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Objectively Measured Physical Activity in Urban Alternative High School Students

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Abstract

Introduction—Alternative high school students are an underserved population of youth at greater risk for poor health behaviors and outcomes. Little is known about their physical activity patterns.

Purpose—The purpose of this study was to describe 1) physical activity levels of students attending alternative high schools (AHS) in St. Paul/Minneapolis, MN and 2) compliance with wearing a physical activity accelerometer.

Methods—Sixty-five students (59% male, 65% <18 years old, 51% African-American, 17% Caucasian, 32% mixed and other) wore an accelerometer during all waking hours for seven days as part of the baseline assessment for a school-based physical activity and dietary behavior intervention. Accelerometer data was reduced to summary variables using a custom software program. Compliance with wearing the accelerometer was assessed by the number of days with ≥ 10 -hours of data. Accelerometer counts/min, and minutes spent in moderate-to-vigorous physical activity (MVPA) were calculated.

Results—Students averaged 323 ± 143.0 counts.min⁻¹ and 51 ± 25.5 min.d⁻¹ of MVPA. Minutes of MVPA.d⁻¹ were greater on weekdays compared to the weekend (52 ± 27.3 vs. 43 ± 39.7 min.d⁻¹, respectively; $p=0.05$). However, students wore the accelerometer less on the weekends (weekdays= 17.2 ± 3.0 , weekend= 14.9 ± 6.8 hrs.d⁻¹). Expressing minutes of MVPA as a percentage of the number of minutes of available data, students spent approximately 5% of their time in MVPA on weekdays and weekends. Forty-five percent of students had 7-days of data, 51% had 4-6 days, and 5% had fewer than four days. On average, students wore the accelerometer for 17 ± 3.2 hrs.d⁻¹ (range 12.0-23.8 hrs.d⁻¹).

Conclusion—Compliance was high (95% of students provided at least four days of data) and physical activity was relatively low representing a vulnerable population in need of further study and intervention.

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Keywords

accelerometer; MVPA; weekday; weekend; compliance

Introduction

Low physical activity and high inactivity are major public health problems in youth (2,19, 25). The decline in physical activity begins in early adolescence and appears more pronounced in females, compared to males (19). Also, low physical activity is more prevalent in certain minority populations, especially African-American and Hispanic youth (2). Further, the prevalence of obesity (11) and type II diabetes (4,6) among adolescents is increasing and there is evidence to suggest that low physical activity levels and high amounts of sedentary behaviour are at least partially responsible (16,21,22). There is also evidence that low-income youth are disproportionately affected by obesity, and that physical inactivity, as well as certain dietary practices contribute to this disparity (17).

Minority and low-income youth are well represented in the nation's alternative high school system. Alternative high schools (AHS) serve students who are at high risk of failing or dropping out of regular high school or have been expelled because of behavioral problems (12). Nationwide, well over one-half million students are enrolled in alternative school programs (10,12). School districts offering alternative programs are more likely than other districts to be urban, have high minority enrollments and high poverty concentrations (12). Compared to youth attending traditional high schools (THS), AHS students report a higher prevalence of a number of health risk behaviors that include substance use, suicidal behaviour, violence-related injuries, sexual behavior, and unhealthy dietary practices (10).

There are also important differences in levels of physical activity among THS and AHS students. Although moderate physical activity levels (walking or bicycling ≥ 30 minutes on 5 of 7 days preceding the survey) are similar for AHS (25%) and THS students (24%), AHS students are significantly less likely (48%) to engage in vigorous physical activity (activities that made them sweat and breathe hard for ≥ 20 minutes on 3 of 7 days preceding the survey) or participate on school and community sports teams (25%) compared to THS students (63% and 58%, respectively) (2,10). Indeed, AHS females appear to be among the least active youth in the country, with only 32% reporting VPA on 3 or more of the 7 days prior to the survey, compared with AHS males (59%) and THS females (55%) and males (70%) (1,2).

AHS students represent a high risk population of youth that are often overlooked for health promoting services and little is known about their physical activity behaviour (1,10). The primary aim of this study was to objectively measure the physical activity of AHS students. A secondary aim included assessment of student's compliance with wearing a physical activity accelerometer. The findings of this study will identify the most salient targets for physical activity intervention and facilitate accurate measurement of PA among this high-risk population.

Methods

Schools and Subjects

This paper presents baseline data from a school-based physical activity and dietary intervention pilot study conducted in alternative high schools in the Minneapolis and St. Paul metropolitan area. Six schools (urban=4; suburban=2) were contacted and agreed to participate in the Team COOL (Controlling Overweight and Obesity for Life) pilot study. The schools represent a convenience sample of alternative high schools in the Twin Cities metropolitan area whose

principals had participated in previous research assessing the feasibility of conducting alternative school-based intervention research with a physical activity and dietary focus (12). Schools ranged in size from 27 to 142 students. There was a high percentage of minority students (44% African-American, 7% Latino, 7% Asian, and 3% American Indian) and students receiving free or reduced price school meals (61%). Data were collected in the fall of 2006, prior to school level randomization to intervention conditions.

All students attending the study schools were invited to participate in measurement, which included a self-report survey, and height/weight measures taken by staff. Due to a limited number of accelerometers, a sub-sample of students was selected to wear accelerometers for 7 days. All participating students received a \$5 retail gift card for completing the survey and anthropometric measures. Those wearing accelerometers received an additional \$5 gift card for every day the monitor was worn for at least 10 hours, and an additional \$10 gift card for returning the monitor and completing an additional physical activity survey (not presented in this paper). Prior to scheduled measurement, research staff visited schools and classrooms to extend an invitation for participation, review measurement procedures and distribute parental consent forms to those younger than 18 years old. Written signed parental informed consent forms were returned prior to the beginning of measurement. On the day of measurement, all students provided signed assent prior to commencing measurement activities. Across the six schools, 145 students completed surveys and height/weight measures. In the two larger suburban schools, a random sample of students was selected to wear an accelerometer; in the urban schools with fewer students, all were invited to wear an accelerometer. A total of 111 students were selected to wear an accelerometer for seven days. Accelerometer data collected from the two suburban schools were not available due to insufficiently charged batteries ($n = 44$). From the four urban schools, two monitors experienced technical failure resulting in accelerometer data for a total of 65 subjects. The study was approved by the University's Committee on the Use of Human Subjects in Research.

Demographic Characteristics

On the survey, students self-reported their age, race/ethnicity, and number of hours working per week, receipt of free or reduced school lunch and public assistance; and their parent's education and work status.

Physical Activity

The ActiGraph physical activity monitor, model GT1M (ActiGraph, LLC, Pensacola, FL) was used to collect seven days of physical activity data using 30-second epochs (data collection intervals). The monitor is an objective measure of physical activity and has been previously validated for use with children in laboratory and field settings (7,15,31). It is a small ($5.1 \times 3.8 \times 1.5$ cm), lightweight (42.6 g) single plane (vertical) accelerometer that collects and stores accelerations from 0.05-2.00 G with a frequency response of 0.25–2.50 Hz. These settings capture normal human motion but will filter out high frequency vibrations such as operating a lawn mower or from mechanical sources (3). The analog acceleration is filtered and converted to a digital signal and this value (count) is stored in user-specified time intervals; 30-seconds for this study. After data collection, each monitor was downloaded to a computer for subsequent data reduction and analysis.

At monitor distribution, trained research staff fit an elastic belt with an attached monitor to each student, according to a standardized protocol. The students were told not to adjust the belt once it was fitted. Students were given written and verbal instructions on the use and care of the monitors and were instructed to wear the monitor during all waking hours except when swimming, bathing, or sleeping. Telephone calls were made to the students prior to the weekend

to answer questions and remind students to wear the monitor. A second call was made the day before the monitor was due to be collected at school.

ActiGraph Data Reduction

ActiGraph data were reduced using a custom developed software program (23). All data contained within the time frame starting from when the monitor was initialized until the same time the following week (end time) were processed. For days 2 through 7, data from 00:00:30 until midnight was reduced to summary variables. Data from days one and eight were combined to form a composite seventh day.

Daily inclusion criteria were established to determine days and times with acceptable accelerometer data. Blocks of time incorporating at least 30 continuous minutes of “0” output were considered to be times when the subject was not wearing the monitor. Using this 30-minute rule resulted in an average of 2.5 ± 1.05 bouts of continuous zeroes per day. These data points were eliminated and not used in any calculations. Also, days with less than 10 hours of data were eliminated from data reduction to account for unrepresentative days of activity. No data were imputed for these analyses.

The reduced data were placed into three data sets (usual, weekdays, weekend). Previously, it has been shown that four days of activity monitoring are needed to provide a reliable estimate ($ICC = 0.80$) of usual physical activity (29). Students with at least four out of seven days of data were retained for the usual data set. The weekday data set contained reduced data for all weekdays meeting inclusion criteria (3-5 days). For the weekend data set, students were required to have at least one weekend day that met the daily inclusion criteria.

After applying inclusion criteria to the data, summary compliance and physical activity variables were calculated. Compliance was assessed by calculating the number of days with at least 10 hours of data and the average number of hours of data per day. Several physical activity summary variables were calculated. *Average ActiGraph counts per minute* was calculated as the total counts for all included days divided by the total number of minutes the monitor was worn for all included days. *Time spent in MVPA* was calculated in two ways: 1) the average number of minutes per day spent in MVPA and 2) the average percent of time spent in MVPA each day. The time spent in MVPA was calculated using age-specific count cutoffs for students less than 17 years old (e.g., for a 16-year old, ≥ 3.0 METs, ≥ 940 counts per 30-sec) (9). The age-specific cutoff for 17 year olds is 1034 counts per 30-sec, which is greater than the adult cutoff of 976 counts per 30-sec (8). Therefore, for students who were at least 17 years old, the adult cutoff of 976 counts per 30-sec was applied. Time spent in sedentary behaviour was defined as the average number of epochs below 50 counts per 30-seconds (27). Time spent in light intensity activity was defined as the average number of 30-sec epochs between the sedentary and MVPA count cutoff points.

Statistical Analysis

All analyses were performed using SAS version 9.1, with significance set at the $p = 0.05$ level. Since gender differences in physical activity often exist, all analyses were stratified by gender. T-tests and chi-square analyses were performed to assess gender differences for sociodemographic variables. Chi-square and general linear models were used to identify demographic differences for compliance and physical activity variables. Log transformed values were used for analyses of skewed dependent variables. Repeated measures general linear models were used to identify differences in physical activity variables between weekdays and weekends.

Results

Table 1 contains the subject characteristics for the total sample and by gender. Most students were 14 to 17 years old and one-half were African-American. About 70% of students reported parents' education level to be less than or equal to high school. For all demographic variables, there were no significant gender differences.

Comparing the accelerometer sample (n=65) to the remaining sample of students (those with survey data but whom were not selected to wear the accelerometer, n=80), there were no significant differences by age, gender distribution, parental work or education status, and receipt of public assistance. However, the accelerometer sample had a greater percentage of African-American students (51% vs. 16%, respectively; $\chi^2_{DF=2} = 28.9, p < 0.001$) and students receiving free/reduced school meals (78% vs. 57%, respectively; $\chi^2_{DF=1} = 6.8, p = 0.009$). These differences likely reflect the omission of the suburban schools from the accelerometer sample.

Physical Activity

Table 2 contains the physical activity data by gender. When data are expressed in absolute minutes, males were more active than females but both genders accumulated a similar number of minutes sedentary behavior. When expressed relative to the total wear time, males still spent more time in MVPA but less time in sedentary behaviour, compared to females. Gender differences for vigorous physical activity were statistically significant for the absolute minutes per day, with males accumulating more vigorous physical activity compared to females (absolute, 4 ± 8.6 vs. 1 ± 2.8 , $p < 0.01$; relative; 0.47% vs. 0.12%, $p = 0.13$).

Students recorded greater average count per minute values on weekdays compared to weekends (323.9 ± 150.63 vs. 302.9 ± 188.12 , $p = 0.045$) and males were more active than females on weekdays and weekends ($p = 0.01$ and 0.04 , respectively). Figure 1 presents the time frame (weekday and weekend) physical activity data by gender for absolute minutes of time spent in sedentary, light, and MVPA. No significant time by gender interactions were detected. Therefore, tests for weekday and weekend differences were conducted on the full Actigraph sample. No significant gender differences were detected for sedentary or light activity ($p = 0.61$ and 0.81 , respectively). Students accumulated significantly more minutes of MVPA on weekdays compared to weekends ($p = 0.045$), and males accumulated more minutes of MVPA on weekdays ($p < 0.001$) and weekends ($p = 0.005$) compared to females.

Since the students wore the monitors for approximately two hours less on the weekends, comparisons were also made based on the percentage of time spent in the intensity categories (Figure 2). When expressed relative to the amount of wear time, sedentary and light activity were similar for weekdays and weekends ($p = 0.64$ and 0.24 , respectively). Similarly, there was no significant difference in the percent of time spent in MVPA between weekdays and weekends ($p = 0.128$). The gender difference for MVPA was only seen for the weekend ($p = 0.008$) but not for the weekdays ($p = 0.147$).

An age-related decline in MVPA was detected for the entire sample with the 14-15, 16-17, and 18-19 year olds obtaining 60.9 ± 22.85 , 52.6 ± 28.31 , and 40.4 ± 20.85 MVPA min.day⁻¹ ($p = 0.04$). When separated by gender, cell sizes within each age group category were small (range 5 – 14 students). Still, decreasing age-related trends were observed for both genders with the males decreasing from 67.0 ± 24.61 to 47.9 ± 17.77 ($p = 0.10$) and the females decreasing from 47.4 ± 10.73 to 30.7 ± 21.44 MVPA min.day⁻¹ ($p = 0.26$).

Compliance

The compliance results for the total sample and by gender are provided in Table 3. Overall, 45% of the students provided seven days of quality data with a greater percentage of males

(52.6%) meeting this level of compliance, compared to females (33.3%). Ninety-five percent of students provided at least four days of data (29); 94% provided at least three weekdays of data; 89% provided at least one weekend day of data. Slightly more males than females attained these compliance levels, but the difference was not statistically significant. On days that met inclusion criteria, students wore the monitors for approximately 17 hours per day across all days and weekdays, but only 15 hours per day during the weekend. There were no gender differences in the hours worn per day for all days, weekdays, or weekend days.

Differences in compliance (days/week and hours worn/day) by demographic characteristics revealed several significant differences. The youngest students (14-15 years old) accumulated more hours per day (19.4 ± 3.31 hours) than the 16-17 year olds (16.3 ± 2.61 hours) and the 18-19 year olds (16.2 ± 2.93 hours) ($p=0.0019$), and a greater number of complete days of data (6.6 ± 0.73 days) compared to the 18-19 year olds (5.6 ± 1.34 days) ($p = 0.05$). Students receiving free or reduced school meals accumulated approximately one more day of complete data (6.2 ± 1.02 days) compared to those not receiving meal assistance (5.3 ± 1.75 days) ($p = 0.02$). Students working at least 40 hours or more per week accumulated significantly more hours per day of accelerometer data (20.5 ± 3.7 hours) compared to part-time workers (17.0 ± 2.99 hours) or non-workers (16.5 ± 3.01 hours) ($p = 0.05$). Since there were only four students working at least full time, an additional analysis compared all working students to non-working students. Working students accumulated significantly more hours per day of accelerometer data (17.5 ± 3.30 hours) compared to those reporting no work for pay (16.5 ± 3.01 hours) ($p = 0.02$).

Discussion

The aims of this paper were to describe the objectively measured physical activity levels and student compliance with wearing a physical activity accelerometer among alternative high school students. Overall physical activity, assessed by minutes spent in MVPA was low (51 minutes of MVPA per day) with age-related declines observed for both males and females. Low levels of physical activity were especially true for females who averaged only 38 minutes of MVPA per day and only one minute per day of vigorous physical activity. Compliance with wearing the accelerometers was good with nearly one-half wearing the accelerometer for at least 10 hours per day on all seven days of measurement. Furthermore, almost all students accumulated at least four days of quality, usable data. These findings indicate that high-risk AHS students are in desperate need of physical activity intervention programs and accelerometry data are an acceptable method of data collection in this population.

Comparison of physical activity levels of this sample of urban alternative high school students with other published studies requires caution due to the lack of standardization in the procedures used for reducing accelerometer data to summary variables. Comparisons of our study findings to the largest study to date using accelerometry in youth (28) suggests that male and female AHS students accumulate fewer average counts per minute than their counterparts in the NHANES sample (AHS: males = 364 ± 159.7 and females = 262 ± 85.5 , and NHANES 16-19 year olds: males = 428.9 ± 11.3 and females = 327.8 ± 12.1). Despite this, minutes of MVPA per day was actually higher in the current sample of AHS males (60 ± 25.8) and females (38 ± 18.6) compared to the 16-19 year old males (32.7 ± 2.2) and females (19.6 ± 2.4) from the NHANES sample. This discrepancy may be due to the inclusion of 14-15 year olds in the AHS sample. Also, there are several differences in accelerometer data processing between the NHANES and the present study. For students up to 17 years old, NHANES chose to use the same count cutoff equation as in the current study (30) but used 4-METS in the equation while we chose 3 METS. This choice is not clear cut as the true MET value of a given activity will likely decrease in a linear fashion with age rather than an abrupt change at 17 years old. The result of these different MET values applied to the Freedson/Trost cutoff equation would be a

higher count cutoff for the NHANES sample and, all other things being equal, a lower number of minutes categorized as MVPA. Also, the slightly higher count cutoff used by NHANES (2020 counts per minute) for the 18 to 19 year olds would have the same effect of reducing the number of minutes categorized as MVPA. Unfortunately, there is still considerable discrepancy between data processing methods and recent reports (Masse 2007) do indicate that these decisions can affect outcomes such as minutes of MVPA. However, the counts per minute outcome is not subject to these processing differences and would suggest that the urban AHS students sampled here may have accumulated less physical activity than those in the general population sampled by NHANES.

Two additional studies were identified that used the ActiGraph accelerometer to measure youth physical activity and similar count cutoffs to categorize physical activity intensity (19,20,30). The Amherst Health and Activity (AHA) Study collected 7-days of data on 1st through 12th grade students (19,30). Males and females in the 10th through 12th grades (similar in age to the students in the current study) accumulated a median of 61 and 55 minutes of MVPA per day, respectively. Similarly, Patrick et al. reported that among 330 11 to 15 year olds in the PACE + intervention, males and females accumulated an average of 72 and 53 minutes of MVPA per day, respectively (20). Males in the current study accumulated similar levels of MVPA as males in the previous studies (60 minutes per day), however, females accumulated only 38 minutes of MVPA per day.

In contrast, middle school females from the Trial of Activity for Adolescent Females (TAAG) (24) accumulated even fewer minutes of MVPA with only 23.7 ± 11.7 for sixth graders and 22.2 ± 11.2 for eighth graders. However, the very low activity levels among the TAAG sample is likely due to the accelerometer cutoff of 1500 counts/30 sec whereas the AHA, PACE+ and the Team COOL studies used the age-specific count cutoffs established by Freedson et al. (9). Using this age-specific cutoff, more 30-second time intervals would be classified as MVPA, compared to the TAAG cutoff. The age-specific count cutoffs were applied to the current data due to the 6-year age span (14-19 years) of the Team COOL sample compared to the younger sample and smaller age range for the middle school females in TAAG.

Another difference between the TAAG count cutoff and the Freedson age-specific cutoffs is the TAAG cutoff is based on MVPA being defined as ≥ 4.6 METS (or 4.6 times greater than resting metabolic rate). The Freedson age-specific cutoffs used in Team COOL (and the AHA and PACE+ studies) were based on a definition of MVPA as ≥ 3.0 METS. Children's higher resting metabolic rates, compared to adolescents and adults, supports the use of the higher 4.6 METS for the TAAG sample. However, given the older ages of the students in the current study, the ≥ 3 -MET definition of MVPA was retained.

The gender difference in physical activity observed among the AHS students is similar to differences seen in numerous other studies using objective monitoring in THS students (19, 20,30) or self report (2,20) Females in this sample were 37% less active than their male counterparts (38 vs. 60 minutes of MVPA). Females also spent a greater proportion of time in sedentary behavior compared to males. While the absolute values were not significantly different, the high proportion of time spent being sedentary is concerning and requires further attention, including focused interventions designed to decrease sedentary activities.

In general, males were more physically active than females when data were viewed separately for weekdays and weekends. Similar to previous studies of youth (26,29) and college-aged students (5), there were more minutes of MVPA on weekdays compared to weekends. However, when expressed relative to the total time the students wore the monitors, this difference was no longer significant (Figures 1 and 2). This inconsistency was likely due to the two fewer hours per day the accelerometers were worn on weekends compared to weekdays.

Alternatively, this may, in part, be a real reduction in MVPA on weekends due to a less structured day (no school).

AHS students' compliance with wearing the accelerometers was slightly better than that of middle school students participating in the Eating and Activity Survey Trial (Project EAST) (32). Just over 95% of the AHS students provided 4-7 days with at least 10 hours of accelerometer data compared to 86% of students in Project EAST. The percentage of students obtaining all seven days of data was more similar (45% versus 50%, respectively). While Project EAST students received a \$5.00 movie pass for returning their accelerometer, the Team COOL students received \$5.00 on a gift card for each day the accelerometer was worn for at least 10 hours and an additional \$10.00 when they returned the device and took the additional survey. It is likely that the larger incentives used with the AHS students contributed to the greater proportion of students providing at least four usable days of data. Importantly, the incentive structure directly encouraged the wearing of the accelerometer, not just its return. Additionally, this high compliance rate was obtained without the use of daily reminder phone calls or logs, two commonly used strategies to improve compliance with wearing accelerometers.

This study observed less wear time for older students compared to younger students, suggesting greater incentives may be needed to achieve the same level of compliance with older high school students. In contrast, no age difference in compliance was observed in Project EAST, possibly due to the younger age and more limited age range of students (32). Similar to Project EAST, the current study found no difference in compliance by gender or race/ethnicity. In addition, we observed no difference in the average hours per day the accelerometer was worn between those that received and those that did not receive free or reduced school meals. However, we did observe that students receiving free or reduced school meals accumulated approximately one additional day of data compared to those not receiving assisted school meals. No differences in compliance were observed for those receiving and not receiving public assistance. These results provide some limited evidence that the incentive structure used in this study may have been more attractive to those students that were relatively more economically disadvantaged.

Lastly, students that worked for pay obtained a greater number of days of data and average number of hours per day compared to those that did not work. Those that were currently working may have recognized this research as an opportunity to supplement their typical income, more so than those that were not working for pay. Also, the additional work hours may indicate less leisure time and, possibly, fewer opportunities to remove the accelerometer, or their working status may reflect a greater level of responsibility that may have carried over to wearing the accelerometer. Higher compliance among those currently employed is an intriguing finding since one could hypothesize that those who were not working for pay could actually have a stronger motivation to participate and acquire incentives. Lastly, the relatively low economic status of the AHS students may have made the incentive (possible \$45.00 total) an attractive income-generating option while this level of incentive may not have the same effect in a traditional public school population.

To our knowledge, this is the first study to objectively measure physical activity in students attending alternative high schools. The study sample of urban youth was racially/ethnically and economically diverse and inclusive of males and females. Our data also indicate that collecting accelerometry data in AHS students is feasible and productive. Almost all students provided four or more days of quality, usable data. The generalizability of these data is limited by the small sample size drawn from four urban alternative high schools within one Midwestern metro region. Further study will be needed to identify differences in physical activity by urbanization level and geographic region. The loss of ActiGraph data from the suburban

schools is a limitation. However, Nelson et al. indicate that simple urban/suburban/rural classifications may mask important differences in the associations between the environment and physical activity (18). For example, adolescents living in older suburban and inner city neighborhoods were similarly active and more likely to be active than those in new suburban or rural neighborhoods. Therefore, a more complex understanding of the physical environment appears important but beyond the scope of this study.

Conclusions

In conclusion, the AHS students in the present study were relatively inactive compared to studies assessing activity among students attending traditional middle and high schools; this was especially true for females. AHS students represent a segment of the adolescent population that is rarely studied but more vulnerable to engaging in risky health behaviours, which include low levels of physical activity and high inactivity. The low levels of physical activity put these AHS students at greater risk for overweight and early onset of type II diabetes or heart disease that can carry forward to adulthood. The AHS setting provides an often overlooked venue to access at risk youth and intervene to support and promote healthy lifestyle practices that include more physical activity and less sedentary behavior. Formative data from AHS students and staff suggest interest in school-based programming that supports students to be more active (14,13) and data from the current study demonstrate a clear need.

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a significant difference between weekday and weekend MVPA; $p = 0.045$
b significant gender difference for weekday MVPA $p < 0.001$;
c significant gender difference for weekend MVPA $p = 0.005$

Figure 1.

Males and females physical activity on weekdays and weekends expressed as absolute minutes per day (Mean + SD)

^c significant gender difference for weekend MVPA; $p = 0.008$

Figure 2.

Males and females physical activity on weekdays and weekends expressed as the percent of time spent in that intensity category (Mean + SD)

Table 1
Subject Characteristics for the total sample and by gender

Variable	Total Sample (N=65)	Females (n=27)	Males (n=38)	
Age, yrs (mean $\pm$ sd)	16.7 $\pm$ 1.34	16.7 $\pm$ 1.23	16.7 $\pm$ 1.43	p = 0.92
14-15; n (%)	16 (24.6%)	5 (18.5%)	11 (28.9%)	p = 0.10
16-17	26 (40.0%)	12 (44.4%)	14 (36.8%)	
18-19	23 (35.4%)	10 (37.0%)	13 (34.2%)	
Race/Ethnicity; n (%)				
Am Indian	3 (4.6%)	1 (3.7%)	2 (5.3%)	p = 0.76
Asian	6 (9.2%)	2 (7.4%)	4 (10.5%)	
African-American	33 (50.8%)	15 (55.6%)	18 (47.4%)	
Hispanic	2 (3.1%)	1 (3.7%)	1 (2.6%)	
Caucasian	11 (16.9%)	5 (18.5%)	6 (15.8%)	
Other and Multi	10 (15.4%)	3 (11.1%)	7 (18.4%)	
Mother Educ (n=49); n (%)				
< high school	13 (26.5%)	5 (27.8%)	8 (25.8%)	p = 0.56
high school	22 (44.9%)	9 (50.0%)	13 (41.9%)	
> high school	14 (28.5%)	4 (8.1%)	10 (32.3%)	
Father Educ (n=45); n (%)				
< high school	11 (24.4%)	3 (20.0%)	8 (26.7%)	p = 0.52
high school	24 (53.3%)	8 (53.3%)	16 (53.3%)	
> high school	10 (22.2%)	4 (26.7%)	6 (20.0%)	
Mother Work Status (n=50); n (%)				
Full Time	33 (66.0%)	14 (70.0%)	19 (63.3%)	p = 0.52
Part Time	7 (14.0%)	3 (15.0%)	4 (13.3%)	
No Work Outside Home	10 (20.0%)	3 (15.0%)	7 (23.3%)	
Unemployed	0 (0%)	0 (0%)	0 (0%)	
Father Work Status (n=64); n (%)				
Full Time	29 (44.6%)	10 (37.0%)	19 (50.0%)	p = 0.76
Part Time	10 (15.4%)	5 (18.5%)	5 (13.2%)	
No Work Outside Home	6 (9.2%)	3 (11.1%)	3 (7.9%)	
Unemployed	19 (29.2%)	9 (33.3%)	10 (26.3%)	
Free Lunch (% yes; n=59); n (%)	46 (78.0%)	21 (80.8%)	25 (75.8%)	p = 0.64
Public Assistance (% yes; n=52); n (%)	19 (36.5%)	9 (42.9%)	10 (32.3%)	p = 0.43
Student Work for Pay (n=63); n (%)				
0 Hrs	35 (55.6%)	17 (65.4%)	18 (48.7%)	p = 0.49
1-9 Hrs	7 (11.1%)	1 (3.9%)	6 (16.2%)	
10-19 Hrs	4 (6.4%)	1 (3.9%)	3 (16.2%)	
20-29 Hrs	9 (14.3%)	4 (15.4%)	5 (13.5%)	
30-39 Hrs	4 (6.4%)	2 (7.7%)	2 (5.4%)	
40 hrs	3 (4.8%)	1 (3.9%)	2 (5.4%)	
> 40 hrs	1 (1.6%)	0 (0%)	1 (2.7%)	

Table 2
ActiGraph-based physical activity variables calculated for students with at least 4 days of data (n=62)

Variable	Total	Females (n=25)	Males (n=37)	p-value
Counts.min ⁻¹	323 + 143.0	262 + 85.5	364 + 159.7	p = 0.02
Absolute Values (min.d ⁻¹)				
Sedentary	723 + 173.1	737 + 167.5	714 + 178.4	p = 0.45
Light	250 + 59.3	246 + 59.7	253 + 59.7	p = 0.47
Moderate	48 + 23.5	37 + 18.1	56 + 23.7	p < 0.01
Vigorous	3 + 7.0	1 + 2.8	4 + 8.6	p < 0.01
Moderate-to-Vigorous	51 + 25.5	38 + 18.6	60 + 25.8	p < 0.01
Relative Values (% of time.d ⁻¹)				
Sedentary	70.20%	71.94%	69.02%	p = 0.05
Light	24.69%	24.26%	24.97%	p = 0.38
Moderate	4.78%	3.66%	5.54%	p < 0.01
Vigorous	0.33%	0.12%	0.47%	p = 0.13
Moderate-to-Vigorous	5.12%	3.80%	6.01%	p < 0.01

Table 3
Compliance with Wearing the Accelerometer for the Full Sample and by Gender

Variable	Total Sample (N=65)	Females (n=27)	Males (n=38)	p-value
0 Days	0 (0.0%)	0 (0.0%)	0 (0.0%)	
1 Day	0 (0.0%)	0 (0.0%)	0 (0.0%)	
2 Days	2 (3.1%)	1 (3.7%)	1 (2.6%)	
3 Days	1 (1.5%)	1 (3.7%)	0 (0.0%)	
4 Days	4 (6.2%)	3 (11.1%)	1 (2.6%)	
5 Days	9 (13.9%)	4 (14.8%)	5 (13.1%)	
6 Days	20 (30.8%)	9 (33.3%)	11 (29.0%)	
7 Days	29 (44.6%)	9 (33.3%)	20 (52.6%)	
At least 4 Days	62 (95.4%)	25 (92.6%)	37 (97.4%)	0.37 ^a
At least 3 Weekdays	61 (93.8%)	24 (88.9%)	37 (97.4%)	0.76 ^a
At least 1 Weekend Day	58 (89.2%)	23 (85.2%)	35 (92.1%)	0.38 ^a
Hours Worn.d-1 (mean±SD)	17.0 ± 3.17	17.0 ± 3.20	17.0 ± 3.18	0.98 ^b
Hours Worn.Wkday-1	17.2 ± 3.01	17.1 ± 3.02	17.3 ± 3.03	0.81 ^b
hours Worn.Wkend day-1	14.9 ± 6.81	14.6 ± 7.68	15.2 ± 6.22	0.72 ^b

A day needed to have ≥ 10 hours of data after subtracting non-wearing time

Non-wearing time = at least 20 minutes of continuous zero counts

^a Chi Square test for difference in proportions between genders

^b t-test for difference in means between genders