*Title:* Physical activity and sedentary behaviours levels of Kuwaiti adolescents: the Study of Health and Activity among Adolescents in Kuwait.

*Running head:* Lifestyle in Kuwaiti adolescents.

*Manuscript type:* Original research.

*Key words:* accelerometry, youth, sedentary behaviour.

*Abstract*

Background: There are scarce number of studies describing the lifestyle of adolescents living in Arab countries. We described physical activity (PA) and sedentary behaviours patterns among Kuwait adolescents and the associations with parental education. Methods: Cross-sectional data from 435 adolescents (201 boys) from the Study of Health and Activity among Adolescents in Kuwait (SHAAK), conducted between 2012-2013. Outcomes variables included PA (Actigraph GT1M accelerometers) and sedentary behaviours. Exposure variable was parental education. Descriptive and multiple logistic regression analysis to examine the association between parental education and outcomes variables. Results: Total sedentary time (minutes/day) was higher in girls (568.2 ± 111.6) than boys (500.0 ± 102.0), whereas boys accumulated more minutes in light, moderate and vigorous PA (all P-values≤0.001). In total, 3.4% of adolescents spent ≥60 minutes/day of moderate to vigorous PA (by accelerometry) whilst only 21% met screen-time guidelines. Low/medium maternal education was associated with a higher odds of exceeding screen-time guidelines (OR, 95% CI: 2.09, 1.09-4.02). Conclusions: Most Kuwaiti adolescents in this sample were physically inactive and exceeded screen-time guidelines. Objective PA was not socially patterned, yet an inverse association between maternal education and screen-time behaviours was found.

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## Introduction

Lifestyle in modern industrialized societies is characterized by a pandemic of physical inactivity as well as the wide use of technology-based sedentary behaviours. For example, in a large survey 80% of adolescents (13-15 years) were not meeting physical activity (PA) recommendations (1 hour/day of moderate to vigorous PA intensity)[1]. In addition, at least two thirds of children and adolescents exceeded 2 hours/day of screen time (TV viewing plus computer use)[2] in a large pooled international study. However, there are scarce number of studies describing the lifestyle of adolescents living in Arab countries. Kuwait remains one of the most affluent countries in the world (ranked 5$^{th}$ in 2015 according to the World Bank)[3], which may enable a widespread use of diverse electronic media among adolescents regardless of familial socioeconomic level.

Epidemiological studies in Arab countries have traditionally relied on self-reported PA and sedentary behaviours questionnaires in both sexes[4-7] with the exception of one study conducted in males that included pedometers[8]. Using data from 2009, Allafi et al.[5] described PA and sedentary behaviours patterns among Kuwaiti adolescents aged 14-19 years. Half of the boys and three quarters of the girls did not meet physical activity recommendations, and almost all students reported >2 hours/day on screen time. However, PA levels were estimated by questionnaires which present well-known limitations[9].

Understanding the socioeconomic variation in health related behaviours in adolescents is important as it may help to understand the pathways by which low socioeconomic status (SES) leads to poorer health outcomes. To our knowledge no study has examined the association between PA, sedentary behaviours and SES indicators in Kuwaiti adolescents. Although in high-income countries there is a consistent inverse association between SES and adolescents' total screen time,[10,11] fewer studies in the literature have examined the association between SES and objectively measured total sedentary time[10]. One systematic review published in 2010 concluded that higher SES was associated with higher PA levels in adolescents[12]. Conversely, a recent pooled analysis of 12770 adolescents from Europe, Australia, Brazil and the USA found lower levels of objectively light intensity PA and higher of total sedentary time in adolescents with high SES (based on maternal education)[10]. Reasons of these equivocal findings might may be explained by methodological reasons: for example, how PA was measured (questionnaires or objective methods) and the choice of different SES indicators among studies (education, household income, composite measures, etc).

Given the reduced number of published studies in Arab adolescents further studies in this region are warranted. The aims of this study were to describe objectively measured PA and self-reported sedentary behaviours among Kuwaiti adolescents. In addition, we examined the association between parental education and, adolescents' PA and sedentary behaviours.

## Methods

### *Study design*

The Study of Health and Activity among Adolescents in Kuwait (SHAAK) was a cross-sectional study targeting Kuwaiti adolescent students between 2012 and 2013. A multistage stratified sampling design with proportionate sampling was used. The original sampling frame included all the governmental (intermediate and secondary) schools in Kuwait. They were stratified by governorate (Hawalli, Asimah, Jahra, Farwaniya, Ahmadi and Mubarak), gender and the school grades (7 to 12). In a first stage, researchers randomly selected (using a box with folded papers) schools for each sex and governorate by a serial number assigned to each school. In a second stage, using a similar allocation process, one class was selected from each grade (that is, three classes from each intermediate school and three from each secondary one). From a total estimated population of 128,948 adolescents, it was originally planned to obtain a representative sample of 1% (n=1,289). Due to resource and time constraints, data were collected from only three (Hawalli, Asimah and Jahra) of Kuwait's six governorates. From 594 students invited to participate, 591 gave written informed consent (99%). For the aim of this study 435 students had valid data including complete sociodemographic information and PA and sedentary behaviour measurements.

### *Data collection*

Data collection took place from October 2012 through June 2013. Researchers followed one standard protocol that included: a general questionnaire requesting information on socio-demographic, health-related behaviours (smoking, sleep and soda drinks intake) PA and sedentary behaviours, as well as a physical examination (anthropometric measurements) and the provision of PA sensors (accelerometers) to participants.

### *Physical activity and sedentary behaviours:*

Physical activity measurements included both self-reported questionnaires and objective methods. The questionnaire requested information about physical activity in different domains: transport (car, bus, walking, other), school breaks (sitting, standing and/or walking, running and/or playing), and leisure time (type, duration and frequency per week).

Objectively measured PA was assessed by Actigraph GT1M activity monitor (Actigraph, LLC, Pensacola, FL, USA). The Actigraph is a small and lightweight device, which is attached to a belt around the waist. The Actigraph monitor is a uniaxial accelerometer designed to measure change in acceleration in the vertical plane with respect to time. The GT1M measures the vertical acceleration and deceleration of human motion. The detected accelerations are filtered, then converted to a number (count) and subsequently summed over a specified time interval called an epoch[13]. The Evenson et al.[14] cut points for adolescents were chosen as appropriate cut points for categorizing the intensities of activity as sedentary (≤100), light (>100), moderate (≥2296) and vigorous (≥4012). A number of inclusion and exclusion criteria were specified to reduce the accelerometer data. First, a 20-minute count of consecutive "zero" counts was used to indicate that the accelerometer was not worn. Second, days with fewer than ten hours of wear time data were excluded from the analyses to account for unrepresentative days of activity[15]. Last, data for any participant with at least one valid day were included in the analyses to maximise the use of the sample.

Participants also reported habitual daily sedentary behaviour using a self-completed questionnaire: television viewing, non-active video games (games played while being seated), active video games (games eliciting light-intensity activity), computer use, social networks, homework, leisure-time reading). Response options were: I do not do this; one to two hours; two to three hours; or more than three hours.

*Parental education:*

A self-reported questionnaire was used to collect participant's demographic information (date of birth, gender, school grade, birth order, type of and family size, number of cars in their family). Parental education level was reported by the adolescents using a self-completed questionnaire that listed the following response options: illiterate, read and write, intermediate, secondary, university or higher education. Because of too few answers in some categories the five categories of answers were merged into: 1) Low: included read and write level and intermediate level (Grades 7-9); 2) Medium: included secondary level (Grades 10-12); 3) High: at least University degree.

*Physical measurements*

Nurses were trained by researchers in measuring anthropometric measurements before the study commencement date. Weight, height and waist circumference were measured in all participants.

Weight was measured (light clothing, emptied pockets and without shoes), to the nearest 0.1 kg using a SECA (Germany) electronic scale, model 813. Height was measured (without shoes, in bare or stocked feet), to the nearest 0.1cm using a SECA (Germany) portable stadiometer, model 217, with adolescents standing upright. Waist circumference was measured (over light clothing), using a non-elastic flexible measuring tape (Myotape, USA). Waist circumference measurements were taken midway between the tenth rib and the iliac crest, to the nearest 0.1 cm, with participants standing erect, arms by their sides, feet together and abdomen relaxed (at the end of expiration).

*Ethical Approval*

Participants received a detailed explanation of the aim of the study and its methods. Written consent forms were attached to the study questionnaire and signed by the participating students, before starting the assessment. In addition, the students took home a parental consent form to be signed by their guardians. Both students and their parents were free to agree or refuse to participate and/or withdraw from the study at any time, without any obligation. Written consent was obtained in each participant. Ethical approval for all study procedures and instruments was obtained by Kuwait Institute for Medical Specialization (Reference number: VDR/JC/505. Date: April 8, 2012).

*Data handling and statistical analysis*

Descriptive results are expressed as, median and inter-quartile range (or mean and standard deviation) for continuous variables and percentages for categorical variables. To be used in the regression model, education categories were recoded into two levels: High, if parents achieved at least university studies; Low, below University studies. Physical inactivity was defined as accumulating less than 60 minutes of daily moderate to vigorous physical activity (MVPA)[16]. Participants in the upper quartile of objectively measured sedentary time were defined as the sedentary group. Meeting screen-time guidelines was based on <120 minutes per day[17] of television viewing or/and computer use or/and non-active videogames. Associations among maternal and paternal education with: screen-time, TV-viewing, sedentary time (accelerometry) and physical inactivity (accelerometry) were analysed using a multiple logistic regression (Odds ratio, OR and 95% confidence intervals CIs). Each continuous outcome variable was recoded into binary variables: For screen-time, 0: <120 minutes per day; 1: ≥120 minutes per day; For television-viewing, 0: <120 minutes per day;

1: ≥120 minutes per day; For sedentary time, 0: First and Second quartile; 1: Third quartile; Physical inactivity, 0: <60 minutes of MVPA per day; 1: ≥60 minutes of MVPA per day. Data for boys and girls were combined to boost the statistical power, with one model adjusting by age, sex and governorate. Two-tailed statistical significance was set at the 5% level. Analysis and were carried out using SPSS version 24.0' (IBM Corp, Armonk, NY, USA).

## Results

*Sample characteristics*

Table 1 shows the descriptive characteristics of the participants, N=435 (201 boys (median age: 15.9 years), 234 girls (median age: 16.0)). As shown in Table 1 some statistically significant sex differences emerged (boys were taller, heavier, larger waist circumference, had higher smoking prevalence and less time sleeping at the weekend, and were in families with higher number of cars, than girls).

*Self-reported physical activity and sedentary behaviours*

As shown in Table 2, car was the predominant way of transport to school (in 87.6% in total participants). By sex, girls reported a higher prevalence of motorized transport (car and bus) than boys whereas only boys walked to school (17.4%) (P ≤0.001). In the school breaks, a higher percentage of boys reported sitting than girls, but a higher percentage of boys reported be physically active than girls during leisure time (ex. Frequency of PA during school days: 3 times or more, in 42.2% of boys versus 17.2% of girls).

For sedentary behaviours, boys played more with videogames whereas girls spent more time watching TV, using computers, reading and doing homework. Most of adolescents (79%) exceeded screen-time recommendations (≥2 hours/day), in boys (74.6%) and girls (83.3%). Using just TV viewing, 41.4% of adolescents exceeded screen-time guidelines.

*Objectively measured physical activity*

As shown in Table 3, objectively measured total sedentary time (minutes per day) was higher in girls (568.2 ± 111.6) than boys (500.0 ± 102.0), whereas boys accumulated more minutes in light, moderate and vigorous physical activity

(all P ≤0.001). In the total sample, 3.4% of adolescents met PA guidelines (≥60 minutes per day of moderate to vigorous PA), being slightly higher the prevalence in boys than girls (5.6% and 1.6%, respectively).

*Associations among screen time, sedentary time and physical inactivity with SES status*

Table 4 shows the results of the multivariate logistic regression analyses. For paternal education, no associations were found. For maternal education, adolescents whose mother had a low/medium level was associated with a higher risk of exceeding screen-time recommendations: (OR, 95% CI: 2.09, 1.09-4.02) and screen-time guidelines based solely in TV viewing: (OR, 95% CI: 1.88, 1.15-3.07). However, maternal education was not associated with objectively measured PA (sedentary group defined as the third quartile, physically inactive defined as less than 60 minutes of MVPA (or even in further analyses when physically inactive was defined as less than 30 minutes of MVPA).

## Discussion

The present study examined the prevalence of PA and sedentary behaviours as well as their associations with an important indicator or familial socioeconomic status (parental education) in a sample of Kuwaiti adolescents. The main findings were: I) Based on the accelerometry, almost all adolescents were physically inactive (total sample: 97%), and boys accumulated more time in light, moderate and vigorous PA than girls. II) Most of adolescents spent ≥2 hours/day of total screen-time (79%). III) Low maternal education was associated with a higher odds of exceeding screen-time guidelines, but not with meeting objectively measured PA guidelines.

*Prevalence of physical inactivity*

PA differences between sexes have been consistently reported in the literature using objective measurement methods[18] and also in Kuwait using PA questionnaires[5]. For example, in the latter study conducted in 2009 in Kuwaiti adolescents (aged 14-19 years) 56% of boys and 24% of girls met PA recommendations[5]. However, based on accelerometer data we found a substantial lower prevalence of Kuwaiti adolescents meeting with PA recommendations (3% of total sample, 6% boys and 2% girls). These worrisome findings are in agreement with recent data from a pooled study (n=27637, age=5-17 years) conducted in ten countries (Australia, Belgium, Brazil, Denmark, Estonia, Norway, Portugal, Switzerland, UK, USA)[18] where only 9% of boys and 2% of girls met PA guidelines. In addition, we observed that boys were less sedentary and more active than girls, as previously noted[18]. There are many possible

explanations of the high prevalence of physical inactivity in Kuwait. Remarkably, we found that around 90% of adolescents travelled by car to school and owned at least 3 familiar cars. There is growing evidence that active school travellers are more physically active on the whole than non-active travellers[19]. It can be also suggested that the extremely hot climate in Kuwait (in summer temperatures above 40ºC) and cultural norms adopted in some Arab countries (example, girls are socially discriminated against participating in any kind of exercise) could explain the low physical activity levels in this sample of adolescents. Nonetheless, it is important to bear in mind that the very high prevalence of physical inactivity observed in this sample of Kuwaiti adolescents is almost similar to previous data published in other wealthy countries[18].

As described in Table 3 by PA intensity levels, boys accumulated more time in light, moderate and vigorous PA than girls, but the major difference was observed with light intensity PA (median values: 42 minutes/day higher in boys). If higher amounts of light PA may provide health benefits in physically inactive adolescents must be investigated.

*Prevalence of meeting screen-time guidelines*

A low percentage of Kuwaiti adolescents (total sample: 21%) met screen-time guidelines (TV viewing plus non-active videogames plus computer use <2 hours/day). Based solely in time spent watching TV, the proportion of adolescents watching less than 120 minutes/day increased (total sample: 59%), being higher than previous data published in USA[20] (~40%) or Brazil[21] (~30%). In agreement with data from Westernized European countries[22], we found marked differences between sexes by types of sedentary behaviour, with boys spending more time with videogames whereas girls more time in academic related behaviours (reading, homeworks). Our results (girls reported more time watching TV than boys) agree with the Arab Teens Lifestyle Study conducted in Kuwait in 2009[5], where girls also reported a higher time watching TV.

*Associations between socioeconomic status with physical activity and sedentary behaviours*

Maternal education was associated with exceeding screen-time guidelines. Our data obtained in Kuwait (a rich country) are in agreement with the conclusions of a recent systematic review about socioeconomic correlates of sedentary behaviour in adolescens[11]. In high-income countries a strong and consistent inverse association between SES and total screen time and TV time was found[11]. Despite the role of mothers may vary given societal and cultural differences among rich countries, the inverse association observed in Kuwait between maternal education and TV

time is identical to prior data reported in the literature. Nevertheless, paternal education was not associated with sedentary behaviours. Regarding physical activity, maternal and paternal education were not associated with meeting PA guidelines, in agreement with a pooled observational study that included 10 studies from Europe, Australia, Brazil and the USA[10]. In other words, the dramatic low PA levels found in this sample of adolescents suggest that recent changes in wealthy countries, such as wide-use of technology in leisure time and motorized transport, have eroded physical activity levels across all social strata, age groups and countries.

*Strengths and limitations*

This is the first study conducted in Kuwaiti adolescents using an objective method of PA measurement, as well as the association with a proxy of SES (parental education). An additional strength was the use of well-established cut-points (Evenson)[14] to define the time spent at various PA intensities which may allow comparison with other large international pooled studies[10,18]. As limitations, the type of accelerometer used in this study (Actigraph GT1M) have a set of well-known methodological limitations. For example, they inaccurately record upper arms movements or physical activity when cycling[23]. However, due to the predominant use of motorised transport in Kuwait (in our study 90% of adolescents used cars for commuting to school) it can be rule out a general PA underestimation. In addition, Actigraph monitors misclassify time spent in standing as sedentary, which is not sedentary behaviour[24]. Finally, the current study was conducted in three out of six governorates in Kuwait, which may limit the generalizability of our findings for the whole population of Kuwaiti adolescents. From a public health perspective, a high parental education was not advantageous in terms of increase the probability to become physically active. The low number of subjects meeting PA recommendations in this study (n=12) could partially account for the lack of associations found. However, null associations were also found when we defined the active group as doing a minimum of 30 daily minutes of MVPA (Table 4).

In conclusion, in our sample of Kuwaiti adolescents almost all the adolescents were physically inactive, and exceeded screen-time guidelines. PA was not socially patterned, yet for screen-time behaviours, association with maternal education emerged. As a physical inactivity pandemic is affecting Kuwait, population-wide strategies (i.e., promote active ways of transport) should be implemented to boost physical activity in the population.

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Table 1. Characteristics of participants in the Study of Health and Activity among Adolescents in Kuwait (SHAAK)

| | | Boys (n=201) | Girls (n=234) |
|---|---|---|---|
| Age (year) | | 15.9 (14.7-17.3) | 16.0 (14.6-17.6) |
| Height (cm) | | 169.0 (168.0-171.0)*** | 156.0 (155.0-157.0) |
| Weight (kg) | | 70.8 (58.9-91.3)*** | 58.4 (46.1-67.5) |
| BMI (kg $m^{-2}$) | | 24.4 (20.6-30.8)** | 23.3 (19.1-26.9) |
| Waist circumference (cm) | | 84.0 (72.0-97.1)*** | 77.0 (67.6-84.5) |
| Maternal education level (n, %) | Low[1] | 15 (7.5) | 25 (10.7) |
| | Medium[2] | 27 (13.4) | 35 (15.0) |
| | High[3] | 159 (79.1) | 174 (74.4) |
| Paternal education level (n, %) | Low[1] | 31 (15.4) | 26 (11.1) |
| | Medium[2] | 40 (19.9) | 45 (19.2) |
| | High[3] | 130 (64.7) | 163 (69.7) |
| Number of cars (n, %) | Low[#] | 20 (10.0) | 41 (17.5)* |
| | High[§] | 181 (90.0) | 193 (82.5) |
| Smoking (currently Yes) (n, %) | | 25 (12.4)*** | 2 (0.9) |
| Soft-drinks (frequency) (n, %) | Low^ | 96 (47.8) | 120 (51.3) |
| | High~ | 105 (52.2) | 114 (48.7) |
| Sleep weekdays (hours/day) | | 7.5 (6.2-8.1) | 7.5 (6.3-8.5) |
| Sleep weekend (hours/day) | | 9.0 (8.0-10.0)*** | 10.0 (9.0-10.5) |

Continuous variables are shown as median (interquartile range) according to their distribution. n= number of participants. For categorical variables, n and percentages are shown. Education level: [1]Low, read and write, intermediate (Grades 7-9); [2]Medium, secondary (Grades 10-12); [3]High, at least University degree. Number of cars: [#]Low, up to 2 cars. [§]High, at least 3 cars. Soft drinks: ^Low, less than 1 drink per day; ~High, at least 1 drink per day. P-values for sex differences using Mann-Whitney U Test (non-parametric) or Chi-Square Test (categorical): * ≤0.05; **≤0.01; ***≤0.001. The p value refers to the overall result of the Chi-Square Test describing the associations of number of cars and sex

309 Table 2. Self-reported physical activity and sedentary behaviours in adolescents:
310 the Study of Health and Activity among Adolescents in Kuwait (SHAAK study)

| *Physical activity domain* | Boys n=201 | Girls n=234 | Total n=435 |
|---|---|---|---|
| Transport to school | | | |
| Car (n, %) | 164 (81.6) | 217 (92.7)*** | 381 (87.6) |
| Bus (n, %) | 0 (0) | 16 (6.8) | 16 (3.7) |
| Walking (n, %) | 35 (17.4) | 1 (0.4) | 36 (8.3) |
| Other (n, %) | 2 (1.0) | 0 (0.0) | 2 (0.5) |
| PA first school break | | | |
| Sitting (n, %) | 84 (41.8)* | 82 (35.0) | 166 (38.2) |
| Standing and/or walking (n, %) | 106 (52.7) | 147 (62.8) | 253 (58.2) |
| Running and/or playing (n, %) | 11 (5.5) | 5 (2.1) | 16 (3.7) |
| PA second school break (n, %) | | | |
| Sitting (n, %) | 103 (51.8)*** | 83 (35.5) | 186 (43.0) |
| Standing and/or walking (n, %) | 92 (45.8) | 147 (62.8) | 239 (55.2) |
| Running and/or playing (n, %) | 4 (2.0) | 4 (1.7) | 8 (1.8) |
| Leisure PA school days | | | |
| Never (n, %) | 33 (16.5) | 67 (28.8) | 100 (23.1) |
| Once per week (n, %) | 33 (16.5) | 43 (18.5) | 76 (17.5) |
| Twice per week (n, %) | 50 (25.0) | 83 (35.6) | 133 (30.7) |
| Three times or more (n, %) | 84 (42.2)*** | 40 (17.2) | 124 (28.6) |
| Leisure PA weekend days | | | |
| Never (n, %) | 67 (33.7) | 128 (55.2) | 195 (45.2) |
| Once per week (n, %) | 67 (33.7) | 53 (22.8) | 120 (27.8) |
| Twice per week (n, %) | 65 (32.7)*** | 51 (22.0) | 116 (26.9) |
| *Leisure time Sedentary behaviour* | | | |
| TV viewing | | | |
| None (n, %) | 33 (16.4) | 16 (6.8) | 49 (11.3) |
| 1-2 hours (n, %) | 116 (57.7) | 90 (38.5) | 206 (47.4) |
| 2-3 hours (n, %) | 25 (12.4) | 70 (29.9) | 95 (21.8) |
| +3 hours (n, %) | 27 (13.4) | 58 (24.8)*** | 85 (19.5) |
| Videogames-non active | | | |
| Nothing (n, %) | 89 (44.3) | 145 (62) | 234 (53.8) |
| 1-2 hours (n, %) | 66 (32.8) | 66 (28.2) | 132 (30.3) |
| 2-3 hours (n, %) | 27 (13.4) | 14 (6.0) | 41 (9.4) |
| +3 hours (n, %) | 19 (9.5)*** | 9 (3.8) | 28 (6.4) |
| Videogames-active | | | |
| Nothing (n, %) | 151 (75.1) | 161 (68.8) | 312 (71.7) |
| 1-2 hours (n, %) | 35 (17.4) | 49 (20.9) | 84 (19.3) |
| 2-3 hours (n, %) | 8 (4.0) | 18 (7.7) | 26 (6.0) |
| +3 hours (n, %) | 7 (3.5) | 6 (2.6) | 13 (3.0) |
| Computer use | | | |
| Nothing (n, %) | 102 (51.3) | 80 (34.5) | 182 (42.2) |
| 1-2 hours (n, %) | 72 (36.2) | 106 (45.7)** | 178 (41.3) |
| 2-3 hours (n, %) | 12 (6.0) | 31 (13.4) | 43 (10.0) |

| | | | |
|---|---|---|---|
| +3 hours (n, %) | 13 (6.5) | 15 (6.5) | 28 (6.5) |
| Social networks | | | |
| Nothing (n, %) | 44 (21.9) | 45 (19.5) | 89 (20.6) |
| 1-2 hours (n, %) | 77 (38.3) | 83 (35.9) | 160 (37.0) |
| 2-3 hours (n, %) | 35 (17.4) | 41 (17.7) | 76 (17.6) |
| +3 hours (n, %) | 45 (22.4) | 62 (26.8) | 107 (24.8) |
| Homework | | | |
| Nothing (n, %) | 44 (21.9) | 12 (5.2) | 56 (12.9) |
| 1-2 hours (n, %) | 110 (54.7) | 97 (41.6) | 207 (47.7) |
| 2-3 hours (n, %) | 28 (13.9) | 69 (29.6) | 97 (22.4) |
| +3 hours (n, %) | 19 (9.5) | 55 (23.6)*** | 74 (17.1) |
| Reading | | | |
| Nothing (n, %) | 151 (75.1) | 130 (56.5) | 281 (65.2) |
| 1-2 hours (n, %) | 42 (20.9) | 72 (31.3) | 114 (26.5) |
| 2-3 hours (n, %) | 8 (4.0) | 25 (10.9) | 33 (7.7) |
| +3 hours (n, %) | 0 (0.0) | 3 (1.3)*** | 3 (0.7) |
| Meeting screen-time guidelines (n, %) | 51 (25.4)*** | 39 (16.7) | 90 (20.7) |
| Meeting TV-time guidelines (n, %) | 149 (74.1)*** | 106 (45.3) | 255 (58.6) |

PA: Physical activity. Screen-time guidelines based on <2 hours per day of television viewing or/and computer use or/and non-active videogames[14] P-values (two sided) for sex differences: * ≤0.05; **≤0.01; ***≤0.001 using Chi Square Test. The p value refers to the overall result of the chi-square with the asterisk indicating the sex with higher value. Data are number of participants (n) and percentage (%).

Table 3. Objectively measured physical activity in adolescents: the Study of Health and Activity among Adolescents in Kuwait (SHAAK study)

| *PA intensity level* | Boys (n=162) | Girls (n=189) | Total (n=351) |
|---|---|---|---|
| Sedentary (min/day) x±sd | 500.0 ± 102.0 | 568.2 ± 111.6*** | 536.7 ± 112.4 |
| Median (IR) | 492.2 (431.4-565.4) | 567.3 (489.7-635.0) | 532.7 (456.7-610.1) |
| Light (min/day) | 306.7 (244.7-370.8)** | 262.0 (220.0-323.9) | 276.00 (229.5-347.0) |
| Moderate (min/day) | 16.1 (9.0-26.9)*** | 8.2 (4.4-14.7) | 12.0 (5.8-20.0) |
| Vigorous (min/day) | 1.7 (0.5-4.5)*** | 0.67 (0.0-1.9) | 1.00 (0.2-3.0) |
| Moderate to Vigorous (min/day) | 19.0 (10.4-30.6)*** | 8.7 (4.8-16.7) | 13.71 (6.2-23.0) |
| Meeting PA guidelines (n, %) | 9 (5.6)* | 3 (1.6) | 12 (3.4) |

Data are median (interquartile range, IR) or mean (± standard deviation) according to the distribution of the variables using Evenson cut points[12]. One valid day was considered if adolescents wore at least ten hours of wearing time. PA guidelines based on ≥60 minutes per day of moderate to vigorous PA[13]. P-values (two sided): * ≤0.05; **≤0.01; ***≤0.001 using non-parametric tests, t-test and Chi-square test. PA: Physical activity.

Table 4. Odds ratio and 95% confidence intervals for not meeting screen time guidelines, being physically inactive or sedentary by maternal and paternal education: the Study of Health and Activity among Adolescents in Kuwait (SHAAK study)

| | *Screen time (≥ 2hours/day)* | *TV viewing (≥ 2hours/day)* | *Sedentary (Third quartile)* | *Physically inactive (accelerometry)* | *Physically inactive alternative definition (accelerometry)* |
|---|---|---|---|---|---|
| | Total (n=433) | Total (n=433) | Total (n=350) | Total (n=350) | Total (n=350) |
| Maternal education | OR 95% CI | OR 95% CI | OR 95% CI | OR 95% CI | OR 95% CI |
| High[§] | 1 | 1 | 1 | 1 | 1 |
| Low/Medium[#] | 2.09 (1.09-4.02) | 1.88 (1.15-3.07) | 1.05 (0.60-1.85) | 1.88 (0.39-9.00) | 0.57 (0.28-1.15) |
| P-value | 0.03 | 0.01 | 0.87 | 0.43 | 0.12 |
| Paternal education | OR 95% CI | OR 95% CI | OR 95% CI | OR 95% CI | OR 95% CI |
| High[§] | 1 | 1 | 1 | 1 | 1 |
| Low/Medium[#] | 1.19 (0.71-2.03) | 1.34 (0.86-2.09) | 0.94 (0.55-1.59) | 1.81 (0.47-7.05) | 0.81 (0.45-1.47) |
| P-value | 0.50 | 0.19 | 0.81 | 0.39 | 0.49 |

Model adjusted model by age, sex and governorate. Screen-time guidelines based on <2 hours per day of television viewing or/and computer use or/and non-active videogames (reference). Physical activity guidelines: at least 60 daily minutes of moderate to vigorous PA. Alternative definition: at least 30 daily minutes of moderate to vigorous PA. [#]Low/Medium education level: read and write, intermediate, secondary level; [§]High education as having at least University studies. OR, odds ratio, CI, confidence intervals.