

Inactivity Physiology—Staying Still, Singaporean Youths Are Not Moving Enough

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THE PHYSICAL INACTIVITY of Singaporean youths was examined using state-of-the-art ambulatory motion sensors (Actitrainer triaxial accelerometers) under free-living conditions on 3 weekdays and 2 weekend days. Participants included 128 male and 116 female adolescents, aged 12–15, from seven secondary schools. Neither boys nor girls met the national and international recommendation to accumulate at least 60 mins of moderate-to-vigorous physical activity (MVPA) on a daily basis for healthy cardiovascular health. Sedentary time over the weekday and weekend accounted for a majority of the accelerometer-monitored time. Step count accumulated in school was 16% greater than outside-of-school time. Under free-living weekday and weekend living conditions, Singaporean youths are not sufficiently engaged in MVPA and if this behaviour becomes entrenched, it may have dire consequences on the future physical and metabolic health of adult Singaporeans.

INTRODUCTION

Previous research on the physical activity of Singaporean adolescents relied on largely self-reported engagement in physical activity and such survey outcomes do not differentiate between weekday and weekend day patterns of physical activity.

There is persuasive evidence that adolescent youths over-report physical activity engagement over a week compared to when objective motion sensors were used to monitor physical activity engagement over the same period of time (Chia, 2008).

KEY IMPLICATIONS

- Measures adopted to ameliorate physical inactivity and to increase physical activity must be multifaceted and targeted, and require a holistic approach.
- These findings should be disseminated to teacher-education institutions and schools to be utilized as evidence-based studies or interventions in sport, physical and health education, exercise physiology and exercise psychology.

Moreover, it is a misconception that physical activity and physical inactivity are similar behavioural constructs. In fact, they are not merely antithetical to each other but are different behavioural constructs. Simply increasing physical activity does not alter the physical inactivity behaviour; and reducing one form of sedentary behaviour often leads to a substitution of another form of sedentary behaviour, which may not necessarily lead to an increase in physical activity behaviour.

Therefore, more research is needed to better understand the complex interplay of the activity–inactivity nexus among Singaporean adolescent youths.

RESEARCH DESIGN

Institutional ethics clearance (DOER 20/09) for the study was granted and participants consisted of 128 male and 116 female adolescents, aged 12–15 from seven secondary schools. Out of these 244 participants, 71.5% were of healthy weight, 14.7% were underweight, and the rest were either overweight (8.9%) or obese (4.9%). This was based on the BMI-for-age for children and adolescents set by the Ministry of Education.

The Triaxial Actitrainer accelerometer manufactured by Actigraph was worn at the hip over a period of 5 consecutive days (3 weekdays and 2 weekend days). It assessed physical inactivity and activity time engaged. Minute-by-minute data (acti-counts and acti-steps) were recorded over at least 9 hrs on the weekday and over at least 5 hrs on the weekend day. Counts per minute for each participant were extracted from the Actitrainer accelerometer using the ActiLife Data Analysis Software (ActiGraph). Daily time spent in various metabolic equivalents (METs) was summed up and categorized using cut-offs by Evenson, Catellier, Gill, Ondrak, & McMurray (2008).

MET is explained as the ratio of the work metabolic rate to the resting metabolic rate. One MET is the rate at which adults burn kcal at rest: This is approximately 1 kcal per kilogram of body weight per hour (expressed as 1 kcal/kg/hr). MET values also are defined as multiples of resting metabolic rate. Resting metabolic rate is explained as the energy expenditure while at rest.

All statistical analyses were performed using the Statistical Package for Social Science (SPSS). Mean difference between weekday and weekend physical

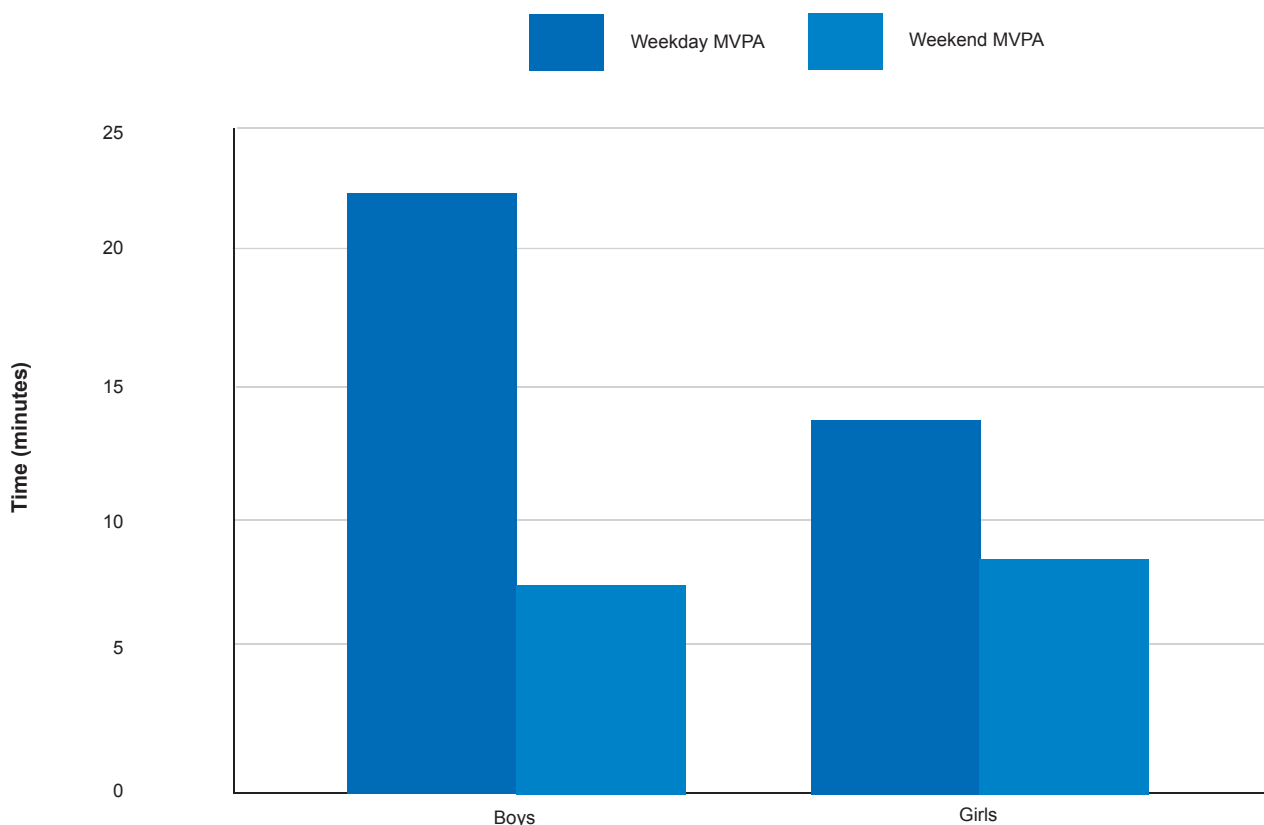


Figure 1. MVPA in minutes of boys and girls on the weekday and on the weekend.

activity (acti-counts and acti-steps) was evaluated using the paired sample *t*-tests. The independent student's *t*-test was used to evaluate between-sex comparisons. Homogeneity of variance between grouped data was established using Levene's test. The level of statistical significance was accepted as $p < 0.05$.

KEY FINDINGS

Accelerometer-determined physical activity under free-living conditions showed that none of the adolescent participants achieved the minimum national and international benchmarks for physical activity engagement set at 60 mins per day.

Male and female adolescents spent significantly more time on weekdays and on weekend days engaged in sedentary activities than engaged in moderate-to-vigorous physical activity (MVPA).

The pooled data of both sexes showed that the average time spent sedentary was more than 15-fold of the time spent engaged in MVPA on weekdays (312.9±109.1 mins versus 18.5±11.1 mins; 95%CI 280.0–308.8 mins, $p < 0.001$). This difference

increased to more than 20-fold on weekends (187.6±154.5 mins versus 7.9±13.3 mins; 95%CI 160.4–198.9 mins, $p < 0.001$).

Overall girls were significantly more 116% more sedentary compared to boys on weekdays and 148% more sedentary than boys on weekend days (see Figure 1). Daily weekday step count amounted to 7824 (pooled data of boys and girls) while weekend step count was 2900.

On weekdays, the total in-school accumulated step count was 16% more than accumulated step count taken outside of school. Sedentary lifestyles are entrenched in adolescent youths in Singapore and time engaged in sedentary activities is 16.9 times more than time spent engaged in MVPA on the weekday. On the weekend, the ratio is increased to 23.5 times (see Figure 2).

IMPLICATIONS

For Practice

Targeted multimodal approaches should be explored to reduce sedentary time among adolescent youths within school, and especially outside of school.

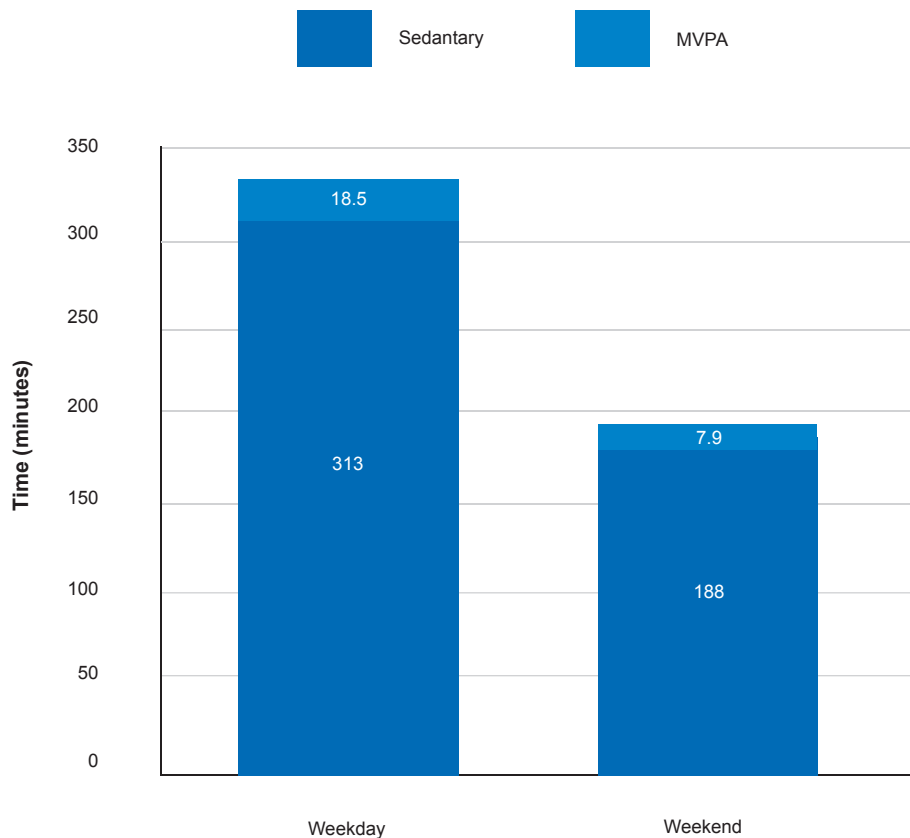


Figure 2. Sedentary time compared to MVPA time of the total number of participants.

Classes can have physical activity breaks between sedentary periods of schooling. Programmes specially tailored to get girls engaged in sport and games should be explored.

Since girls are more sedentary than boys, more effort should be made to engage them in MVPA. Outreach programmes can also be explored to get girls to be more physically active outside of school.

For Teacher Training

These findings should be disseminated to teacher-education institutions, such as the National Institute of Education, and schools so that the data could be utilized as evidence-based studies or interventions in sport, physical and health education, exercise physiology and exercise psychology. This will help affect the syllabus and inform future teachers of the importance of having less sedentary time.

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