

Perceived Barriers to Physical Activity among Iranian Women

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Abstract: Lack of physical activity (PA) is related to more than 2million annual deaths worldwide. PA level among women is unsatisfactory worldwide. The aim of this study was to determine the barriers and status of PA among Iranian women in Mashhad, Iran. 408 volunteer women aged 18 to 59 years were studied. Demographic and anthropometric data (height, weight, BMI, waist and hip circumference and waist hip ratio) were obtained. A 24-item questionnaire on barriers to PA and the short form IPAQ were filled. 33.3% of subjects were overweight or obese and 13.48% had central obesity. Preferring being with family to doing PA, lack of company and time were chosen as the most important barriers. PA level was related only to physical environmental barriers ($p<0.01$). Marital status was related to most barriers ($p<0.01$). Physical environmental barriers were mostly related to PA performance in Iranian women.

Key words: Physical activity • Barriers • Women • Iran

INTRODUCTION

Regular physical activity (PA) is not only beneficial in improving self-esteem, self-consciousness and reducing anxiety and stress, but also has protective effects against serious health issues such as cardiovascular diseases (CVD), obesity, diabetes mellitus and some types of cancer [1-7]. Rapid changes in lifestyle, PA and dietary habits due to urbanization and economic development had changed human health issues [5, 8]. Therefore, PA has become center of attention in recent years due to its preventive effect on chronic diseases and increased worldwide prevalence of inactivity.

According to the World Health Organization (WHO) report in 2002, approximately 60% of the world population, especially women, are not sufficiently active [9]. The cognitive variables have been used to describe participation in physical activity could be categorized into the following domains; personal and physiological, physical environmental and weather and social [10].

Many studies were conducted to determine the perceptions in terms of benefits and constraints of a physical activity among adult women worldwide [11-16]. These studies revealed that the main motivators for active participants in PA were social reasons, personal appearance, being fit in cloths and not being able to play with their children while the main barriers were laziness, fatigue, culture, health problems, lack of child care and absence of encouragement in physically inactive subjects [11-16].

Local studies in Iran also showed low PA levels in women [15, 17, 18]. However, few studies have assessed the barriers to participation in PA among Iranian women especially in reproductive age. A study by Taymoori *et al.* observed the effect of social support factors on PA while another study on elderly Iranian women in (over 60 years old) showed that knowledge, perceived benefits and self-efficacy were the predictors of PA in older women [15, 19]. To the best of our knowledge, no study has assessed the barriers to PA performance in Iranian women

in all suggested cognitive domains especially in women in reproductive age.

The purpose of this study was to determine the PA level and obstacles of participating PA in three major domains, personal and physiological, physical environmental and weather and social, among 18-59 year old women living in Mashhad, Iran.

MATERIALS AND METHODS

Study Design: This study cross sectional study was performed on a sample of 408 women out of 500442 women population between the age of 18 and 59 years in Mashhad, Iran. Subjects enrolled in the study by using convenient sampling method.

Subjects: 408 Iranian volunteer women between 18-59 years old who referred to private and governmental health clinics in Mashhad, Iran participated in this study. Inclusion criteria were being within the age limits, physically and mentally healthy and willing to participate in the study by giving written consent. Exclusion criteria were pregnancy and lactation period and disabled women unable to perform normal physical activity or refusing to perform measurements. Study proposal and procedure was approved by the head of each private and governmental clinic to which sampling was performed.

Anthropometric Measurements: Weight of the subjects was measured using TANITA analog weight scale (TANITA, HA521SV) to the nearest 0.5 kg. Height of subjects was measured by SECA bodymeter, 208 to the nearest 0.1 cm. Weights and heights measurements were performed three times and the average of the three measurements was taken as the final measure. BMI was calculated by dividing weight (kg) by the square of height (m) using the average weights and heights. Waist circumference was measured at the narrowest waist level and hip circumference was measured at the level of maximum protrusion of the buttocks using the cross-hand technique according to the International Society of Advancement of kinanthropometry (ISAK) [20].

Instruments

International Physical Activity Questionnaire (IPAQ)

Short Form: This IPAQ version consists of seven questions assessing the frequency and duration of participation in vigorous, moderate and walking activity and the time spent sitting during the last week. The short

form IPAQ is considered as the format of preference in comparable prevalence studies both at national and international levels [21-24]. The short form of IPAQ was filled by subjects prior to performing measurements. Data on PA of illiterate subjects (3 cases) were obtained via interview. The total score was expressed in metabolic equivalents (METs) according to the IPAQ guidelines [23].

Perceived Barriers to Physical Activity Questionnaire:

Using Likert type scale, from 1 representing strongly disagree to 5 representing strongly agree, participants answered an instrument with 24 items representing barriers to physical activity [25]. The barriers were categorized into three main groups: (i) personal and psychological barriers such as lack of interest and lack of motivation; (ii) physical environmental barriers such as lack of resource or skills; and (iii) weather and social environmental barriers such as lack of family or peer support. For the 3 cases who were unable to read the data were taken via interview. Mean scores were computed. The higher the score, the greater the tendency for the item to be a perceived barrier [25].

Statistical Analysis: Data analyses were carried out using the SPSS for Windows statistical software package version 17.0. Descriptive analysis was performed and the results were shown as mean and standard deviation (SD). Chi-square test was used for comparing the association of perceived barriers to PA variables and spearman correlation was used for defining the correlations of other continuous variables such as anthropometric measurements.

RESULTS AND DISCUSSION

408 subjects were recruited in this study. Mean age of participants was 30.28 ± 11.07 years. Mean height of the subjects was 160.99 ± 6.37 cm (minimum 106.6cm and maximum 188cm) and mean weight was 61.73 ± 11.24 Kg (minimum 36Kg and maximum 105Kg). Waist diameter, hip diameter, waist/hip ratio (WHR) and BMI of the subjects are shown in Table 1. Only 55 subjects (13.48%) had WHR measurements greater than the cut off ratio (0.85) for abdominal obesity [26]. Subjects were categorized into four groups; underweight, normal, overweight and obese according to WHO cutoffs for BMI (Table 1).

Table 1: Waist circumference, hip circumference and WHR measurements of subjects

	Frequency	Mean \pm SD (cm)	WHO values
Anthropometric measurements			
Waist circumference	408	77.44 \pm 29.08	\leq 80[26]
Hip circumference	408	97.24 \pm 9.88	
WHR	408	0.812 \pm 0.458	<0.85[26]
BMI	408	23.75 \pm 4.23	18.5-24.99[2]
BMI category			
Underweight	39 (10%)		<18.5
Normal	233 (57%)		18.5-25
Overweight	94 (23%)		25-30
Obese	42 (10.3%)		>30
Job category			
Student	148 (36.3%)	-	-
Housewife	139 (34.1%)	-	-
Employee	95 (23.3%)	-	-
Self employed	12 (2.9%)	-	-
Retired	14 (3.4%)	-	-
Marital status			
Single	181 (44.5%)	-	-
Married	217 (53.3%)	-	-
Widow	3 (0.7%)	-	-
Divorced	6 (1.5%)	-	-

Table 2: IPAQ test results

Physical activity level	Frequency	Percentage (%)	PA (METs) (median + IQR)
Low	134	32.4	574.8
Moderate	110	27	2036.5
High	130	31.9	6771
No answer	34	8.3	-
Total	408	100	-

This study showed that 23% of subjects were overweight and 10.3% were obese. This finding was lower than he previously reported prevalence of obesity among Iranian women [27]. Previous studies reported the prevalence of central obesity to be 13.48% to 43.4% of Islamshahr citizens [27, 28]. The difference between these findings might in part be related to the age of the subjects. In this study the mean age of the subjects was 30.28 years old which might indicate a higher reported level of PA due to their age (participation in more leisure time PAs or university PA programs). The previous studies revealed higher levels of physical activity in the age range of 20 to 35 years which was similar to the findings of this study [27, 28].

Total daily physical activity of subjects was evaluated using the short form of the International Physical Activity Questionnaire (IPAQ). 374 subjects (91.6%) filled the questionnaire. PA level was categorized into low, moderate and according to the METs (Table 2). Most of this study subjects reported either low (32.4%) or high physical activity (31.9%). This finding was in

contrast with the previous studies that revealed high prevalence of low physical activity among Iranian populations [18, 29-31]. This finding might be due to the high prevalence of younger subjects that were mostly university students and had physical exercise sessions at university. Some studies also reported lack of relation between marital status and PA level as was shown in this study [32-34].

Mean scores of perceived barriers to PA participation in each domain and its sub-domains is shown in Table 3. Among categories of personal barriers, subjects reported that they were more willing to be with other family members rather than doing PA. This might be due to the special social and cultural constraints for Iranian women in performing PA especially outside the house. The second important factor was found to be lack of energy among this study population. These results were somewhat in accordance with the study by Osuji *et al.* on 2510 rural Midwest women, lack of time and motivation, being disinterested in exercise were considered as the personal barriers that can affect PA in women [35]. Marital status was significantly related to personal and physiological barriers in this study which was in line with the results of Ainsworth's study on 917 African-American women [36].

Among physical environmental barriers subjects were mostly agreed with "having no friends to do PA" to be the most important barrier followed by inaccessible sport facilities. Taymoori *et al.* found that social supports

Table 3: Barriers to physical activity mean scores and standard deviations

Barrier	Number of responders	Mean score \pm SD
Personal and physiological		
I do not have the energy to do excessive physical activity after finishing my work	405	3.37 \pm 1.34
I feel pain and physical discomfort during exercise	408	2.59 \pm 1.33
I have health problems that prevent me to be physically active.	405	1.68 \pm 1.13
Physical activity is difficult and tiring for me.	405	2.18 \pm 1.29
I look funny and feel ashamed when doing physical activities	408	1.50 \pm 0.95
I'm not interested in exercise or physical activity.	408	1.81 \pm 1.20
I do not get pleasure of physical activity or exercise.	403	1.70 \pm 1.10
I have found other recreational activities with friends or family members are much more enjoyable than exercise or physical activity	408	4.03 \pm 1.34
I believe that physical activity does not bring benefits to my health.	408	1.42 \pm 0.91
I am afraid of injury and have fear for the safety of the exercise	408	2.11 \pm 1.29
I'm too lazy to do physical activities.	406	2.86 \pm 1.45
Intensity of exercise required to obtain health benefits seems too high to me.	401	2.08 \pm 1.18
Physical and environmental		
I think I am not talented in physical activities.	408	2.13 \pm 1.25
I lack self discipline / initiatives in doing physical activity.	404	2.14 \pm 1.24
My body condition does not allow me to do physical activities.	404	1.83 \pm 1.16
My family member or friends do not encourage me to do physical activities.	407	2.16 \pm 1.29
I do not have a friend to perform physical activities with.	405	2.78 \pm 1.49
There are no facilities or places for physical activity in my neighborhood.	403	2.12 \pm 1.35
Sports facilities or places are too far and I do not have any means of transportation.	407	2.20 \pm 1.38
I do not know how to use sports equipment or skills in physical activities.	407	1.95 \pm 1.19
Weather and social environmental		
I do not have free time to exercise or do physical activities because I am busy at work.	406	2.88 \pm 1.51
I have to take care of my children and family members.	403	2.43 \pm 1.52
The weather is too hot or rainy that prevents me from doing physical activity	407	1.88 \pm 1.16
I did not have enough money to go to sports facilities such as gym or to buy equipment and sports clothing.	399	1.95 \pm 1.22

Table 4: Correlation/association between each category of perceived physical activity barriers with demographic, anthropometric and PA level data

	Personal	Environmental	Weather
Age ^a	r(383)=0.05, p=0.29	r(394)=-0.03, p=0.48	r(393)=0.05, p=0.31
BMI ^a	r(383)= 0.20, p<0.001*	r(394)=0.11, p=0.03*	r(393)=0.18, p<0.001**
Waistcircumference ^a	r(383)=0.20, p<0.001**	r(394)=0.11, p=0.03*	r(393)=0.18, p<0.001**
Hip circumference ^a	r(383)=0.18, p<0.001**	r(394)=0.08, p=0.13	r(393)=0.12, p=0.02*
WHR ^a	r(383)=0.12, p=0.01*	r(394)=0.08, p=0.11	r(393)=0.16, p<0.001**
Marital status ^b	$\chi^2(3, N=384)=-2.65, p<0.001**$	$\chi^2(3, N=395)=-1.86, p=0.06$	$\chi^2(3, N=394)=-2.92, p<0.001**$
Children under 5y ^b	$\chi^2(1, N=383)=-0.64, p=0.52$	$\chi^2(1, N=394)=-0.96, p=0.34$	$\chi^2(1, N=391)=-3.55, p<0.001**$
Physical activity level ^b	$\chi^2(2, N=353)=-4.03, p<0.001**$	$\chi^2(2, N=362)=-3.14, p<0.001**$	$\chi^2(2, N=361)=-0.82, p=0.41$

*significant at $\alpha=0.05$ **significant at $\alpha=0.01$ ^aSpearman's correlation was used to identify the correlations^bchi-square was used to identify the association

either by family, siblings or friends are significantly related to PA performance in Iranian women [15]. In the study by Osuji *et al.* lack of company was related to PA in women [35]. Marital status and having children below 5 years were significantly associated with weather and social barriers. In the study by having no child to support reported to be more related to PA in women than men [37]. This finding can be due to lack of time or less support by the family related to child sitting and extra housework [38]. Among all the barriers indicated above only physical

environmental barriers were shown to have significant correlation with PA performance. This finding indicates that these barriers are the real contributors to the final PA performance of Iranian women as indicated by the previous studies [15, 37].

Relationships between each category of perceived barriers to physical activity and other parameters are tabulated in Table4 (Table 4). Since all the PA barriers were associated with anthropometric measurements, this can be estimated that these barriers have been chosen

correctly. In a study on 460 women 20-50 years in Iran, PA was showed to be related to healthy dietary pattern ($p < 0.05$) [39].

The most important limitation of this study was the limitation of a cross-sectional in assessing the PA change over time. For instance different ages were compared at the same time not same cases after a certain period. Indeed there have been situations in the past, like the 8 year war between Iran and Iraq that have resulted in many nutritional and psycho-social stigmas in a certain age group. For instance wives of soldiers at the time of war were found to report less marital relation satisfaction compared to those whose husbands did not attend the war [40]. Such psychological stigmas can affect PA perceptions and performance. It is recommended that longitudinal studies on more clusters be done in the future.

CONCLUSION

This study determined most important barriers to physical activity were having no company, low priority of PA related to family affairs and lack of time. Physical environmental barriers were mostly related to the final PA level of Iranian women.

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REFERENCES

1. Strawbridge, W.J., S. Deleger, R.E. Roberts and G.A. Kaplan, 2002. Physical activity reduces the risk of subsequent depression for older adults. *American Journal of Epidemiology*, 156(4): 328-34.
2. Nabkasorn, C., N. Miyai, A. Sootmongkol, S. Junprasert, H. Yamamoto, M. Arita and K. Miyashita, 2006. Effects of physical exercise on depression, neuroendocrine stress hormones and physiological fitness in adolescent females with depressive symptoms. *The European Journal of Public Health*, 16(2): 179-184.
3. Tao, F.B., M. L. Xu, S. D. Kim, Y. Sun, P. Y. Su and K. Huang, 2007. Physical activity might not be the protective factor for health risk behaviours and psychopathological symptoms in adolescents. *Journal of Paediatric and Child Health*, 43(11): 762-7.
4. Dashti, S., T.T. Su, A.J. Esfehiani and R.J. Esfehiani, 2014. Effect of Physical Activity Level on Emotional Status of Iranian Women. *World Applied Sciences Journal*, 30(7): 852-857.
5. Lopez, A.D., M.C. Ezzati Majid, T. Jamison Dean and J.L. Murray Christopher, 2006. *Global Burden of Disease and Risk Factors*, Washington DC: World Bank Publications.
6. Kaleta, D. and A. Jegier, 2007. Predictors of inactivity in the working-age population. *International Journal of Occupational Medicine and Environmental Health*, 20(2): 175-82.
7. Dashti, S., A.J. Esfehiani and H.J. Leonard Joseph, 2014. The preventive effect of physical activity on weight maintenance in overweight and obese women. *La Clinica Terapeutica*, 165(3): 155-161.
8. Raymond, S.U., S. Leeder and H.M. Greenberg, 2006. Obesity and cardiovascular disease in developing countries: a growing problem and an economic threat. *Current Opinion in Clinical Nutrition and Metabolic Care*, 9(2): 111-116.
9. Reducing Risk, Promoting Healthy life, in *The World Health Report 2002*, World Health Organization: Geneva.
10. Dishman, R.K., J.F. Sallis and D.R. Orenstein, The determinants of physical activity and exercise. *Public Health Reports*, 100(2): 158.
11. Jewson, A., M. Spittle and M. Casey, 2007. A Preliminary analysis of barriers, intentions and attitudes Towards Moderate physical activity in women who are overweight. *Journal of Science and Medicine in Sport*, 11(6): 558-561.
12. Chang, M.W., S. Nitzke, E. Guilford, C.H. Adair and D.L. Hazard, 2008, Motivators and barriers to health eating and physical activity among low-income Mothers overweight and obese. *Journals of the American Dietetic Association*, 108: 1023-1028.
13. Hoebeke, R., 2008. Low-income women's Perceived barriers to physical activity: focus group results. *Applied Nursing Research*, 21: 60-65.
14. Sit, C.H.P., J.H. Kerr and I.T.F. Wong, 2008. Motives for and barriers to physical activity participation in middle-held Chinese women. *Psychology of Sport and Exercise*, 9: 266-283.

15. Taymoori, P., R.E. Rhodes and T.R. Berry, 2010. Application of a social cognitive model in explaining physical activity in Iranian female adolescents. *Health Education Research*, 25(2): 257-267.
16. Abbasi, M., C. Bewley and O. Van Den Akker, 2011. Personal and environmental factors encouraging or preventing healthy lifestyle behaviours among Persian couples: a phenomenological investigation. *Journal of Reproductive and Infant Psychology*, 29(2): 136-147.
17. Janghorbani, M., M. Amini, W.C. Willett, M.M. Gouya, A. Delavari, S. Alikhani and A. Mahdavi, 2007. First nationwide survey of prevalence of overweight, underweight and abdominal obesity in Iranian adults. *Obesity*, 15(11): 2797-808.
18. Maddah, M., M.R. Eshraghian, A. Djazayeri and R. Mirdamadi, 2003. Association of body mass index with educational level in Iranian men and women. *European Journal of Clinical Nutrition*, 57(7): 819-823.
19. Salehi, L., H. Eftekhari, K. Mohammad, M.H. Taghdisi and D. Shojaeizadeh, 2010. Physical activity among a sample of Iranians aged over 60 years: an application of the transtheoretical model. *Archives of Iranian Medicine*, 13(6): 528-36.
20. Marefelli-Jones, M.J., A.D. Stewart and J.H. De Ribber, 2007. International Standards for Anthropometric Assessment. The International Society for the Advancement of Kinanthropometry, pp: 137.
21. Kurtze, N., V. Rangul and B.E. Hustvedt, 2008. Reliability and validity of the international physical activity questionnaire in the Nord-Trøndelag health study (HUNT) population of men. *BMC Medical Research Methodology*, 8(1): 63.
22. Deng, H.B., D.J. Macfarlane, G.N. Thomas, X.Q. Lao, C.Q. Jiang, K.K. Cheng, T.H. Lam, 2008. Reliability and validity of the IPAQ-Chinese: the Guangzhou Biobank Cohort study. *Medicine and Science in Sports and Exercise*, 40(2): 303-307.
23. Craig, C.L., A.L. Marshall, M. Sjostrom, A.E. Bauman, M.L. Booth, B.E. Ainsworth and P. Oja, 2003., International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*, 35: 1381-1395.
24. Papathanasiou, G., G. Georgoudis, M. Papandreou, P. Spyropoulos, D. Georgakopoulos, V. Kalfakakou and A. Evangelou, 2009. Reliability measures of the short international physical activity questionnaire (IPAQ) in Greek young adults. *Hellenic Journal of Cardiology*, 50: 283-294.
25. Ngu, L.M. and N. AK, 2009. Perceived barriers to physical activity participation among Malay women in Kuala Lumpur, in 24th Scientific Conference of the Nutrition Society of Malaysia, S30.
26. Waist Circumference and Waist-Hip Ratio: Report of a WHO Expert Consultation, World Health Organization, 2008, WHO: Geneva. pp: 27.
27. Sotoudeh, G., S. Kosravi, F. Khajehnasiri and H.R. Khalkhali, 2005. High prevalence of overweight and obesity in women of Islamshahr, Iran. *Asia Pacific Journal of Clinical Nutrition*, 14(2): 160-172.
28. Kelishadi, R., S. Alikhani, A. Delavari, F. Alaedini, A. Safaie and E. Hojatzadeh, 2008. Obesity and associated lifestyle behaviours in Iran: findings from the First National Non-communicable Disease Risk Factor Surveillance Survey. *Public Health Nutrition*, 11(3): 246-251.
29. Flegal, K.M., J.A. Shepherd, A.C. Looker, B.I. Graubard, L.G. Borrud, C.L. Ogden, T.B. Harris, J.E. Everhart and N. Schenker, 2008. *Comparison of percentage body fat, body mass index, waist circumference and waist-stature ratio in adults*. *American Journal of Clinical Nutrition*, 89(2): 500-508.
30. Zabetian, A., F. Hadaegh, P. Sarbakhsh and F. Azizi, 2008. Weight change and incident metabolic syndrome in Iranian men and women: a 3 year follow-up study. *BMC Public Health*, 9: 1-9.
31. Hajian-Tilaki, K.O. and B. Heidari, 2007. Prevalence of obesity, central obesity and the associated factors in urban population aged 20-70 years, in the north of Iran: a population-based study and regression approach. *Obesity Reviews*, 8(1): 3-10.
32. Booth, M.L., N. Owen, A. Bauman, O. Clavisi and E. Leslie, 2000. Socialcognitive and perceived environment influences associated with physical activity in older Australians. *Preventive Medicine*, 31(1): 15-22.
33. Brownson, R.C., A.A. Eyler, A.C. King, D.R. Brown, Y.L. Shyu and J.F. Sallis, 2000. Patterns and correlates of physical activity among US women 40 years and older. *American Journal of Public Health*, 90(2): 264-270.
34. King, A.C., C. Castro, S. Wilcox, A.A. Eyler, J.F. Sallis and R.C. Brownson, 2000. Personal and environmental factors associated with physical inactivity among different racial-ethnic groups of US middle-aged and older aged adults. *Journal of Health Psychology*, 19(4): 354-364.

35. Osuji, T., S.L. Lovegreen, M. Elliot and R.C. Brownson, 2006. *Barriers to physical activity among women in the rural midwest*. Women Health, 44(1): 41-55.
36. Ainsworth, B.E., S. Wicox, W.W. Thompson, D.L. Richter and K.A. Henderson, 2003. Personal, social and physical environmental correlates of physical activity in African-American women in South Carolina. American Journal of Preventive Medicine, 25(3, Supplement 1): 23-29.
37. Brownson, R.C., E.A. Baker, R.A. Housemann, L.K. Brennan and S.J. Bacak, 2001. Environmental and policy determinants of physical activity in the United States. American Journal of Public Health, 91(12): 1995-2003.
38. Andajani-Sutjahjo, S., K. Ball, N. Warren, V. Inqlis and D. Crawford, 2004. Perceived personal, social and environmental barriers to weight maintenance among young women: A community survey. International Journal of Behavioral Nutrition and Physical Activity, 1(1): 15.
39. Rezazadeh, A., B. Rashidkhani and N. Omidvar, 2010. Association of major dietary patterns with socioeconomic and lifestyle factors of adult women living in Tehran, Iran. Nutrition, 26(3): 337-341.
40. Babee, E., J. Sacin, B. Cardona, A. Williams and N. Naghizadeh, 2009. Comparative Evaluation of General Health and Marital Satisfaction among Iranian Women Married to Veterans and non Veterans. World Applied Sciences Journal, 6(12): 1612-1616.