INTRODUCTION

Over the past 30-40 years, general declines in physical activity and physical fitness levels in children and adolescents have been reported globally (Moliner-Urdiales et al., 2010; Tomkinson & Olds, 2007). This development is alarming, as physical activity is significantly associated with numerous health benefits, especially for high-risk youth (e.g., obesity) (Janssen & Leblanc, 2010).

To address the decline in children’s and adolescents’ exposure to physical activity from a research standpoint, the first logical step is to assess physical activity levels (PALs) of their daily routines. Following this thought, the most significant daily routine in school-aged youth is spending time in school. In fact, students spend a huge amount of their daytime in school. Furthermore, research has shown that school plays a significant role in kids’ overall physical activity (Stratton, Fairclough, & Ridgers, 2008).

However, to date, PALs of students in German schools are rather unclear. There is only marginal empirical evidence about PALs in German schools according to the use of valid and objective measurement (Kretschmann, 2012). In regard to the importance of physical activity for school students’ daytime in school, the aim of this study was to investigate PALs of German school students during the school day.

Additionally, the students’ way to school (transportation), recess, physical education (PE), and leisure were put into focus, as these day sections are part of the students’ daily routines in and around school as well. The idea of adding this level of detail was to investigate which part of the regular school day and schedule adds the most to the global amount of PALs, thereby also setting the school day PALs in contrast with leisure time PALs, including the weekend.

METHODS

Physical activity was objectively measured via
combined accelerometry and heart rate monitoring, using the physical activity monitoring device ActiHeart (Cambridge Neurotechnology Ltd., Papworth, Cambridge, UK). The ActiHeart device objectively and validly measures PALs (Crouter, Churilla, & Bassett, 2008), and has been validated and proven a feasible instrument in the target population of school-aged children and adolescents (Butte et al., 2010; Corder, Brage, Wareham, & Ekelund, 2007; Slingerland, Oomen, & Borghouts, 2011).

26 ninth grade school students (M=15.28 years, SD=.47) of a German secondary school took part in the study. They wore the Actiheart the whole day for one week, including weekend and except for sleep. All students followed the same school schedule and participated in the same classes.

The ActiHeart device was attached to participants via two ECG electrodes on the chest (Figure 1). The ActiHearts were set to record heart rate in short-term recording mode continuously over 30-seconds epochs. Recorded data was analyzed using ActiHeart software (Version 4.032, Cambridge Neurotechnology Ltd., Papworth, Cambridge, UK).

**RESULTS**

Table 1. PALs (MET) for time spend in school (school time), way to school (transportation), class time, recess time, leisure time, school week, and weekend

<table>
<thead>
<tr>
<th>Activity category</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time spend in school (school time)</td>
<td>1.68&lt;sub&gt;a&lt;/sub&gt;</td>
<td>.2</td>
</tr>
<tr>
<td>Way to school (transportation)</td>
<td>2.8&lt;sub&gt;a&lt;/sub&gt;</td>
<td>.49</td>
</tr>
<tr>
<td>Recess time</td>
<td>2.4&lt;sub&gt;b&lt;/sub&gt;</td>
<td>.36</td>
</tr>
<tr>
<td>Class time</td>
<td>1.94</td>
<td>.17</td>
</tr>
<tr>
<td>Leisure time</td>
<td>1.86&lt;sub&gt;c&lt;/sub&gt;</td>
<td>.21</td>
</tr>
<tr>
<td>School week</td>
<td>1.7&lt;sub&gt;c&lt;/sub&gt;</td>
<td>.28</td>
</tr>
<tr>
<td>Weekend</td>
<td>1.58&lt;sub&gt;b&lt;/sub&gt;</td>
<td>.17</td>
</tr>
</tbody>
</table>

Note. N=26. Means with same subscripts are significantly different at the p<.01. Means with same superscripts are significantly different at the p<.05.

The way to school (transportation) significantly (p<.01) adds above-average school time PALs (M= 2.8 MET, SD=.49), although, active transportation was not common for the German sample. However, active transportation did not accumulate higher amounts and levels of physical activity compared to passive transportation.

Students showed significantly (p<.01) higher
amounts of physical activity during recess time ($M=2.4, SD=.36$) as compared to mere class time ($M=1.58$ MET, $SD=.17$). Leisure time PALs ($M=1.94$ MET, $SD=.17$) were slightly higher compared to school time PALs ($M=1.68, SD=.2$), but do not show a statistically significant difference.

Students showed significantly ($p<.05$) lower PALs during the weekend ($M=1.7$ MET, $SD=.28$) than during the school week from Monday to Friday ($M=1.86$ MET, $SD=.21$). Students’ PALs for time spend in school (school time), school way (transportation), class time, recess time, leisure time, school week, and weekend are shown in Table 1.

According to Total Energy Expenditure (TEE), days with PE lessons ($M=2444$ kcal, $SD=525$) reached significantly ($p<.01$) higher PALs compared to school days without PE ($M=2173, SD=625$) (Figure 2).

Compared to the report of the Expert Consultation of Human Energy Requirements (ECHER, 2004), the vast majority of the students ($N=21$) showed a moderately to vigorously active lifestyle for the assessed whole week.

CONCLUSION

School as an institution that has a major effect on children’s and adolescents’ lifestyle, including physical activity patterns. It “simply” plays a significantly influencing role in the daily routine of students. It also serves as a main socializing agent and socializing environment, especially in terms of exposure to physical activity.

This study’s results confirm that school is an important source for overall physical activity, thereby providing significant PALs in adolescents. The next step from a research standpoint would be planning and implementing programs that increase the amount of PALs in adolescents. The next important source for overall physical activity, thereby especially in terms of exposure to physical activity.

REFERENCES


Crawlea, M.B. (2003). Validation of the sensewear hr armband for measuring heart rate and energy expenditure. (Bachelor Thesis, Pennsylvania State University, United States)


Correspondence:
Rolf Kretschmann
University of Dortmund
Department of Sports and Sports Science
Otto-Hahn-Str. 3, 44227 Dortmund, Germany
E-mail: rolf.kretschmann@uni-dortmund.de