Secular trends in moderate-to-vigorous physical activity in 32 countries from 2002 to 2010: a cross-national perspective

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Introduction

There are substantial health benefits of regular moderate-to-vigorous physical activity (MVPA) for adolescents.1 International guidelines state that adolescents should participate in at least 60 min of MVPA daily2 and many countries have developed national policies to promote physical activity (PA) among adolescents. Recent reviews on time trends in youth MVPA observe inconsistent findings with no clear declining or increasing patterns for overall PA as well as for specific PA domains.3,4 However, four-fifths of adolescents do not reach the recommended levels of PA.4 Boys are more likely to report at least 60 min of MVPA daily.5 It is important to monitor secular trends in MVPA for public health surveillance purposes as well as to evaluate the effectiveness of national policies and interventions, and to inform future national and international priorities and policies. A cross-national perspective is especially important to shed further light into the overall time patterns of MVPA across different policy and cultural contexts.

This article examines country-specific trends in MVPA from 2002 to 2010 across 32 countries from Europe and North America using data from the Health Behaviour in School-aged Children (HBSC) Study. Since gender differences in PA are widely documented,5 we analysed boys and girls separately.

Methods

HBSC is a self-report, school-based survey conducted every 4 years in many countries across Europe and North America according to the international research protocol.6 This article presents data from the surveys in 2001/2002, 2005/2006 and 2009/2010 (2011 in Israel). Representative samples from 32 participating countries included 479 674 pupils (234 395 boys; 49%) aged 11 years (n = 156 383), 13 years (n = 163 729) and 15 years (n = 159 562). Each country obtained approval to conduct the survey from an ethics review board or a country-specific equivalent regulatory body. Participation was voluntary and consent was sought from school administrators, parents and children as per national human subject requirements. Students’ response rates were more than 70% in all years for almost all national surveys.

Measurement

Physical activity

Young people were asked: ‘Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?’ with possible answers ranging from 0 to 7 days. The question was preceded by a definition of MVPA as ‘any activity that increases your heart rate and makes you get out of breath for some time’. This measure was originally developed by Prochaska7 and intends to give a picture of overall PA in compliance with recent PA guidelines. It thus aims to capture PA in a range of contexts including transportation, recreation and school. Previous studies have shown acceptable reliability and validity,8,9 and the measure has been recommended for brief surveillance purposes.10

Covariates

Age and the Family Affluence Scale (FAS) were included as covariates in our gender-specific analyses. Age was treated as categorical as only 11-, 13- and 15-year olds were included into HBSC. FAS is a measure of the material conditions of the household...
and is used as a proxy indicator of the socioeconomic position. It includes 4 items (i.e., own bedroom, family holidays, vehicle ownership and computer ownership). Responses to the individual items are weighted, summed up and subdivided into three categories for low (0–3), medium (4 and 5) and high (≥6) affluence.

**Statistical analysis**

Data analyses were conducted using the IBM SPSS v. 19 two-step cluster analysis. Descriptive analyses were used to characterize the sample. We evaluated the trends in meeting the recommendations for PA using logistic regression. Meeting the PA recommendation (yes or no) was the dependent variable with survey year (2002, 2006 and 2010) as the independent variable. The significance of a trend was tested by treating the variable survey cycle as categorical in the logistic regression, with 2002 as the reference category. Resulting odds ratios express a change in MVPA per survey cycle. The results are presented separately for boys and girls. We controlled the analyses for age and FAS.

**Results**

Over all survey years taken together, 23.1% of boys and 14.0% of girls reported at least 60 min of MVPA daily (OR/95% CI: 0.536–0.554). Gender differences were significant in most countries across all age groups. A significantly higher frequency of daily MVPA was found among adolescents aged 11 years (23.2%) than those aged 15 years (14.0%; OR/CI: 0.534/0.524–0.544). In addition, we found that adolescents from high affluent families meet PA guidelines more often than adolescents from low affluent families (19.8% vs. 16.3%; OR/CI: 1.187/1.161–1.212).

Table 1 presents the proportions of school-aged children who achieved at least 1 h of MVPA per day by gender and by country. Across the whole sample, there was a slight overall increase between 2002 and 2010 (17.0% and 18.6%, respectively). The most significant increases in MVPA were reported in Finland (boys +11.9%, girls +5.7%). The most significant decreases were reported in Lithuania (boys –11.1%, girls –7.2%).

Among boys, the proportion meeting the current guidelines ranged from 10.7% in Italy to 37.6% in Ireland between 2002 and 2010. MVPA increased significantly among boys in 16 countries (Austria, Belgium, Croatia, Finland, France, Germany, Hungary, Israel, Latvia, Macedonia, Netherlands, Norway, Portugal, Spain and Ukraine). Conversely, nine countries showed a significant decrease (Czech Republic, Denmark, Italy, Lithuania, Russia, Scotland, Slovenia, Switzerland and USA). In the remaining seven countries the levels of MVPA remained stable.

Between 2002 and 2010, the proportion of girls achieving at least 60 min of MVPA a day ranged from 4.5% in France to 27.4% in...
Greenland. Ten countries showed a significant increase (Belgium, Finland, France, Germany, Hungary, Latvia, Macedonia, Spain, Sweden and Ukraine). Eight countries showed a significant decrease (Czech Republic, Denmark, Greenland, Italy, Lithuania, Russia, Scotland and Switzerland). MVPA remained stable in the remaining 14 countries.

For all countries combined, a significant interaction between year and gender was observed whereby girls were slightly less likely to show an increase in MVPA over time (OR [ref boys] = 0.949, 95% CI = 0.913–0.986, P = 0.007).

Discussion

This study of young people from 32 European and North American countries identified a small increase in the proportion of boys and girls aged 11–15 years who meet the current PA recommendations between 2002 and 2010. However, these positive trends were not evident in all countries. While many countries do report increasing (n = 16) or stable levels (n = 7) of PA, the proportion of adolescents achieving 60 min of MVPA daily has decreased in nine countries.

Our findings are similar to recent time trends in other studies of MVPA levels. The nationally representative Youth Risk Behavior Surveillance Surveys from the USA found stable patterns in adolescents for moderate intensity PA from 1999 up to 2005. Another study in the USA found a slight increase in MVPA between 2002 and 2006 among children aged 9–13 years. In contrast, a recent study in the Czech Republic observed declining steps by day measured by pedometers and declining amounts of moderate-intensity PA between 1998 and 2010. Overall, however, there is little evidence of sharp declines over time. In light of increasing car ownership leading to decreases in active transportation and increasing opportunities for sedentary leisure activities, these trends may be considered encouraging. Despite this, the overall levels of PA among adolescents are still low and, in line with many previous studies, decrease with age. Similar concerns over current levels of inactivity among children and adolescents were highlighted by a recent international report on child PA in 15 countries which found that the majority of participating countries scored low on indicators for PA. This highlights a need for continued investment in PA promotion among this age group with a focus on strategies which enable young people to make better use of available community and environmental resources.

In the majority of HBSC countries, similar trends are observed for boys and girls. However, in 11 countries, (Australia, Croatia, Greenland, Israel, Netherlands, Norway, Poland, Portugal, Slovenia, Sweden and USA) diverging gender trends were observed, with more positive trends among boys. Additional analyses for the whole sample showed a significant interaction between year and gender whereby girls were slightly less likely to show an increase in MVPA over time (data not shown).

Findings from our study also show a variation by socioeconomic status (SES), as measured by FAS. Across all countries combined, children with higher FAS scores were more likely to meet the PA recommendations than children with low FAS scores. Despite the inconsistent use of SES and PA measures, other studies have also shown an association between SES and PA among adolescents, with those from higher SES backgrounds more likely to be physically active than those with lower SES.

The strengths of the HBSC study include the size and international nature of the sample. The study is one of the few international adolescent health surveys to employ common measures and survey procedures internationally, facilitating the conduct of robust trend analyses. The limitations of the HBSC study include a repeated cross-sectional design. This in turn limits causal inferences. Measures are self-reported and may be susceptible to recall bias. Finally, the HBSC sampling strategy excluded adolescents in non-classroom settings, which may impact upon the external validity of our findings.

Conclusions

Across Europe and North America, a majority of adolescents do not meet PA recommendations. Despite efforts to promote PA among this age group, we observed only a small increase in the proportion of adolescents aged 11–15 years meeting the recommendations, from 2002 to 2010. Further investment at national and international levels is therefore necessary to increase PA participation among children and adolescents and reduce future health burden associated with inactivity. Further investigation of those HBSC countries showing an increase in PA may help identify effective strategies for PA promotion.

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Conflicts of interest: None declared.

Key points

- Between 2002 and 2010, there was a small overall increase in the proportion of adolescents meeting current PA guidelines in 32 countries across Europe and North America.
- At country level, a positive trend was observed among boys in 16 countries and among girls in 10 countries.
- The majority of adolescents in Europe and North America did not meet current PA recommendations.
- More actions are needed on a local, national and international level to improve PA levels among the adolescent population.

References


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