Screen Time and Physical Activity in Youth: Thief of Time or Lifestyle Choice?

Gavin R.H. Sandercock, Ayodele Ogunleye, and Christine Voss

Background: This study aimed to examine the relationship between screen time and physical activity (PA) in children and adolescents but also to determine specific elements of PA that were most closely associated with screen time. Methods: We studied a cross-sectional sample of 6176 10.0–15.9 year olds (53% boys, 12.9 ± 1.5 years) who completed the Physical Activity Questionnaire for Children/Adolescents and reported daily screen time. Differences in total PA and specific elements of PA were examined between groups reporting: < 2 h, 2–4 h, and > 4 h daily screen time. Results: There were significant differences between screen time groups in: total PA, number of bouts of PA reported, after school PA, evening PA and weekend PA (P < .0001). There was a graded, negative association between higher screen time and lower free-time PA. Participants reporting < 2 h screen time were also significantly more active during school lunch breaks than those reporting > 2 h. Boys reporting > 4 h screen time were less active during physical education lessons. Conclusions: Screen time is significantly and negatively associated with PA in British youth. Screen time may displace active pursuits out of school but is also associated with lower PA during school. Daily screen time should be limited to < 2 h in line with current recommendations.

Keywords: adolescent, public health, pediatrics

Guidelines suggest children and adolescents accumulate 60 min of moderate-to-vigorous physical activity (PA) and spend no more than 2 hours engaging with small screen media (screen time) daily. Failure to adhere to both of these guidelines presents a 3 to 4 times greater risk of obesity.

A simple negative correlation between screen time and PA is intuitive and some evidence that screen time displaces active pursuits exists. Screen time and PA are interrelated, but also independently predictive of poor metabolic health suggesting they may be separate entities or constructs. Data from ‘inactive physiology’ studies suggest sitting time has a deleterious effect on adults’ metabolic health regardless of whether they are active enough to meet current PA guidelines.

Through meta-analysis, Marshall et al found only a weak negative association between TV viewing and physical activity. Biddle et al found TV to be a poor predictor of overall sedentary behavior and recommend that the study of sedentary behavior should encompass a wide range of behaviors as possible. Children and adolescents report a multitude of sedentary behaviors some of which are clearly necessary and should not be discouraged (hobbies, talking with friends, homework).

However, much of (particularly adolescents’) sedentary time involves the use of small screen media including video gaming and personal computer use, with television viewing being the dominant activity.

Television viewing has remained relatively stable for several decades, but recent evidence suggests increases in children’s use of other small screen media such as games consoles and personal computers. Findings are remarkably similar when such activities are included in screen time measures. Meta-analysis of the relationship between PA and elements of screen time show a weak negative relationship similar to that reported for television viewing. Small screen media are fast-changing and research becomes quickly outdated, limiting comparability across studies. Small screen media are a fast-adapting phenomena studies are quickly outdated.

Even in a recent study, however, Melkevik et al found no consistent cross-national association between screen time and physical activity in youth despite a very large sample size (n = 200,615). A reason for the inconsistency in findings within this study and between others may be that PA was assessed by self-report responses to only 2 questions. Vigorous PA was assessed by response to: ‘Over the past 7 days how many days were you physically active for a total of at least 60 minutes?’ Moderate PA was assessed by asking: ‘Outside school hours, how
many hours per week do you usually exercise so much that you get out of breath or sweat?’

Throughout the literature, definitions of PA are heterogeneous and a relatively small number of studies have used well-validated assessment tools. The PA of children and adolescents can vary greatly by type (play, exercise, sports), location (school, clubs, alone) and timing (during school, after school, evenings, weekends) yet the literature is often limited to reporting associations between screen time and total measures of PA. Information regarding associations between screen-time and differing elements of PA may help guide formulation of national guidelines on screen time and provide input to interventions designed to increase PA.

This study aimed to assess the association between screen time and PA measured using a well-validated instrument. In addition to assessing total PA, we also assessed the associations between screen time and the following elements: variety of sports and activities, activity after school, evening activity, and activity at the weekend. To determine if screen time does more than simply displace active pursuits, we also aimed to determine if screen time was associated with in-school physical activities: physical education (PE) and activity at lunchtime.

**Methods**

After ethical approval by the university board, we recruited 6176 10.0–15.9 year olds from a structured convenience sample of 23 schools from 2007–2009. All data collection was performed between May and October to reduce potential seasonal effects as much as possible. We sent letters to schools in the region inviting them to participate and selected a representative mix of volunteer schools to take part in the study. Only state-run, comprehensive schools were sampled. The sample population was representative of the east of England in terms of rural (30%) or urban location (70%) and area deprivation.15 In England as a whole, 80% of the population lives in urban areas whereas the east has more rural areas. The East of England itself is also relatively affluent lives in urban areas whereas the east has more rural areas. The East of England itself is also relatively affluent.15

**Statistical Analysis**

Differences in the frequency of boys and girls in each screen time group were assessed using \( \chi^2 \) analysis. Between-sex differences in PA were assessed using independent t tests. Age showed a negative linear relationship \( (r = .13) \) with PA and was used as a covariate in all further analyses. Deprivation assessed from postcode,15 self-reported mode of travel to school23 and ethnicity were investigated as potential covariates but none met assumptions underlying inclusion in analysis. The intracluster correlation coefficient was determined for each PA measure. These values were generally low \( (r = 0.01–0.06) \) but we corrected for clustering by entering cluster (school) as a random factor. Two-way (sex by
screen time group) analysis of covariance was performed with post hoc (Bonferroni) analysis to determine differences in PA between participants reporting < 2 h, 2–4 h, and > 4 h daily screen time. All analyses were performed using SPSS version 16.0.

Results

The mean age of the sample was 12.9 (±1.5) years and 53% were boys. The ethnic mix broadly represented that of the UK with 93% self-classifying as White-British with Black (3%) and Asian (2%) minorities represented accordingly. The remaining 2% comprised a mixture of Chinese and those who self-classified as ‘Other.’

The majority of participants reported daily screen time of < 2 h (Table 1) and the mean screen time reported was 151 ± 92 minutes per day in boys and 140 ± 89 in girls. The modal category for screen time was < 2 h in both sexes. Boys were significantly more likely to report 2–4 h (P < .05) or > 4 h (P < .001) screen time than girls. Total PA (from composite PAQ score) was lower in girls than in boys. This was also the case between each comparable screen time group.

Between-Group Differences in PA According to Screen Time Groups

Total PA differed significantly between screen time groups in boys (F = 60.2, P < .001) and girls (F = 50.4, P < .001). Post hoc (Bonferroni) tests of estimated marginal means showed significant, progressively lower values for PA in higher screen time groups for both sexes (Table 1).

Two-way (screen time by sex) analysis of covariance was performed for individual PAQ elements; results are shown in Tables 2 and 3. All PAQ elements showed significant main effects for screen time and sex but none showed significant sex by screen time interactions. Therefore, only screen time main effects and post hoc analyses of marginal means are reported. These results are split into 2 groups as follows: Sports and activity participation and out of school activities are shown in Table 2; PA during school time is shown in Table 3. Effect sizes (Cohen’s d) are also shown in Figures 1a and b for comparison with previous studies.

Sports and Activity Participation and Out of School Activities

Frequency and variety of participation in sports and activities was significantly different between screen time groups. Post hoc analysis of estimated marginal means (Bonferroni) revealed that in boys, all groups differed significantly from one another (P < .01). Boys with < 2 h screen time were more active than those with either 2–4 h (d = 0.12) or > 4 h (d = 0.28). Compared with girls reporting < 2 h screen time, sports and activity participation was also lower in those reporting either 2–4 h (d = 0.28) or > 4 h (d = 0.32) daily screen time.

Table 2 shows that boys with < 2 h screen time were more active after school than those reporting 2–4 h (d = 0.1) or > 4 h (d = 0.42) and there was a smaller but similar differences between girls with < 2 h and those reporting 2–4 h (d = 0.1) or > 4 h (d = 0.47). Similar between-group differences and effect sizes were evident for boys’ and girls’ evening activities. Boys with < 2 h daily screen time were more active than those with 2–4 h (d = 0.17) or > 4 h (d = 0.46). Girls with < 2 h screen time were also more active in the evenings than those reporting either 2–4 h (d = 0.18) or > 4 h (d = 0.3). A similar pattern was evident at weekends in both sexes.

Physical Activity Within School

Lastly, there were differences in reported PA during school lunch, where boys who reported < 2 h screen time were more active than those with both 2–4 h (d = 0.18) and > 4 h (d = 0.27). Similarly, girls reporting < 2 h screen time were more active during school lunch times than their peers reporting > 4 h (d = 0.33). Boys with 2–4 h and > 4 h screen time were less active during PE classes than those reporting < 2 h, but there were no such differences in girls.

Discussion

Despite the intuitive theory that sedentary, screen-based behaviors displace physically active ones, the existing literature does not consistently support this hypothesis. The aim of this study was to assess the relationship between habitual screen time and physical activity in English youth and to further examine how different elements of PA are associated with screen time. Like others we found a negative association between

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Frequency of Screen Time Categories and Physical Activity Levels by Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Boys</td>
<td></td>
</tr>
<tr>
<td>&lt; 2 hours</td>
<td>61.8</td>
</tr>
<tr>
<td>2–4 hours</td>
<td>24.6***</td>
</tr>
<tr>
<td>&gt; 4 hours</td>
<td>13.6***</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
</tr>
<tr>
<td>&lt; 2 hours</td>
<td>67.8</td>
</tr>
<tr>
<td>2–4 hours</td>
<td>22.3</td>
</tr>
<tr>
<td>&gt; 4 hours</td>
<td>9.9</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* Significantly (P < .001) different from all other same sex screen time groups (P < .0167 required after Bonferroni correction).
** Significantly (P < .001) different from same screen time group of opposite sex (t test).
*** Significantly (P < .001) greater frequency reported than girls (χ²).
Table 2 Differences in sports participation and Out of School Physical Activity According to Self-Reported Daily Screen Time

<table>
<thead>
<tr>
<th>Screen time</th>
<th>&lt; 2 hours</th>
<th></th>
<th>2–4 hours</th>
<th></th>
<th>&gt; 4 hours</th>
<th></th>
<th>ANOVA (F = )</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports participation</td>
<td>All</td>
<td></td>
<td>32.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>1.72 .434</td>
<td>1.65* .379</td>
<td></td>
<td>1.60** .435</td>
<td></td>
<td>18.2</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>1.64 .396</td>
<td>1.55* .354</td>
<td></td>
<td>1.52* .368</td>
<td></td>
<td>13.8</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>0.57</td>
<td>= 0.561</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After school</td>
<td>All</td>
<td></td>
<td>57.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>3.12 1.27</td>
<td>2.98* 1.31</td>
<td></td>
<td>2.57** 1.44</td>
<td></td>
<td>32.8</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>2.81 1.24</td>
<td>2.62* 1.23</td>
<td></td>
<td>2.25** 1.16</td>
<td></td>
<td>25.1</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>0.174</td>
<td>= 0.884</td>
<td></td>
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<tr>
<td>Evening activity</td>
<td>All</td>
<td></td>
<td>68.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>2.95 1.16</td>
<td>2.83* 1.18</td>
<td></td>
<td>2.38** 1.27</td>
<td></td>
<td>43.9</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>2.72 1.12</td>
<td>2.52* 1.12</td>
<td></td>
<td>2.22** 1.15</td>
<td></td>
<td>27.3</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>1.10</td>
<td>= 0.132</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Weekend activity</td>
<td>All</td>
<td></td>
<td>48.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>3.13 1.09</td>
<td>2.93* 1.09</td>
<td></td>
<td>2.71** 1.24</td>
<td></td>
<td>27.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>2.83 1.03</td>
<td>2.64* 1.03</td>
<td></td>
<td>2.37** 1.05</td>
<td></td>
<td>21.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>0.01</td>
<td>= 0.993</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Note. Sports participation scored as the rank of reported bouts divided by the total number of potentially reported activities (n = 22). All other PA scores are ranked on a Likert scale 1–5; 1 being least active and 5 being most active. Interaction refers to screen time by sex interaction effect for ANOVA.
* Significantly different from <2 hours.
** Significantly different from <2 hours and 2–4 hours.

Table 3 Differences in Physical Activity Performed at School According to Self-Reported Daily Screen Time

<table>
<thead>
<tr>
<th>Screen time</th>
<th>&lt; 2 hours</th>
<th></th>
<th>2–4 hours</th>
<th></th>
<th>&gt; 4 hours</th>
<th></th>
<th>ANOVA (F = )</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity during PE</td>
<td>All</td>
<td></td>
<td>4.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>= 0.009</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>4.01 .917</td>
<td>3.99 .868</td>
<td></td>
<td>3.80** 1.056</td>
<td></td>
<td>8.13</td>
<td>&lt; 0.001</td>
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<tr>
<td></td>
<td>Girls</td>
<td>3.90 .876</td>
<td>3.87 .833</td>
<td></td>
<td>3.85 .966</td>
<td></td>
<td>0.23</td>
<td>= 0.798</td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>2.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>= 0.085</td>
</tr>
<tr>
<td>Activity at lunch</td>
<td>All</td>
<td></td>
<td>15.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>= 0.001</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>3.31* 1.24</td>
<td>3.18 1.23</td>
<td></td>
<td>2.97 1.30</td>
<td></td>
<td>13.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>2.50* 1.02</td>
<td>2.30 .940</td>
<td></td>
<td>2.28 .992</td>
<td></td>
<td>4.57</td>
<td>= 0.010</td>
</tr>
<tr>
<td></td>
<td>Interaction</td>
<td>3.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>= 0.052</td>
</tr>
</tbody>
</table>

Note. Sports participation scored as the rank of reported bouts divided by the total number of potentially reported activities (n = 22). All other PA scores are ranked on a Likert scale 1–5; 1 being least active and 5 being most active. Interaction refers to screen time by sex interaction effect for ANOVA.
* Significantly different from < 2 hours.
** Significantly different from < 2 hours and 2–4 hours.
time spent on screen-based activities and overall physical activity in youth but also that children with high screen time are less active at all times including within school hours.

Most schoolchildren in the current study (65%) reported less than < 2 h of daily screen time. This figure is similar to that reported in a recent large international sample (59%) and to the value reported in a quantitative review of studies (66%). Like others our questionnaire was categorical and designed specifically to allow comparisons between groups based on screen time. By estimating total daily screen time from the response categories we found lower levels of screen time in boys (151 ± 92 min) and in girls (140 ± 89 min) than previously reported. These values are, however, similar to those from the review of Marshall et al. Recently, Biddle et al.
reported higher (212 min in boys and 177 min in girls) screen time in Scottish youth using ecological momentary assessment. Differences between these values and those of the current study may be methodological but may also represent regional differences as our study was carried out in a more southerly and affluent area (East of England) than Biddle et al.11 (Scotland).

Given the inadequacy of measuring only television viewing in the assessment of sedentary behaviors, the following discussion is largely limited to studies which have used either composite screen time measures or more complex, multifaceted assessments of sedentary behavior. In common with earlier studies of television viewing studies which include multiple sedentary behaviors also, however, show only modest associations with PA.10

We found that overall levels of PA were sequentially lower in each of the 3 daily screen time groups: < 2 h, 2–4 h, or > 4 h. The American Association of Pediatrics1 describes the latter 2 categories as high (2–4 h) and heavy (> 4 h) users. The effect size for differences between the < 2 and 2–4 h groups was small (d = 0.2) and broadly similar to that reported for video gaming (0.17) and higher than that for television viewing (0.11) in a previous meta-analysis.10 The effect size between the lowest (< 2 h) and highest (> 4 h) groups is, however, well in excess of these values (d = 0.78) the difference in PA between these groups is large and likely to be of clinical importance.

The present data show a clear dose-response relationship, the reasons for such large effect sizes compared with other studies may be the PA assessment methodology which is more detailed than some studies which report particularly small effect sizes.14 Overall, these data support the displacement hypothesis and add to the existing literature by suggesting a significant dose-response relationship exists. Such a relationship has previously been shown between total PA and television viewing21,22 but we believe this is the first time it has been demonstrated with a composite screen-time measure. These data suggest that heavy users of screen-based media may be a potential target for interventions designed to increase PA. Practical interventions such as limiting TV viewing time via electronic timers appear effective in increasing children’s PA in the short-term.27 Such a large-scale problem might benefit more from interventions aimed at policy level such as educating parents regarding the risks of screen time in a manner similar to those used to promote PA.

Screen Time and Elements of Physical Activity

An advantage of the PAQ-A/C is that it is a multifaceted questionnaire6–8,18,20 comprising 5 general categories of PA: sports and activity participation, activity at school lunch time, during PE, after school, in the evenings, at weekends. We were able, therefore, to investigate the particular elements of our sample’s overall PA levels which were most strongly associated with screen time.

Figures 1a and 1b show effect sizes for differences between screen time groups in all categories of PA. In boys, there was a dose-response relationship between screen time and sports participation but this was less evident in girls. Effect sizes were small to moderate but these findings suggest that screen time impacts the total number of bouts of activity engaged in, but whether this is due to less variety of pursuits or fewer bouts representing an equal number of activities cannot be determined from these data.

The displacement hypothesis predicts that measures of PA which takes place out of school would be most greatly impacted, but that activity during school should be similar between screen time groups. Television viewing remains the dominant sedentary behavior in British youth11 and shows 2 distinct peaks; a smaller one in the after school period 4–6 PM and a larger one during centered around 9 PM.13 As expected, effect sizes for differences in PA between screen-time groups were largest after school and in the evenings. In both sexes, there were small to moderate effect sizes (Figure 1a 1b) and clear support for a negative association between PA and screen time. In common with previous data21,22 the > 4 h group reported the lowest after school and evening PA. Biddle et al.13 found that physical activity peaks in the early evening, and their findings of high screen time in this period and the large between group differences in the current study strongly suggest that screen time displaces physical activity although true direction of causality cannot be inferred from such data.

We found an equally pronounced negative association between weekend PA and screen time in girls. In boys, however, only heavy users (< 4 h) were significantly less active than those reporting less screen time. For simplicity, our measure of screen-time did not differentiate between weekend and weekday behavior which may be a weakness in our data. Screen time during these 2 periods appears to be related but patterns are different.13 The between-sex differences in the screen time / weekend PA relationship may be due the higher overall levels and greater variance in PA reported by boys. Alternatively, it may show true between-sex difference suggesting male heavy users as a good target for interventions to increase weekend PA.

Screen Time and PA at School

As well as displacing more physically active pursuits, it may also be that screen time is indirectly associated with lower PA at other times via habit, opportunity or choice. In this study and others, screen time is used and interpreted as a proxy measure of sedentary behavior; high screen time may, therefore, be indicative of other sedentary behavior choices. For an analogy, it is known that children who use motorized transport to school are less active during break and lunch times despite equal opportunities of PA.23,28 These are the first data to suggest that high levels of screen time are associated with lower PA during school. We assume that television was not available during school time but this may reflect use of portable media (mobile phones), educational or
recreational PC use of school facilities which are sometimes available.

Heavy screen-time users are missing out on opportunities for volitional PA during school breaks, a potentially important opportunity for all schoolchildren to attaining at least a portion of their recommended daily PA in a safe environment.29 Perhaps even more worrying is that boys reporting heavy screen time use also reported less PA during PE. Physical education classes were statutory for our participants as they are for all English schoolchildren up to 16 years. The PAQ question asks participants to rate how often they were very active during PE. The lower rating of PA in the > 4 h group might represent lower effort during PE classes or avoidance of the lesson or its content. Motor skill proficiency, which is often developed during school PE, can predict children’s PA.30 It may be that those reporting high screen time have low motor skill and therefore participate or engage less in PE classes. The direction of causality between screen time, PA, and motor skill may warrant further examination.

Conclusions

The results of this study suggest that screen time is significantly and negatively associated with PA in youth. As expected, it seems screen time displaces activity mostly in the evenings, after school and at the weekend. Further to the simple displacement of active pursuits, these data show for the first time, that high screen time is associated with lower PA during school breaks and even during PE. This is despite the fact that there is no access to screen-based media at these times.

Study Limitations and Future Research

Since we used self-reported PA in our sample, recall bias is an obvious potential weakness but we feel that the mix of quantitative (bouts of activity) and qualitative (number of sports) data afforded by our chosen assessment tool outweigh this limitation. To date, only 1 similar study has used objective PA monitoring31 and further large-scale studies are an obvious future recommendation. Our chosen measure (PAQ-A) does not allow us to estimate energy expenditure or the intensity of exercise undertaken. This dose-response relationship observed here should, therefore, be interpreted with caution.

For simplicity and comparability14 we did not differentiate between weekend and weekday screen time. Our measure of screen time was also a usual measure whereas our PA assessment period was specific (the last 7 days). Weekend and weekday screen time differ but patterns of use are well-related. We did not intend to gain an all-encompassing overview of our sample’s sedentary behaviors, but only to gain insight into screen time as a proxy for these behaviors. We did not, for example assess the use of motorized transport which comprises a significant element of sedentary behavior in both sexes.12,13

Our composite measure of screen time does not allow us to determine which media took up most of our sample’s time. This makes comparisons with previous studies of TV viewing difficult and may be important due to the significant between-sex differences in media use.12 Television viewing dominates the sedentary activities of youth12,13,32 but pursuits such as social networking and multiplayer online gaming which can be very time consuming are growing in popularity. The uptake of such activities by children and adolescents should be investigated.

A common paradox is that boys tend to report both higher PA and higher screen time than girls do.12,14,21 This could be for a number of reasons. It may be that PA questionnaires are biased toward male pursuits leading to relative over-reporting. Boys tend to sleep slightly less than girls but it seems more likely that girls under report sedentary time via the instrument used here. For instance, we did not assess time spent doing homework which may or may not be computer-based. In the UK, girls attain higher academic achievement than boys at age 16. Girls report more time spent on homework12 which may represent an important sedentary activity but not a target for reduction. Girls are also more likely to spend time reading than boys and to report talking in groups or on the phone.12 None of these were assessed in the current study. Mobile telephone use, talking, surfing the internet and particularly text messaging are hugely popular sedentary activities for British girls with teenage females sending between 5 and 24 texts a day and making 5 telephone calls at an average duration of 7 min each. Invention and integration of computer-phone media such as Smart Phone applications (Apps) and Twitter mean such estimates are instantly out of date. Such pastimes have not yet been studied in relation to PA but may present opportunities to enhance the way we assess sedentary behaviors of young people, particularly females.

Acknowledgments

We would like to thank the schools who volunteered for taking part.

References


