Physical activity and perceived barriers among high-school students in Muscat, Oman

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الأنشطة البدنية والعوائق الـمُدرَكة بين طَلَبة المرحلة الثانوية في مسقط، عُمان

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الخلاصة: أجرى الباحثون في آذار/ مارس 2011 مسحاً مستعرضاً لدراسة نماذج ومحددات الأنشطة البدنية لدى 439 من طَلَبة المرحلة الثانوية في محافظة مسقط، استناداً على استبيان يُدار ذاتياً. واتضح أن نصف الطَلَبة(52.9٪) يساهمون في حصص التربية الرياضية، وأن 95.9٪ منهم قد أبلغ عن ممارسة لأنشطة بدنية بعد الانصراف من المدرسة. واتضح للباحثين أيضاً أن 23.9٪ من الطلاب قد أدركوا المستوى الموصى به من الأنشطة البدنية (ما يعادل أو يزيد على 1680 مكافئاً استقلابياً من الدقائق كل أسبوع؛ إلا أن هذه النسبة منخفضة لدى الطالبات (9.8٪) أكثر من انخفاضها لدى الطلاب (38.8٪). وكان عدد أكبر من الطالبات في مرحلة ما قبل التفكير (5.8٪) وفي مرحلة التفكير (26.7٪) بالقيام بالتمرينات، في مقابل عدد أكبر من الطلاب كانوا يقومون بالفعل بالتمرينات (15.4٪)، وفي مرحلة المداومة (36.0٪). وقد أبلغت الطالبات عن عوائق تقف في طريق أدائهن للتمرينات على قدرٍ يعتدُّ بأهميته إحصائياً، منها ما يعود لفقد الطاقة أو الاهتمام بالأنشطة الأخرى، وفقد التشجيع، والخوف من النظرات إليهن، وعوائق تتعلق بأوقات الممارسة بسبب المسؤوليات الأكاديمية والالتزامات العائلية. وأظهر نموذج التحوُّف اللوجستي الكامل أن الطلاب في السنة الحادية عشرة يحاولون تنظيم وزنهم من خلال ممارسة الأنشطة البدنية التي يتوقعون أنها توصلهم للمستويات الموصى بها من الوزن.

ABSTRACT A cross-sectional survey was conducted in March 2011 to study the patterns and determinants of physical activity among 439 secondary-school students in Muscat governorate based on a self-administered questionnaire. Half of the students (52.9%) were enrolled in physical education classes and 95.9% reported after-school physical activities. The recommended level of physical activity (≥ 1680 MET minutes/week) was met by 23.9% of students, being significantly lower among girls (9.8%) than boys (38.8%). More girls were in the stages of pre-contemplation (5.8%) and contemplation (26.7%) of adopting exercise while more boys were in the action (15.4%) and maintenance stages (36.0%). Girls reported significantly more barriers to exercise, related to lack of energy, interest in other activities, lack of encouragement, worries about looks, and time constraints from academic responsibilities and family obligations. The full model logistic regression revealed that boys, 11th-grade students and attempts to regulate weight significantly predicted physical activity meeting the recommended levels.

Activité physique des lycéens et obstacles perçus par ces derniers à Mascate (Oman)

RÉSUMÉ Une enquête transversale a été menée en mars 2011 pour étudier les caractéristiques et les facteurs déterminants de l'activité physique de 439 lycéens dans le gouvernorat de Mascate à l'aide d'un auto-questionnaire. La moitié des lycéens (52,9 %) ont été recrutés dans le cours d'éducation physique et 95,9 % déclaraient avoir des activités sportives après l'école. Le niveau d'activité physique recommandé (≥ 1680 minutes MET [équivalence métabolique] par semaine) était atteint par 23,9 % des élèves, mais il était nettement inférieur chez les filles (9,8 %) que chez les garçons (38,8 %). Les filles étaient plus nombreuses à être au stade de la pré-réflexion (5,8 %) et de la réflexion (26,7 %) au sujet de l'adoption d'une activité physique tandis que les garçons étaient plus nombreux à être au stade de l'action (15,4 %) et du maintien (36,0 %). Les filles déclaraient rencontrer davantage d'obstacles à la pratique d'une activité physique, tels qu'un intérêt pour d'autres activités, l'absence d'encouragement, l'inquiétude vis-à-vis du regard des autres, et des contraintes de temps par rapport aux obligations scolaires et familiales. Le modèle de régression logistique appliqué a permis de découvrir que le fait d'être un garçon, ou d'être en avant dernière année de lycée ou de tenter de réguler son poids étaient des facteurs fortement prédictifs d'une activité physique à la hauteur des niveaux recommandés.

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Introduction

Noncommunicable diseases (NCDs) have emerged as a global public health concern. Of the 56 million deaths that occurred in 2008, 63% were due to NCD and nearly 80% of these deaths occurred in low- and middle-income countries [1]. Oman is no exception, as 83% of the deaths that occurred in 2008 were due to NCD and 49% of these deaths were due to cardiovascular diseases [2]. The high rates of morbidity and mortality from chronic diseases threaten the gains in health and longevity achieved over the past 4 decades and the sustainability of the health-care system. Expenditure on health care in Oman rose by 64% between 1995 and 2005 and by the year 2025 treatment of cardiovascular diseases alone is predicted to account for 21% of the total health-care expenditure [3].

The predominant factors in the emergence of NCD in Oman are assumed to be the changes in the nutritional habits of the population and the decline in habitual physical activities brought by the economic leap of the 1970s and 1980s [4]. Systematic analysis of population health data has revealed that these factors are amenable to modification [5–7] by implementing large-scale community intervention programmes focusing on increased physical activity and healthier food options, particularly for children [8]. Childhood can be a period of acquiring healthy habits that last across the lifespan and schools offer the best opportunity, as physical education is one of the 8 components of the school health programme [9] and nearly 25% of the Omani population between 5 and 15 years can be reached [10]. Despite the opportunities for exercise offered in Omani schools a study reported that only 23.3% of 7th- to 10th-grade students were physically active for 60 minutes per day [9]. Apparently the pattern of physical activities extends to late adolescence and adulthood, as a recent survey of college students revealed that only 30.7% of them were physically active for 60 minutes per day [11]. Anshel pointed to a number of factors that predict physical activity, including attitudes towards physical exercise, level and stage of motivation as well as the perceived barriers to exercising [12].

Previous studies in Oman have focused on the rates of physical activities and exercise, without addressing the determinants. Detailed investigation of the obstacles is indispensable for promoting physical activity among Omani children. This study aimed to describe the patterns and determinants of physical activity among secondary-school students and to identify the perceived barriers to exercise. The findings of the current study will guide the planning of relevant programmes promoting physical activity by addressing effectively the perceived barriers and the stage of motivation of schoolchildren.

Methods

A cross-sectional survey was conducted in March 2011 in Muscat governorate, targeting Omani students enrolled in secondary public schools.

Sample

The sampling frame consisted of a list of all secondary public schools in each educational region. The primary sampling unit was the educational region, the secondary sampling unit was the schools and the third was the classes. The unit of enquiry was school students enrolled in 11th and 12th grades. The sample size was estimated using the *Epi Info* program, version 2.3.1 [13], based on the number of students in 11th and 12th grades in Muscat governorate for the scholastic year 2010/11 (n = 16 676) [14] and prevalence of physical activity of 23.3% reported by the Global School Based Health Study [9], with a 5% degree of precision and a design effect of 1.5. Based on this assumption, the estimated minimum sample size was 405 students.

A multistage sampling technique was used to select schools and enrol students. Out of the 6 education regions, 4 with the highest population size were selected. From each region, 2 secondary public schools (1 for girls and 1 for boys) were randomly selected. Two classes (1 of each grade) were randomly selected from each school and all Omani national students were requested to participate. Non-Omani students were excluded.

Data collection

A self-administered, pre-tested and precoded questionnaire was developed for data collection in the classroom setting with the presence of one of the investigators. It included the demographic characteristics of students (10 questions), physical education classes in school (including the number and duration of classes per week), pattern of participation and types of activities (5 questions), the frequency and intensity of 14 types of out-of-school hours physical activities (15 questions) and the time spent in small-screen sedentary activities (2 questions). A set of 12 questions was used to assess the internal (6 questions) and external barriers (6 questions) to exercising [15,16]. All questions were negatively phrased with 5 responses ranging from strongly disagree (score 1) to strongly agree (score 5). Respondents were also asked about attempts to maintain or lose weight in the 30 days preceding the survey (2 questions). The weight and height of each student was obtained following standard procedures.

Students were informed about the purpose of the study and its implications for health programmes planning. Emphasis was placed on voluntary participation, the anonymity of the questionnaire and the confidentiality of the information during all phases of the study. The study was approved by the ethics committee at Sultan Qaboos

University and the Ministry of Education and a written informed consent was obtained from students prior to data collection.

Data analysis

The intensity of all activities performed in after-school hours combined was calculated as the sum of each type of activity weighted by its energy equivalent and expressed as the metabolic equivalent of task (MET) per week as follows: MET minutes/week = Σ (energy equivalent of the task × number of days × duration per minute). The energy equivalent was 3.3 for walking, 4 for moderate activity and 8 for vigorous activity. Multiples of 1 MET indicated higher energy expenditure in a specific activity [17,18]. The recommendation of 60 minutes per day of moderate activity for school-age children [18,19], equivalent to 1680 MET minutes/week and calculated as Σ (60 minutes × 4 MET × 7 days) [20], was taken to classify students. "Physically active" students were those who accumulated ≥ 1680 MET minutes/week while "physically inactive" were those who accumulated < 1680 MET minutes/week.

Body mass index (BMI) was calculated from weight and height data and the participants were classified into underweight (BMI < 18.5 kg/m^2), normal weight (BMI 18.5–24.9 kg/m^2), overweight (BMI 25–29.9 kg/m^2) and obese (BMI > 30 kg/m^2). The latter group was further classified into class 1 (BMI 30–34.9 kg/m^2), class 2 (BMI 35–39.9 kg/m^2) and class 3 obesity (BMI > 40 kg/m^2) [21].

Separate scales were generated for internal and external barriers to exercising by summing the responses of the 6 related questions. The scores on each scale ranged from a minimum of 6 to a maximum of 30. Higher scores reflected greater barriers to exercising. All items in each scale were positively correlated and the Cronbach alpha reliability for the scale of internal barriers was 0.59 and that for the scale of external barriers was 0.50.

SPSS, version 16 was used for data analysis. The odds ratio (OR) and associated confidence interval (95% CI) were computed. The chi-squared and the *t*-test for independent samples were the tests of significance used. Univariate and multivariate logistic regression analyses were used to identify the predictors of physical activity. The significance of the obtained results was judged at the 5% level.

Results

Background characteristics

The study included 439 students; 225 girls (51.2%) and 214 boys (48.8%), with 229 enrolled in 11th grade (52.2%) and 210 in 12th grade (47.8%). The majority were in the age group 15–< 17 years (*n* = 116; 26.4%) and 17–< 19 years (*n* = 309; 70.4%) while a few were in the age group 19–20 years (*n* = 14; 3.2%). The majority of students (*n* = 396; 90.2%) reported a monthly family income sufficient to cover their expenses, either with savings (*n* = 236; 53.8%) or without savings (*n* = 160; 36.5%), while a small proportion reported a monthly family income insufficient in most (*n* = 29; 6.6%) or all months (*n* = 14; 3.2%).

Chronic health problems requiring medical care were reported by 25.3% of girls and 15.4% of boys. The most frequently reported health problems were anaemia (21.1%), hereditary blood disorders (15.6%), bronchial asthma (13.3%), depression or anxiety (12.2%), joint pain (12.2%), diabetes mellitus (4.4%) and hypertension (2.2%) among others.

Physical education during school hours

Table 1 reveals that only half of the boys and girls (52.9%) enrolled for physical education classes during school hours and the majority of them (91.4%) opted for 80 minutes per week. However, considerable proportions of girls (45.5%) and boys (36.0%) were irregular in attending these physical education classes. Although boys were not significantly more likely to opt for physical education classes relative to girls (OR = 1.08; 95% CI: 0.74–1.57) they were 3 times more likely to attend physical education classes either always (OR = 3.78; 95% CI: 1.36–10.53) or sometimes (OR = 3.94; 95% CI: 1.51–10.31). Ball games were the predominant type of activity during physical education classes among boys and girls (91.8%), with no difference between the sexes. Types of exercises more frequently reported by girls were jogging (39.7%), aerobics (14.9%) and rope jumping (9.1%).

Physical activity in after-school hours

Physical activities in after-school hours for recreation or exercising were reported by 98.1% of boys and 93.8% of girls and it was 3.48 times (95% CI: 1.05–12.75) more likely among boys (Table 2). Girls were nearly 3 times more likely to report walking (OR = 3.11; 95% CI: 1.97–4.90), climbing stairs (OR = 2.80; 95% CI: 1.70–4.62) and cycling (OR = 2.93; 95% CI: 1.92–4.47). Boys were nearly 8 times (OR = 8.29; 95% CI: 4.50–15.46) more likely to report weight lifting and were nearly 3 times more likely to participate in ball games (OR = 2.95, 95% CI = 1.88–4.62) and swimming (OR = 2.86; 95% CI: 1.78–4.59). They were also more likely to report running (OR = 1.92; 95% CI: 1.27–2.92) and jogging (OR = 1.83; 95% CI: 1.22–2.74). Less than a quarter of students (23.9%) met the recommended level of physical activity equivalent to ≥ 1680 MET minutes/week, and the rate was significantly lower among girls (9.8%) than boys (38.8%).

Readiness to adopt regular exercising

Enrolled students were at different stages of motivational readiness to adopt

Table 1 Frequency and patterns of physical education during school hours among boys and girls in Muscat, Oman

Physical education in school hours	Boys		Girls		Total	
	No.	%	No.	%	No.	%
Participation in physical education classes	**(*n* = 214)**		**(*n* = 225)**		**(*n* = 439)**	
No	103	48.1	104	46.2	207	47.1
Yes	111	51.9	121	53.8	232	52.9
Duration of exercise per week (min)	**(*n* = 111)**		**(*n* = 121)**		**(*n* = 232)**	
30	1	0.9	5	4.1	6	2.6
80	104	93.7	108	89.2	212	91.4
150	2	1.8	6	5.0	8	3.4
≥ 240	4	3.6	2	1.7	6	2.6
Type of exercise[a]						
Ball games[b]	102	91.9	111	91.7	213	91.8
Jogging	8	7.2	48	39.7	56	24.1
Aerobics	3	2.7	18	14.9	21	9.1
Rope jumping	0	0.0	11	9.1	11	4.7
Weight lifting	4	3.6	1	0.8	5	2.2
Martial arts	1	0.9	2	1.7	3	1.3
Frequency of participation						
Rarely	6	5.4	22	18.2	28	12.1
Sometimes	34	30.6	33	27.3	67	28.9
Always	71	64.0	66	54.5	137	59.0

[a] *Categories are not mutually exclusive.*
[b] *Includes football, basketball and volleyball.*

Table 2 Rates and types of after-school hours physical activities among boys and girls

After-school hours activities	Boys		Girls		OR	95% CI
	No.	%	No.	%		
Participation in after-school activities	**(*n* = 214**		**(*n* = 225)**			
No	4	1.9	14	6.2		
Yes	210	98.1	211	93.8	3.48	1.05–12.75
Types of activities[a]	**(*n* = 210**		**(*n* = 225)**			
Walking	117	55.7	168	79.6	0.32	0.20–0.51
Climbing stairs	140	66.7	179	84.8	0.36	0.22–0.59
Ball games[b]	165	78.6	117	55.5	2.95	1.88–4.62
Running	143	68.1	111	52.6	1.92	1.27–2.92
Jogging	119	56.7	88	41.7	1.83	1.22–2.74
Aerobics	72	34.3	57	27.0	1.41	0.91–2.18
Swimming	81	38.6	38	18.0	2.86	1.78–4.59
Weight lifting	85	40.5	16	7.6	8.29	4.50–15.5
Cycling	61	29.1	115	54.5	0.34	0.22–0.52
Rope jumping	27	12.9	41	19.4	0.61	0.35–1.08
Martial arts	14	6.7	8	3.8	1.81	0.69–4.88
Racket games[c]	17	8.1	14	6.6	1.24	0.56–2.74
Table tennis	6	2.9	1	0.5	6.18	0.73–137.33

[a] *Categories are not mutually exclusive.*
[b] *Includes football, basketball and volleyball.*
[c] *Includes tennis and squash.*
OR = odds ratio; CI = confidence interval.

regular exercise. More than a third of students (39.0%) had plans to exercise regularly within the next 6 months (preparation stage), 18.7% would think of exercising regularly in the coming 6 months (contemplation phase) and 5.1% were not thinking of exercising regularly (pre-contemplation). A statistically significant difference was observed between boys and girls in this respect (χ^2_4 = 47.87, P = 0.000). Higher percentages of girls were in the stages of pre-contemplation (5.8%) and contemplation (26.7%), while higher percentages of boys were in the action stage (15.4%) of exercising regularly for < 6 months and the maintenance stage (36.0%) of exercising regularly for > 6 months (Table 3).

Small-screen recreational activities

As for small-screen recreational activities, 23.2% of students reported spending 3–7 hours daily watching television and 29.2% of them reported spending 3–7 hours daily on computer activities (Table 3).

Body weight and attempts to control weight

More than a quarter of students were overweight (14.1%) or obese (13.0%). Attempts to lose or control weight in the 30 days preceding the survey was reported by 56.0% of boys and 48.1% of girls. Exercising was the most frequently cited method of losing weight, while food restriction and starving for a day or more were the next most common methods (Table 4). Relative to students with normal BMI, obese students were 1.75 times (95% CI: 1.03–2.97) more likely to report never participating in physical education classes (42.5% compared with 55.6%) and 4.89 times (95% CI: 2.83–8.47) more likely to report attempts to control or lose weight in the last 30 days (42.5% compared with 55.6%).

Perceived barriers to exercising

Variable proportions of students expressed agreement with statements representing barriers to exercising. Regarding internal barriers, substantial proportions of students expressed agreement that other recreational activities were more entertaining than exercising (72.2%), having limited energy to exercise (43.3%) and thinking that exercise was difficult and too tiring (40.1%). Only 18.0% were not thinking that exercise has positive health effects. As for external barriers, a high proportion of students agreed that parents give priority to academic success (71.5%) or that they lacked leisure time due to academic responsibilities (65.4%). Other perceived external barriers were lack of exercise equipment in the home (53.5%) and lack of leisure time because of social and family responsibilities (39.6%).

The mean scores of students on the scale measuring internal and external barriers for exercising were low (Table 5). The mean scores of girls was significantly higher than that of boys on the scale measuring internal barriers [14.2 (SD 0.27) versus 13.4 (SD 0.25)] (P = 0.023) and external barriers for exercising [16.1 (SD 0.26) versus 14.9 (SD 0.25)] (P = 0.001). The scores

Table 3 Daily time spent in small-screen sedentary activities and stages of motivation for adopting exercise among boys and girls

Time spent in sedentary activities/stage of motivation	Boys (n = 214)		Girls (n = 225)		Total (n = 439)	
	No.	%	No.	%	No.	%
Daily time spent watching television (hours)						
< 0.5	48	22.4	49	21.8	97	22.1
1–2	121	56.5	119	52.9	240	54.7
3–4	29	13.6	41	18.2	70	15.9
5–7	16	7.5	16	7.1	32	7.3
Daily time spent on computer (hours)						
< 0.5	65	30.4	62	27.6	127	28.9
1–2	92	43.0	92	40.9	184	41.9
3–4	30	14.0	30	13.3	60	13.7
5–7	27	12.6	41	18.2	68	15.5
Stage of motivation for adopting exercise						
Pre-contemplation	10	4.7	13	5.8	23	5.1
Contemplation	22	10.3	60	26.7	82	18.7
Preparation	72	33.6	99	44.0	171	39.0
Action	33	15.4	27	12.0	60	13.7
Maintenance	77	36.0	26	11.5	103	23.5

Table 4 Body weight and attempts to control weight among boys and girls

Body weight and attempt at weight loss	Boys		Girls		Total	
	No.	%	No.	%	No.	%
Classification of body weight	(*n* = 212)		(*n* = 221)		(*n* = 433)[a]	
Underweight	50	23.6	45	20.4	95	21.9
Normal	111	52.3	110	49.8	221	51.0
Overweight	27	12.7	34	15.4	61	14.1
Obese class 1	18	8.5	16	7.2	34	7.9
Obese class 2	5	2.4	12	5.4	17	3.9
Obese class 3 (morbid)	1	0.5	4	1.8	5	1.2
Attempts to control weight (in last 30 days)	(*n* = 214)		(*n* = 225)		(*n* = 439)	
No	111	51.9	99	44.0	210	47.8
Yes[b]	103	48.1	126	56.0	229	52.2
Methods of weight control[b,c]	(*n* = 103)		(*n* = 126)		(*n* = 229)	
Exercising	72	69.9	65	51.6	137	59.8
Food restriction	35	34.0	60	47.6	95	41.5
Starving for days	1	1.0	10	7.9	11	4.8
Slimming pills	1	1.0	4	3.2	5	2.2
+Induction of vomiting	0	0.0	2	1.6	2	0.9

[a] *6 cases were excluded due to missed information.*
[b] *Categories are not mutually exclusive;.*
Denominator is total attempting to control weight;

of girls were significantly higher than those of boys on internal barriers related to lack of energy ($P = 0.014$), interest in other recreational activities ($P < 0.0001$), and worries about looks ($P < 0.0001$). Their scores were significantly higher on external barriers related to lack of encouragement for exercising ($P < 0.0001$) and limited leisure time because of academic responsibilities ($P < 0.0001$) and family obligations ($P = 0.039$).

Table 5 Scores on perceived barriers to exercising among boys and girls

Barrier and stage of motivation	Boys (*n* = 214)		Girls (*n* = 225)		*P*-value
	Mean score	SE	Mean score	SE	
Internal barrier					
Total	13.36	0.25	14.21	0.27	0.023
Thinking exercise is difficult and too tiring	2.35	0.08	2.22	0.07	0.252
Never having energy for exercise	1.79	0.06	2.03	0.07	0.014
Other recreational activities are more entertaining	3.01	0.08	3.48	0.09	0.000
Not thinking that exercise has positive health effects	1.82	0.08	1.65	0.07	0.116
Worrying about looks when exercising	1.94	0.07	2.32	0.08	0.000
Limited abilities to exercise	2.45	0.08	2.51	0.08	0.595
External barrier					
Total	14.91	0.25	16.13	0.26	0.001
No fitness centre to exercise	2.21	0.08	2.17	0.08	0.767
No exercise equipment at home	2.74	0.09	2.75	0.08	0.945
No encouragement to exercise	1.76	0.07	2.13	0.08	0.000
Parents give priority to academic success	3.15	0.08	3.18	0.08	0.775
No leisure time because of academic responsibilities	2.80	0.09	3.43	0.08	0.000
No leisure time because of social & family responsibilities	2.25	0.07	2.47	0.08	0.039

SE = standard error.

Determinants of physical activity in after-school hours

Table 6 illustrates the determinants of physical activity in after-school hours. The recommended level of physical activity was 5 times more likely to be met by boys (OR = 5.85; 95% CI: 3.48–9.82). It was also more likely to be met by students in 11th grade (OR = 1.78; 95% CI: 1.13–2.79), those who attempted to control or lose weight in the 30 days preceding the survey (OR = 1.60; 95% CI: 1.02–2.50) as well as those who opted for exercise to lose or control their body weight (OR = 2.15; 95% CI: 1.32–3.52). Students in the maintenance stage of motivation readiness were 3 times more likely to meet the recommended level of physical activity relative to those in the pre-contemplation stage (OR = 3.14; 95% CI: 1.08–9.10). In contrast, higher scores on the scale measuring external barriers to exercise lowered the likelihood of meeting the recommended level of physical activity (OR = 0.93; 95% CI: 0.88–0.98).

Independent determinants of physical activity

Physical activity in after-school hours was modelled as a function of the scores on the scale measuring internal and external barriers as well as the significant determinants identified in univariate analysis (Table 7). The stage of motivation for adopting physical activity was excluded as it was related to the scores on the scale measuring barriers to exercise. Adjusted for other factors, the model revealed that boys, 11th-grade students and those who attempted to control or lose weight significantly increased the likelihood of physical activity meeting the recommended levels. Scores on the scale measuring internal and external barriers for exercise fell just behind significance. This model classified correctly 75.9% of students who met the recommended levels of physical activities and explained 21.1% of the variability between physically active and physically inactive students.

Discussion

Health promotion activities by the government of Oman focus on physical activity at school [9] and in the community [22]. Although physical education is an integral part of the school health programme it is not part of the core curriculum. Half of the students enrolled in our study opted for physical education classes at school and only 59.0% of them were attending classes regularly. This finding reflects the lack of students' interest in physical education classes that engage them mostly in ball games. It also indicates the limited role of schools in fostering an acceptable level of physical activities, as those students who were regular in attending physical education classes were not more likely to be physically active in after-school hours. It has been shown that the success of schools in promoting physical activity is not so much accomplished by providing physical education classes but by having a written policy defining goals to be achieved through specific plans to increase students' level of physical activity [23] and by providing diverse activities to attract and maintain students' interest in physical education classes. Haug et al. pointed to the higher likelihood of participation in physical activities among students attending schools with multiple facilities, playgrounds and weight-lifting equipment [24].

A minimum of 60 minutes per day of moderate physical activity or its equivalent of vigorous activity is recommended for school-age children to achieve beneficial effects on physical and mental health [18,19,25,26]. Our study revealed that the majority of students reported different types of physical activities but less than a quarter met the recommended level equivalent to 1680 MET minutes/week. This rate is similar to the national figure of 23.3% among 7th- to 10th-grade students reported in 2005 using different methods [9]. Nearly a quarter of students reported spending 3 or more hours in small-screen recreational activities, namely watching television (23.2%) and computer-related activities (29.2%), which is slightly lower than the 34.1% reported by the Global School Health Survey in Oman in 2005 [9]. Rosenberg et al. demonstrated that the accessibility of electronic equipment such as television and computers was associated with sedentary behaviour among children [27].

Obesity is of major concern in Oman and it has its roots during the childhood period. In 2008, estimates revealed that 55.8% of the Omani population were overweight and another 20.9% were obese [2]. Among university students, the combined prevalence of overweight and obesity was 28.2% [11]. More than a quarter of students in this study were overweight or obese and the rate was higher among girls than boys. Students seem to be aware of their body image, as a half of the boys and girls reported that they were attempting to lose weight or maintain a normal body weight using different means. This study, as well as that of Chen et al., revealed that the desire to lose weight or maintain an ideal body weight increased the likelihood of participating in physical activity [28].

Generally the level of perceived barriers for exercising was low and the perception of the beneficial effects of exercising was high. The most prominent internal barriers were a high interest in activities other than exercising and a lack of energy. This study, as well as others, underscored the role of external barriers as a deterrent to exercising, notably time constraints because of academic obligations [15,29–31] and priority given to academic success [29,30]. This was particularly true for 12th-grade students, whose future career depends on their achievement in this final school year. These students can overcome time constraints by integrating physical activity into their daily routine with the added knowledge of its favourable impact on school achievement.

Table 6 Determinants of recommended level of physical activity in after-school hours

Determinants of recommended level of physical activity	Inactive (*n* = 334)		Active (*n* = 105)		OR	95% CI
	No.	%	No.	%		
Sex						
Male	203	60.8	22	20.9	1	
Female	131	39.2	83	79.1	5.85	3.48–9.82
Age group (years)						
15–16	79	23.6	37	35.2	1.63	0.36–7.46
17–18	243	72.8	66	62.9	2.81	0.59–13.20
19–20	12	3.6	2	1.9	1	
Education grade						
Grade 11	163	48.8	66	62.9	1.78	1.13–2.79
Grade 12	171	51.2	39	37.1	1	
Family income						
Sufficient	302	90.4	94	89.5	1	
Insufficient	32	9.6	11	10.5	1.10	0.54–2.28
Chronic health problems						
Yes	72	21.6	18	17.1	1	
No	262	78.4	87	82.9	1.33	0.75–2.35
Physical education in school						
Never	157	47.0	50	47.6	1	
Rarely or sometimes	74	22.2	21	20.0	0.89	0.50–1.59
Always	103	30.8	34	32.4	1.04	0.63–1.71
Daily time spent watching television (hours)						
< 0.5	69	20.6	28	26.7	1	
1–2	193	57.8	47	44.8	0.60	0.35–1.03
3–4	46	13.8	24	22.8	1.29	0.66–2.49
5+	26	7.8	6	5.7	0.57	0.21–1.53
Daily time spent on computer (hours)						
< 0.5	96	28.7	31	29.5	1	
1–2	143	42.8	41	39.1	0.89	0.52–1.51
3– 4	47	14.1	13	12.4	0.86	0.41–1.79
5–7	48	14.4	20	19.0	1.29	0.67–2.50
Body weight classification[a]						
Overweight or obese	86	26.1	31	30.1	1	
Normal	168	50.9	53	51.5	0.90	0.36–1.33
Underweight	76	23.0	19	18.4	0.69	0.36–1.33
Attempt to control weight (in last 30 days)						
No	169	50.6	41	39.0	1	
Yes	165	49.4	64	61.0	1.60	1.02–2.50
Method of weight control						
None	169	50.6	41	39.0	1	
Other methods	75	22.5	17	16.2	0.93	0.49–3.52
Exercising	90	26.9	47	44.8	2.15	1.32–3.52
Motivation stage for adopting physical activity						
Pre-contemplation	18	5.4	5	4.8	1	
Contemplation	75	22.4	7	6.7	0.34	0.96–1.18
Preparation	146	43.7	25	23.8	0.62	0.21–1.81
Action	40	12.0	20	19.0	1.80	0.58–5.55
Maintenance	55	16.5	48	45.7	3.14	1.08–9.10
Barriers to physical activity	**Mean (SD)**		**Mean (SD)**			
Internal barriers	13.9 (3.7)		13.4 (4.4)		0.96	0.91–1.02
External barriers	15.8 (3.8)		14.8 (3.9)		0.93	0.88–0.98

[a] *6 cases excluded due to missing information.*
SD = standard deviation; OR = odds ratio; CI = confidence interval.

Table 7 Full model of the independent determinants of recommended level of physical activities in after school hours

Independent determinant	B	SE	Wald statistic	Adjusted OR	95% CI
Sex					
Female[a]					
Male	1.809	0.275	43.24	6.11	3.56–10.47
School grade					
Grade 12[a]					
Grade 11	0.532	0.250	4.523	1.70	1.04–2.78
Attempt to control weight (in last 30 days)					
No[a]					
Yes	0.601	0.251	5.719	1.82	1.12–2.99
Barriers to physical activity					
Internal barriers	–0.021	0.033	0.417	0.98	0.92–1.05
External barriers	–0.019	0.34	0.312	0.98	0.92–1.05

Model sensitivity = 75.9%; Nagelkerke R^2 = 21.1%
[a]Reference category.
SE = standard error; OR = odds ratio; CI = confidence interval.

Girls had greater internal barriers related to lack of energy, interest in activities other than exercising and worries about looks while exercising, as well as external barriers related to lack of encouragement and time constraints due to studies and family obligations. Worry about looks reflects low self-confidence [29] that should be challenged. The other barriers mirror the cultural norm in Oman that values home-centred activities for girls and encourages their involvement in household chores. These barriers are probably the reason for finding a significantly higher percentage of girls in the pre-contemplation and contemplation stage, which is subsequently reflected in their behaviour. Girls were less likely to participate in after-school hours activities, especially those of moderate and vigorous intensity such ball games, running, jogging and swimming. Less than one-tenth of girls met the recommended level of physical activity equivalent to 1680 MET minutes/week. The variation in the levels of physical activity between boys and girls has been previously reported from Oman [9] and elsewhere [28,32]. Rosenberg et al. demonstrated an inverse relationship between the presence of exercise equipment in the home and sedentary behaviour [27] and the use of such equipment at home may promote acceptable levels of physical activity among girls in Oman. Also encouragement will result in the desired behaviour through increasing girls' perception of their sports competence [33].

The use of metabolic equivalents to express the levels of physical activity allowed the identification of the proportion of students who met the recommended levels with a certain degree of objectivity. The use of a self-administered, pretested questionnaire eliminated interview bias, but recall bias cannot be totally eliminated. Despite these limitations, the rates and levels of physical activity found in this study, particularly among girls, were low. Furthermore, even lower rates of exercise would be expected from school students outside the capital city of Muscat. Students in Oman do have opportunities for exercising, and therefore further tailoring of programmes and activities to surmount barriers and constraints would be expected to promote acceptable levels of physical activity. Maximizing the role of schools is indispensable. The focus of future studies should be on investigating the barriers to participation in physical education classes and exploring means of addressing these barriers.

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