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1 **Differences in the physical activity, sedentary time and BMI of Finnish**
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10 **Differences in the physical activity, sedentary time and BMI of Finnish**
11 **grade five students**

12

13 **Abstract**

14 Background: This study examined the distribution of objectively measured
15 physical activity (PA) and sedentary time (ST) of fifth grade students during the
16 school, leisure-time and physical education (PE) classes. Demographic,
17 anthropometric and PA data were collected from 17 representative Finnish
18 schools.

19 Methods: To estimate the PA and ST, participants ($N=592$) wore wGT3X-BT
20 Actigraphs for seven consecutive days. Comparisons were made between genders
21 and different BMI groups.

22 Results: From the study sample, 43.7% met the MVPA guidelines. Participants
23 spent 62.2% of the day sedentary and 8.2% they were moderately or vigorously
24 active. Boys performed more moderate to vigorous PA (MVPA) than girls, and
25 girls were more sedentary during school day. Boys had more MVPA than girls in
26 leisure-time, but in ST there were no differences. However, an examination of
27 PA assessed during PE classes revealed no differences between boys and girls.
28 Normal weight boys engaged in more MVPA than overweight and obese
29 children. No differences were found for girls.

30 Conclusions: The PE levels differs between different BMI groups in leisure-time
31 and during school but not during PE lessons. Targeted efforts for overweight
32 children should be targeted or compulsory PE should be increased to reach the
33 PA guidelines.

34 Keywords: physical activity; adolescent; accelerometry, physical education, body
35 weight

36

37 **Introduction**

38 Research has detailed that insufficient levels of physical activity (PA) and excessive
39 levels of sedentary time (ST) has become a major concern in developed countries¹⁻². As
40 a result of insufficient PA and excessive calorie intake, the obesity epidemic among
41 children has become a crucial major health concern³. Regular PA and especially
42 moderate to vigorous physical activity (MVPA) have variety of health benefits,
43 including significant caloric expenditure and hence, prevention and control of obesity⁴.
44 Overweight has also been found to be a barrier for PA among children⁵. This study
45 examined differences in PA and ST among 11-12 years old Finnish children and
46 different BMI groups during week days and weekends.

47
48 PA guidelines for children aged 5-17 outline that at least 60 minutes of MVPA every
49 day is necessary to facilitate gain health benefits⁶. During the school day there is
50 potential for engagement in PA, however, previous studies have shown that European
51 schoolchildren (aged 10-12) spent only 5% in MVPA during recesses⁷ and much of
52 their time during school day is spent in sedentary behaviors (e.g. in Brazil among 7-12-
53 year-old children)⁸. In previous studies boys (aged 9-12 Hungarians)⁹, normal weight
54 children⁷ and children with high cardiorespiratory fitness (European children aged 12-
55 17)¹⁰ have been assessed as more active than their peers during school days.

56
57 Researchers reported that leisure-time is crucial period for MVPA,¹¹⁻¹² and most of their
58 sedentary time occurs between 3pm and 9pm¹³⁻¹⁴. According to Arundell et al. (2015)¹⁵
59 children aged 8 years spend only 40.9 minutes in light physical activity (LPA) and 17.6
60 minutes in MVPA during leisure-time. It has also been found that 10-18-year-old
61 Portuguese children participating in organized sport engage in more MVPA than

62 nonparticipants¹⁶. However, in another study, MVPA levels during free-play activity
63 were higher than during organized or structured activity sessions among primary school
64 students. The study also detailed the analyses of the mean MVPA durations in different
65 activities as follows: free play indoors (12.1 minutes), organized PA indoors (9.2
66 minutes), free play outdoors (12.7 minutes), and organized PA outdoors (5.7 minutes)¹⁷.

67
68 Previous research has shown that during school physical education (PE) classes the
69 mean proportion of time spent in MVPA is 40.5% (4-12-year-old children)¹⁸. Mooses et
70 al.¹⁹ also found that during PE lessons students spent 28.6% in MVPA and 29.3% of ST
71 (7-12-year-old Estonian children). In another study, involving children aged 11-12 in
72 the US, results showed that 38.4% of their time was spent in MVPA and 18.3% in ST²⁰.
73 However, the context of PE activities significantly influences the level of MVPA
74 accumulated during lessons (children aged 8-9 in England)²¹.

75
76 The distribution of the type of daily activities in which children engage varies
77 depending on the age of children. Younger children tend to accumulate more MVPA
78 and less ST than older children²². Previous research has found that weight status
79 predicts MVPA but not ST during school day^{7,23}. Overweight/obese children engage in
80 less MVPA than normal weight children^{7,23}. Leisure-time differences in MVPA have
81 been found between different BMI groups²³. However, there are also studies that reveal
82 a lack of differences in MVPA between different BMI groups²⁴. Findings have also
83 shown that there are no differences between different BMI groups in LPA or ST during
84 school day, or leisure-time^{7,24}. Daily percentages of the time spent in different intensity
85 activities among primary school students has been reported as ST 57-63% LPA 31-37%
86 and MVPA 5-6%^{23,25}. Increase of BMI among children and adolescents' is evident,

87 since 1975 BMI has increased 0.32 kg/m^2 per decade²⁶. While the world mean for girls
88 was 17.2 for girls and 16.8 for boys in 1975, the values were 18.6 and 18.5 in 2016,
89 respectively. However, there has been some plateau recently, mostly in northwestern
90 Europe, high-income English-speaking and Asia-Pacific regions for both sexes²⁶.

91

92 The current study investigated the distribution of periods of PA and ST in a cohort of
93 fifth grade students (11-12 years old). More specifically, this study investigated
94 differences between gender and BMI groups, and the associations among children's
95 BMI and different PA levels during weekdays, weekends and PE lessons. Although
96 previous research related to these topics has been undertaken, it is based on LPA and
97 MVPA levels during school days or leisure-time. This study includes more
98 comprehensive analysis of LPA, moderate (MPA) and vigorous (VPA) PA collected
99 during PE lessons, the school-day and leisure-time separately. Hence, this study
100 provides data to extend and support current information in the area of children's PA
101 engagement. Data has shown that during the school days children are mostly sedentary
102 and only engage in low levels of MVPA, boys are more active in PE lessons than girls²⁷
103 and the influence of BMI on MVPA and ST are contradictory^{23,24}. The aim of this study
104 is to investigate 1) PA intensities among 11-12-year-old children during week and
105 weekend, 2) level and intensity of PA during school day, PE lessons and leisure time,
106 and 3) level and intensity of PA among boys, girls and different BMI groups.

107 **Methods**

108 This study used data from the research project "Associations between Move! –
109 monitoring and feedback system for physical functional capacity and Finnish students'
110 physical performance, physical activity engagement and motivation in physical
111 education. Study targeted children's PA and sedentary behaviors. In total, 592 children

112 (309 girls, 283 boys) aged 11-12 years (Mean =11.3, SD=0.3) participated in the study.
113 Data were collected across 37 different classes across 17 socio-demographically
114 representative Finnish schools in September 2017. Participants' stature was measured to
115 the nearest 0.1 cm using portable measuring equipment by leading researcher. Body
116 mass was measured to the nearest 0.1 kg using calibrated scales for children in light
117 clothing and barefooted. For each participant, BMI was calculated and z-scores were
118 assigned to each child²⁸. Mean BMI was 18.80 (SD 3.06) (girls 18.78 [2.98], boys 18.84
119 [3.17]). Children were categorized as underweight, healthy weight, overweight and
120 obese²⁸ (table 1). Because of the small number of underweight participants, these were
121 combined to normal weight cohort in the analysis.

122
123 Children were fitted with a wGT3X-BT Actigraph accelerometer (Pensacola, FL) by
124 trained researchers at the beginning of the data collection period. Participants were
125 asked to wear the accelerometer for seven consecutive days (with exception of sleep-
126 time and water-based activities) on their right hip attached via an elastic belt. The epoch
127 length was set at 15 seconds and data was processed using Actilife Lifestyle monitoring
128 System, version 6.12.1. Non-wear time was defined as 30 min of consecutive zeros.
129 Analyses were restricted to 453 participants (76.5% of 592 participants) who provided
130 at least three days (two-week days + one weekend day) of valid accelerometer data
131 (mean 5.24, range 3-7). Three-day measurement has proven to be reliable method when
132 investigating PA and ST²⁹. A valid day was defined as recording at least 500 min of
133 measured wear time between 07:00 and 23:00. In previous studies it has been shown
134 that at least 360 minutes should have been measured for a valid day³⁰. To avoid possible
135 bias in PA levels and ST, children who provided three valid days of accelerometer data

136 were compared with those who provided four or more days. No differences between
137 MVPA levels were found.

138

139 Standard cut-points were used to define the mean daily percentage of time spent at
140 various intensities: sedentary (0-100CPM), light (101-2295CPM) and moderate to
141 vigorous (>2295CPM)³¹. Light intensity and moderate to vigorous were divided into
142 two categories to allow closer examination (LPA1 101-1197, LPA2 1198-2295, MPA
143 2296-4011, VPA 4012-19999). The relative time in which children participated in LPA,
144 MVPA or ST was calculated as percentages [(certain activity level time / total wear
145 time)×100].

146

147 PA and ST levels were studied during the different phases of the day. An official
148 timetable for each participant was obtained from the school. In addition, and for
149 reliability reasons, participants were asked to fill out diaries indicating the beginning
150 and the end of the school day. They also provided information regarding how they
151 travelled their school trip and whether they were sick or not. In addition, PE lessons
152 were tracked from the accelerometer data, based on the school timetable of the students.

153 PA in different sections of the day were compared between boys and girls using
154 independent t-tests. In addition, different BMI groups were also compared using
155 MANCOVA. The numbers of participants meeting the PA guidelines were compared
156 between groups using chi-square tests. Linear regression was used to predict the PA and
157 ST based on gender and BMI.

158 *Ethics statement*

159 Ethical approval was obtained from the university of [REDACTED] ethics committee.

160 Written parental consent and child assent to complete the study were obtained prior to
161 participation.

162 **Results**

163 Analysis of the total wear time revealed that the percentage distribution for categories of
164 the children's activity time was 62.5% in sedentary behaviors, 29.4% in LPA
165 (LPA1=22.7%, LPA2=6.7%) and 8.1% in MVPA (MPA 5.0%, VPA=3.1%) during
166 week days and 61.00% in sedentary behaviors, 31.1% in LPA (LPA1=24.0%,
167 LPA2=7.1%) and 7.9% in MVPA (MPA=5.0%, VPA=2.9%), during weekend days.
168 Examination of the total level of LPA indicated that 40.7% was accumulated during
169 school days (girls 39.4%, boys 42.4%) and 59.3% during leisure-time (girls 60.6%,
170 boys 57.6%). Total level of MVPA was represented by 43.3% accumulated during
171 school day (girls 41.7%, boys 45.0%) and 56.7% accumulated during leisure-time (girls
172 58.3%, boys 55.0%). The total level of ST was represented by 39.1% accumulated
173 during school day (girls 39.4%, boys 37.7%) and 60.6% during leisure-time (girls
174 60.6%, boys 62.3%). During the study, boys performed more MVPA than girls (64.03
175 [± 14.34] minutes vs 54.90 [± 21.05] minutes daily). (Table 2). A simple linear
176 regression was calculated to predict the participant's BMI based on their gender.
177 Significant equation was not found ($F(1, 438) = 0.172, p = .679, R^2 = .000$).

178 Comparisons between different BMI groups revealed that normal weight boys (67.55
179 [± 24.13] minutes) had more MVPA than overweight (53.40 [± 23.66] minutes) or obese
180 children (48.64 [± 12.86] minutes) ($p = 0.14-.009$) in weekdays, but not in weekend days.
181 Results for LPA showed there were no differences between groups. Among girls,
182 differences between BMI groups were not found. Different activity levels during the
183 school day and leisure-time were distributed in the BMI groups as follows: normal

184 weight (LPA 41.0%/59.0%, MVPA 43.2%/56.8%, ST 39.1%/60.9%), overweight (LPA
 185 42.3%/57.7%, MVPA 46.9%/53.1%, ST 39.7%/60.3%), obese (LPA 41.4%/58.6%,
 186 MVPA 43.3%/56.7, ST 38.5%/61.5%). Comparing the proportion of participants who
 187 meet the PA recommendation of 60 min of daily MVPA between different BMI groups
 188 revealed that normal weight children (46.9%) met the recommendations more often than
 189 overweight (34.5%) and obese children (27.3%) ($p=.029$). A higher percentage of
 190 normal weight boys (58.2%) met the recommendations than overweight (30.8%) or
 191 obese boys (26.7%) ($p=.004$). Among girls, the difference between normal weight
 192 (38.8%), overweight (37.5%) and obese girls (27.8%) was not statistically significant.
 193 (Table 3).

194 *PA and ST during school day*

195 During school day children spent 60.7% engaged in sedentary behaviors, 30.5% in LPA
 196 and 8.8% in MVPA (girls= 63.2%/28.9%/7.9%, boys 57.4%/32.5% 10.1%). Comparison
 197 of PA levels between boys and girls during school day demonstrated that boys were
 198 more active during the school day ($p<.001$) while girls were more sedentary ($p<.001$).
 199 Boys had more LPA1, LPA2, VPA, MVPA ($p<.001$) and MPA ($p=.002$) than girls.
 200 Between different BMI groups it was found that during the school day obese children
 201 engaged in higher levels of LPA1 ($p=.015$), LPA2 ($p=.030$) and LPA ($p=.009$) than
 202 normal weight children. On the contrary, obese children had lower levels of VPA than
 203 normal weight ($p<.001$) and overweight ($p=.009$) children and lower levels of MVPA
 204 than normal weight ($p=.015$). (Table 3 & 4).

205

206 A multiple linear regression was calculated to predict the PA and ST based on gender
 207 and BMI. Significant regression results were found for school-day ST ($F(2, 438) =$
 208 $41.582, p<.001, R^2=.140$), LPA1 ($F(2, 438) = 16.124, p<.001, R^2=.059$), LPA2 ($F(2,$

209 438) = 40.087, $p < .001$, $R^2 = .136$), LPA ($F(2, 438) = 24.451$, $p < .001$, $R^2 = .087$), MPA
 210 ($F(2, 438) = 34.492$, $p < .001$, $R^2 = .119$), ($F(2, 438) = 25.530$, $p < .001$, $R^2 = .091$) VPA (F
 211 ($2, 438) = 25.530$, $p < .001$, $R^2 = .091$) and MVPA ($F(2, 438) = 35.601$, $p < .001$,
 212 $R^2 = .122$).

213 *PA and ST in leisure-time*

214 During leisure-time children spent 63.1% of time engaged in sedentary behaviors,
 215 29.2% in LPA and 7.6% in MVPA (girls=63.6%/29.2%/7.2%, boys=
 216 62.6%/29.2%/8.2%). Likewise, during leisure-time boys engaged in more MPA
 217 ($p = .021$) and MVPA ($p = .046$) than girls. During the leisure-time period girls spend
 218 more time sedentarily ($p = .036$). During leisure-time obese children spent more time in
 219 LPA1 than normal weight children ($p = .018$) and more time in LPA1 ($p = .041$) and LPA
 220 ($p = .044$) than overweight children. Again, normal weight children spent more time in
 221 VPA than overweight ($p = .007$) and obese children ($p = .004$). Normal weight children
 222 had more MVPA than overweight children ($p = .012$). (Table 3 and 4).

223
 224 A multiple linear regression was calculated to predict the PA and ST based on gender
 225 and BMI. Significant regression results were found for leisure-time LPA1 ($F(2, 438) =$
 226 3.187 , $p = .042$, $R^2 = .012$), MPA ($F(2, 438) = 4.939$, $p = .008$, $R^2 = .019$), VPA ($F(2, 438)$
 227 $= 8.466$, $p < .001$, $R^2 = .004$) and MVPA ($F(2, 438) = 35.601$, $p < .001$, $R^2 = .122$).

228 *PA and ST during PE lessons*

229 During PE lessons children spent 34.0% of their time in sedentary behaviors, 41.0% in
 230 LPA and 25.0% in MVPA (girls=36.1%/40.5%/23.4%, boys=31.5%/41.7%/26.8%).
 231 During PE lessons there was a statistical difference in ST between boys and girls
 232 ($p = .016$). Instead, in PA categories there were no differences between genders, or

233 between different BMI groups. Likewise, no differences were found when different
234 BMI groups were compared between genders. However, children who met the WHO
235 recommendations for PA engaged in more MVPA (girls $p=.013$, boys $p<.005$) and
236 lower level of ST ($p=.001$) during PE lessons was found for the boys than those who did
237 not met the recommendations. (Table 3 and 4).

238
239 A multiple linear regression was calculated to predict the PA and ST based on gender
240 and BMI. No significant regression results were found for PE lesson PA or ST
241 variables.

242

243 *PA and ST during weekends*

244 During weekends boys spent more time in LPA2 and MPA than girls ($p=.009-.010$) but
245 for ST there were no differences. Normal weight children had more VPA than
246 overweight ($p=.044$) and obese ($p=.018$) children. All BMI groups had less MVPA
247 during weekends when compared to weekdays ($p=.001-.030$). Normal weight and obese
248 children also had less VPA during weekends ($p=.003-.004$) than week days. Normal
249 weight and obese children also had less MPA during weekends ($p=.002-.005$). Obese
250 children also spent less time in LPA1 and LPA during weekends ($p=.016-.018$) than
251 week days.

252 **Discussion**

253 The present study was designed to investigate difference in PA and ST for a sample of
254 5th grade students over a continuous five weekday and two weekend day period.
255 Comparisons were made between different gender and BMI groups during the school-
256 day, leisure-time, PE-lessons, and weekend days. This study revealed detailed

257 information regarding objectively measured PA among 11-12-year-old students. The
258 results of this study indicated that there are significant differences between genders and
259 different BMI groups in PA and ST during school day and leisure-time but not during
260 PE lessons.

261

262 Distribution of different activity levels are in line with a previous study that involved
263 children of the same age, whereby, daily percentages in ST (62.5%), LPA (29.4%) and
264 MVPA (8.1%) are comparable to the results reported by Trost²⁵ (63%, 31% and 6%,
265 respectively). Marques et al.¹⁶ reported findings supporting the current results
266 demonstrating that boys engaged in more MVPA than girls during school day and in
267 leisure-time. The present study found that the difference primarily exists because of
268 higher proportion of VPA among boys. Mean times for MVPA among boys (64.0 min)
269 and girls (54.9 min) in this study, were higher than times found for boys (40-50 min)
270 and girls (23-43 min) in data collected across five European countries³². Even though
271 girls performed less MVPA, it is notable that during leisure-time girls accumulated a
272 larger portion of their daily PA (both MVPA and LPA) than boys. Similar results have
273 also been reported in Australian samples¹³. In addition, normal weight boys met the
274 recommendations for daily PA more consistently than overweight or obese boys, a
275 pattern also shown in similar research³³. This type of PA behavior could be explained
276 by higher usage of video/computer games³⁴ or screen time³⁵ among boys. High screen
277 time is especially concern, if children are not meeting the recommendations for PA. It
278 has been found that children with simultaneous influence of high screen time and lack
279 of PA are 3 to 4 times more likely to be overweight³⁶.

280 The current study determined that during both the school day and leisure-time periods,
281 obese children had more LPA1, but less VPA than normal weight children. A similar

282 pattern was found during leisure-time among overweight children. These results,
283 however, were not replicated during PE lessons with time in MVPA being similar for all
284 children. This finding highlights that PE does have the capacity to promote equity in
285 MVPA engagement for all weight groups, however, a previous Czech study did not
286 report any similarity between the MVPA of children in relation to their body weight
287 status³⁷. This highlights the importance of compulsory PE lessons for school aged
288 children, especially for overweight children. Since there were no differences in BMI
289 groups during PE lessons it may be that these children do not move in other contexts
290 and hence, PE may be the only time period where they are encouraged to move and
291 have the possibility to engage in a variety of different sports and physical activities. The
292 pedagogical intent of PE also has other important objectives beyond PA, including
293 social and psychological objectives³⁸. In PE lessons, various activities contribute to
294 engagement in PA differently. For example, ball games accumulate more MVPA and
295 less ST than gymnastics or track and field lessons³⁹ or in movement lessons²¹. However,
296 for boys and girls, it was found that during PE lessons girls recorded a higher level of
297 sedentary time than boys. This is in line with previous research highlighting the more
298 active participation of boys during PE lessons and the more sedentary participation of
299 girls²⁰.

300 This study details differences in the patterns of engagement in PA between girls and
301 boys and between different BMI groups across the day, including time spent in PE.
302 Findings that support the claim that a focus should be maintained on obese and
303 overweight boys and provide activities specifically designed for these groups. In
304 addition, targeted interventions could be directed to immigrant children, since these
305 groups seems to be in risk group when entering to new culture with westernization of
306 eating habits, body image perceptions and PA⁴⁰. Even though girls have less MVPA

307 there are no differences between different BMI groups. Hence, more attention should be
308 focused on girls PA during school day and leisure-time, how to promote PA and
309 activate more generally. While schools have promoted PA during the day in Finland, it
310 seems that increasing compulsory PE would be the most potential way to increase PA
311 for all students.

312 **Abbreviations**

313 BMI=body mass index

314 CPM=counts per minute

315 LPA=light PA, LPA1 & LPA2 indicates the intensity of LPA

316 MPA=moderate PA

317 MVPA=moderate to vigorous PA

318 PA=physical activity

319 SD=Standard deviation

320 ST=sedentary time

321 VPA=vigorous PA

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449 Table 1. Physical characteristics and % of meeting the PA guidelines of the participants

450 with valid PA data.

451

	Girls	Boys	All
	Mean (SD)	Mean (SD)	Mean (SD)
	(n=258)	(n=189)	(n=453)
Age (years)	11.25 (3.20)	11.27 (0.33)	11.26 (0.32)
Height (cm)	148.08 (7.22)	148.40 (6.45)	148.21 (6.90)
Weight	41.40 (8.61)	41.91 (4.40)	41.62 (8.94)
BMI (kg/m ²)	18.78 (2.98)	18.84 (3.17)	18.80 (3.06)
Weight status			
Underweight (%)	2.0	2.1	2.0
Normal weight (%)	78.5	75.9	77.4
Overweight (%)	12.5	13.9	13.1
Obese (%)	7.0	8.0	7.4
% of children meeting PA guidelines			
Week day	39.8	57.7	47.5
Weekend day	34.0	44.8	38.6

452

453 Table 2. Differences between boys and girls in intensity levels (minutes)*.

	Girls (n=259)	Boys (n=194)	p	All (n=453)
Mean time spent in PA and ST, average day (week days)				
LPA	214.66 (41.39)	223.26 (41.62)	.022	218.57 (41.68)
MVPA	56.51 (19.85)	65.38 (24.10)	<.001	60.55 (22.31)
ST	474.08 (58.83)	444.13 (65.73)	<.001	460.45 (63.78)
Mean time spent in PA and ST, average day (weekend day)				
LPA	213.43 (51.18)	217.20 (60.81)	.426	215.07 (55.54)
MVPA	51.87 (32.42)	59.35 (39.00)	.055	55.12 (35.58)
ST	424.69 (86.31)	414.13 (101.17)	.309	420.10 (93.11)
Mean time spent in PA and ST, average day (week total)				
LPA	215.17 (38.85)	222.88 (40.47)	.041	218.48 (39.66)
MVPA	54.90 (21.05)	64.03 (24.34)	<.001	58.95 (22.79)
ST	463.09 (56.57)	441.02 (64.52)	<.001	453.79 (60.15)

454 * Minutes shown as absolute values. In the analyses, wear-time considered.

456 Table 3. Differences between BMI groups in different intensity levels (minutes)*.

School day	Normal weight	Overweight	Obese	F (2,438)	<i>p</i>
ST	181.92 (24.98)	180.57 (24.60)	173.94 (22.77)	0.79	
LPA1	69.14 (15.34)	72.77 (16.00)	77.79 (14.57)	4.50	1<3
LPA2	20.37 (5.12)	20.63 (5.23)	23.01 (4.14)	3.37	1<3
LPA	89.51 (18.89)	93.41 (19.69)	100.80 (17.41)	4.75	1<3
MPA	17.07 (5.62)	16.64 (5.97)	16.46 (4.09)	0.36	
VPA	9.78 (5.34)	9.00 (5.11)	5.61 (3.51)	9.99	1>3, 2>3
MVPA	26.85 (9.72)	25.64 (10.0)	22.07 (1.10)	4.15	1>3
Leisure-time				F (2,438)	
ST	285.87 (52.17)	282.43 (54.39)	289.59 (61.84)	0.09	
LPA1	101.66 (22.91)	99.72 (24.31)	113.50 (27.56)	3.95	1<3, 2<3
LPA2	29.95 (10.16)	27.44 (9.18)	32.45 (11.40)	2.05	
LPA	131.61 (30.73)	127.16 (31.67)	145.95 (36.44)	3.24	1<3
MPA	21.45 (9.56)	18.43 (9.10)	20.95 (10.03)	2.51	
VPA	14.64 (10.23)	11.14 (9.20)	8.84 (8.16)	8.81	1>2, 1>3
MVPA	36.09 (18.13)	29.58 (16.88)	29.79 (16.57)	5.66	1>2
PE				F (2,398)	
ST	30.52 (14.67)	29.79 (15.39)	30.22 (15.22)	0.72	
LPA1	24.87 (7.10)	23.72 (7.21)	24.97 (7.79)	0.96	
LPA2	12.24 (5.01)	11.94 (5.58)	11.53 (4.82)	2.05	
LPA	37.11 (9.45)	35.67 (10.75)	36.50 (9.64)	0.75	
MPA	13.65 (8.07)	14.56 (8.05)	13.74 (8.43)	1.02	

VPA	8.50 (7.68)	9.98 (9.21)	9.54 (9.27)	0.24
MVPA	22.15 (13.38)	24.54 (13.67)	23.28 (16.85)	0.33

457 * Minutes shown as absolute values. In the analyses, wear-time considered.

458 Table 4. Differences between boys and girls in different intensity levels (minutes)*.

School day	Boys	Girls	F (1, 438)	p
ST	170.50 (24.75)	188.80 (22.11)	22.26	<.001
LPA1	73.87 (15.40)	67.40 (14.94)	14.20	<.001
LPA2	22.68 (5.09)	19.10 (4.53)	16.40	<.001
LPA	96.55 (18.64)	86.50 (18.14)	13.38	<.001
MPA	19.21 (5.91)	15.36 (4.73)	9.61	.002
VPA	10.78 (5.99)	8.25 (4.55)	12.94	<.001
MVPA	29.99 (10.34)	23.61 (8.15)	14.88	<.001
Leisure-time			(1,438)	
ST	288.26 (85.19)	299.1 (77.47)	4.44	.036
LPA1	102.51 (33.82)	107.37 (30.80)	0.01	.939
LPA2	31.84 (13.21)	29.67 (10.85)	1.98	.160
LPA	134.35 (44.78)	137.05 (39.99)	0.12	.733
MPA	23.01 (11.41)	20.44 (9.79)	5.37	.021
VPA	14.42 (11.68)	13.77 (9.62)	1.86	.173
MVPA	37.43 (21.20)	34.21 (17.99)	3.99	.046
PE			F (1,398)	
ST	29.28 (14.52)	32.11 (32.11)	5.81	.016
LPA1	24.40 (7.63)	24.37 (6.91)	0.96	.328
LPA2	12.19 (5.51)	11.74 (5.19)	2.13	.139
LPA	36.60 (10.62)	36.11 (9.24)	2.11	.147
MPA	14.44 (8.31)	13.30 (8.20)	2.68	.102

PA differences in fifth graders

VPA	9.50 (8.68)	8.26 (7.32)	1.33	.249
MVPA	23.94 (14.79)	21.56 (21.56)	2.72	.100

459 * Minutes shown as absolute values. In the analyses, wear-time considered.

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