Leisure-Time Physical Activity and Physical Fitness of Male Adolescents in Oman

Selina Khoo, PhD¹, and Ali Khalifa Al-Shamli, PhD²

Abstract
This study investigated the relationship between leisure-time physical activity and physical fitness (cardiovascular fitness, body fat percentage, flexibility, muscle strength, and endurance) of 10th-grade male students in Oman. Data were collected from 330 students. All participants completed a descriptive questionnaire, a 1 mile walk/run test; a skinfold analysis of the chest, abdomen, and thigh; a sit and reach test; a hand grip test; and a 1-minute sit-up test. Students spent an average of 19.20 ± 6.77 hours on sedentary activities, 3.46 ± 2.11 hours on sports activities, and 11.22 ± 9.24 hours working per week. The students had an average body fat percentage of 6.38% ± 4.67%, muscle strength 38.04 ± 7.55 kg, flexibility 38.01 ± 7.41 cm, abdominal muscle endurance 38.85 ± 8.15 times/min, and cardiovascular endurance 8.10 ± 1.65 minutes.

Keywords
male adolescents, Oman, physical activity, physical fitness, sedentary activities

Technological advances, mechanization, and automation have radically reduced physical activity in the general population of developed nations.¹ New recreational activities, such as the Internet, pay television, and video games, have led to a more sedentary lifestyle, particularly among young people. Moreover, increased intake and accessibility of high calorie and high fat fast foods have resulted in a higher prevalence of obesity and other health concerns in populations of all ages.² Governments and health organizations have become alarmed by these trends. The consequences of physical inactivity among youth are worrying. Compared with those who are active in childhood, youths who are inactive in their childhood and early teens are more likely to grow into sedentary adults.³,⁴ Governments and health organizations have also become aware of the link between physical inactivity and, for example, the incidence of cardiovascular disease and type 2 diabetes in adults and children.⁵,⁶ Concerted efforts are therefore being made to monitor physical fitness trends⁷,⁸ and to encourage and promote a physically active lifestyle in young people.¹⁰,¹¹

¹University of Malaya, Kuala Lumpur, Malaysia
²Sohar University, Oman

Corresponding Author:
Selina Khoo, Sports Centre, University of Malaya, Kuala Lumpur 50603, Malaysia
Email: selina@um.edu.my
In Asian countries such as Singapore and Kuwait, studies have shown that the consequences of physical inactivity are worrying. In Singapore, physical activity engagement in youths meets only 40% of the recommended 60 minutes of at least moderate intensity physical activity whereas in Kuwait, the overall prevalence of overweight and obesity in adolescents are, respectively, 30.7% and 14.6%. Not much detailed information is known about the levels of physical activity and fitness in Oman, a small country in southwest Asia with a population of 3.2 million. To establish baseline data, the World Health Organization and the US Centers for Disease Control and Prevention conducted a school-based health survey for male and female Omani students (n = 2979, age 13-15 years). The results showed that 23.1% of students (32.1% of male students) were physically active for a minimum of 60 minutes per day, whereas 34.1% of them (32.2% of males) spent 3 hours or more per day sitting and watching television, playing computer games, talking with friends, and reading. These initial results are of concern and show that in Oman more hours are spent per week being physically inactive than active, suggesting the trend is to live a more sedentary lifestyle.

Hassan and Al-Kharusy attempted to address the reasons underlying this sedentary lifestyle in a group of Omani boys (n = 109, age 9-11 years). The researchers found that television viewing and video/computer games were the major recreational pastimes, with subjects watching television or playing video/computer games an average of 3.2 h/d. Al Barwani et al, in a study of 83 Omani girls and 64 boys aged between 15 and 16 years, reported that students did sedentary activities an average of 16.4 ± 8.4 h/wk (2.3 h/d).

The social environment has also been shown to influence participation in physical activity. The differences in spatial characteristics and opportunities for physical activity in urban and rural areas may create differences in the level of physical fitness. Sjolie and Thuen found lower levels of physical fitness in rural adolescents compared with those living in urban areas, whereas Ozdirenc et al found the opposite to be true. Ozdirenc et al found that students who live in urban areas were more inactive and obese with decreased physical fitness.

There are many health benefits of regular physical activity. Physical activity has been shown to reduce the risk of coronary heart disease, hypertension, diabetes, and obesity in adults, as well as to have positive effects on the musculoskeletal, cardiovascular, respiratory, and endocrine systems. Physical activity in adolescence is beneficial to health, whereas inactivity may aggravate cardiovascular risk factors such as hypertension and hyperlipidemia in children. There is also a link between physical inactivity and obesity in children. In contrast, active children have healthier cardiovascular profiles, are leaner, and have higher bone mass. Adolescent physical activity has long-term benefits on bone health, breast cancer, and sedentary behaviors. In addition, studies have found that physical activity in adolescence has a positive correlation with physical activity in adulthood. Physically active adolescents are more likely to become active adults, thus reducing the incidence of chronic disease. Leisure-time physical activity too has an effect on fitness. Tuero et al found that heavy-intensity leisure-time physical activity was highly related to improved \( V_{\text{O}_{2}\text{max}} \). Aarnio recommended that adolescents participate in various sports to maintain long-term leisure-time physical activity.

The purpose of this study was to collect baseline data on the physical activity levels of a representative sample of Omani adolescents, specifically 10th-grade male students from the Al-Dhahirah region of Oman. We examined the relationship between leisure-time physical activity and physical fitness. In this study, leisure-time refers to all “waking” time outside school hours, including weekdays and weekends, and may include work that is not school related. Fitness was measured by determining cardiovascular fitness, body fat composition, flexibility, muscle strength, and endurance.
Methods

A descriptive study of male adolescents was undertaken using survey results and physical fitness assessments. The Al-Dhahirah region of Oman was selected because of the geographical diversity in the region, which is representative of the varied geography of Oman. This region is located in the northwestern part of Oman and its landscape is made up of plains, hills, and mountains. The weather in summer is hot and dry with an average temperature of 38°C. In winter, the weather is bright and sunny with a mean temperature of 19°C.

Participants

Secondary school boys in the Al-Dhahirah region of Oman were stratified according to geographic location (urban/rural). There are a total of 26 boys’ schools in the Al-Dhahirah region with a total of 1,643 students. In all, 20% of 10th-grade boys were randomly selected, providing a random sample of 330 students (mean age, 16.41 ± 0.49 years). There were 188 students (56.9%) drawn from urban schools and 142 students (43.1%) from rural schools. The boys participated voluntarily and their parents provided signed parental consent. Authorization to perform the study was obtained from the Ministry of Education and the General Directorate of Education of the Al-Dhahirah Region.

Measures

Physical activity. Study participants were asked to complete a survey to assess levels of leisure-time physical activity. The Global School–Based Health Survey\textsuperscript{14} and the Longitudinal Aging Study Amsterdam Physical Activity Questionnaire\textsuperscript{26} were used as a guide to develop the survey, but additional questions related to work activities were also added. The survey comprised 4 demographic questions plus 12 questions divided in 4 sections: mode of transport to school, sedentary activities, physical activities, and work activities. The demographic questions requested information on age, school, and city. The next 2 questions inquired about the location of the student’s school relative to his house, and the mode of transport to school. Question 3 sought to determine the number of hours students spent per day on sedentary activities, whereas questions 4 to 8 inquired as to which sports activities the students participated in during the week, the number of days, where they participated, and the time spent on these activities. Lastly, questions 9 to 12 asked about work activities the students did during the week, the number of days, the types of work activities, and the time spent on them. Sedentary activities were defined as behaviors that are considered inactive such as watching television, using the computer, and reading. Work activities encompassed activities performed as part of the student’s daily life, such as farming and shepherding. The survey was translated into Arabic language by a translation expert and self-completed by the students.

A pilot test was carried out to ensure the stability of the questionnaire. One way of doing this is by the test–retest method.\textsuperscript{27} A sample of 30 students from the 10th grade was selected for the pilot test. Testing and retesting was carried out with a 2-week time interval between tests. Paired sample \( t \)-test was calculated to measure the strength between the study variables. Table 1 summarizes the results. Survey questions showed moderate to high correlation, which ranged from .386 to .906. Correlations <.30 are considered low, between .30 and .60 are considered moderate, and >.60 are considered high.\textsuperscript{28}

Physical fitness. Skinfold calipers were used to calculate the participants’ body fat. A Lange skinfold caliper (Cambridge Scientific Industries, Cambridge, MA) was used to measure 3 skinfold...
sites, namely chest, abdomen, and thigh, on the right side of the student. At each skinfold site, 3 measurements were taken and the average was recorded for each site. The percentage of body fat was calculated from the total sum of the 3 skinfold measurement sites using the Jackson and Pollock\textsuperscript{29} equation.

Cardiovascular endurance was measured using a 1-mile walk/run test. Students ran or walked around an outdoor rectangular area (60 meters long and 40 meters wide) for 8 laps. The course was flat and sandy and the temperature was 30$^\circ$C to 35$^\circ$C. The students lined up behind the starting line in groups of 12 and dressed in numbered T-shirts. They were instructed to cover the 1-mile distance in as short a time as possible. The time to complete the 1-mile course was recorded.

Flexibility was assessed by a modified sit and reach test, as previously described by Katzmarzyk and Craig.\textsuperscript{9} Two attempts were allowed with a 10- to 15-second rest between them. The flexibility scores were read in centimeters and the best score was recorded.

Muscle strength was determined by a hand grip test, as previously described by Tammelin et al.\textsuperscript{30} A hand dynamometer with an adjustable handle was used (TKK 5401, Takei Scientific Instruments, Tokyo, Japan). Two attempts were allowed and the best score was recorded.

The 1-minute sit-up test was used to measure abdominal muscle endurance.\textsuperscript{9} The number of correctly executed sit-ups performed in 60 seconds was documented.

**Data Analysis**

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), Version 14. Means were used to describe the data, whereas paired-sample $t$-tests and one-way analysis of variance (ANOVA) were used to assess differences between groups. All results are listed as mean ± standard deviation (mean ± SD).

**Results**

The weight of the students ranged from 31.3 to 98.9 kg (mean 55.01 ± 10.29 kg), whereas height ranged from 131.5 to 189.5 cm (mean 168.06 ± 7.58 cm). A total of 313 (94.8\%) of the participants reported in the survey that they participated in sports activities whereas 233 (70.6\%) reported working. Overall, 110 reported playing sports 3 or 4 days a week and spending between 60 and 90 minutes playing sport each time. Football (soccer) was the most popular sport with 272 of the students reporting that they played it. This was followed by walking (135 students),

<table>
<thead>
<tr>
<th>Question</th>
<th>Correlation</th>
<th>$t$</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time spent on sedentary activities during the week</td>
<td>.745</td>
<td>1.161</td>
<td>.255</td>
</tr>
<tr>
<td>Participation in sports activities</td>
<td>.695</td>
<td>-1.000</td>
<td>.326</td>
</tr>
<tr>
<td>Participation in sports activities (number of days)</td>
<td>.813</td>
<td>1.306</td>
<td>.202</td>
</tr>
<tr>
<td>Number of sports activities that are participated in</td>
<td>.715</td>
<td>0.701</td>
<td>.489</td>
</tr>
<tr>
<td>Location of sports activities</td>
<td>.730</td>
<td>-1.649</td>
<td>.110</td>
</tr>
<tr>
<td>Time spent participating in sports activities</td>
<td>.520</td>
<td>-0.494</td>
<td>.625</td>
</tr>
<tr>
<td>Participation in work activities</td>
<td>.386</td>
<td>1.000</td>
<td>.326</td>
</tr>
<tr>
<td>Participation in work activities (number of days)</td>
<td>.601</td>
<td>-0.154</td>
<td>.879</td>
</tr>
<tr>
<td>Number of work activities that are participated in</td>
<td>.906</td>
<td>0.0011</td>
<td>1.000</td>
</tr>
<tr>
<td>Time spent doing work activities during the week</td>
<td>.797</td>
<td>-1.223</td>
<td>.231</td>
</tr>
<tr>
<td>Amount of time spent on physical activities</td>
<td>.772</td>
<td>-0.183</td>
<td>.856</td>
</tr>
</tbody>
</table>
jogging (90 students), and cycling (52 students). Only 4 students reported playing basketball whereas 5 played handball. The most common work reported done by students was farming. A total of 168 students farmed, 56 worked as shop assistants, and 16 were shepherds.

All the students combined spent an average of 19.20 ± 6.77 h/wk on sedentary activities, 3.46 ± 2.11 h/wk on sports activities, and 11.22 ± 9.24 h/wk working. A summary of the time urban and rural students spent on sedentary, sports, and work activities is shown in Table 2. Significant differences were found between urban and rural students for all 3 activities. Urban students spent significantly more time on sedentary activities than rural students, \( t(328) = 3.32, P < .05 \), and also spent significantly more time playing sports, \( t(328) = 2.05, P < .05 \), whereas rural students spent significantly more time working than urban students, \( t(328) = 6.74, P < .05 \).

The physical fitness results of the overall sample were as follows: body fat percentage 6.38% ± 4.67%, muscle strength 38.04 ± 7.55 kg, flexibility 38.01 ± 7.41 cm, abdominal muscle endurance (sit-up test) 38.85 ± 8.15 times/min, and cardiovascular endurance 8.10 ± 1.65 minutes. The differences between urban and rural students are shown in Table 3.

The \( t \)-test shows that there are significant differences between rural and urban students in body fat percentage, \( t(328) = 2.04, P < .05 \), and cardiovascular endurance, \( t(328) = 5.24, P < .05 \), with rural students having significantly lower body fat and better cardiovascular endurance.

A one-way ANOVA was conducted to compare the physical fitness of students with the time spent doing sedentary activities. The results showed that there were no significant differences for all 5 physical fitness scores. There were, however, differences in muscle (hand grip) strength in students who reported working more each day, \( F(5, 324) = 3.09, P < .05 \). Post hoc analyses using the Scheffe post hoc test indicated that the hand grip scores of students were significantly higher in students who worked 3 to 4 h/d (43.70 ± 11.80) compared with those who worked less than 1 h/d (36.3 ± 5.83). There was no relationship between physical fitness and the number of days in a week that the students worked.

There were also differences in terms of dimensions of physical fitness between the boys who reported playing sports daily, those who reported 1 to 2 days of participation/week, and those who reported playing no sports. A one-way ANOVA showed there was a significant difference in abdominal muscle endurance, \( F(4, 325) = 5.61, P < .001 \). Post hoc analyses using the Scheffe
post hoc test indicated that the 1-minute sit-up scores of students were significantly higher in students who participated in sports 7 days/week (42.14 ± 7.37) compared with those who did not participate (33.06 ± 9.48), those who participated for 1 to 2 d/wk (37.89 ± 7.94) and 3 to 4 d/wk (38.37 ± 7.82).

**Discussion**

This study found that students had an average weight of 55.01 ± 10.29 kg. This is lower than the weight of American adolescents (75 kg) and Flemish adolescents (67 kg), but higher than Taiwanese adolescents (52.1 ± 11.6 kg). The average height of the sample was 168.06 ± 7.58 cm, which was also shorter than American adolescents (175.3 cm) and Flemish adolescents (178.1 cm), but taller than Taiwanese adolescents (160.8 ± 7.4 cm).

Omani students in this study reported spending an average of 19.20 ± 6.77 h/wk engaged in sedentary activities such as watching television, playing computer games, and surfing the Internet. These findings are consistent with the previous research of Al Barwani et al., which found that 15- to 16-year-old boys and girls in Oman spent 16.4 h/wk in sedentary activities, and Vilhjalmsson and Thorlindsson, which found that 15-16 year old boys and girls in Iceland spent 3.7 hours/day doing sedentary activities. In contrast, Ekelund et al. reported much higher sedentary activity results (mean = 9.3 hours daily) among 14- to 15-year-old Swedish boys and girls. In our study, urban students reported spending more time on sedentary activities compared with rural youth (20.26 and 17.80 h/wk, respectively). These figures are consistent with data from Loucaides et al., who found that urban students spent more time in sedentary activities than did their rural counterparts (2.9 and 2.5 h/d, respectively). Ozdirenc et al. also reported that urban students spent more time in sedentary activities than did rural students (13.4 and 10.9 h/wk, respectively). However, Sjolie and Thuen found no difference between rural and urban students on the time spent on sedentary activities (24.2 and 23.7 h/wk, respectively).

The students of the Al-Dhahirah region have a lower body fat percentage (6.38%) compared with the North American students reported in the work of Ogden et al. (19%) and the Swedish students reported by Ekelund et al. (15.5%). In abdominal muscle endurance (sit-ups), the students’ scores averaged 38.85 ± 8.15 times. The results are higher than those reported by Huang and Malina for Taiwanese participants, who scored an average of 34.7 ± 9.6 times. The students in the present study scored lower in the 1-mile walk/run for cardiovascular endurance (7.56 ± 1.59 minutes) than the norms of the Presidential Physical Fitness Award (6.06-6.08 minutes), but higher than the study by Huang and Malina where students scored 8.34 ± 1.31 minutes.

This study found a difference in abdominal muscle endurance between male adolescents who report different levels of weekly sports participation. Students who reported playing sports 7 d/wk had better muscle endurance compared with those who reported no participation in sports, played sports 1 to 2 d/wk and 3 to 4 d/wk. Furthermore, male students who reported working 3 to 4 h/d had better muscular strength than those who reported working less than 1 h/d. Huang and Malina found that Taiwanese adolescents who scored better in the 1-mile run and sit-and-reach tests were more physically active than were their less active peers. Many previous studies have also shown that students who are more active have higher levels of physical fitness than less active ones. These results, and those reported in the current study, suggest that increasing the amount of time spent on nonsedentary activities may positively influence physical fitness.

Of particular interest in this study is the finding that rural students have lower body fat and better cardiovascular endurance compared with urban students, 2 factors that are important indicators of long-term health. The reasons for the discrepancy between the rural and urban students cannot be discerned but could be related to the fact that urban students are engaged in more sedentary activities than their rural counterparts, or that the rural adolescents are more...
active (sports + work activities combined) than urban adolescents. Additional studies are, however, needed to determine the validity of these statements, and to further investigate what other factors, such as ease of access to sports programs, the Internet, and so on, may be involved. Future intervention studies will evaluate if the introduction of a regular school activity program is effective at improving physical fitness of Omani students. Finally, future work is needed to examine the fitness levels of female students in Oman, because at least one report suggests that their leisure and physical activity profiles may be quite different from males.14

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

Funding

The author(s) received no financial support for the research and/or authorship of this article.

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