Correlates of Children's Moderate and Vigorous Physical Activity during Weekdays and Weekends

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Abstract

Background: Vigorous intensity physical activity (VPA) may confer superior health benefits for children than moderate intensity physical activity (MPA) but the correlates of MPA and VPA may differ. The study purpose was to investigate associations between selected enabling, predisposing, and demographic physical activity correlates, and MPA and VPA during weekdays and at weekends.

Methods: Data were gathered from 175 children (aged 10-11 years). MPA and VPA were assessed using accelerometers. Correlates were measured at child and school levels. Multi-level analyses identified correlates that significantly predicted MPA and VPA.

Results: Gender significantly predicted weekday MPA ($p < .001$), and weekend MPA ($p = .022$) and VPA ($p = .035$). Weekday VPA was predicted by gender ($p < .001$), indices of multiple deprivation score ($p < .003$), BMI ($p = .018$), and school playground area ($p = .046$).

Conclusions: Gender was the most significant correlate of MPA and VPA. Children most likely to engage in weekday VPA were boys with lower deprivation scores and BMI values, with access to larger playground areas.

Introduction

Regular engagement in appropriate amounts of physical activity is important for child growth and development and confers benefits to cardiovascular, skeletal, and psychological health [1]. Physical activity may be particularly important in addressing the increasing prevalence of childhood overweight and obesity, which in developed countries is a major public health concern, not least because obesity tracks at moderate levels through to adulthood [2]. Considerable efforts have been made to develop effective ways of promoting physical activity in youth but few studies have demonstrated efficacy. Moreover, even fewer studies have demonstrated potential for broader dissemination [3]. To advance research on youth activity promotion it is important to better understand factors that can be targeted in behavioral interventions [4].

Recent recommendations suggest that efforts to promote children's physical activity must take into account the developmental, psychological, and behavioral characteristics of children [5], and recognize the multi-dimensional correlates of youth physical activity [6]. Such correlates are organized in a hierarchical framework within the Youth Physical Activity Promotion Model (YPAPM) [7]. The YPAPM is based on the fundamental principles of the PRECEDE-PROCEED model of health program planning and evaluation [8]. Within this model emphasis is placed on the proposition that health and risks to health are caused by multiple factors, and it is for this reason efforts to effect behavior and environmental change must also be multi-dimensional [8]. The YPAPM categorizes physical activity correlates as enabling (e.g., motor skills, environment), reinforcing (e.g., parents, teachers), and predisposing factors (e.g., attitudes, perceived competence).   Demographic factors (e.g., age, gender) are positioned at the base of the model because these correlates directly influence how individuals assimilate other variables encapsulated in the enabling, predisposing, and reinforcing factors [7]. By virtue of the promotional nature of the model, the emphasis is placed on those correlates which are potentially related to youth physical activity and are most amenable to change [7]. The YPAPM provides a framework for this study as the correlates of interest reflect the enabling, predisposing, and demographic factors described therein.

Activity promotion efforts among young people typically focus on moderate-to-vigorous intensity physical activity (MVPA) [9-10]. The majority of children's health-enhancing physical activity comes from the moderate end of this intensity spectrum during free-living [11]. Moderate intensity physical activity (MPA) provides significant health benefits, is accessible and achievable by the majority of children, can be easily built into children's every day routines, and carries a relatively low risk of injury [1]. These factors are important considerations for public health guidelines so physical activity recommendations commonly relate to MPA as the minimum intensity level required for children to achieve health benefits [9]. Recent evidence however suggests that vigorous intensity physical activity (VPA) may confer greater benefits than MPA in relation to cardiovascular [12], musculoskeletal [13], and psychological health [14]. It is acknowledged though that for overweight children or those with low cardiorespiratory fitness the energy cost of VPA may be greater than for leaner or fitter peers [15]. As a consequence, compared to MPA some children may find VPA more challenging to engage in and maintain, and VPA that is especially tiring may lead to decreases in adherence to physical activity participation on subsequent days [16]. Though VPA may potentially be more beneficial to health than MPA, lack of adherence and/or reductions in overall physical activity levels and affect are counterproductive to health promotion efforts.

Correlates of young people's physical activity are commonly described in relation to MVPA [6, 17] as this outcome variable is consistent with public health recommendations. However, considering the contrasting characteristics of different forms of MPA (e.g., walking to school) and VPA (e.g., running, some sports participation), it is plausible that the correlates of physical activity at these intensities also differ [18]. The study objective was to investigate the association between selected youth physical activity correlates, and primary school children's MPA and VPA during weekdays and weekends. As the selected correlates represented enabling, demographic, and predisposing factors [7], the YPAPM provided an appropriate conceptual framework for the study. Weekday and weekend comparisons were made to account for the contrasting structure and available recreational choices available to youth during these periods of the week. Reinforcing correlates relating to parents, teachers, coaches, etc were not investigated due to resource constraints during data collection.

Methods

Participants

Data were gathered from 10 to 11 year old children from a large north-west England town. All primary schools in the town were informed about the study and invited to participate. Of the schools that expressed an interest one was randomly selected from each of 10 geographically representative Township areas. Prior to the project commencing two schools withdrew and due to time pressures were not replaced. A verbal explanation of the project along with written information and consent forms were given to all children in school Year 6 (age 10 to 11 years; n = 307) in the remaining 8 schools, which were situated in urban and suburban areas. The mean number of children enrolled in each school was 347.8 ± 143.8, ranging from 149 in the smallest school to 517 in the largest one. The proportion of children eligible for free school meals in these schools averaged 7.8 ± 3.6% (range = 3.4% to 15.1%) which was less than the national average of 16.1%. Completed parental informed consent and child assent with home postcodes were returned from 230 children (116 girls; 74.4% response rate). Ethical approval was obtained from the University Ethics Committee. Data were collected on one day in one school per week between October and December 2008.

Instruments and procedures

Enabling factors

School spatial areas. An aerial view of each school was located using Google™ Earth Pro (GEP) software [version 4.2.0205.5730] in order to quantify available outdoor spatial areas for physical activity participation. Spatial areas identified by teachers as being accessible and usable for activity (grass and playground areas) were calculated using the GEP polygon tool. The GEP application has been used previously in geo-coding studies [19] and provides a simple, cost-effective means of quantifying spatial areas. The area of each of the polygons was calculated by the software and then recorded and summed for each school to provide an estimate of total outdoor spatial area, and playground spatial area. To the best of our knowledge this is the first time this resource has been used in youth physical activity research.

Anthropometry. Stature and sitting height were measured to the nearest 0.1 cm using a portable stadiometer (Leicester Height Measure, Seca, Birmingham, UK). Leg length was calculated by subtracting sitting height from stature. Body mass was measured to the nearest 0.1 kg using calibrated scales (Seca, Birmingham, UK). All measurements were taken by trained research staff using standard procedures.

Maturity status. Somatic maturity status was estimated by determining years from attainment of peak height velocity (APHV). Years from APHV for each child were predicted using gender-specific regression equations that included stature, sitting height, leg length, chronological age and their interactions [20]. Chronological age was calculated by subtracting each child's date of birth from the measurement date.

Demographic factors

Socio-economic status. Socio-economic status was calculated using the 2007 Indices of Multiple Deprivation which are comprised of seven domains of deprivation which relate to income, employment, health, education, housing, environment, and crime [21]. Deprivation scores were derived from the children's main home postcodes using the National Statistics Postcode Directory database [22]. Higher socio-economic status was represented by lower deprivation scores.

Predisposing factors

Physical self-perceptions. Physical self-perceptions were assessed using the Children and Youth version of the Physical Self-Perception Profile [23]. This instrument has been shown to be an appropriate measure of physical self-perceptions among North American [24] and European youth [25]. The Children and Youth Physical Self-Perception Profile follows a hierarchical structure with global self-esteem at the apex and physical self-worth positioned at the domain level. Subordinate to physical self-worth are four sub-domains of sport competence, physical condition, body attractiveness, and physical strength. Each domain is measured on a 1 (low perceptions) to 4 (high perceptions) scale by six items that utilize a structured alternative format to reduce socially desirable responses. Strong internal consistencies were demonstrated for physical self-worth and each sub-domain. Cronbach's alpha coefficients were .81 (physical self-worth), .75 (sport competence), .80 (physical condition), .86 (body attractiveness), and .83 (physical strength). The questionnaire was administered in the children's classrooms by research staff who provided verbal and visual examples of how and where to respond to items on the profile.

Outcome measures

Physical activity. Physical activity was objectively measured every 5 seconds for five consecutive days (Friday through to Tuesday) using ActiGraph accelerometers (GT1M, ActiGraph LLC, Pensacola, FL). The ActiGraph is a common tool to assess the volume and intensity of physical activity, and it has previously been validated with children [26]. The children were instructed to wear the ActiGraph over the right hip using a waist mounted nylon belt, during all waking hours. At the end of the data collection period the ActiGraphs were downloaded using Actlife software (ActiGraph LLC, Pensacola, FL). Downloaded files were initially checked for compliance to the monitoring protocol using customized software (MAHUffe; www.mrc-epid.cam.ac.uk). Sustained 20 minute periods of zero counts were deemed to indicate that the ActiGraph had been removed, and total 'missing' counts for those periods represented the duration that monitors were not worn [27]. For inclusion in the analyses, each child was required to have produced counts for ≥ 629 min and ≥ 605 min on each weekday and weekend day, respectively. These figures represented 'non-missing' counts for at least 80% of a standard measurement day, which was defined as the length of time that at least 70% of the sample wore the monitor [27] .

Data from children with at least 3 valid measurement days (including a minimum of 1 weekend day) were retained for further analysis, as this has previously been deemed a reliable minimum wear time for children of this age [28]. Fifty-five children (19 girls) did not meet the minimum wear time criteria and so were excluded from the data set, leaving a final sample size of 175 (97 girls). The number of minutes of MPA and VPA were calculated using cut-points of 2000 and 3000 counts per minute, respectively, which have previously been used in this age group to study associations between physical activity intensity and metabolic risk factors [11]. Number of counts per minute (count • min^{-1}) during weekdays and weekends were also calculated as a raw measure of physical activity.

Data analysis

Preliminary Kolmogorov-Smirnov tests confirmed that the physical activity variables were excessively skewed. Base-10 logarithm transformations were performed to normalize the data, which were subsequently back-transformed for interpretation and presentation purposes. Individual and school level descriptive statistics ($M \pm$ SD) were then calculated for all measured variables and independent *t*-tests were used to compare child level variables between boys and girls and between children who were included and excluded from the data analysis. These analyses were conducted using SPSS version 15 (SPSS inc., Chicago, IL). To account for the nested nature of the child data within the 8 schools, multi-level modeling was performed for the main analysis [29]. A two-level data structure was used where children were defined as the first level unit of analysis and schools as the second level unit [30]. School was included as a second level unit to control for the effect that this particular context could have on the children's physical activity behaviors and self-perceptions [30]. The data were analyzed using MLwiN 1.10 software (Institute of Education, University of London, UK). Separate multi-level prediction models were constructed to identify correlates that were significantly associated with MPA and VPA during weekdays and weekends (4 models in total). The correlates included outcome variables from the school level (e.g., number on roll), and child level (i.e., deprivation score, anthropometric variables, maturity status, and physical self-perception measures). Correlates were retained in the models when they were significant predictors of MPA and VPA and remained significant when subsequent correlates were retained in the models. In addition, potential effect modification (interaction effects) was assessed for selected correlates in order to investigate whether differences existed between different subgroups. Where appropriate, interaction terms were added separately to the analyses to determine their effects on MPA and VPA [30]. Regression coefficients in the models were assessed for significance using the Wald statistic [30]. Statistical significance was set at $p < .05$ except for the interaction terms where it was $p < .10$ [30].

Results

The descriptive statistics for boys and girls are presented in Table 1. The children were well matched in relation to their anthropometric characteristics and deprivation scores. Boys were significantly older than girls, but girls were significantly closer to APHV than boys. Boys reported more positive physical self-perception ratings than girls in all domains including self-esteem. Similarly, boys accumulated more physical activity than girls during weekdays and weekends, with the greatest differences in physical activity occurring during weekdays. No significant differences between children included and excluded from the analyses were found for any variables with the exception of years from APHV (included > excluded; t (228) = 2.8, p = .006). Total area available for physical activity in the schools was 10,265.4 ± 4,691.7 m^2 and playground space was 1,929.6 ± 1,110.8 m^2.

TABLE 1 ABOUT HERE

Table 2 shows that gender was the sole significant predictor of weekday MPA, with boys more likely to engage in 10.9 minutes more activity at this intensity than girls ($p < .001$). The prediction model for weekday VPA included enabling and demographic factors. The strongest predictor was gender ($p < .001$), followed by deprivation score ($p = .003$). BMI ($p = .018$) and playground area ($p = .046$) were the other significant predictor variables. The model suggests that the children most likely to engage in weekday VPA were boys with lower deprivation scores, lower BMI values and those who had access to the largest playground areas. The only correlate to significantly predict weekend MPA ($p = .022$) and VPA ($p = .035$) was gender, with boys more likely than girls to spend time being active at each intensity (Table 3). Compared to girls, at the weekend boys engaged in 6.2 and 2.8 minutes more MPA and VPA respectively.

TABLES 2 AND 3 ABOUT HERE

Within each multi-level analysis perceptions of sport competence significantly improved the model fit, though this correlate did not significantly predict the outcome variables. This observation suggests that perceived sport competence had an influence on the significant correlates. To test this supposition, interaction terms were constructed consisting of the interaction between sport competence and the significant predictor variables from each of the four models. These analyses revealed a significant interaction effect between sport competence and gender for weekday VPA (β (*SE*) = 3.77 (2.01), p =.06), demonstrating that the effect of sport competence perceptions on weekday VPA was stronger in boys than girls. Overall, boys with the highest perceptions of competence accumulated almost 16 minutes more VPA on weekdays compared to girls with the lowest perceptions of competence.

Discussion

This study provides new insight into individual and environmental correlates of MPA and VPA in youth which reflect the enabling, predisposing ,and demographic factors described in the YPAPM [7]. From the range of correlates assessed gender was the most consistently significant predictor of MPA and VPA on weekdays and weekend days. In agreement with recent reviews of youth physical activity correlates, boys were more likely to engage in most physical activity [6, 17]. These well established gender differences are most likely influenced by biological, environmental, and psychosocial factors. Maturation effects during early adolescence may influence boys and girls differently and explain some of the gender differences. Recent research reported that objectively assessed physical activity was similar when boys and girls of the same biological age were compared [31], suggesting that the earlier maturation of girls and the combined biological, psychosocial, and emotional changes experienced throughout maturation influence physical activity levels, [31].

The structure and context of the days when physical activity was assessed may also partly explain the significant influence of gender on MPA and VPA. During weekdays when the children were at school, differences in MPA and VPA were greater than those observed at the weekend. Moderate-to-vigorous physical activity (MVPA) accumulated during the UK school day has been shown to account for 56% of total daily MVPA [32], but values in excess of 70% have been reported in France where the school day is somewhat longer [33]. During the school day, distinct opportunities for MPA and VPA typically centre on physical education classes and recess periods, as well as before and after-school activities [34]. During elementary school physical education boys and girls usually participate in similar volumes of physical activity [35] often by virtue of classes being taught co-educationally. On occasions when there are gender differences in activity, boys typically are the more active [35], possibly due to them possessing superior motor skills [36] and intrinsic motivation in physical education mediated by perceived competence and enjoyment [37]. Perceptions of competence and enjoyment in physical education are heavily influenced by teachers who plan and deliver lesson content, and provide children with feedback on their participation [38]. Gender differences in physical activity tend to be more apparent during recess than physical education as boys typically dominate the playground space playing competitive games (e.g., soccer), while girls are more likely to take part in sedentary play and socializing [39]. Though less research has been conducted in after-school contexts, there is also evidence to demonstrate that in this setting boys do more MPA and especially VPA than girls during free play and structured activities [40]. Taken together, such typical gendered activity engagement in these settings may explain why boys had higher levels of both MPA and VPA during weekdays. Boys and girls were less active at weekends and the effect of gender on physical activity was largely attenuated.

The discrepancy between weekday and weekend physical activity is consistent with other recent work in the UK [41] and United States [42]. It is suggested that the lower weekend activity levels may be influenced by less frequent bouts of light and more intense physical activity [41], which are possibly mediated by the greater choice of recreational (and often sedentary) pursuits available to youth at weekends. Moreover, during weekends there are fewer organized clubs and activities available for girls compared to boys, and girls are less likely than boys to use community sports and physical activity facilities [43]. For some boys and girls the absence of the structured school environment and its regular opportunities for physical activity may explain the lower weekend activity levels [42]. Our data were collected during autumn and winter when reduced daylight hours limited afternoon and evening opportunities for outdoor physical activity. It is well established that children's physical activity is lowest during the winter months [44] so seasonality may also contribute to the lower physical activity levels of our sample during weekends.

Deprivation score was a highly significant predictor of weekday VPA, suggesting that the least deprived children were the most active. This inverse relationship between physical activity and deprivation level has been demonstrated previously. In their study of Scottish youth Inchley and colleagues [45] found that the lowest levels of VPA were reported by children from the least affluent families, and that this effect was more pronounced among girls. Similar results were observed among young people in London, but a significant association between VPA and deprivation level was only evident in girls, but not boys [46]. The results of these large UK studies suggest that girls' VPA may be more strongly influenced by socio-economic status than boys', possibly because greater opportunities exist for boys to participate in structured and unstructured forms of VPA, such as sports clubs [43] and active play, respectively. The fact that our data revealed how gender and deprivation score were the most significant predictors of weekday VPA lends some support to the supposition that there may be an additive effect of gender and socio-economic status putting girls from low socio-economic backgrounds at particular risk of low physical activity [45]. This perspective though should be considered cautiously as a significant interaction effect between gender and socio-economic status was not reported by Inchley et al. [45] or ourselves.

While such trends between socio-economic status and physical activity are quite consistent, the mechanisms for them are less obvious. Children aged 10-11 years are still relatively dependent on family members to facilitate and reinforce physically active behaviors. A recent qualitative study demonstrated that parental encouragement for physical activity differed depending on socio-economic status [47]. It was concluded that parents of children from high to middle socioeconomic backgrounds used more proactive methods of encouragement (e.g., logistical and financial support, modeling, etc) than parents of children from less affluent backgrounds, who relied more on verbal instructions and demands [47]. Parental encouragement is required for all children regardless of family circumstances, but for it to be effective there needs to be greater investment in safe, open play spaces [48], and physical activity initiatives that are within all families' fiscal means. Furthermore, low cost interventions such as active travel schemes have potential to influence activity levels of all children, particularly on school days [49].

Weekday VPA was inversely associated with BMI suggesting that children with higher BMI values were likely to spend the least time in VPA. Similar observations were reported by Trost et al. [50] who found that obese 11 year olds took part in approximately 15 minutes and 5 minutes less MPA and VPA per day, respectively than non-obese peers. Correlates of physical activity were also measured in this study and it was found that obese children had significantly lower levels of self-efficacy, less involvement in community physical activity promoting initiatives, and less likelihood of having their father or male guardian model physical activity [50]. This suggests that there are social and environmental factors that may explain lower activity levels of overweight youth. Overweight children of upper primary or middle school age have also been shown to posses lower levels of fundamental movement skills than peers with healthy weight status [51]. As fundamental movement skill proficiency is associated with participation in organized physical activities [52] this may explain in part the inverse relationship between adiposity and physical activity levels. Consistent with the YPAPM, lack of movement skill competence may lead to reduced physical activity enjoyment [53] perceived competence [54], and self-efficacy [50]. Thus, it is probable that a number of interlinked factors mediate the impact of weight status on VPA.

Playground spatial area was the fourth significant predictor of weekday VPA, which concurs with previous studies reporting positive associations between the size of school environments and physical activity [55-56]. The significance of playground area reinforces the important role of recess periods and outdoor physical education classes as regular opportunities for health-enhancing physical activity. The data were collected during the autumn and winter months when grassed areas were often wet and as a result children were only allowed to use the tarmac playground areas during recess and outdoor physical education. The positive association between playground area and VPA supports the notion that children are more likely to be active when outdoors [17] and with optimal amounts of space to play in [55-56]. However, during recess in particular, interactions between area type, adult supervision, and equipment have been shown to have stronger effects on MVPA than area size alone [56], suggesting that space may be only one aspect of the school environment that can facilitate physical activity. On the basis of these results, a combination of strategies to engage children in physical activity during unstructured settings such as recess is required. Simple cost effective methods like maximizing playtime duration and installing playground markings have been shown to be effective [57]. Other approaches such as making play and sports equipment available have impacted on physical activity, particularly among girls [58], though the implementation of such approaches during short recess periods may be problematic and not necessarily increase activity levels.

It was interesting to note that perceived sport competence was a significant predictor of weekday VPA in the model before playground space was added, but not after (though in all cases it actually improved the overall model fit). This analysis suggests that the size of the playground area had more influence on weekday VPA than perceived sport competence. This implies that the size of the playground space facilitates children's VPA independent of children's perceptions of technical or physical competence. Potentially girls may benefit most from having more playground space, which typically is dominated by boys playing games such as soccer [39]. Larger playground spaces may allow girls greater opportunities for VPA away from boys, and without the need for girls to engage in sport related activities [59]. As a result of the significant role played by sport competence in each of the models, interaction terms were constructed between sport competence and each of the significant predictors. The only significant interaction was between sport competence and gender, signifying that perceived sport competence had a greater influence over boys' rather than girls' weekday VPA. Previous studies have also reported stronger associations for boys compared to girls between perceived sport competence and, MVPA [25], and change in pedometer step counts [60]. The exact reasons for these gender differences are not clear. It is possible that differences in perceived sport competence reflect boys' superior actual competence [25]. Alternatively, it has been suggested that boys and girls have similar perceptions of sport competence but that girls are more modest, and boys more extravagant when rating themselves on this self-perception sub-domain [61].

The strengths of this study were the use of objectively assessed physical activity to describe MPA and VPA and the division of the week into weekdays and weekends. In addition, the multi-level analyses accounted for the nested nature of the children within the schools and also allowed school level correlates to be analyzed. Furthermore, the study included a range of enabling, predisposing, and demographic correlates, which according to the YPAPM [7] work in combination to influence youth physical activity behavior. There were also limitations, the most important was the use of a cross-sectional research design which precludes conclusions being made about causality. The children were sampled from 8 schools, which may have contributed to a lack of power in the analyses. Had the sample been larger, more correlates may have demonstrated significant associations with the outcome variables. A greater range of correlates, and in particular the inclusion of reinforcing factors would have better reflected the range of influential correlates proposed in the YPAPM [7]. The number of children excluded from the data analysis due to insufficient number of valid days of accelerometer wear suggests that procedures to ensure compliance to the monitoring protocol required improvement. Indeed, the lack of consensus over the minimum number of required days of valid accelerometer data may raise a doubt over whether a minimum of 3 days accelerometer data were sufficiently representative, particularly in relation to the weekend period. While more stringent inclusion criteria were an option, 3 days is a commonly used standard that has been applied in similar studies [41, 62, 63], possibly because it strikes a pragmatic balance between representativeness of the data and inclusion of participants for analysis.

Of the correlates measured gender was the most significant predictor of physical activity regardless of intensity or period of the week. In addition to gender, weekday VPA was significantly associated with deprivation scores, BMI values, and playground area, suggesting that the most vigorously active children were boys from the least deprived families, who were relatively lean, and who had access to the most playground space. The results reinforce the identification of girls as a target population for intervention programs. Moreover, the findings underline the utility of theoretical frameworks such as the YPAPM to inform and develop such programs.

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Table 1. Boys' and girls' descriptive data (*M* ± *SD*)

	Boys (*n* = 78)	Girls (*n* = 97)	*p*	*d*
Age (yr)	10.7 (0.3)	10.6 (0.3)	.013	0.33
Stature (cm)	145.1 (6.8)	144.3 (6.4)	.43	0.12
Body mass (kg)	39.2 (8.3)	37.3 (8.0)	.14	0.23
BMI (m • kg^{-2})	18.5 (3.1)	17.8 (3.2)	.17	0.22
Years from APHV (yr)	-2.8 (0.5)	-1.3 (0.5)	< .0001	3.14
Deprivation score	19.1 (11.1)	16.5 (9.8)	.10	0.25
Physical self-perceptions				
Sport competence	3.13 (0.61)	2.87 (0.58)	.005	0.44
Physical condition	3.14 (0.64)	2.92 (0.60)	.021	0.35
Attractive body	2.80 (0.66)	2.58 (0.67)	.036	0.33
Physical strength	2.96 (0.62)	2.59 (0.56)	<.0001	0.63
Physical self-worth	3.08 (0.62)	2.90 (0.65)	.080	0.28
Self-esteem	3.28 (0.53)	3.10 (0.63)	.049	0.30
Physical activity				
Weekday MPA (min)	59.6 (13.2)	52.2 (10.8)	<.001	0.62
Weekday VPA (min)	22.8 (9.6)	18.5 (7.0)	.001	0.52
Weekend MPA (min)	53.8 (17.6)	46.9 (13.2)	.003	0.45
Weekend VPA (min)	16.0 (10.2)	13.1 (7.3)	.044	0.33

Weekday count • min^{-1}	534.5 (142.2)	471.8 (121.2)	.002	0.42 562
Weekend count •min^{-1}	466.2 (208.5)	424.4 (147.4)	.123	0.23

Table 2. Multi-level correlates of weekday MPA and VPA

Weekday MPA				Weekday VPA			
Correlate	*B* (*SE*)[a]	95% *CI*	*p*	Correlate	*B* (*SE*)[a]	95% *CI*	*p*
Constant	38.27 (1.68)	34.98 to 41.56	< .001	Constant	25.96 (3.89)	18.34 to 33.58	< .001
Gender	10.86 (1.53)	7.86 to 13.86	< .001	Gender	5.38 (1.16)	3.11 to 7.65	< .001
				BMI	-0.45 (0.19)	-0.82 to -0.08	.018
				Deprivation score	-0.18 (0.06)	-0.30 to -0.06	.003
				Playground area	0.002 (0.001)	0.00004 to 0.004	.046
Random				Random			
School level	13.29 (9.19)			School level	3.97 (3.38)		
Child level	99.89 (10.93)			Child level	55.95 (6.12)		
Deviance	1312.83			Deviance	1208.12		

[a]The Beta values reflect differences in minutes of MPA and VPA for every one measured unit of each correlate. Girls are the reference group.

Table 3. Multi-level correlates of weekend MPA and VPA

Weekend MPA				Weekend VPA			
Correlate	*B* (*SE*)[a]	95% *CI*	*p*	Correlate	*B* (*SE*)[a]	95% *CI*	*p*
Constant	37.88 (2.24)	33.49 to 42.27	< .001	Constant	13.14 (0.89)	11.40 to 14.88	< .001
Gender	6.17 (2.69)	0.90 to 11.44	.022	Gender	2.81 (1.33)	0.20 to 5.42	.035
Random				Random			
School level	12.56 (13.72)			School level	0.0 (0.0)		
Child level	310.11 (33.91)			Child level	75.40 (8.08)		
Deviance	1505.50			Deviance	1245.95		

[a]The Beta values reflect gender differences in minutes of MPA and VPA. Girls are the reference group.