance (COPM-P) and satisfaction (COPM-S) scores were separately summed and divided by 5 (the number of problem areas). The Turkish cross-cultural adaptation, reliability, and validity study had been previously done for the COPM.[19]

The reliable and valid Turkish version of the Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. In PSQI, 19 self-rated questions evaluate several factors such as quality, duration, latency of sleep as well as frequency and severity of sleep disorders. The questionnaire consists of 7 subscores, and the total score varied between 0 and 21. A PSQI total score higher than 5 indicates poor sleep quality.[20]

For objective PA level measurement, the participants who have Samsung Galaxy S4 smartphones loaded with the S Health app (version 6.12.3.001) were asked to record step counts for 2 weekdays and 1 weekend day in the same week for the study. They selected the pedometer option on the main screen in order for their steps to be counted according to the researchers' instructions. The participants were asked not to update S Health app during the week in which their step counts are recorded.[21]

Fatigue severity of the obese participants was evaluated with the reliable and valid Turkish version of the Fatigue Severity Scale (FSS). The total score varies between 0 and 7, and a score of $\geq$4 indicates severe fatigue.[22] Anxiety level of the participants was assessed using the reliable and valid Turkish version of the State Trait Anxiety Inventory (STAI-S; STAI-T). The questionnaire consists of 2 sections consisting of 20 items that evaluate state and trait anxiety. Total score ranges from 20 to 80, and higher scores indicate a greater level of anxiety. While $\leq$35 scores in the questionnaire are considered normal, scores between 36 and 41 points indicate a mild anxiety level, and $\geq$42 points indicate a higher anxiety level.[23] Depression level of participants was evaluated using the reliable and valid Turkish version of the Patient Health Questionnaire-9 (PHQ-9). This questionnaire is used for the diagnosis and detection of the severity of depression and contains 9 questions. The summed score between 1 and 4 is considered minimal, 5-9 mild, 10-14 moderate, 15-19 moderately severe, and 20-27 severe depression. The questionnaire also contains 1 question phrased as "If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?", which is not included in the total score.[24]

Statistical Analysis

Data analysis was conducted with the statistical package program of Statistical Package for the Social Sciences 23.0 (Version 23.0, IBM SPSS Corp., Armonk, NY, USA). The data were submitted to a descriptive statistical analysis in which mean $\pm$ standard deviation, minimum, maximum, median value, frequency, and percentage were calculated in all variables. The distribution of the data was evaluated through normality tests (Kolmogorov–Smirnov test, histogram). In order to compare

continuous variables, we used Student's *t*-test under parametric conditions and Mann–Whitney *U* test under non-parametric conditions. The variables determined by step counts were compared with the chi-square test. Statistical significance was determined as $P < .05$ for all statistical tests.[25] For sample size calculation, PA (min/day walking) results of obese men and women in the study of Lagarrigue et al[10] were used. According to the sample size calculation conducted through G*Power statistical software (G*Power 3.0.10 software) for 80% power, 41 individuals at minimum were required for each group.[26]

Results

In this study, 41 men and 51 women with obesity were included. Physical and demographic characteristics of the patients are shown in Table 1. While 92.5% of obese men's waist circumference was above the cut-off values determined for our country, 80% of obese women had increased cardiovascular risk according to cut-off values ($P = .133$).

Whereas alcohol consumption and cigarette exposure were similar between groups ($P > .05$, Table 1), the ratio of current smokers was significantly higher in men than in women ($P < .05$, Table 1). There was also a statistically significant difference in educational and employment status between 2 groups ($P < .05$, Table 1). When we look at the comorbidities, the ratio of systemic hypertension was significantly higher in women (23.5%) than in men (5%).

The PA levels of obese men and women were similar ($P > .05$, Table 2). The most problematic occupational performance activities were cleaning (50% for men and 90.2% for women), walking (89.7% for men and 72.5% for women), shopping (60% for men and 70.6% for women), climbing stairs (82.5% for men and 76.5% for women) and driving (52.5% for men and 17.6% for women). The mean COPM-P score of obese men was significantly higher than those of obese women ($P < .05$, Table 2).

The FSS, STAI-S, PHQ-9, and PSQI scores of men and women were statistically similar ($P > .05$, Table 2). The participants had severe fatigue perception level as indicated by the mean FSS score (4.06 ± 1.70). According to the PHQ-9 results, 14% of women and 13.1% of men had severe depression levels. The mean STAI-T score of obese women was significantly higher than those of obese men ($P < .05$, Table 2). According to STAI-T scores, 52.9% of women and 30% of men with obesity had high anxiety level (Table 2).

Table 1. Comparison of Physical and Demographic Characteristics, Body Composition, and Comorbidities in Obese Men and Women

	Men (n = 40)	Women (n = 51)	
Variables	**Mean ± SD**	**Mean ± SD**	***P***
Age (years)	40.8 ± 13.0	43.3 ± 9.02	.401[&]
Height (cm)	173.6 ± 7.7	160.7 ± 7.4	**<.001***[,&]
Weight (kg)	103.0 ± 16.6	90.6 ± 15.7	**<.001***[,#]
BMI (kg/m^2)	33.8 ± 3.8	35.1 ± 4.4	.131[#]
Waist circumference (cm)	110.0 ± 8.7	105.0 ± 15.2	**.016***[,&]
Hip circumference (cm)	114.0 ± 8.2	117.9 ± 10.9	.062[#]
Waist/hip ratio	1.0 ± 0.0	0.9 ± 0.1	**<.001***[,&]
Waist/height ratio	0.6 ± 0.0	0.7 ± 0.1	.453[#]
Marital status (married/single)	30/10	37/14	.792[ø]
Alcohol consumption	**n (%)**	**n (%)**	
None	35 (87.5)	46 (90.2)	.211[ø]
Social drinker	2 (5.0)	5 (9.8)	
One glass/week	2 (5.0)	0 (0.0)	
One glass/day	1 (2.5)	0 (0.0)	
Cigarette consumption			
Non-smoker	16 (40.0)	35 (68.6)	**.015***[,ø]
Ex-smoker	4 (10.0)	1 (2.0)	
Current smoker	20 (50.0)	15 (29.4)	
Cigarette exposure (pack-years)	35.28 ± 5.59	21.39 ± 6.93	.229[#]
Educational level			
Literate	1 (2.5)	0 (0.0)	**.016***[,ø]
Primary school	5 (12.5)	15 (29.4)	
Middle school	1 (2.5)	6 (11.8)	
High school	6 (15.0)	12 (23.5)	
Graduate	27 (67.5)	18 (35.3)	
Working status			
Not working	4 (10.0)	38 (74.5)	**<.001***[,ø]
Retired	4 (10.0)	4 (7.8)	
Working at a desk job	20 (50.0)	4 (7.8)	
Working in a physical work	12 (30.0)	5 (9.8)	
Comorbidities			
Diabetes mellitus	4 (10.0)	7 (13.7)	.750[ø]
Systemic hypertension	2 (5.0)	12 (23.5)	**.019***[,ø]
Insulin resistance	0 (0.0)	1 (2.0)	1.000[ø]
Goiter	0 (0.0)	2 (3.9)	.502[ø]
Hypothyroidism	0 (0.0)	2 (3.9)	.502[ø]
Obstructive sleep apnea syndrome	1 (2.5)	0 (0.0)	.440[ø]
Rheumatological diseases	1 (2.5)	2 (3.9)	1.000[ø]
Orthopedic diseases	0 (0.0)	2 (3.9)	.241[ø]

BMI, body mass index. *$P < .05$; [&]Student's *t*-test; [#]Mann–Whitney *U* test; [ø]Chi-squared test.

Discussion

The main findings of our study indicate that the perception of performance in challenging activities is lower in women than men with obesity in spite of similar satisfaction levels. Trait anxiety levels are significantly higher in obese women than obese men. PA levels, sleep quality, fatigue, depression, and anxiety results are similar in the male and female obese participants.

Obese people were found to avoid daily activities until they lose weight or to have difficulties in mobility or PA performance.[6,27] Obese people, in general, were shown to spend most of the time in the activities of daily living (ADL), but the time spent in instrumental ADL such as work and recreational activities is decreased.[28] Especially, personal factors such as pain, fatigue, perceived lack of control, and environmental barriers like spaces that limit mobility or seats that are not supportive for weight prevent them from participation in occupational performance areas.[27] Cognitive and affective problems were more pronounced in the activities reported in a study using the COPM questionnaire to evaluate occupational performance and satisfaction in 241 obese individuals who were bariatric surgery candidates.[29] The most problematic occupational performance areas were exercise and eating behavior. Whereas occupational performance and satisfaction level of obese individuals were negatively correlated with depression and anxiety level, these were positively associated with self-esteem. Self-esteem also explained 27% of the variance in occupational performance.[29] The COPM-P score indicates the performance of individuals in challenging activities, and the COPM-S indicates their satisfaction with this performance.[19] In our study, physical difficulties (cleaning, walking, shopping, climbing stairs, and driving) were mostly reported in the participant responses for problematic occupational performance areas, in line with the findings of Norsum et al.[6] In addition, while obese women had lower perceived performance during challenging

Table 2. Comparison of Physical Activity Level, Occupational Performance, Fatigue Severity, Anxiety, and Depression Levels, and Sleep Quality in Obese Men and Women

	Men (n = 40)	Women (n = 51)	
Variables	**Mean ± SD**	**Mean ± SD**	***P***
PA level			
SH step counts (weekdays)	9907.4 ± 5852	8453.5 ± 5345.6	.280[#]
SH step counts (weekend)	4618.5 ± 3616.4	4310.4 ± 3639.47	.548[#]
Occupational performance			
COPM-P score (0-10)	7.32 ± 1.30	6.32 ± 1.70	**.003***[,&]
COPM-S score (0-10)	7.50 ± 1.70	6.62 ± 2.34	.169[#]
Fatigue severity			
FSS score (0-7)	3.97 ± 1.62	4.14 ± 1.79	.633[&]
Anxiety level			
STAI-S score	32.10 ± 11.53	34.80 ± 11.80	.146[#]
STAI-T score	37.10 ± 9.40	42.10 ± 11.00	**.019***[,#]
STAI classification	**n (%)**	**n (%)**	
Normal	21 (52.5)	16 (31.4)	.072[ø]
Mild anxiety level	7 (17.5)	8 (15.7)	
High anxiety level	12 (30.0)	27 (52.9)	
Depression level			
PHQ-9 total score	8.50 ± 4.90	8.50 ± 5.30	.732[#]
PHQ classification			
Minimal depression	9 (23.7)	12 (24.0)	.973[ø]
Mild depression	16 (42.1)	23 (46.0)	
Moderate depression	8 (21.1)	8 (16.0)	
Moderately severe depression	4 (10.5)	5 (10.0)	
Severe	1 (2.6)	2 (4.0)	
Sleep quality			
Sleep duration (0-3)	0.92 ± 1.04	0.60 ± 0.76	.177[#]
Sleep disturbance (0-3)	2.54 ± 2.61	1.64 ± 1.29	.344[#]
Sleep onset latency (0-3)	1.18 ± 1.10	1.34 ± 1.21	.589[#]
Daytime dysfunction (0-3)	0.74 ± 1.12	0.72 ± 1.34	.752[#]
Sleep efficiency (0-3)	0.30 ± 0.83	0.14 ± 0.50	.409[#]
Sleep quality (0-3)	1.40 ± 0.70	1.28 ± 0.67	.572[#]
Hypnotic drugs (0-3)	0.08 ± 0.48	0.02 ± 0.90	.847[#]
PSQI total score (0-21)	7.18 ± 4.35	5.74 ± 3.00	.120[#]

SH, Samsung health; COPM-P, Canadian occupational performance measurement-performance; COPM-S, Canadian occupational performance measurement satisfaction; FSS, fatigue severity scale; STAI-S, state trait anxiety inventory-state; STAI-S, state trait anxiety inventory-trait; PHQ-9, patient health questionnaire-9; PSQI, Pittsburgh Sleep Quality Index. *$P < .05$; [&]Student's *t*-test; [#]Mann–Whitney *U* test; [ø]Chi-squared test.

activities than obese men, their perceived satisfaction scores were found to be similar to men. Although similar depression and fatigue severity levels were found between 2 groups, higher trait anxiety level and higher rate of hypertension in obese women can be related to this result and support the findings of Barclay et al.[29] Also, the mean COPM-P and COPM-S scores of our participants in both groups were obviously higher than those reported in the study of Nossum et al.[6] We think that this finding could be related to the lower mean BMI values of our participants than those of Nossum et al.[6] which also included morbid obese individuals who were mostly female. Another factor that could lead to a difference in activity performance of obese men and women was different employment status. Obese women were mostly (74.5%) housewives. Though only 30% of obese men were involved in physical work, the percentage of non-working men (10%) was quite small. As obese men were active workers and they mostly had to actively participate in communal activities, these might have led to a higher performance perception among men.

Obesity was shown to lead to slower walking speed and especially higher waist circumference increases dependency by worsening walking speed.[30] Internal and external factors that prevent PA in obese individuals vary by gender. A study published in 2018 stated that social lives of women are restricted more than those of men due to social stigma. The reason for this situation was explained by the fact that women may be more sensitive in terms of psychosocial conditions.[8] Weight-related stigma and low motivation for exercise may affect obese women more than obese men.[8] In the literature, there are studies indicating that the PA level of men is higher than women.[8,10] However, PA level of the male and female obese participants was similar in our study. There are many methods for evaluating PA; however, among them, the number of daily step counts can be an objective and simple means of assessment through pedometers.[31] Although daily step counts can be easily counted by S Health app by simply putting the mobile phone in a pocket, some of the actions such as picking up the phone, putting it down, holding it to tap on a picture may also increase the step count. These can limit the accuracy of the results. 7000-8000 steps/day was shown to be an acceptable threshold related to minimal rate of steps taken in moderate–vigorous PA.[32] Our participants' similar and acceptable PA level on weekdays could be associated with their mean BMI values under 40 kg/m^2, and most of the male participants (80%) were active workers, while most of the female participants (80%) were not working but they were housewives which could have enabled them to take a lot of steps at home when they were doing household chores. Otherwise, their mean steps/day were still under the acceptable threshold during a weekend day. In addition, current evidence in the literature demonstrates that smokers have unsatisfactory PA level than non-smokers.[33] Although cigarette exposure of obese men and women were similar, higher smoking rate (50%) among obese men might have led to similar PA levels with obese women.

A review published in 2017 reported a bidirectional relationship between obesity and depression.[34] One of the underlying biological causes of this condition has been attributed to chronic neuro-inflammation affecting brain physiology.[35] Also, it has been reported that a high-fat diet or stress can disrupt the gut microbiota affecting behavior and mood.[35] There are also studies concluding that the deterioration of the gut microbiota may differ by gender.[36] Another review argued that obese female individuals may be more prone to mental health problems but the authors emphasized that this is a more complex process and an unclear issue that needs to be investigated.[37] Although women demonstrated higher perceived fatigue than men did, fatigue was independently associated with inflammation, depression, PA, and adiposity in women, but the only predictor of fatigue in men was depression.[13] Our obese male and female participants' similar and mostly mild depression level is compatible with the literature and could be related to similar fatigue severity between them. Although general opinions suggest that anxiety levels are higher in obese women, the evidence is contradictory.[34,37] In our study, while the state anxiety level was similar in obese men and women, the trait anxiety level of obese women was higher than those of obese men, as expected. Obesity was reported to be related to anxiety disorders (specific phobia and social phobia), especially panic disorders in women.[38] We think that high likelihood of anxiety disorders stated in obese women and higher systemic hypertension rate of women in our study could have led to these findings.

Sleep quality is more important in obese individuals in order to ensure hormonal balance.[11,12] Ru-Qing Liu et al[11] demonstrated that abdominal obesity affects the sleep quality of men more than that of women. In a comprehensive study examining sleep quality in the Chinese population through PSQI, they found that the female gender

and being obese are highly correlated with low sleep quality and there is no difference between male and female obese individuals in total sleep quality score.[12] Similarly, in our study, there was no difference between male and female obese individuals in sleep quality results. However, we found that total sleep quality was poor (PHQI > 5 points) in both groups as expected in the literature.

The first limitation of our study was that our participants did not include morbid obese individuals. Maybe a group that includes morbid obese individuals in the majority could have affected the results differently. The second limitation was that more objective and accurate PA level indicators including accelerometer and multi-sensor armband that address energy consumption in daily physical activities such as climbing stairs, lifting weights, housework, and gardening could have provided detailed and more accurate results in addition to the number of steps. Also, due to the cross-sectional nature of this study, our study is a representative of the obese population, from which random individuals were selected, within a certain time period. It does not determine the cause and effect of differences between obese men and women in these parameters.

In conclusion, we have demonstrated that obese women had a significantly lower perception of occupational performance and a higher trait anxiety level than obese men. Obese men and women have similar but insufficient PA level. Sleep quality, fatique severity, and depression levels do not differ by gender in obese individuals. These results could increase the awareness of rehabilitation professionals about the improvement of gender-based approaches for occupational performance problems in obese individuals.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Hacettepe University (Date: February 26, 2021, Decision No: 2020/05-08).

Informed Consent: Written informed consent was obtained from participant who participated in this study.

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