

# Lifestyles of Adult Omani Women

## Cross-sectional study on physical activity and sedentary behaviour

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### أنماط حياة المرأة العمانية دراسة مستعرضة للنشاط البدني والسلوك الخامل

عزة الحبسية و هاشم الكيلاني

**ABSTRACT: Objectives:** This study aimed to investigate the lifestyles of adult Omani women with regards to physical activity (PA) levels and sedentary behaviour (SB). **Methods:** The study was carried out between May and June 2013 and included a total of 277 healthy women aged 18–48 years from five governorates in Oman. Total, moderate and vigorous PA levels and walking were self-reported by participants using the short form of the International Physical Activity Questionnaire. SB (total sitting time and different types of sitting time) was self-reported using the Domain-Specific Sitting Time Questionnaire on both working and non-working days. PA levels and SB were also objectively measured among 86 of the participants using an accelerometer. **Results:** The self-reported median  $\pm$  interquartile range (IQR) total PA was  $1,516 \pm 3,392$  metabolic equivalent of task minutes/week. The self-reported median  $\pm$  IQR total sitting time was  $433 \pm 323$  minutes/day and  $470 \pm 423$  minutes/day for working and non-working days, respectively. Sitting at work on working days and sitting during leisure activities on non-working days formed the greatest proportion of total sitting time. Overall, accelerometer results indicated that participants spent 62% of their time involved in SB, 35% in light PA and only 3% in moderate to vigorous PA. **Conclusion:** Sedentary lifestyles were common among the adult Omani women studied. Lack of PA and increased SB is known to increase the risk of metabolic syndrome and obesity. The use of accelerometers to monitor PA and SB among different groups in Oman is highly recommended in order to accurately assess the lifestyle risks of this population.

**Keywords:** Lifestyle; Adult; Women; Physical Activity; Sedentary Lifestyle; Oman.

**الملخص: الهدف:** هدفت الدراسة إلى البحث في أساليب حياة المرأة العمانية المتعلقة بمستويات النشاط البدني (PA) والسلوك الخامل (SB). **الطريقة:** أجريت الدراسة في الفترة ما بين شهري مايو ويونيو 2013 وشملت ما مجموعه (277) امرأة سليمة تتراوح أعمارهن بين 18–48 عاماً من خمس محافظات بسلطنة عمان. تم التحقق من مستويات النشاط البدني الإجمالية، المعتدلة والمرتفعة الشدة إضافة إلى المشي للمشاركة بواسطة الاستبانة القصيرة الدولية المعبئة ذاتياً لقياس مستوى النشاط البدني. تم قياس مستوى السلوك الخامل (اجمالي) وأوقات الجلوس وأوقات الجلوس للأنماط المختلفة للجلوس) بواسطة استبيان الأوقات الخاصة بالجلوس المعبئ ذاتياً لكل من أيام العمل وأيام غير العمل. كذلك تم قياس مستوى النشاط البدني والسلوك الخامل بموضوعية بواسطة استخدام أجهزة التسارع لعدد (86) مشاركة من عينة الدراسة. النتائج: كان إجمالي متوسط  $\pm$  النطاقات الربعية للوقت الجلوس للنشاط البدني الخامل بموضوعية بواسطة استخدام أجهزة التسارع لعدد (86) مشاركة الأسبوع. وكان إجمالي متوسط  $\pm$  النطاقات الربعية لأوقات الجلوس الخامل عنده ذاتياً (433  $\pm$  323) دقيقة/اليوم و (470  $\pm$  423) دقيقة/اليوم لأيام العمل وأيام غير العمل بالتتابع. شكّل الجلوس في العمل خلال أيام العمل والجلوس خلال أوقات الفراغ في غير أيام العمل النسبة الأكبر من إجمالي أوقات الجلوس. إجمالاً بينت نتائج أجهزة التسارع أن المشاركات يقضين 62% من وقتهن في نمط الحياة الخامل و 35% في أنشطة بدنية خفيفة و 3% فقط في أنشطة بدنية معتدلة إلى مرتفعة الشدة. الخلاصة: نمط الحياة الخامل هو السائد لدى النساء العمانيات المشاركات بالدراسة ومن المعروف بأن قلة النشاط البدني وزيادة النشاط الخامل يزيدان من مخاطر متلازمة الايض والبدانة. نوصي بضرورة استخدام أجهزة التسارع لمتابعة النشاط البدني والسلوك الخامل لدى المجموعات المختلفة للنساء بسلطنة عمان للحصول على تقييم دقيق عن مخاطر الأنماط الحياتية للسكان.

**مفتاح الكلمات:** أنماط الحياة؛ الكبار؛ المرأة؛ النشاط البدني؛ نمط الحياة الخامل؛ عمان.

#### ADVANCES IN KNOWLEDGE

- There is a lack of information in the literature regarding the physical activity (PA) and sedentary behaviour (SB) of adult Omani women.
- This is the first time PA and SB have been objectively measured using accelerometers in a group of adult Omani women.

#### APPLICATION TO PATIENT CARE

- As demonstrated in this study, accelerometers can be used as a tool to remotely and accurately monitor the PA and SB of different population groups in Oman.
- The results of this study indicate that an awareness promotion programme, with regards to lifestyle behavioural changes, aimed at the adult female population is urgently needed in Oman.

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UNLIKE INACTIVITY, SEDENTARY BEHAVIOUR (SB) can be defined as actions which have low energy expenditure, typically between 1–1.5 metabolic equivalent of task (METs), such as sitting.<sup>1</sup> Like many countries in the Gulf region, Oman has experienced recent socioeconomic growth. The technological innovations and advances in automation related to this socioeconomic change may affect aspects of an individual's daily life. As such, lifestyles of the Omani population are evolving to reflect a more sedentary way of living. A recent study in Oman revealed an increase in lifestyle-related metabolic syndrome and the prevalence of associated risk factors, such as type 2 diabetes (the frequency of which was ranked among the 10 highest prevalences reported worldwide), cardiovascular disease (CVD) and being overweight or obese.<sup>2</sup> Mabry *et al.* also demonstrated an association between low physical activity (PA), frequent sitting time and metabolic syndrome, suggesting that low PA levels increase the risk of developing metabolic syndrome.<sup>3</sup> The population-wide surveillance of PA levels and SB is both a national and international priority, as measurement of these indicators enable a better understanding of their associated health risks.

In Oman, women may be at greater risk of associated health concerns due to their low PA levels and high SB. A report by the Omani Ministry of Health in 2011 revealed that, out of 5,006 new cases of type 2 diabetes, 51.5% were female.<sup>4</sup> Furthermore, nearly 53.6% of Omani women were reported to be overweight or obese.<sup>5</sup> Despite this, studies measuring PA levels and SB among Omani women are rare. A study of Omani college students showed that male students spent significantly more time exercising weekly ( $6.84 \pm 1.04$  hours) than female students ( $3.36 \pm 0.70$  hours).<sup>6</sup> Another recent study found that 32.5% of female Omani university students had low PA levels.<sup>7</sup> Data from the World Health Survey in Oman demonstrated that only 59% of women were undertaking sufficient exercise compared to 67% of men.<sup>5</sup>

The majority of the above mentioned studies were found to have assessed PA levels using subjective measures. To the best of the authors' knowledge, no studies which objectively measure PA levels and SB in adult Omani women have yet been published. Therefore, the aim of this study was to assess PA levels and SB among a cohort of adult Omani women using both subjective and objective tools. Additionally, this study aimed to describe the differences in PA levels and sitting time between various demographic groups.

## Methods

A cross-sectional study was undertaken between May and June 2013 in five out of 11 governorates in Oman (including the governorates of Muscat, north Al-Batinah, south Al-Batinah, north Ash Sharqiyah and south Ash Sharqiyah). A total of 277 healthy adult Omani women aged 18–48 years with no physical illnesses or disabilities that could affect their normal daily activities were included in the study. All participants were recruited through word-of-mouth advertising in several different workplaces, higher education institutions, committees and sports organisations.

Participants were initially visited either in the workplace or in other institutions. At this time, the following were measured: weight (seca 875 electronic flat scale, Seca GmbH, Hamburg, Germany), height (seca 217 mobile stadiometer, Seca GmbH) and waist and hip circumferences (seca 203 ergonomic circumference measuring tape, Seca GmbH). Body mass index (BMI) was calculated and participants were categorised according to the World Health Organization (WHO) as underweight ( $<18.5$  kg/m<sup>2</sup>), normal weight (18.5–24.9 kg/m<sup>2</sup>), overweight ( $>25.0$ –29.9 kg/m<sup>2</sup>) or obese ( $\geq 30.0$  kg/m<sup>2</sup>).<sup>8</sup> Waist-to-hip ratio (WHR) was calculated by dividing waist circumference by hip circumference and participants were subsequently classified as having a low ( $<0.80$ ), moderate (0.80–0.85) or high ( $>0.85$ ) risk of developing a non-communicable disease.<sup>9</sup>

Demographic characteristics were elicited using an Arabic-language questionnaire that was specifically designed for this study. Participants were classified according to age as young adults or adults (18–29 or 30–48 years old, respectively), marital status; level of education; employment status, and income level.

Participants completed two questionnaires assessing their PA and SB. Both questionnaires were back-translated into Arabic for use in this study. Participants reported their estimated total PA levels using the self-administered short form of the International Physical Activity Questionnaire (IPAQ).<sup>10</sup> It has been shown that the IPAQ is a valid and reliable measure of PA.<sup>11</sup> Results from this questionnaire were scored using the IPAQ scoring protocol.<sup>10</sup> Light PA, moderate to vigorous PA (MVPA), walking and total PA levels were calculated in METs minutes/week. SB was self-assessed by participants using the Domain-Specific Sitting Time Questionnaire (D-SSTQ), which has been validated for use by adults.<sup>1,12</sup> Minutes spent sitting were calculated for both working and non-working days by domain (sitting during transportation,

**Table 1:** Descriptive characteristics of a sample of adult Omani women by instrument

Characteristic	Instrument Mean $\pm$ SD		
	IPAQ* (n = 229)	D-SSTQ** (n = 191)	Accelerometer (n = 80)
Age in years	29.6 $\pm$ 7.3	31.0 $\pm$ 7.1	29.0 $\pm$ 8.0
Weight in kg	64.0 $\pm$ 16.0	65.1 $\pm$ 15.0	61.0 $\pm$ 15.0
Height in cm	161.0 $\pm$ 66.0	156.2 $\pm$ 4.9	156.0 $\pm$ 5.0
BMI in kg/m <sup>2</sup>	25.9 $\pm$ 6.3	26.7 $\pm$ 5.9	25.1 $\pm$ 6.1

SD = standard deviation; IPAQ = International Physical Activity Questionnaire; D-SSTQ = Domain-Specific Sitting Time Questionnaire; BMI = body mass index.

\*Data collected using the International Physical Activity Questionnaire.<sup>10,11</sup>

\*\*Data collected using the Domain-Specific Sitting Time Questionnaire.<sup>1,12</sup>

at work, while watching television, while using the computer or during another type of leisure activity). Total daily sitting times were then calculated by adding up the minutes spent sitting across each domain.

Of the 277 participants, 86 women volunteered to take part in the further objective measurement of their PA levels. After baseline measurements were obtained, participants were provided with and asked to wear a GT3X accelerometer (ActiGraph, Pensacola, Florida, USA) which is a small device of 4.6 x 3.3 x 1.5 cm, weighing 19 g.<sup>13</sup> This device has been shown to be a valid and reliable measure of PA levels and SB.<sup>14</sup> Participants wore the accelerometer for seven consecutive days while continuing with their normal daily activities and were instructed to wear the device at all times during waking hours, only removing the device to sleep or during water-based activities. The accelerometer epoch interval was set at one minute.<sup>12,14</sup> Data from the accelerometer were downloaded and summarised using ActiLife software, Version 6.5.3 (ActiGraph). Data were considered to be valid if the device had recorded a minimum of 600 minutes per day (excluding continuous strings of zero counts for 60 minutes or longer) for four days, including at least one non-working day on a weekend. A cut-off value of <100 counts per minute (cpm) was considered to indicate SB, while values of 100–1,951 cpm and  $\geq$ 1,952 cpm indicated time spent engaged in light PA and MVPA, respectively.<sup>15,16</sup> The frequency of time spent in either SB, light PA or MVPA per week was obtained by dividing the time spent in each activity by the mean wearing time per week. Accelerometer data were obtained for weekdays and weekend days separately.

Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS), Version 20.0 (IBM Corp., Chicago, Illinois, USA). A *P* value of  $\leq$ 0.05 was considered significant. Data from

the IPAQ and D-SSTQ were checked for normality using the one-sample Kolmogorov-Smirnov test. Non-parametric analyses were also carried out. Medians and interquartile ranges (IQRs) were used to describe the data descriptively throughout. To examine differences in self-reported PA levels and SB among the different demographic groups, the Mann-Whitney U and the Kruskal-Wallis tests were used for non-parametric data and the independent t-test and the one-way analysis of variance were used for parametric data.

The procedures of the study were approved by all participating institutions (including universities, schools and committees). All participants gave written informed consent. Ethical approval for the study was obtained from the Office of the Advisor for Academic Affairs at Sultan Qaboos University, Muscat, Oman.

## Results

Table 1 shows the descriptive demographics of the participants by the instrument used to measure PA levels and SB (IPAQ, D-SSTQ and accelerometer). Table 2 shows the participants' self-reported PA levels by demographic group. Of the 277 participants enrolled in the study, only 229 provided complete responses to the IPAQ. According to their responses, 34% of the participants were categorised as minimally active, 32% were classified as moderately active and 34% were classified as highly active. Women reported that they spent a median of 75  $\pm$  249 minutes/week engaged in moderate PA, 0  $\pm$  80 minutes/week on vigorous PA and 120  $\pm$  330 minutes/week walking. In addition, the self-reported median  $\pm$  IQR total sitting time was 433  $\pm$  323 minutes/day and 470  $\pm$  423 minutes/day for working and non-working days, respectively.

There was a significant difference in time spent in self-reported moderate PA between age groups ( $z = -1.96$ ;  $P \leq 0.05$ ), with adults reporting more moderate PA than young adults. However, neither age group differed significantly in terms of vigorous PA or walking. Based on education level, the high school education or lower group reported significantly higher levels of vigorous PA compared to those with a degree or postgraduate qualification ( $\chi^2 = 20.51$ ;  $P \leq 0.001$ ). Nevertheless, these groups did not differ in terms of moderate PA or walking. Married women reported more moderate PA than those who were single ( $z = -2.2$ ;  $P \leq 0.03$ ), but no differences were reported in vigorous PA or walking. Unemployed participants reported significantly more vigorous PA ( $z = -3.81$ ;  $P \leq 0.001$ ) compared with those women who were

**Table 2: Self-reported physical activity levels\* among a sample of adult Omani women by demographic group (N = 229)**

Demographic group	n (%)	Median physical activity by types ± IQR in METs minutes/week			
		Vigorous	Moderate	Walking	Total
<b>Total</b>		<b>0 ± 640</b>	<b>300 ± 1,176</b>	<b>396 ± 1,089</b>	<b>1,516 ± 3,392</b>
<b>Age in years</b>					
18–29	113 (49.3)	0 ± 560	160 ± 960 <sup>†</sup>	462 ± 295	1,584 ± 3,478
30–48	116 (50.7)	0 ± 720	480 ± 1,440 <sup>†</sup>	396 ± 974	1,478 ± 3,512
<b>Level of education</b>					
High school or lower	50 (22.3)	720 ± 1,680**	600 ± 1,080	396 ± 891	2,316 ± 2,460
Degree	164 (73.2)	0 ± 260**	240 ± 1,182	462 ± 245	1,431 ± 3,671
Postgraduate qualification	10 (4.5)	0 ± 330**	240 ± 795	272 ± 2,186	1,473 ± 2,363
<b>Marital status</b>					
Single	111 (48.9)	0 ± 960	180 ± 960 <sup>†</sup>	495 ± 1,254	1,638 ± 4,263
Married	116 (51)	0 ± 480	480 ± 1,438 <sup>†</sup>	371 ± 924	1,431 ± 3,209
<b>Employment status</b>					
Employed	133 (58.6)	0 ± 280**	360 ± 1,440	396 ± 1,320	1,314 ± 2,873
Unemployed	94 (41.4)	0 ± 1,920**	300 ± 690	396 ± 929	2,168 ± 5,072
<b>Location</b>					
Urban	132 (58.7)	0 ± 720	240 ± 840**	371 ± 1,287	1,440 ± 2,866
Rural	93 (41.3)	0 ± 480	480 ± 1,680**	396 ± 817	1,638 ± 4,167
<b>Monthly income</b>					
Low	56 (25.9)	0 ± 1,620	380 ± 1,050	445 ± 795	2,249 ± 4,320
Moderate	70 (32.4)	0 ± 480	540 ± 1,434	396 ± 1,320	1,584 ± 3,088
High	90 (41.7)	0 ± 480	2,020 ± 765	462 ± 1,254	1,350 ± 3,823
<b>BMI</b>					
Underweight	18 (7.9)	0 ± 60	40 ± 1,080	289 ± 1,411	945 ± 2,997
Normal	90 (39.3)	0 ± 630	240 ± 1,182	478.5 ± 1,320	1,440 ± 3,417
Overweight	68 (29.7)	0 ± 960	240 ± 960	445.5 ± 1,139	1,611 ± 2,616
Obese	53 (23.1)	0 ± 1,440	480 ± 1,440	297 ± 685	1,800 ± 4,961
<b>WHR</b>					
Low risk	142 (62)	0 ± 480	330 ± 1,440	495 ± 1,188	1,550 ± 3,353
Moderate risk	44 (14.7)	0 ± 960	220 ± 840	396 ± 1,341	1,584 ± 3,820
High risk	43 (18.8)	0 ± 1,440	360 ± 1,200	198 ± 792	792 ± 3,804

IQR = interquartile range; MET = metabolic equivalent of task; BMI = body mass index; WHR = waist-to-hip ratio.

\*Data collected using the International Physical Activity Questionnaire.<sup>10,11</sup> <sup>†</sup> $P < 0.05$ . \*\* $P < 0.001$ .

employed. Women in rural areas spent significantly more time in moderate PA in comparison to those living in urban areas ( $z = -2.52$ ;  $P \leq 0.05$ ). However, no significant differences were noted among any form of PA when participants were grouped according to income. Moreover, there were no differences in

PA between BMI and WHR groups ( $P > 0.05$ ). PA ranged from  $945 \pm 2,997$  METs minutes/week in the underweight group to  $1,800 \pm 4,961$  METs minutes/week in the obese group.

Table 3 presents the self-reported sitting times among different domains for the sample by demographic

**Table 3: Self-reported sitting time\* among a sample of adult Omani women by demographic group and domain per weekday/weekend day (N = 191)**

Demographic group	n (%)	Median sitting time by domain ± IQR in minutes/day									
		Weekday					Weekend day				
		Transport	Work	TV	Comp	Other LA	Transport	Work	TV	Comp	Other LA
<b>Total</b>		30 ± 50	120 ± 210	30 ± 60	60 ± 150	60 ± 92.5	60 ± 120	0 ± 120	60 ± 120	60 ± 180	120 ± 123.5
<b>Age in years</b>											
18–29	73 (39.7)	30 ± 80	120 ± 210	150 ± 60**	120 ± 120**	60 ± 105	60 ± 135	0 ± 70	60 ± 120	120 ± 180	120 ± 180
30–48	111 (60.3)	30 ± 60	120 ± 210	60 ± 75**	60 ± 90**	60 ± 105	60 ± 120	0 ± 120	60 ± 120	60 ± 180	120 ± 120
<b>Level of education</b>											
High school or lower	43 (24.0)	50 ± 111	105 ± 180**	60 ± 120	90 ± 175	60 ± 120	0 ± 58**	0 ± 64**	37 ± 120**	10.5 ± 23**	120 ± 180
Degree	128 (71.5)	30 ± 50	120 ± 199**	30 ± 60	60 ± 131	60 ± 90	120 ± 120**	20 ± 120**	60 ± 118**	120 ± 150**	120 ± 120
Postgraduate qualification	8 (4.5)	25 ± 29	270 ± 150**	30 ± 98	87 ± 128	30 ± 48	90 ± 134**	0 ± 28**	60 ± 68**	30 ± 148**	90 ± 128
<b>Marital status</b>											
Single	73 (39.9)	30 ± 80	180 ± 248**	2 ± 60**	120 ± 120**	60 ± 90	60 ± 120	0 ± 60	60 ± 120	60 ± 193	120 ± 128
Married	110 (60.1)	20 ± 50	120 ± 150**	60 ± 83**	60 ± 90**	60 ± 100	60 ± 108	0 ± 120	60 ± 120	60 ± 179	120 ± 143
<b>Employment status</b>											
Employed	119 (66.1)	30 ± 50**	120 ± 195**	30 ± 50	60 ± 90	60 ± 100	90 ± 105	10 ± 120	60 ± 110	60 ± 178	120 ± 120
Unemployed	61 (33.9)	35 ± 95**	120 ± 240**	30 ± 60	120 ± 150	60 ± 120	40 ± 120	0 ± 29	60 ± 120	60 ± 193	120 ± 178
<b>Location</b>											
Urban	106 (58.9)	30 ± 49	120 ± 210	30 ± 52	60 ± 120	60 ± 100	60 ± 105	0 ± 60	60 ± 120	60 ± 180	120 ± 128
Rural	74 (41.1)	30 ± 74	120 ± 195	30 ± 60	120 ± 150	60 ± 90	67.5 ± 150	0 ± 120	60 ± 120	60 ± 180	120 ± 136
<b>Monthly income</b>											
Low	43 (25.3)	40 ± 110	120 ± 240	30 ± 60	120 ± 150	60 ± 90	30 ± 75**	0 ± 60	60 ± 120	60 ± 180	120 ± 180
Moderate	51 (30.0)	20 ± 40	120 ± 200	25 ± 120	60 ± 110	60 ± 100	120 ± 85**	0 ± 120	60 ± 105	120 ± 165	120 ± 150
High	76 (44.7)	30 ± 60	120 ± 199	60 ± 49	60 ± 120	60 ± 90	115 ± 153**	5 ± 120	60 ± 118	60 ± 168	120 ± 120
<b>BMI</b>											
Underweight	9 (4.9)	20 ± 88	120 ± 257	20 ± 60	180 ± 150	60 ± 155	60 ± 125	40 ± 120	45 ± 120	60 ± 195	180 ± 190
Normal	67 (36.4)	20 ± 52	120 ± 205	20 ± 60	120 ± 135	60 ± 90	75 ± 100	0 ± 120	60 ± 105	120 ± 178	90 ± 150
Overweight	59 (32.0)	40 ± 55	120 ± 195	60 ± 110	60 ± 150	60 ± 90	60 ± 105	0 ± 120	60 ± 120	60 ± 165	120 ± 120
Obese	49 (26.6)	30 ± 80	120 ± 228	30 ± 120	60 ± 120	60 ± 120	30 ± 130	0 ± 23	60 ± 120	30 ± 120	120 ± 180
<b>WHR</b>											
Low risk	104 (56.5)	30 ± 60	120 ± 210	30 ± 60	120 ± 131 <sup>†</sup>	60 ± 90	75 ± 98	0 ± 120	60 ± 120	105.3 ± 169	120 ± 120
Moderate risk	44 (23.9)	25 ± 50	120 ± 210	30 ± 56	60 ± 90 <sup>†</sup>	60 ± 180	60 ± 124	0 ± 60	60 ± 114	60 ± 120	120 ± 135
High risk	36 (19.6)	30 ± 90	120 ± 150	60 ± 110	60 ± 123 <sup>†</sup>	60 ± 105	60 ± 120	0 ± 120	60 ± 120	35 ± 180	68 ± 180

IQR = interquartile range; TV = television; Comp = computer; LA = leisure activity; BMI = body mass index; WHR = waist-to-hip ratio.

\*Data collected using the Domain-Specific Sitting Time Questionnaire.<sup>1,12</sup> <sup>†</sup>P < 0.05. \*\*P < 0.001.

group for both a weekday (working) and weekend (non-working) day. Out of the total 277 participants, only 191 completed the D-SSTQ. The mean self-reported sitting time by domain is shown in Figure 1 for both a working and non-working day. There were significant

differences in sitting time spent watching television ( $z = -3.6$ ;  $P < 0.001$ ) during a working day between age groups, with adults reporting more time spent sitting watching television than young adults. In contrast, young adults reported significantly more time using

the computer ( $z = -2.5$ ;  $P \leq 0.01$ ). Individuals with a high school education or lower, college degree or postgraduate qualification differed significantly in time spent sitting at work on a working day ( $\chi^2 = 0.57$ ;  $P \leq 0.001$ ), with postgraduate qualification holders reporting more sitting time than the other two groups. Additionally, these groups differed significantly in the sitting time reported on a non-working day in the domains of transportation ( $\chi^2 = 33.41$ ;  $P \leq 0.001$ ), work (as a number of working women reported carrying out work-related tasks during non-working days) ( $\chi^2 = 18.91$ ;  $P \leq 0.001$ ) and the use of a computer ( $\chi^2 = 9.9$ ;  $P \leq 0.001$ ); degree holders spent more time sitting in all of these domains.

Single women reported significantly more time spent sitting at work ( $z = -3.0$ ;  $P \leq 0.004$ ) and using a computer ( $z = -3.0$ ;  $P \leq 0.006$ ), while married women spent more time sitting while watching television ( $z = -4.0$ ;  $P \leq 0.001$ ). Employed women spent more time sitting on a non-working day while travelling ( $z = -2.3$ ;  $P \leq 0.02$ ) and working ( $z = -2.7$ ;  $P \leq 0.01$ ), compared with unemployed women. Participants in the moderate monthly income group reported significantly more sitting time while travelling on a non-working day than the other income groups ( $\chi^2 = 14.21$ ;  $P \leq 0.001$ ). However, there were no significant differences between sitting time among women in terms of their location and BMI categories.

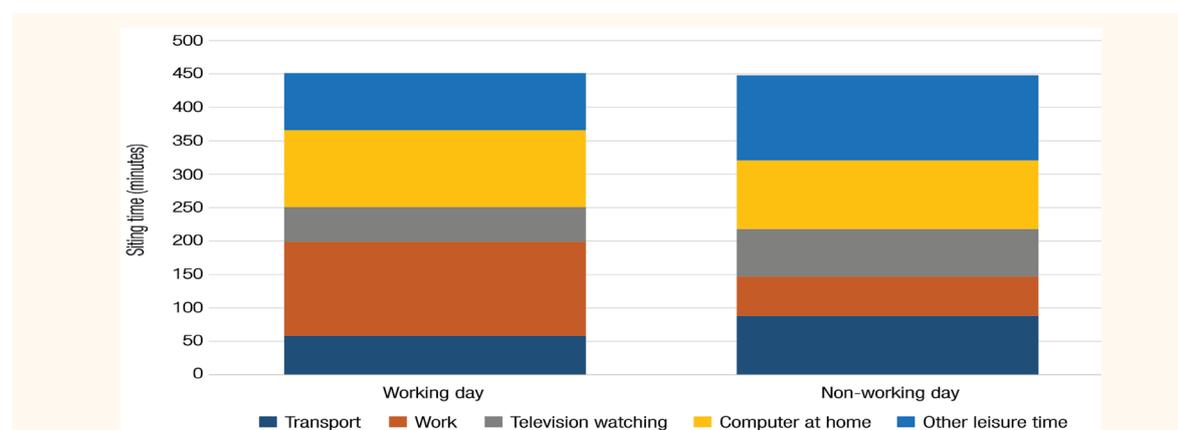
Demographic groups were compared in terms of total sitting time on a working day versus that of a non-working day. There were significant differences found between the two age groups ( $t = 2.02$ ;  $P = 0.04$ ) with young adults reporting more sitting than adults on working days. However, no differences were observed between the groups on non-working days. The same results were found with regards to marital status ( $t = 2.75$ ;  $P = 0.007$ ) with single women

reporting more time spent sitting on working days in comparison to married women. In contrast, no significant differences were observed on non-working days. Significant differences were noted among education groups ( $F = 11.86$ ;  $P = 0.001$ ), with degree holders spending more time sitting on non-working days. No significant differences were found between the groups on working days. In addition, no significant differences were observed in total sitting time between the other demographic groups (employment status, location, income, BMI and WHR) on working and non-working days. Generally, participants spent the greatest proportion of sitting time at work on working days (31% of the total sitting time) and while doing other leisure activities during non-working days (26% of the total sitting time).

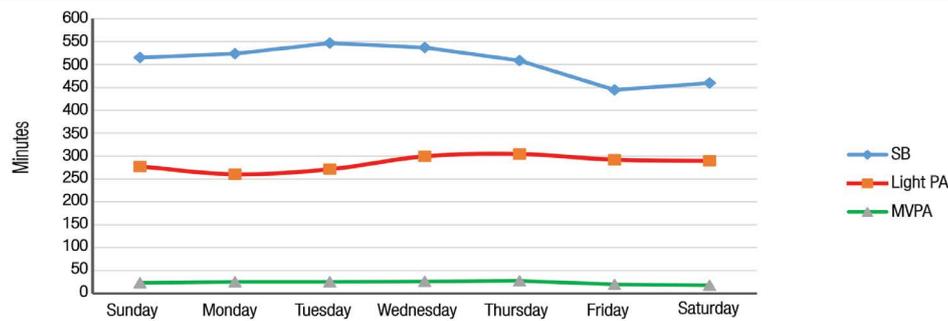
Of the 86 women who agreed to wear the accelerometers, only 80 participants provided usable data according to the study's criteria. The mean time spent wearing the accelerometer was  $813.7 \pm 101.6$  minutes/day. Figure 2 shows the mean accelerometer-recorded PA levels and SB among the sample for the seven day period. These objective measurements revealed that the participants spent 62% of their time engaged in SB, 35% of their time taking part in light PA and only 3% of their time engaged in MVPA.

## Discussion

The results of this study suggest that further research on the determinants of physical inactivity or activity is needed in Oman; Mabry *et al.* recommended several strategies to this effect.<sup>17</sup> Sitting time is also a major concern; the deleterious effects of SB suggest that excessive sitting carries a serious health hazard when it is not balanced by a corresponding increase in



**Figure 1:** Mean self-reported sitting time among a sample of adult Omani women by domain and by weekday (working) or weekend (non-working) day (N = 191). Participants assessed their sitting time using the Domain-Specific Sitting Time Questionnaire.<sup>1,12</sup> The mean total sitting time calculated across all domains was 450 minutes on a weekday and 448 minutes on a weekend day.



**Figure 2:** Mean time spent engaged in sedentary behaviour, light physical activity and moderate to vigorous physical activity over a seven day period among a sample of adult Omani women who wore an accelerometer for a minimum of four days (N = 80).

SB = sedentary behaviour; PA = physical activity; MVPA = moderate to vigorous PA.

PA.<sup>18</sup> A physiological study has identified unique and hazardous mechanisms in SB that are distinct from the biological benefits of exercising.<sup>18</sup> Unfortunately, according to objective measurements from an accelerometer, the participants in the current study were observed to spend the majority of their time engaged in SB. This therefore indicates that urgent action is needed in Oman to increase awareness of the health risks of low PA and increased SB as well as to create public health interventions and programmes aiming to change the lifestyle behaviours of Omani women.

Among the sample of adult Omani women, self-reported PA levels from the IPAQ revealed that women between 30–48 years old reported more moderate PA than their younger counterparts. Although some research indicates that PA levels decrease with age,<sup>19</sup> the results from the current study showed that adults reported increased levels of moderate PA compared with young adults. This finding is supported by a study by Al-Hazaa, in which a slight increase in PA levels was observed between 15–29-year-olds and 30–44-year-olds (from 28.4% to 29.1%, respectively).<sup>20</sup>

Additionally, women living in rural areas reported engaging in increased levels of moderate PA in the current study. This finding is in line with another study which also indicated that rural women were more active in terms of moderate PA in comparison to those in urban areas.<sup>21</sup> In Oman, this association could be explained by the fact that small towns and villages which are less built-up and have less infrastructure may afford opportunities to engage in increased PA, such as walking, as local residents in these rural environments do not have to rely as much on transportation.<sup>22</sup> Moreover, women in rural areas are more likely to be involved in physically demanding work, such as farming, raising livestock or creating handicrafts.

In the current study, married women were also found to engage in more moderate PA. While this finding is supported by a study by Al-Hazaa *et al.*,<sup>23</sup>

Jacoby *et al.* found discordant results.<sup>24</sup> Cleaning, cooking and looking after children are typical activities that may constitute moderate PA in the daily routine of a married Omani woman.

In the current study, those with a high school education or lower reported more vigorous PA compared to participants with a degree or postgraduate qualification. In line with this, Padrão *et al.* observed that vigorous PA decreased in inverse proportion to the level of education.<sup>25</sup> These findings are additionally supported by a study by Cohen *et al.* in the USA, which investigated PA and SB in African American and white adults.<sup>26</sup> Cohen *et al.* observed that participants reported lower overall PA levels as their level of education increased.<sup>26</sup> In the current study, Omani women with higher levels of education may have had jobs which demanded less PA as compared to the women who were less educated.

Research supports the observation that PA levels decrease as BMI and WHR increase; in a study describing PA patterns in French adults, researchers found that PA decreased by 1.31–1.67 METs minutes/week in women with an increased BMI.<sup>27</sup> In contrast, the current study did not find a significant difference between BMI groups with respect to measured variables, although there was a small difference in total PA between the underweight and obese groups, as those who were obese reported increased levels of PA. This increase is probably due to an increasing trend among overweight and obese women to try to reduce their body fat. Al-Kilani *et al.* found that female Omani students were less likely to be obese than male students.<sup>6</sup>

To date, only a few studies have examined PA levels and SB among adult women in Oman. These studies have shown that increased PA results in a corresponding increase in fitness and thus helps to reduce excessive weight gain.<sup>28,29</sup> Another lifestyle study investigating PA and SB in under-18-year-

old Omanis found a significant association between low levels of fitness and obesity.<sup>30</sup> The results of the current study found that walking was considered the main contributor to the total PA levels among the participants. For Omani women, walking is a common, accessible and inexpensive form of PA and is considered culturally acceptable.

In terms of the proportion of women classified as inactive, moderately active and highly active, the results of the present study were found to differ from those of the World Health Survey in Oman, which observed that 59% of Omani women were getting sufficient exercise.<sup>5</sup> This disparity could be due to differences between study designs, measurement tools and sample sizes. However, a comparison of the Omani women's activity levels with those of women in other Gulf countries showed similar results. In a Saudi Arabian study, 40.6% of the studied men and women living in Riyadh exhibited low activity, 34.3% were minimally active and 25.1% were highly active.<sup>20</sup>

Studies in both Australia and the UK reported similar results in terms of sitting time at work.<sup>1,12</sup> Furthermore, both studies found that sitting at work contributed to 50% of the total daily sitting time and that watching television was the major contributor to non-working day activities. In the present study, married adult women seemed to spend more time sitting while watching television, as compared to single young adults who spent more time using the computer, which may potentially be explained by a desire for socialisation among the latter.

To the best of the authors' knowledge, this study was the first to use accelerometers in order to objectively measure PA and SB among an Omani population. The use of this tool is recommended for future studies to monitor PA and SB in order to accurately assess the lifestyles of different population groups in Oman.

One of the limitations of this study was that the data were collected during the summer months. Furthermore, 33.9% of the participants were unemployed and the majority were students who participated in the study during their final exams. All of these factors may have affected the daily PA routines of the participants and could potentially have increased their sitting times. In addition, this study sought to examine PA levels and SB among young and middle-aged women only. A small sample size was used and the volunteers who wore the accelerometers were recruited exclusively from the governorate of Muscat; these factors may have limited the generalisability of the results. Further research with a larger sample and multivariate analysis is recommended to enhance understanding of the associations between demographic variables and indicators of PA and SB.

## Conclusion

Investigation of the lifestyles of the studied adult Omani women revealed a lack of PA and a high level of SB. Leisure activities during non-working days and sitting at work on working days contributed the majority of sitting time. Lifestyle-related factors such as low PA levels, increased SB and being overweight or obese can result in an increased risk of metabolic syndrome and other non-communicable diseases. The use of objective measuring tools, such as accelerometers, is highly recommended in future studies to accurately monitor PA and SB among population groups. Public awareness of the health concerns associated with low levels of PA and increased SB is urgently needed along with public health interventions aimed at changing lifestyle behaviours among Omani women.

## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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