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Physical Activity and Physiological Fitness Status of 10th Grade Male Students in Al-Dhahirah Region, Sultanate of Oman

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Abstract: The objective of this study was to measure the physical activity and physiological fitness (cardiovascular fitness, body composition, flexibility, muscle strength and endurance) of 10th grade male students in the Al-Dhahirah region, Sultanate of Oman. The study sample consisted of 330 male students from rural and urban areas. The study used a physical activity survey to measure the physical activity and a test battery to measure the physiological fitness components (1 mile walk/run test; a skinfold of chest, abdominal, and thigh; sit and reach test; hand grip test; and one minute sit-ups). The results showed that body fat percentage (6.82±4.91) and muscle strength (38.15±7.60) of urban students were higher than rural students (body fat percentage 5.79±4.29, muscle strength 37.81±6.93). Rural respondents scored higher in flexibility (39.36±6.95), muscle endurance (40.03±7.64) and cardiovascular endurance (7.63±1.30) compared to urban students (flexibility 37.96±6.97, muscle endurance 39.78±7.67, cardiovascular endurance 8.03±1.77). The results showed significant difference in body fat percentage ($p = 0.04$), muscle endurance ($p = 0.00$), and cardiovascular endurance ($p = 0.01$) between participation in sports activities and physiological fitness components for the overall sample. The study recommends that a concerted effort be made by all parents, teachers, school administrators and the community to improve the general physical fitness of students on the whole.

Key words: Physical activity, physiological fitness, male students' activities, fitness status of Omani students

INTRODUCTION

In the previous century, the population of Oman led a more active lifestyle compared to the current generation. Currently, technological advances, mechanization and automation have radically reduced human physical activity (Faith *et al*., 2001; Richardson *et al*., 2004; USDHHS, 2002; WHO, 2004). This, along with similar advances in information and entertainment technologies (internet, satellite television and video games), have led to sedentary activities. Furthermore, the demands for fast food, high calories and fat have raised more concerns about human health (Faith *et al*., 2001). Governments and health organizations have realized the risks of this emerging trend and have made concerted efforts to measure the levels of physical fitness of its populations (Freedson *et al*., 2000; Frotier *et al*., 2000; Katzmarzyk and Caric, 2002). They have also encouraged and promoted a physically active lifestyle (Carrol *et al*., 2000; Talbot *et al*., 2000; WHO, 2004).

Few studies have been conducted to measure physical fitness indicators in Oman (Al Barwani *et al*., 2001; Hassan and Al-Kharusy, 2000; GSHS, 2005). In one study conducted by Hassan and Al-Kharusy to determine cardiovascular fitness, the 1 mile walk/run protocol was used, while for percentage of body fat the skinfold protocol was applied (Hassan and Al-Kharusy, 2000). Skinfold was conducted over five body areas; subscapular, suprailiac, abdomen, thigh and triceps. The study samples were 109 boys aged between 9-11 years from schools in the Muscat region. It showed that television viewing and video/computer games (3.2 hour/day) were the major causes of physical inactivity. In another similar study (Al Barwani *et al*., 2001) to determine cardiovascular fitness, a 20 m shuttle run was conducted for 83 girls and 64 boys aged between 15-16 years from some schools in the Muscat region. It showed that the main reason for the reduction of aerobic fitness in Omani adolescents is probably due to the very small component that physical education occupies in Omani schools curricula as well as the complete lack of extracurricular physical activities in all government schools.

A school-based health survey (GSHS, 2005) was conducted in Oman for students from grades 7 to 10 (12-15 years old). The results showed that 32.1% of male students were physically active for a minimum of 60 minutes per day, while 32.2% of them spent three hours or more per day sitting and watching television, playing computer games, talking with friends, and reading. This finding was higher than those found by Al Barwani *et al.* (2001), Hassan and Al-Kharusy (2000), who reported 3.2 hours per day and 16.4± 8.4 hours per week respectively. This conclusion showed that there was a tendency within the community to be inactive.

These studies were the reason for a systematic examination of physical fitness, as none of them had examined the five physiological fitness components (cardiorespiratory fitness, body composition, flexibility, muscle strength and muscle endurance) in Omani society in general and in the Al-Dhahirah region in particular. Also, none of the previous studies examined the differences between urban and rural students and sport and work activities on these components.

MATERIALS AND METHODS

With reference to the period of measuring the physiological fitness components of 10th grade male students (16-17 years old) in the Al-Dhahirah region, Sultanate of Oman, the test took place at the beginning of the second semester of the 2006/2007 academic year on 20th February 2007 till 7th March 2007. Each school was informed of the number of students who would be participating and the dates of data collection.

The tests were carried out between eight and ten o'clock in the morning during school days. The decision for this time was made on the assumption that at that time of day the students would not have done any substantial physical activity, and as such would not be tired (Al-Hazzaa and Al Mozaini, 1999; Gretebeck and Montoye 1992; Heyward, 1998; Hinson, 1995; Maud and Foster, 1995; Shellock and Prentice, 1985; Watson *et al*., 2005). Moreover, this procedure when carried out in the early morning is believed to be valid and reliable as it eliminates diurnal variation in hydration as simple dehydration could affect the measurements of skinfolds by as much as fifteen percent. Therefore the skinfold test can be affected by dehydration at around fifteen percent (Heyward, 1998). To rule out any external factors (i.e. airflow, hot weather), they were also exempted from the daily 15-minute assembly, which is held every morning from 7.30am to 7.45am. They were exempted because the assembly can be physically demanding, especially if the weather is hot, as the students have to stand in queues for the whole 15 minutes.

In the Al-Dhahirah Region, there are 26 male schools with a total number of 1643 students. Ibri has 18 schools with a total number of 1206 students. Dank has 5 schools with a total number of 207 students. Yanqul has 3 schools with a total of 230 students. As the two groups (i.e., rural and urban) were not equal in size, a stratified random sampling has been adopted to ensure that 20% was selected from each group (Thomas *et al*., 2005). Lunsford and Lunsford (1995) supported that a 10% sample may yield accurate findings about the group from which it is selected.

In Ibri, there were six urban schools with 611 students and 12 rural schools with 595 students. By taking 20% of students, the study chose two urban schools with 122 students, and three rural schools with a total of 120 students.

In Dank there were three urban schools with 154 students and two rural schools with 53 students. By choosing 20% of students, there was 1 urban school, which consists of 31 students, and 1 rural school with a total of 11 students.

In Yanqul there was 1 urban school with 176 students, and 2 rural schools with 54 students. Therefore 20% of students were in 1 urban school and 1 rural school with 35 and 11 students respectively.

Therefore, the study sample was made up of 330 students (188 urban students and 142 rural students). From them 242 students were from Ibri (122 urban students and 120 rural students), 42 students from Dank (31 urban students and 11 rural students), and 46 students from Yanqul (35 urban students and 11 rural students). The sample was made up of the students of the schools that had been chosen. Parental approval had been collected before the tests were conducted.

A physical activity survey and the physiological fitness tests were used to assess the variables of the study. An extensive reviews of different physical activity questionnaires such as Global School-based Health Survey (GSHS) and Longitudinal Aging Study Amsterdam Physical Activity Questionnaire (LASAQ) was conducted (Stel *et al*., 2004; WHO, 2004). It was found that those surveys did not have enough questions to be used to gather the study information. Therefore a questionnaire was developed with additional items to address the specific variables of the study by using those questionnaires as a guide. As an example, those surveys did not include questions regarding work activities, thus, specific questions were added on work activities to answer the study questions.

The physical activity survey was divided into four sections. The first one included the demographic information such as name, age, school name, distance from the house to the school and the kind of transportation used to school. The second part was the number of hours students spent a day on sedentary activities. This was divided into six levels from no participation to > 4 hours. Students had to choose the appropriate number of hours by putting a tick for the suitable choice. The third and fourth sections were about the physical activities, which were divided into sports activities and work activities. For sports activities, the students answered if they participated in sports activities or not, and in which sports activities they participated in during the week, the days of participation, places where they participated in these activities and the time spent on these sports activities. For work activities students have to answer if they are involved in work activities during the week. The work activities included the days of participation, the kinds of work activities, the time spent on them during the week.

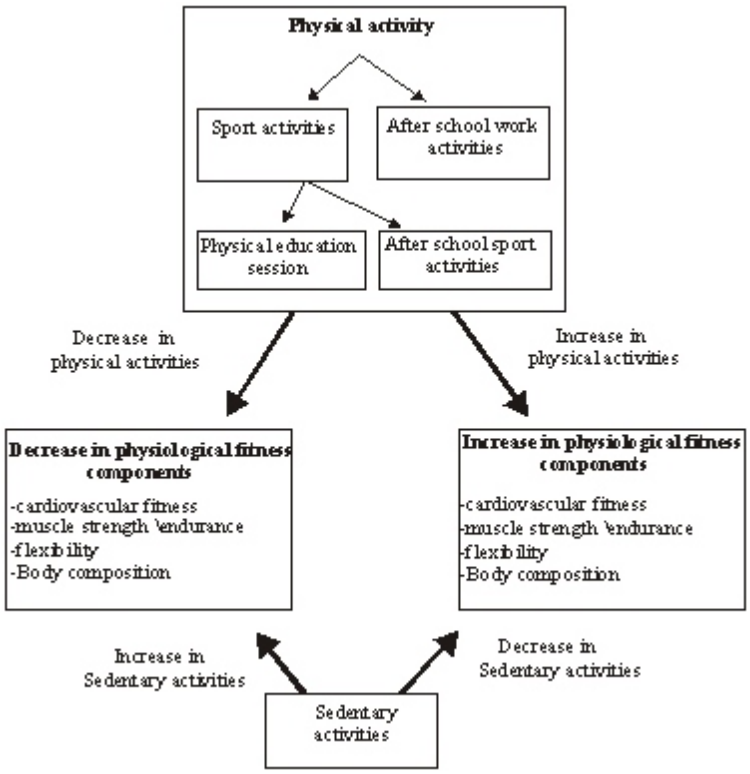

Fig. 1: A framework for understanding the effect of physical activities and sedentary activities in relation to physiological fitness components

The physiological fitness components were measured using a test battery that had been taken from different international physical fitness test batteries (AAHPER youth fitness test, AAHPERD physical best, FitnessGram, President's Challenge, YMCA Youth Fitness Test, Chrysler Fund/AAU test and Eurofit Test Battery). Cardiovascular endurance was measured by using a 1 mile walk/run. Body composition was calculated by taking the sum of three skinfolds from three different sites (chest, abdominal, thigh) on the right side of the body and calculated by Jackson and Pollock's equation to estimate body fat. Lower back and hamstring flexibility was measured by a modified sit and reach test (Jackson and Pollack, 1985). Muscle strength was determined by a handgrip test, and the 1 min sit-up test used to measure muscle endurance.

Figure 1, presents a framework, which shows how physical activity and sedentary activities influence physiological fitness components. As shown, physical activity can be divided into two categories, after schoolwork activities and sports activities. For sports activities, students can achieve this in two ways. Firstly, physical education sessions during the school day and secondly, after school sports activities through participation in clubs and/or sports played in public areas. By increasing these physical activities and decreasing the time spent in sedentary activities, health-related fitness will increase. In other words, students who participate in physical activities either through sport or work, more frequently have greater levels of health related fitness. In contrast, decreasing physical activities and increasing sedentary activities will decrease health related fitness. Therefore students who do not participate in physical activities or decrease their participation and carry out sedentary activities have low levels in physiological fitness components.

The research questions were assessed through statistical analysis including descriptive statistics such as frequencies, means, percentages, and standards deviation, paired sample t-test, Eta-squared h^2 and One Way Analysis of Variance (ANOVA), with the support of the Statistical Package for the Social Sciences (SPSS). Probability (p) values of 0.05 or less were employed for significant results.

RESULTS

Demographics of respondents: The study sample consisted of 330 male students of the 10th grade of Al-Dhahirah region. A total 188 students (56.9%) of the respondents were from urban areas while 142 students (43.1%) were from rural areas.

The average age of the respondents was sixteen with a standard deviation of 0.49. The average weight was about 55 kg with a standard deviation of 10.28. The maximum weight reported was 98.9 kg while the minimum weight was 31.1 kg. The average height reported was 168.06 cm with a standard deviation of 7.57. The maximum height was 189.5cm while the minimum height was 131.5 cm.

Physiological fitness:

Overall: As shown in Table 1, the physiological fitness status of overall sample were body fat percentage 6.38 ± 4.67, muscle strength 38.01±7.31 kg, flexibility 38.03 ± 7.04 cm, muscle endurance 39.88±7.64 times/minute, and cardiovascular endurance 7.56±1.59 minutes.

Rural and urban respondents: The physiological fitness components were compared for rural and urban students. The results of Table 2, showed that body fat percentage (6.82±4.91) and muscle strength (38.15±7.60) of urban students were higher than rural students (body fat percentage 5.79±4.29, muscle strength 37.81±6.93). While the rural respondents scored higher in flexibility (39.36±6.95) and muscle endurance (40.03±7.64), compare to urban students (flexibility 37.96±6.97, muscle endurance 39.78±7.67). Also rural students scored better in cardiovascular endurance than urban students (7.63±1.30, 8.03±1.77 respectively).

The Time Spent on Sedentary Activities and Physiological Fitness Components: The results showed that there was no significant difference in the time spent on sedentary activities during the week on any of the physiological fitness components for the overall sample and rural students, but it found a significant difference only for urban students. The results of the comparison between physiological fitness and sedentary activities of urban students are shown in the Table 3.

As shown in Table 3, the study found a significant difference for body fat percentage (p=0.018) and sedentary activities. The Eta-squared indices indicate that the relationship between number of sports and body fat percentage (η^2 = 0.056) was low. No post hoc test was performed because one group has fewer than two cases.

The Participation in Sports Activities and Physiological Fitness Components:

Overall: The number of sports activities participated and the physiological fitness components was carried out using the analysis of variance (ANOVA). Table 4 shows the ANOVA for the physiological fitness components and the number of sports activities participated in. In the questionnaire, the students were asked to circle the number of sports activities they participated in. The choices given were none, one, two, or three.

Table 1: Summary results of the physiological fitness components (overall sample)

Physiological components	Mean±SD
Body fat %	6.38±4.67
Muscle strength (kg)	38.01±7.31
Flexibility test (cm)	38.03±7.04
Muscle endurance(times/1 minute)	39.88±7.64
Cardiovascular endurance (minutes)	7.56±1.59

Table 2: Summary results of the physiological fitness components t between rural and urban students.

Components	Kind of Wilayah	n	Mean±SD
Body fat%	Urban	188	6.82±4.91
	Rural	142	5.79±4.29
Muscle strength (kg)	Urban	188	38.15±7.60
	Rural	142	37.81±6.93
Flexibility test (cm)	Urban	188	37.96±6.97
	Rural	142	39.36±6.95
Muscle endurance (times/1 minute)	Urban	188	39.78±7.67
	Rural	142	40.03±7.64
Cardiovascular endurance (minutes)	Urban	188	8.03±1.77
	Rural	142	7.63±1.30

As shown in the Table 4, it was found that body fat percentage (p = 0.04), muscle endurance (p = 0.00), and cardiovascular endurance (p = 0.01) were significant at α = 0.05. The Eta-squared indices indicate that the relationship between number of sports and body fat percentage (η^2 = 0.025), muscle endurance (η^2 = 0.04) and cardiovascular endurance (η^2 = 0.38) were low. This trend could be because parents do not allow their children to do more sports activities during school days.

As shown in the Table 5, the test showed a significant difference between no participation and participation in three sports activities (p = 0.02) at α = 0.05. The body fat percentage of students who do not participate in sports are significantly higher than those who participate in three sports activities.

As can be seen from the Table 6, the test showed a significant difference between no participation and participation in only one sport activity (p = 0.00) at α = 0.05. The muscle endurance of students who do not participate in sports is significantly lower than those who participate in one sport activity.

Table 7 shows the summary result of the Scheffe test that was carried out on cardiovascular endurance.

At α = 0.05, the test showed a significant difference between no participation and participation in only one sport activity (p = 0.01), between no participation and participation in two sports activities (p = 0.00), and between no participation and participation in three sports activities (p = 0.01). The cardiovascular endurance of students who do not take part in sports activities significantly lower than those who participate in one, two and three sports.

Rural and urban respondents: The ANOVA was carried for the five physiological fitness components in

Table 3: Summary results of ANOVA between the physiological fitness components and the time spent on sedentary activities during the week of urban students

Physiological components	Time spent on sedentary activities	n	Mean±SD	F-statistics	p-value	Eta-squared
	None	1	10.63			
	< 1 hour	16	9.22±2.65			
	1 – 2 hours	78	8.45±4.37			
Body fat%	2 – 3 hours	61	8.49±4.13	2.47	0.018*	0.056
	3 – 4 hours	18	6.47±6.25			
	> 4 hours	14	6.23±8.56			
	Total	188				
	None	1	35.40			
	< 1 hour	16	40.30±9.02			
	1 – 2 hours	78	37.79±7.99			
Muscle strength (kg)	2 – 3 hours	61	37.26±7.32	0.92	0.47	0.014
	3 - 4 hours	18	39.05±6.72			
	> 4 hours	14	41.30±10.44			
	Total	188				
	None	1	34.00			
	< 1 hour	16	40.78±5.90			
	1 - 2 hours	78	37.15±7.06			
Flexibility test (cm)	2 - 3 hours	61	37.84±8.69	1.07	0.38	0.001
	3 - 4 hours	18	37.39±7.72			
	> 4 hours	14	40.75±7.09			
	Total	188				
	None	1	34.00			
	< 1 hour	16	39.38±6.75			
Muscle endurance	1 - 2 hours	78	38.17±8.06			
(times/1 minute)	2 - 3 hours	61	38.03±7.74	0.76	0.58	0.001
	3 - 4 hours	18	40.33±8.58			
	> 4 hours	14	35.29±9.36			
	Total	188				
	None	1	9.32			
	< 1 hour	16	8.09±0.97			
	1 - 2 hours	78	8.41±1.61			
Cardiovascular	2 - 3 hours	61	8.34±2.06	0.82	0.53	0.004
endurance(minutes)	3 - 4 hours	18	8.86±2.37			
	> 4 hours	14	8.22±2.80			
	Total	188				

*: Significant at 0.05 level of significance

Table 4: Summary results of ANOVA between physiological fitness components and number of sports activities participated in (overall)

Physiological components	Number of sports	n	Mean±SD	F-statistics	p-value	Eta Squared
	None	15	9.52± 8.43			
	One	83	6.51±4.41			
Body fat%	Two	151	6.33±4.50	2.83	0.04*	0.025
	Three	81	5.74±4.16			
	Total	330				
	None	15	35.59±4.89			
	One	83	38.30±7.26			
Muscle strength (kg)	Two	151	37.73±7.42	0.92	0.433	0.008
	Three	81	38.80±8.44			
	Total	330				
	None	15	36.47±7.52			
	One	83	37.63±7.25			
Flexibility test (cm)	Two	151	38.52±7.20	0.57	0.64	0.005
	Three	81	37.74±7.98			
	Total	330				
	None	15	32.80±8.89			
	One	83	38.00±7.69			
Muscle endurance	Two	151	40.14±7.93	4.53	0.00**	0.040
(times/1 minute)	Three	81	38.42±8.37			
	Total	330				
Cardiovascular	None	15	9.54±2.97			
endurance(minutes)	One	83	8.11±1.70			
	Two	151	7.97±1.51	4.31	0.01**	0.038
	Three	81	8.05±1.41			
	Total	330				

*: Significant at 0.01 level of significance
**: Significant at 0.05 level of significance

Table 5: Summary results of the Scheffe test (Body fat %)

No. of sports (i)	No. of sports (ii)	Mean Difference(i) – (ii)	Standard Error	p-value
None	One	3.00	1.30	0.13
None	Two	3.18	1.25	0.07
None	Three	3.78	1.30	0.02*

* Significant at 0.05 level of significance

Table 6: Summary results of the Scheffe test (Muscle endurance)

No. of sports (i)	No. of sports (ii)	Mean Difference(i) – (ii)	Standard Error	p-value
None	One	-5.2	2.17	0.00**
None	Two	-7.34	1.10	0.31
None	Three	-5.62	1.11	0.72

** Significant at 0.01 level of significance

Table 7: Summary results of the Scheffe test (Cardiovascular endurance)

Number of sports (i)	Number of sports (ii)	Mean Difference(i) – (ii)	Standard Error	p-value
None	One	1.43	0.46	0.01*
None	Two	1.58	0.44	0.00*
None	Three	1.49	0.46	0.01*

* Significant at 0.01 level of significance

Table 8: Summary results of ANOVA between physiological fitness components and number of sports activities participated in (urban)

Physiological components	Number of sports	n	Mean±SD	F-statistics	p-value	Eta Squared
	None	10	10.53±			
	One	57	6.96±4.56			
Body fat%	Two	79	6.71±4.54	2.41	0.07	0.038
	Three	42	5.97±4.29			
	Total	188				
	None	10	36.74±4.64			
	One	57	38.89±7.62			
Muscle strength (kg)	Two	79	37.33±7.88	0.82	0.48	0.013
	Three	42	39.27±9.10			
	Total	188				
	None	10	33.70±5.32			
	One	57	37.94±7.35			
Flexibility test (cm)	Two	79	38.62±7.13	1.25	0.29	0.020
	Three	42	37.76±9.10			
	Total	188				
	None	10	30.90±8.03			
	One	57	37.09±8.25			
Muscle endurance	Two	79	39.99±7.06	4.75	0.00*	0.072
(times/1 minute)	Three	42	38.07±8.23			
	Total	188				
	None	10	10.57±3.11			
Cardiovascular	One	57	8.41±1.88			
endurance(minutes)	Two	79	8.31±1.81	4.55	0.00*	0.069
	Three	42	8.34±1.51			
	Total	188				

Significant at 0.01 level of significance

relation to the number of sports activities participated in for urban and rural respondents. The results found a significant difference only for urban students. The Scheffe test was carried out on the components that were found to be significant.

Table 8 shows summary results of ANOVA between physiological fitness components and number of sports activities participated in.

Significant difference were found for muscle endurance ($p = 0.00$) and cardiovascular endurance ($p=0.00$). The Eta-squared indices indicate that the relationship between number of sports and muscle endurance ($\eta^2 = 0.072$), cardiovascular endurance ($\eta^2 = 0.069$) were low. The Scheffe test was carried out on muscle endurance and cardiovascular endurance.

Table 9 shows the Scheffe test that was further carried out on muscle endurance.

The test showed a significant difference between no participation and participation in only one sports activity ($p = 0.00$) at $\alpha = 0.05$. The muscle endurance of students
who do not take part in sports activities is significantly lower than of those who participate in one sport.

Table 10 shows the summary results of Scheffe test on cardiovascular endurance.

The test showed significant differences between no participation and participation in only one sports activity ($p=0.00$), between no participation and participation in two sports activities ($p = 0.00$), and between no participation and participation in three sports activities

Table 9: Summary results of the Scheffe test (Muscle endurance)

No. of sports (i)	No. of sports (ii)	Mean Difference(i) – (ii)	StandardError	p-value
None	One	-6.19	2.60	0.00*
None	Two	-9.09	1.35	0.20
None	Three	-7.17	1.48	1.00

*: Significant at 0.01 level of significance

Table 10: Summary results of the Scheffe test (Cardiovascular endurance)

No. of sports (i)	No. of sports (ii)	Mean Difference(i) – (ii)	StandardError	p-value
None	One	2.16	0.64	0.00*
None	Two	2.26	0.62	0.00*
None	Three	2.23	0.65	0.00*

*: Significant at 0.01 level of significance

Table 11: Summary results of ANOVA between physiological fitness components and number of work activities engaged in (overall)

Physiological components	No. of work activities	n	Mean±SD	F-statistics	p-value	Eta-squared
Body fat%	None	111	6.72±5.37	1.66	0.19	0.01
	One	200	6.05±4.03			
	Two	19	7.78±6.29			
	Total	330				
Muscle strength (kg)	None	111	37.32±7.50	0.76	0.47	0.005
	One	200	38.39±7.55			
	Two	19	38.56±7.94			
	Total	330				
Flexibility test (cm)	None	111	37.83±7.71	0.05	0.95	0.000
	One	200	38.11±7.27			
	Two	19	38.05±7.51			
	Total	330				
Muscle endurance (times/1 minute)	None	111	38.75±8.53	0.26	0.77	0.002
	One	200	39.02±7.98			
	Two	19	37.63±8.06			
	Total	330				
Cardiovascular endurance(minutes)	None	111	8.40±2.02	4.63	0.01*	0.028
	One	200	8.70±1.33			
	Two	19	8.62±1.98			
	Total	330				

*: Significant at 0.01 level of significance

(p = 0.00). The cardiovascular endurance of students who do not take part in sports activities is significantly lower than those who participate in one, two and three sports.

The Participation in Work Activities and Physiological Fitness Components:

Overall: The number of work activities engaged in and the physiological fitness components was carried out using ANOVA. Table 11 shows the summary results of ANOVA on the physiological fitness components and the number of work activities engaged in.

The students were asked to circle the number of work activities they engaged in per week. The choices given were none, one, or two. As seen in Table 11, it was found that only cardiovascular endurance (p = 0.01) showed a significant difference between the number of work activities engaged in and the physiological fitness components. The Eta-squared indices indicate that the relationship between number of work activities and cardiovascular endurance (η^2 = 0.028) was low. The Scheffe test was then carried out to determine which number of work activities showed a significant difference.

As shown in the Table 12, the test showed a significant difference between no engagement and engagement in only one work activity (p = 0.02) at α = 0.05. The cardiovascular endurance of students who do not take part in work activities is significantly lower than of those who participate in one work activity.

Rural and Urban Respondents: When the ANOVA was carried out for the five physiological fitness components in relation to the number of work activities participated in for urban and rural respondents, the results found a significance difference only for rural students. The Scheffe test was carried out on the components that were found to be significant.

Table 13 shows the summary results of ANOVA for the five physiological fitness components in relation to the number of work activities engaged in by rural respondents.

It can be seen that only body fat percentage (p = 0.02) was found to be significant at α = 0.05 for the rural respondents. The Eta-squared indices indicate that the relationship between number of sports and body fat percentage (η^2 = 0.058) was low. The Scheffe test was used to determine which number of engagement in work activities was significant.

Table 12: Summary results of the Scheffe tests (Cardiovascular endurance)

No. of work activities (i)	No. of work activities (ii)	Mean Difference(i) – (ii)	Standard Error	p-value
None	One	-0.30	0.19	0.02*
None	Two	-0.22	0.41	1.00

*: Significant at 0.01 level of significance

Table 13: Summary results of ANOVA between physiological fitness components and number of work activities engaged in (rural)

Physiological components	No. of work activities	n	Mean±SD	F-statistics	p-value	Eta-squared
Body fat%	None	23	9.26±4.01	4.28	0.02*	0.058
	One	108	5.60±3.71			
	Two	11	5.01±7.87			
	Total	142				
Muscle strength (kg)	None	23	36.02±6.71	0.97	0.38	0.014
	One	108	38.24±7.02			
	Two	11	37.46±7.53			
	Total	142				
Flexibility test (cm)	None	23	38.52±7.06	0.08	0.93	0.001
	One	108	37.95±7.15			
	Two	11	38.45±7.92			
	Total	142				
Muscle endurance (times/1 minute)	None	23	39.13±7.78	0.10	0.91	0.001
	One	108	39.88±8.48			
	Two	11	39.18±8.59			
	Total	142				
Cardiovascular endurance(minutes)	None	23	7.84±0.93	0.29	0.75	0.004
	One	108	7.58±1.06			
	Two	11	7.40±1.22			
	Total	142				

*: Significant at 0.01 level of significance

Table 14: Summary results of the Scheffe test (Body fat %)

Number of work activities (i)	Number of work activities (ii)	Mean Difference(i) – (ii)	Standard Error	*p*-value
None	One	3.66	1.33	0.02*
None	Two	4.25	1.54	0.02*

*: Significant at 0.05 level of significance

In Table 14 the Scheffe test showed that between no engagement and engagement in one work activity (p = 0.02) and between no engagement and engagement in two work activities (p = 0.02), was significant. The body fat percentage of students who do not take part in work activities is significantly higher than those who participate in one and two work activities.

DISCUSSION

The study found that students had an average weight of 55±10.28kg. This is lower than the weight of American adolescents (75 kg) (Ogden *et al*., 2004) and Flemish adolescents (67 kg) (Deforche *et al*., 2003), but higher than Taiwanese adolescents (52.1 ± 11.6 kg) (Huang and Malina, 2002). The average height of the sample was 168.06 ± 7.57 cm, which was also shorter than American adolescents (175.3 cm) (Ogden *et al*., 2004) and Flemish adolescents (178.1 cm) (Deforche *et al*., 2003), but taller than Taiwanese adolescents (160.8 ± 7.4 cm) (Huang and Malina, 2002).

The students of the Al-Dhahirah region have a lower fat percentage (6.38%) compared to American adolescents (19%)(Ogden *et al*., 2004) and as found in the study conducted by Ekelund *et al*. (2001) that estimated at (15.5%). In muscle endurance (sit-ups), the students' scores average 39.88 ± 7.64 times. The results are higher than the norms of the FitnessGram (24-47 times) (Welk and Meredith, 1999), and lower than National physical fitness Award (44-45 times) (President's Council on physical fitness and sports, 1997). It was also higher than the results found in Huang and Malina (2002) study where students scored an average of 34.7±9.6 times.

However, this sample scored lower on cardiovascular endurance (1 mile walk/run) 7.56±1.59 min than the norms of the Presidential Physical Fitness Award (6.06 - 6.08 min) (Vilhjalmsson and Thorlindsson, 1998), and National Physical Fitness Award (7.04 - 7.10 min) (President's Council on Physical Fitness, 2003). And higher than the study by Huang and Malina (2002) where students scored 8.34±1.31 min.

The results showed that students spent an average of 11±5.3 hours during the week engaged in sedentary activities such as watching television, playing computer games, and surfing the Internet. These findings are consistent with the previous research. For example, Al Barwani *et al*. (2001) found that adolescents spent 16.4 hours in sedentary activities during the week. Also Ekelund *et al*. (2001) cited that adolescents spent 9.3 hours/day in sedentary activities. While Vilhjalmsson and

Thorlindsson (1998) found that students spend 3.7 hours/day. With regard to the differences between rural and urban students Loucaides *et al.* (2004) found that urban students spend more time in sedentary activities than rural ones (2.9, 2.5 hours/day respectively). Also Ozdirenc *et al*. (2005) cited that urban students spent more time in sedentary activities than rural ones (13.4, 10.9 hours/week respectively). Sjolie and Thuen (2002) showed that rural and urban students spent the same amount of time in sedentary activities (24.2, 23.7 hours/week respectively). This demonstrates that increased amounts of time spent in sedentary activities decreases the level of physiological fitness. In social terms this means that increased levels of sedentary activities in a society could lead to related health risks and also economic consequences for that society.

The study compared the participation in sports activities and the physiological fitness components. The results showed significant difference in body fat percentage ($p = 0.04$), muscle endurance ($p = 0.00$), and cardiovascular endurance ($p = 0.01$) for overall sample. It found that the body fat percentage of students who do not participate in sports is significantly higher than those who participate in more sports activities. It also found that muscle endurance and cardiovascular endurance of students who do not take part in sports is significantly lower than those who participate in more sports activities. This trend could be because parents do not allow their children to do more sports activities during school days.

There were no significant differences found in participation in sports activities and physiological fitness components for rural respondents. However, muscle endurance ($p = 0.00$) and cardiovascular endurance ($p = 0.00$) were found to be significant for urban respondents. The muscle endurance and cardiovascular endurance of students who do not take part in sports activities significantly lower than those who participate in more sports. This difference for urban and not rural could be that urban students participate more in sports activities than rural ones.

This study is however supported by the study conducted by Huang and Malina (2002), who studied the relationship between sports activity and the physical fitness of Taiwanese adolescents. The results from their study showed that the students who scored better in the one-mile run and sit-and-reach tests were more physically active. The most physically fit in those two tests were more active than the less fit in each test. Therefore, students who were more active have higher levels of physiological fitness than less active ones (Hassan and Al-Kharusy, 2000; Huang and Malina, 2002: Loucaides *et al*., 2004; Ozdirenc *et al*., 2005; Sjolie and Thuen, 2002). This demonstrates that by increasing the number and amount of time spent on sports activities could increase the level of the physiological fitness components.

Furthermore, this study compared participation in work activities and the physiological fitness components. The results showed that for cardiovascular endurance ($p = 0.01$) there was a significant difference between participation in work activities and the physiological fitness components. The cardiovascular endurance of students who do not take part in work activities is significantly lower than those who participate in more work activities.

Body fat percentage ($p = 0.02$) was found to be significant at $\alpha = 0.05$ for the rural respondents. While in the urban respondents there was found any significant difference for the physiological fitness components. Body fat percentage of students who do not participate in work activities is significantly higher than those who participate.

This study found that muscle endurance and cardiovascular endurance showed a significant difference between participation in work activities and the physiological fitness components. In addition, body fat percentage was found to be significant for rural respondents whereas none of the physiological fitness components was found to be significant for the urban respondents. That could be due to the effect of geographical diversity, type of work activities and the amount of time spent engaging in them that may involve greater movement and thus greater energy expenditure. Furthermore, the results suggest that increasing the intensity, duration and types of activity will improve the physiological fitness (Hassan and Al-Kharusy, 2000; Huang and Malina, 2002; Loucaides *et al*., 2004; Ozdirenc *et al*., 2005; Sjolie and Thuen, 2002). Results of this study could not be compared with other studies as none of them looked at work activities after school hours. Thus, it is an area in which future research may be conducted.

CONCLUSION

In conclusion, the findings of this research show the physiological fitness status of 10th grade male students (16-17 years old) of the Al-Dhahirah region, Sultanate of Oman. It also provides information about the effect of sedentary, sport and work activities on these components. In addition, it can provide an additional body of knowledge to those studying physiological fitness components in school students as well as in other age categories. The study recommend that a concerted effort be made by all parents, teachers, school administrators and the community to improve the general physical fitness of students on the whole. Therefore the data in this study can serve as basic resource for future research into the physiological fitness components in male students of the al-Dhahirah region specifically and in the Omani context in general.

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