

## Physical activity, sex, and socioeconomic status: A population based study

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### Original Article

#### Abstract

**BACKGROUND:** The purpose of the present study was to investigate physical activity by socioeconomic status (SES) and sex in an Iranian adult population.

**METHODS:** In a cross-sectional study, 6622 adults, who participated in the Isfahan Healthy Heart program (IHHP) surveys in 2004 and 2005 and were living in urban areas, were studied. Daily leisure time, household, occupational, and transportation physical activity, and total physical activity were calculated and compared in 3 socioeconomic status groups classified by the two-step cluster analysis procedure.

**RESULTS:** Statistically significant variations were found in all physical activity levels, except transportation, by sex. Men were more active than women in all fields, except household physical activity. Leisure time physical activity of men and women were significantly higher in higher SES levels. There was an opposite correlation between SES and total physical activity in men.

**CONCLUSION:** Considering the importance of physical activity as a component of a healthy lifestyle, differences among varying socioeconomic status and sex must be considered while planning for healthy lifestyle programs. Women with low SES, in particular, may need more attention.

**Keywords:** Physical Activity, Socioeconomic Status, Leisure Time, Gender, Cluster Analysis

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#### Introduction

There is an international concern about the impact of low levels of physical activity on health.<sup>1</sup> The association between physical activity and health status is well known; active individuals present a lower likelihood of developing several chronic diseases, and physical activity or exercise has been the most common intervention for prevention or management of disability.<sup>2</sup>

Physical activity prevents cardiovascular disease (CVD) by decreasing blood pressure, plasma fibrinogen, viscosity, improvements in glucose metabolism, and blood lipid levels.<sup>3-7</sup> Low levels of physical activity are associated with an increased risk of stroke.<sup>8</sup> It was shown that occupational physical activity reduces woman's risk of breast cancer.<sup>9</sup> A

sedentary life style is a major risk factor for type 2 diabetes.<sup>10</sup> Nonetheless, alarming rates of sedentarism are observed in studies on developed and developing countries.<sup>11-13</sup>

In spite of several current initiatives aimed at increasing the activity level of people, socio-economic differences in physical activity are complex.<sup>14</sup> Some studies showed that in men, overall activity levels are the lowest in those with managerial and professional jobs, while the pattern in women is reversed. Overall activity levels vary by household income in men, being the highest among those with mid-range household incomes and lowest at both extremes of the income distribution but no pattern is apparent in women.<sup>15</sup> Previous studies suggested that males are more active than

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females in leisure-time, although not all were consistent.<sup>16</sup> Low leisure-time physical activity has been found to be strongly associated with low income, low education, and low socioeconomic status.<sup>17-19</sup> On the other hand, in the few studies that considered physical activity domains other than leisure-time physical activity, no gender differences were observed.<sup>20</sup> The majority of these studies were carried out in high-income countries, where activity patterns are different from those observed within low and middle-income countries. In this study we examined different types of physical activity by socioeconomic status in a population of Iranian men and women.

### Materials and Methods

This study was performed as part of annual surveys of the Isfahan Healthy Heart Program (IHHP), collecting two consecutive cross-sectional data from 2004 and 2005. IHHP is a community based, quasi-experimental demonstration program with the aim of CVD prevention and healthy lifestyle promotion.<sup>21,22</sup> After the baseline survey on adults aged 18 years and over residing in three cities in central Iran (Isfahan, Najaf-Abad, and Arak, with nearly similar socio-demographic situations), the IHHP interventions began in late 2001 and continued for 5 years. In all surveys, participants were selected by multistage cluster random sampling method according to the regional population distribution. Full explanation and sampling details were previously given.<sup>21</sup> Due to essential differences in the lifestyle of rural and urban areas, this study focused on 6622 participants in the urban population. The response rates were 91.6% and 93.2% in 2004 and 2005, respectively. Non-respondents were substituted to reach original sample size. Written informed consents were obtained from all participants. Ethical approval was obtained from the Ethics Committee of Isfahan Cardiovascular Research Centre (ICRC), a WHO collaborating centre.

The validity of the questionnaire was confirmed by three experts. The reliability of the questionnaire was 0.73 (Cronbach's Alpha). Based on the existing categorizations and the purpose of each activity done during the day, physical activities are divided into four main fields (leisure time, occupational, household, and transportation physical activities).<sup>23</sup> Particular items in each field were selected based on the usual Iranian life style.

During a structured interview, based on a researcher made questionnaire, the above items in

the everyday life of the participants were asked. The duration of activities in each session and their frequency per week were also asked.

The amount of each physical activity was calculated by multiplying its intensity (in the unit of metabolic equivalent of the task (Met)) and duration (minutes) per day.<sup>23</sup>

$$[\text{MET-minutes}]_{\text{day}} = \frac{\text{times}/_{\text{week}} * \text{duration}/_{\text{times}}}{7} \times \text{Mets}$$

One MET is reflective of energy expenditure during rest (1 metabolic unit = oxygen consumption of 3.5 mL/min kg<sup>-1</sup>).<sup>24</sup> To obtain each field's value, the amounts of physical activities in items related to each field were added together.

Indicators of socioeconomic status (SES), including income, education level, and occupation type, were determined based on a combination of NS-SEC model (National Statistics Socio-Economic Classification), other similar studies, and WHO recommendation on measuring socioeconomic inequalities in health.<sup>25-27</sup> Dependency ratio, an indicator used in population studies to measure the portion of the population that is economically dependent on the active age group, was added as the fourth factor. It was calculated by the number of those aged under 18 or over 65 being divided by the number of those aged 18 to 64.

Reported jobs were categorized into four groups; namely upper white-collar employees, lower white-collar employees, manual workers, and self-employed persons.<sup>28</sup> The unemployed, retired, and housewife groups were added to the mentioned pattern. Education level was defined as illiterate, primary school, guidance school, high school, associate or bachelor degree, and master's degree or higher. Income was reported in Iranian currency unit (RIALs), and as table 1 shows it was categorized into 4 groups.

### Statistical analysis

Data entry was done using EPI info™. All data were analyzed by SPSS for Windows (SPSS Inc., Chicago, IL, USA; version 15). Two-step cluster analysis procedure was done to explore SES grouping of participants using income, education, and occupation as categorical variables, and dependency ratio as continuous variable. This procedure seeks to identify homogeneous subgroups of cases in a population. Number of clusters was limited to three (high, moderate, and low SES), and analysis was performed separately for each gender. To compare various components of physical activity among the three SES groups, ANOVA and Tukey's post-hoc test were used.

Student's t-test was used to compare between men and women. Spearman correlation was used to determine the relationship of physical activity with age. In order to include age as an important related factor, multiple regression analysis was carried out using sex and age as covariates. The averages are reported as mean  $\pm$  standard deviation. For all analyses, statistical significance was assessed at a level of 0.05 (2-tailed).

## Results

The mean age of the 6622 participants in the survey was  $45.2 \pm 17.2$  years. 3401 (51.3%) of the participants were women. Table 1 describes the distribution of SES indicators; the SES levels (three different clusters produced by cluster analysis) were identified based on them. SES levels (high, moderate, and low) were attributed to clusters of people based on the distribution of indicators. Occupational factors were overlapped between low SES and moderate SES in both genders, but other factors perfectly differentiated SES levels. Income, occupation, and education were all used to significantly determine clusters. However, dependency ratio was statistically significant for high SES in women, and both high SES and moderate SES in men. 353 (10.4%) men and 300 (9.3%) women were excluded by cluster analysis.

The mean age of the men did not differ significantly between different SES groups, nor did that of the women. No important relationships were found between physical activity and age in various fields. The most significant correlation was shown to be between age and both Leisure time physical activity ( $r = -0.25$ ,  $P < 0.001$ ), and total physical activity ( $r = -0.23$ ,  $P < 0.001$ ) in women. In men, maximum correlation was between age and total physical activity ( $r = -0.27$ ,  $P < 0.001$ ). Table 2 shows the sex separated differences in various fields of physical activity among three defined socioeconomic status levels; low socioeconomic status (LSES), moderate socioeconomic status (MSES), and high socioeconomic status (HSES).

### Leisure time Physical Activity

The average amount of leisure time physical activity (MET - minutes per day) was  $147.6 \pm 289.3$  (Median: 62.1). It was significantly higher in men than women ( $198.6 \pm 355.9$  vs.  $99.4 \pm 198.6$ ,  $P < 0.001$ ; Median: 90 vs. 45, respectively). In women the estimated amount of MET - minutes in leisure time physical activity was significantly higher

for HSES participants than MSES, and also higher for HSES in comparison with LSES (Figure 1). In men the estimated amount of leisure time physical activity was also greater for HSES participants than MSES as well as HSES and LSES. The age and sex adjusted model yielded a significant regression coefficient for SES level ( $B = 11.5$ ,  $R^2 = 0.046$ ,  $P = 0.03$ ).

### Occupational Physical Activity

Mean occupational physical activity for 2433 (36.7%) of employed participants was  $635.1 \pm 510.5$ . They consist of 2196 (68.1%) men and 237 (6.9%) women. Men had more occupational physical activity than women ( $659.4 \pm 520.5$  vs.  $427 \pm 353.5$ ,  $P < 0.001$ ). According to high frequency of housewives in women of MSES, no occupational physical activity was reported in this level. There was no significant difference between occupational physical activity of women of LSES and HSES (Table 2). In spite of the results in women, occupational physical activity was less in HSES men than MSES men, and also than LSES men. The age and sex adjusted model yielded a significant regression coefficient for SES level ( $B = -68.3$ ,  $R^2 = 0.035$ ,  $P < 0.001$ ).

### Household Physical Activity

Household physical activity was reported by 4305 (65%) participants with the average amount of  $360.8 \pm 307.9$ . Recorded household physical activity was higher in 3390 (99.6%) women than 915 (28.4%) men ( $421.1 \pm 296.1$ ,  $137.2 \pm 240.5$ , respectively), and the difference was significant. In women, the values of this field in all three levels of SES were significantly different ( $P < 0.001$ ) (Table 2). However household physical activity was higher in MSES than HSES and LSES; it was lower in HSES than LSES. No significant differences were found between various SES levels of men. The age and sex adjusted model yielded a significant regression coefficient for SES level ( $B = -38.3$ ,  $R^2 = 0.169$ ,  $P < 0.001$ ).

### Transportation Physical Activity

The mean of transportation physical activity was  $63.8 \pm 120$  (Median: 25.7) MET - minutes in the study sample. There was higher transportation physical activity in men than women ( $84.5 \pm 154.4$  vs.  $44.21 \pm 68.3$ ; Median: 38.5 vs. 25.7); the difference was statistically significant. No significant difference was reported in transportation physical activity for three SES levels neither in men nor in women (Table 2). The age and sex adjusted model did not show a significant relationship for SES ( $P = 0.555$ ).

**Table1.** Distribution of socioeconomic indicators in three levels of socioeconomic status (clusters)

		Female n (%)				Male n (%)				Total <sup>↓</sup>
		Low SES	Moderate SES	High SES	All <sup>↓</sup>	Low SES	Moderate SES	High SES	All <sup>↓</sup>	
Income	≤ 1,000,000 Rials	471 (100)	0	0	898 (26.4)	376 (71.2)	0	152 (28.8)	614 (19.1)	1512 (22.8)
	1,000,000-3,000,000 Rials	0	1661 (81.2)	384 (18.8)	2200 (64.7)	10 (0.5)	1193 (59.8)	793 (39.7)	2176 (67.6)	4376 (66.1)
	3,000,000-5,000,000 Rials	0	0	211 (100)	221 (6.5)	120 (37.2)	0	203 (62.8)	332 (10.3)	553 (8.4)
	5,000,000-10,000,000 Rials	0	0	46 (100)	49 (1.4)	5 (7.7)	0	60 (92.3)	68 (2.1)	117 (1.8)
	≥ 10,000,000	0	0	5 (100)	5 (0.1)	3 (33.3)	0	6 (66.7)	9 (0.3)	14 (0.2)
Education	Illiterate	351 (46.6)	368 (48.9)	34 (4.5)	969 (28.5)	90 (23.2)	93 (24)	205 (52.8)	458 (14.2)	1427 (21.5)
	Primary school	191 (22.9)	590 (70.7)	54 (6.5)	902 (26.5)	193 (27.5)	476 (67.7)	34 (4.8)	791 (24.6)	1693 (25.6)
	Guidance school	70 (19.2)	253 (69.3)	42 (11.5)	386 (11.3)	108 (23.5)	296 (64.5)	55 (12)	488 (15.2)	874 (13.2)
	High school	104 (13.4)	450 (57.8)	225 (28.9)	806 (23.7)	116 (13.6)	284 (33.2)	456 (53.3)	935 (29)	1741 (26.3)
	Associate and bachelor degree	25 (8.3)	0	275 (91.7)	321 (9.4)	7 (1.5)	44 (9.3)	424 (89.3)	507 (15.7)	828 (12.5)
	Master's degree and higher	0	0	16 (100)	17 (0.5)	0	0	40 (100)	42 (1.3)	59 (0.9)
Occupation	Upper white-collar employees	3 (23.1)	0	10 (76)	13 (0.4)	1 (0.8)	0	124 (99.2)	128 (4)	141 (2.1)
	Lower white-collar employees	9 (7.2)	0	116 (92.8)	131 (3.9)	3 (0.8)	0	389 (99.2)	406 (12.6)	537 (8.1)
	Manual Workers	9 (17.6)	0	42 (82.4)	53 (1.6)	248 (32.2)	508 (65.9)	15 (1.9)	812 (25.2)	865 (13.1)
	Self-employed persons	7 (25%)	0	21 (75)	32 (0.9)	154 (26.1)	408 (69.3)	27 (4.6)	621 (19.3)	653 (9.9)
	Housewife	663 (26.1)	1661 (65.4)	217 (8.5)	2860 (84.1)	0	0	0	0	2860 (43.9)
	Unemployed	50 (17.2)	0	240 (82.8)	303 (8.9)	108 (10.3)	277 (26.5)	659 (63.1)	1158 (36)	1461 (22.1)
	Dependency Ratio (mean ± SD)	0.47 ± 0.58	0.47 ± 0.54	0.41 ± 0.46 <sup>§</sup>	0.46 ± 0.54	0.71 ± 1.03 <sup>§</sup>	0.47 ± 0.52	0.39 ± 0.47 <sup>§</sup>	0.48 ± 0.64	0.47 ± 0.59
Total	741 (21.8)	1661 (48.8)	646 (19)	3401 <sup>*</sup>	514 (16)	1193 (37)	1214 (37.7)	3221 <sup>*</sup>	6622	

<sup>↓</sup>Percentages are pertaining to columns

\* In females 353 cases (10.4%) and in males 300 (9.3%) cases could not be inserted to any cluster by cluster analysis and were excluded.

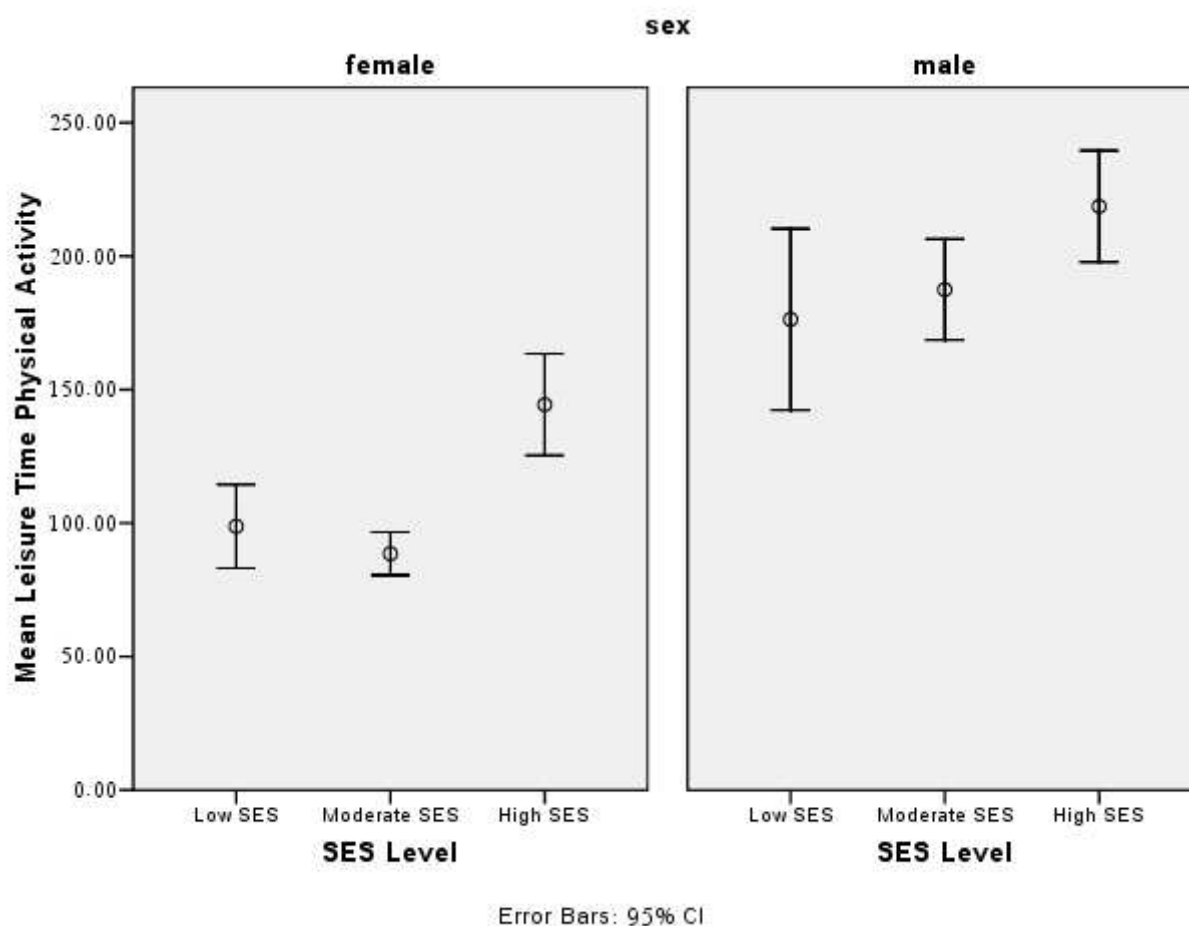
<sup>§</sup> Significantly participate in cluster definition (P < 0.05).

SES: Socioeconomic status

**Table 2.** The mean of physical activity (95% confidence interval) calculated as MET min/day in three different socioeconomic status levels

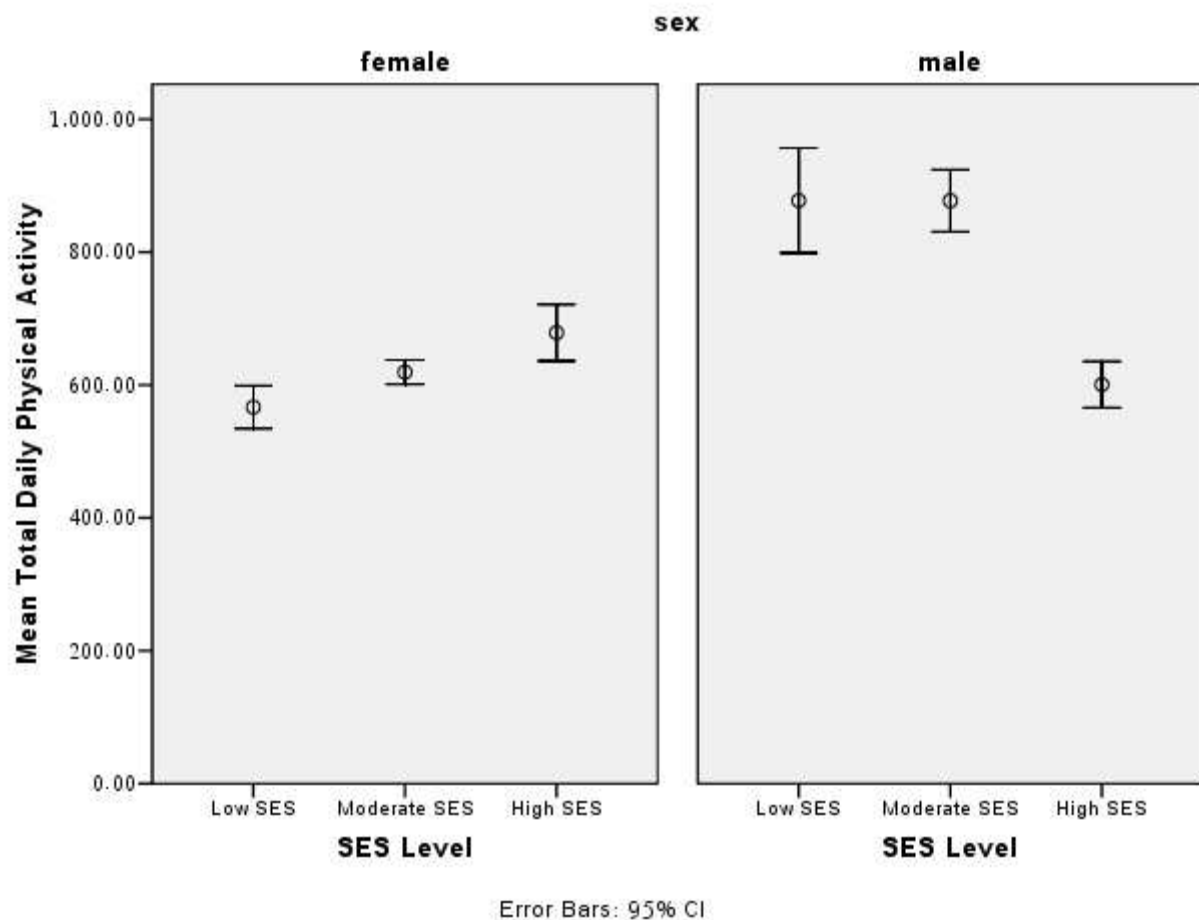
Socioeconomic Status	Leisure time physical activity	Occupational physical activity	Household physical activity	Transportation physical activity	Total physical activity
<b>Men</b>					
High	218 (197-239)	564 (525-602)	114 (93.4-135)	79.6 (73-86.2)	600 (565-635)
Moderate	187 (168-206)	710 (676-745)	131 (102-160)	88.2 (77.8-98.7)	877 (830-924)
Low	176 (142-210)	690 (632-748)	147 (104-189)	84.2 (71.1-97.2)	877 (798-956)
P-value	0.032	< 0.001	0.325	0.385	< 0.001
<b>Women</b>					
High	144 (125-163)	448 (339-497)	331 (309-354)	48 (41.9-54.2)	678 (636-721)
Moderate	88.5 (80.4-96.6)	- *	482 (486-497)	43.5 (40.7-46.3)	619 (600-637)
Low	98.7 (83.1-114)	381 (219-543)	404 (382-425)	45.3 (39.6-51.1)	566 (534-598)
P	< 0.001	0.357	< 0.001	0.364	< 0.001

\*No occupational physical activity was reported due to high frequency of house wives in MSES level.



**Figure 1.** Leisure time physical activity (MET min/day) in different socioeconomic status levels (Error Bars: 95% CI)

SES: socioeconomic status



**Figure 2.** Total daily physical activity (MET min/day) in different socioeconomic status levels (Error Bars: 95% CI) SES: socioeconomic status

### Total Physical Activity

Total physical activity in the sampled population was  $677.5 \pm 624$ . It was higher in men ( $756.6 \pm 766$ ) than women ( $602.71 \pm 437.10$ ), and the difference was significant. Total physical activity of women was higher in HSES than MSES and LSES; it was the same for MSES in comparison with LSES. In contrast with these findings, in men the total daily physical activity was higher in LSES than HSES, and also was higher in MSES than HSES. However, there was no significant difference between total physical activity of participants in LSES and MSES (Figure 2).

The overall differences of men and women in most physical activity fields have been followed similarly in each level of SES. However, the occupational physical activity differences of men and women in LSES were greater in comparison with the overall differences. It was the same in MSES level for household physical activity. Moreover, differences in total physical activity were greater than the overall differences between men

and women in LSES and MSES level, but it was less in HSES. The age and sex adjusted model yielded a significant regression coefficient for SES level ( $B = -97.9$ ,  $R^2 = 0.060$ ,  $P < 0.001$ ).

### Discussion

In this study we found statistically significant differences in the extent of leisure-time, household, occupational, and total physical activity based on SES but not in transportation physical activity.

It seems that none of the socioeconomic factors alone can define the precise socioeconomic level of people in non-industrial countries, like Iran, due to being in a transitory period from traditional to modern conditions. Consequently, in this study we used multivariable method (cluster analysis) to categorize people according to their real SES characteristics, like education or income, etc. It is obvious that the relative importance of leisure-time physical activity has increased over time.<sup>29,30</sup> Reports from developed and developing countries showed that men are more active than women in leisure-

time.<sup>12,16,31,32</sup> In their study, Droomer et al. have found lower levels of leisure-time physical activity in lower educated, lower income level, and in general low socioeconomic status groups.<sup>2,33-36</sup> These findings seem to have two main reasons. The first is internal barriers, such as lack of motivation and free time, and special attitudes in women, who do not think that household physical activity is insufficient for health. The second is external barriers such as lack of appealing public places for physical activity, not enough knowledge about exercise related issues, and low income.<sup>37</sup>

We believe that low SES men were more active than high SES in occupational physical activity due to accumulation of handworkers in this category.

While higher SES is positively associated with leisure time physical activity, lower SES is positively associated with occupational physical activity.<sup>38</sup> It has been suggested that health outcomes depend not on absolute income, but rather on equality or how resources are distributed in society. However, access to health care explains only part of the difference in health status among various SES groups.<sup>38</sup>

Furthermore, it is interesting to note that as the result of using more technology and spending less time in the house, women who had occupational physical activity had less household activity.

Men were prominently more active in transportation physical activity than women. Moreover, in contrast with other studies, gender difference was observed when all domains of activity practice were considered.<sup>20</sup> Nonetheless, no important differences were found between SES levels, which implicate the general behavior of the population apart from SES levels. However, overall values of this field in both genders and all SES levels are trivial. It can be an issue for health policy makers to plan for promoting more active transportation instead of using motor vehicles.

Although higher levels of household physical activity was seen among women, the effect of having lower activity level in other domains of physical activity causes low total physical activity in women. This may be due to cultural characteristics of Iranian women about social behavior, jogging or cycling less than men, or less tendency or opportunity to have a job, and considerably less opportunity to leave the home. As we have shown men were considerably more active than women during leisure time in all 3 levels of SES (the difference was more than 70 Met - minute per day). Similar pattern were shown in total physical activity

except in high SES men, who were less active than women. In both sexes fewer but more important differences were found between SES levels, especially high SES and low SES. However, we should be cautious in our interpretation in men due to overlapping 95%CI compared to significant P-value.

In line with other studies, our finding showed that association between SESs and total physical activity levels was exactly the opposite in men; the lower the SES level, the higher the rate of physical activity.<sup>22</sup> However, in women this pattern has not been shown. Although the pattern of physical activity and SES for women were similar in leisure time physical activity (as the most important field) and total physical activity (as life style marker), the HSES men with the most leisure time physical activity had the least total physical activity. This supports the fact that although they have high leisure time physical activity, they have an inactive lifestyle. Although leisure time physical activity was less in LSES than HSES, higher level of occupational physical activity cause higher total physical activity in these groups. On the contrary, the HSES group had more leisure physical activity, but less occupational physical activity.

In the past, physical activity was simply a part of ordinary life. However, in the modern and new life style of humanity many activities have been transferred to machines. This trend has finally affected people with different SES levels, even if begun in high SES's. Consequently, the role of leisure time physical activity has gradually become more important. In Iran, such activities need extra costs, and are not a part of daily routines in the traditional culture. For these reasons, it seems that leisure time physical activities are considered to be a special behavior rather than a routine. Hence, it is less probable that low SES people have leisure time physical activities. Moreover, they might not be aware of the important role of such activities, and think that the costs are unnecessary. Therefore, attempts to develop these habits among low SES groups, decrease costs, and increase easy available facilities should be taken into account as a part of health policies.

The improvements of the physical environment, eliminating physical barriers, group physical exercise instead of individuals ones, and community and workplace policies may promote physical activity in a population.<sup>39-41</sup> The results presented in this paper emphasize the fact that women of low and moderate SES who live in these areas need particular measures to increase their physical activity. They

not only have low leisure time, but also low total physical activity. Although there are many cultural and social differences between the Persian society and neighbor countries in the Middle East, some similarities like religion or economy may make these results generalizable to them.

This study has a number of strengths. The large sample size provided statistical power to examine associations within subgroups. This study reveals special physical activity patterns related to socioeconomic (that was not clear before) and exaggerated gender differences, and complete profile of physical activity fields (leisure time, occupational, household, and transportation) in Iran. The questionnaire included a wide range of subjects to prepare a more accurate estimation of physical activity together with more variation. Using Mets to report physical activity in this study provides quantifiable values based on calorie expenditure, which is more accurate than physical activity duration, but it leads to some difficulties in comparison with other studies.

Some of the limitations of our research are that assessments of physical activity via a questionnaire may not accurately reflect physical activity. Participation in active sports may be particularly overestimated, considering the strong Iranian social attitudes towards the desirability of an active lifestyle. Furthermore, information on income was self-reported and may be affected by prestige bias, or underestimation to avoid taxation. Our findings emphasize the need for a better understanding of social and environmental barriers, and special considerations for women in the low and moderate socioeconomic status in order to make social and health policies particularly in unindustrialized countries similar to Iran. More research is needed to examine the effect of other constructs of social class, such as acculturation, safety, and social support, in promoting successful interventions to increase physical activity.

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### Conflict of Interests

Authors have no conflict of interests.

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