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Indoor and outdoor context-specific contributions to early adolescent MVPA as measured by combined diary, accelerometer and GPS

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1 **Abstract**

2 **Background**

3 The distribution of adolescent MVPA across multiple contexts is unclear. This study
4 examined indoor and outdoor leisure-time in terms of being structured or
5 unstructured, and explored relationships with total daily MVPA.

6

7 **Methods**

8 Between September 2012 and January 2014, seventy 11-13 year olds from 4 schools
9 in Edinburgh wore an accelerometer and GPS receiver over 7 days, also reporting
10 structured physical activity using a diary. Time spent and MVPA were summarised
11 according to indoor/outdoor location and whether activity was
12 structured/unstructured. Independent associations between context-specific time spent
13 and total daily MVPA were examined using multivariate linear regression.

14

15 **Results**

16 Very little time or MVPA was recorded in structured contexts. Unstructured outdoor
17 leisure-time was associated with an increase in total daily MVPA almost twice that of
18 unstructured indoor leisure-time (b-value [95% CI]: 8.45 [1.71, 14.48] vs. 4.38 [0.20,
19 8.22] minute increase per hour spent). The association was stronger for time spent in
20 structured outdoor leisure-time (35.81 [20.60, 52.27]).

21

22 **Conclusions**

23 Research and interventions should focus on strategies to facilitate time outdoors
24 during unstructured leisure-time and maximise MVPA once youth are outdoors.
25 Increasing the proportion of youth engaging in structured activity may be beneficial as
26 although time spent was limited, association with MVPA was strongest.

27 **Introduction**

28 The UK Government advises that children and young people aged 5 to 18 should
29 participate in structured and unstructured activities throughout the day to achieve the
30 recommended 60 daily minutes of moderate-to-vigorous physical activity (MVPA).
31 Physical activity of this intensity stimulates the cardiorespiratory, musculoskeletal and
32 metabolic systems resulting in health benefits¹. Structured physical activities are those
33 with elements of formality and are commonly facilitated by adults; sport, dance
34 classes and after school clubs are typical examples¹. Unstructured physical activities
35 such as indoor or outdoor play tend to be child directed, intermittent and informal².
36 Young people can also accumulate physical activity during school-time. Developing
37 our awareness of how these varied contexts contribute towards daily MVPA targets is
38 essential because each is likely to have different determinants and/or supplementary
39 social benefits³.
40
41 The outdoors is a potentially lucrative environment to encourage participation in
42 physical activity. Participation in unstructured outdoor physical activity is of
43 particular interest due to the absence of barriers such as cost or need for
44 facilities/equipment, and the high yield of MVPA per unit time^{4,5}. However, activity
45 in the informal outdoor locations which young people prefer⁶, is increasingly
46 restricted due to parental fears about strangers, crime and older teenagers⁷.
47 Simultaneously, young people are lured indoors by attractive screen-based sedentary
48 behaviours⁸. Limited outdoor time and restricted independent mobility denies an
49 important source of physical activity^{9,10}. Compensating for this through structured
50 sport and exercise may not be feasible due to financial or time barriers¹¹, or the
51 absence of appropriate facilities.

52

53 It is hypothesised that rather than engaging in independent activity outdoors, children
54 spend most time indoors alone, and when they do leave the home, are transported by
55 car to take part in structured adult-facilitated sport and exercise¹². At present the
56 distribution of physical activity engagement across different contexts is unclear, and
57 as such it is uncertain where intervention efforts should be directed. The pattern of
58 activity may be particularly complex during early adolescence, when independence
59 from adults begins to develop, allowing greater access to the outdoor environment¹³.
60 Conversely, adolescents are also reported to undergo a shift away from unstructured
61 physical activity with age¹⁴. A key challenge to increasing our understanding of how
62 young people make use of different contexts for physical activity is measurement¹⁵.
63 Accelerometers measure change in intensity with time at high resolution but fail to
64 capture contextual detail, while self-report diaries permit detailed descriptions of
65 physical activity but are cognitively demanding and burdensome for the participant¹⁶.
66 These difficulties are exacerbated in unstructured activities which are typically
67 sporadic and unmemorable¹⁷. By dividing adolescent leisure-time physical activity
68 into context-based dimensions, and combining data from global positioning system
69 (GPS) receivers, diaries and accelerometers, it may be possible to more accurately
70 characterise the specific contexts where MVPA occurs.

71

72 Consistent with an ecological approach to modifying health behaviours¹⁸, context-
73 specific data of this kind are necessary to guide future research and inform
74 intervention strategies. To identify contexts which could have greatest impact on
75 overall daily physical activity, two types of data are required: 1) within each day, the
76 existing contributions of different contexts towards total MVPA (i.e. the MVPA

77 profile); and 2) the independent association of time in each context with daily MVPA.

78 Data of this kind relating to structured and unstructured leisure-time occurring indoors

79 and outdoors have not been reported using combined objective and subjective tools.

80 This paper therefore aims to answer two research questions:

81 1. How much time is spent and how much MVPA is accumulated in different

82 contexts each day?

83 2. What are the strength and nature of associations between time spent in these

84 contexts and total daily MVPA?

85

86 **Methods**

87 **Participants and procedure**

88 Eighty-two early adolescents in the S1 year group (aged 11-13 years) were recruited

89 from secondary schools in Edinburgh, between September 2012 and January 2014

90 across autumn, winter and spring terms. Twenty-five schools were contacted, with 3

91 state schools and 1 independent school selected based upon their willingness to take

92 part. Pupils who returned a consent form signed by a parent/guardian and verbally

93 agreed to take part were included in the study. Ethical approval was granted by Moray

94 House School of Education Ethics Committee.

95

96 **Accelerometer, GPS receiver and diary**

97 For 7 continuous days including both weekend days. physical activity intensity was

98 recorded using an accelerometer (GT3X+; ActiGraph LLC, FL, USA) worn on the

99 right hip during all waking hours except when bathing, showering or swimming.

100 Participants also wore a GPS receiver (Qstarz BT-Q1000eX; Qstarz International,

101 Taiwan, Republic of China) set to record location every 10 seconds (0.1 Hz). A

102 signal-to-noise ratio (SNR) threshold of 212 was used to label each epoch as indoors
103 and outdoors¹⁹. Participants used a diary adapted from one used in a similar
104 population²⁰ to record only the duration of structured physical activity out of school
105 hours. A description of the activity (e.g. football training) and its start and end times
106 was recorded. No other information (e.g. intensity or location) was requested, as this
107 was captured by the other devices. After checking, diary content was used to
108 dichotomise leisure-time as structured or unstructured. Participants were asked to
109 complete the diary with the help of their parent(s) or guardian if necessary. If a child
110 returned an empty diary, it was confirmed verbally that no structured activity had
111 occurred. A detailed definition of structured physical activity was provided with
112 several examples, and a demonstration diary entry was provided for guidance.

113

114 **Other variables**

115 Height (m) and body mass (kg) were measured with shoes removed and indoor
116 clothing using a stadiometer (Seca 213; Seca; CA, USA) and digital scales (Seca
117 Clara 803; Seca; CA, USA); weight status was determined using international
118 standard definitions²¹. One school preferred their pupils to not have height and weight
119 measured. Age, sex, ethnicity and post-code were reported with the help of a parent or
120 guardian. Minutes of daylight were determined using standard tables²². The Scottish
121 Index of Multiple Deprivation (SIMD) quintile was defined using the full home
122 postcode²³.

123

124 **Data processing**

125 Data processing was conducted using STATA (Stata/SE v12.0, Stata Corp. College
126 Station, TX, 2011). In this study a 10 second epoch was used due to limitations of the

127 storage capacity of the GPS device. Each epoch of accelerometer data was labelled as
128 MVPA when counts exceeded 560 per 10 seconds²⁴. Consecutive zero values of 60 or
129 more minutes, with no allowance for interruptions, were identified and excluded and
130 assumed to be accelerometer non-wear time. Days with < 9 hours of accelerometer
131 wear time were excluded from the analyses²⁵. Data collected during the first day of
132 measurement were excluded for all participants due to risk of reactivity bias and
133 variation in the hour of commencement of the study. Spuriously high accelerometer
134 counts were excluded based upon a threshold of 15000 counts per minute²⁶. Data
135 points from GPS data with high speed (> 15 km/h) were assumed to arise from
136 motorised transport and excluded⁹. Some GPS epochs were missing so these were
137 assumed to be indoors. The GPS and accelerometer data were matched by date and
138 time stamp, and diary data were used to label each epoch as structured or
139 unstructured. A summary of how contexts of physical activity were derived is shown
140 in Table 1. Minutes of time spent and MVPA in each context were summed by
141 participant and day. Based on individual means across days of measurement, week-
142 day values were calculated for overall daily MVPA, context-specific MVPA and
143 context-specific wear time.

144

145 **Data analyses**

146 All data analyses were conducted using SPSS (IBM SPSS Statistics, v19.0, SPSS Inc.,
147 Chicago, IL, 2010). There were no statistically significant differences in estimates of
148 overall daily MVPA (One-way analysis of variance; $p = 0.91$), or context-specific
149 MVPA (Kruskal-Wallis tests; $p = 0.77 - 0.86$) by number of valid days of
150 measurement, so all participants who recorded at least 1 valid day were included in
151 analyses. Independent samples t-tests and Chi-squared tests were used to examine

152 differences between included and excluded participants. Means (with standard
153 deviations in parentheses) and percentages were used to examine total daily wear
154 time, total daily MVPA and demographic characteristics. Owing to non-normal
155 distributions, the median and interquartile range (IQR) were used to assess absolute
156 (minutes) and relative (percent) context-specific contributions to daily wear time and
157 daily MVPA.

158

159 A multivariate linear regression model was used to assess associations between time
160 spent in each of the 4 leisure-time contexts and total week-day MVPA. This was
161 expressed as the mean increase in minutes of MVPA for each hour in that context
162 after adjusting for wear time spent in all other contexts. Bivariate associations of
163 potential confounders (age, sex, SIMD, daylight hours) with independent and
164 dependent variables were tested using Pearson correlation coefficients and a criterion
165 for the alpha-level of $p < 0.20$ ²⁶. Presence of confounding was also assessed by
166 comparing unadjusted and adjusted regression coefficients. Factors which resulted in
167 adjusted coefficients differing from unadjusted coefficients by 10% or more were
168 retained in the model²⁷. Hypothesising a large effect ($R^2 > 0.26$) based on previous
169 similar work²⁰, and with a maximum of 8 predictors, the sample size for this study
170 was appropriate to achieve power of 0.80²⁸.

171

172 **Results**

173 **Accelerometer and GPS compliance**

174 Seventy participants provided at least 9 hours of accelerometer data on at least 1
175 measurement day. A mean of 3.1 (1.3) valid days of data were provided per
176 participant. Seventy participants provided a mean of 2.7 (1.1) week-day data with a

177 mean of 11.3 (1.4) hours per day. Twenty-seven participants provided a mean of 1.2
178 (0.4) weekend-day data with a mean of 12.9 (4.1) hours per day; due to insufficient
179 wear-time on weekend-days and non-suitability to combine with week-days, these
180 data were not analysed No participants supplied weekend-day but not week-day data.
181 Those who failed to meet inclusion criteria did not differ by sex, age, ethnicity,
182 SIMD, BMI or school attended ($p = 0.15\text{--}0.97$). Valid GPS data were present for time
183 matching to a high proportion ($> 99.9\%$) of retained accelerometer epochs.

184

185 **Participant characteristics**

186 The final sample consisted of 23 boys and 47 girls of mean age 12.4 (0.4) years. Of
187 the 57 participants who provided height and weight measurements, 1/57 (1.75%) was
188 overweight, 1/57 (1.75%) was obese, and 55/57 (96.5%) were of normal weight
189 status. Of the final sample, 64/70 (91.4%) were white and 44/70 (62.9%) attended the
190 independent school. On average participants resided in areas within the 16th vigintile
191 for SIMD compared to the 14th vigintile for Edinburgh as a whole²³.

192

193 **Overall MVPA**

194 Participants recorded a mean of 67.6 (25.8) minutes of MVPA on week-days, and 42/
195 70 (60%) recorded on average at least 60 minutes MVPA per day. Of the 70
196 participants who met inclusion criteria, 22/70 (31.4%) reported no structured physical
197 activity during the measurement period. Structured activity was reported by 32/70
198 (45.7%) of participants on week-days.

199

200 **Context-specific time spent and MVPA on week-days**

201 Table 2 summarises time spent and MVPA during school-time and 4 leisure-time
202 contexts. Most time was spent at school, followed by periods spent indoors during

203 unstructured leisure-time. Time in structured leisure-time physical activity was
204 limited. Approximately 80 minutes of unstructured outdoor time were recorded per
205 participant per week-day. Most minutes of MVPA were recorded at school; there was
206 no evidence of clustering of MVPA by school (Intra-cluster correlation coefficient =
207 0.00; $p = 0.92$). Across all participants, structured MVPA contributed very little
208 toward week-day totals.

209

210 **Associations between time in specific leisure-time contexts and MVPA on** 211 **week-days**

212 Table 3 shows output from the multivariate linear regression model. Time in
213 structured outdoor contexts was most strongly associated with MVPA. Leisure-time
214 spent in unstructured outdoor contexts was associated with an increase in daily
215 MVPA almost double that of unstructured indoor contexts.

216

217 **Discussion**

218 This is the first study to investigate the contributions of indoor and outdoor contexts
219 of health-related MVPA in terms of whether they are structured or unstructured, an
220 important variable relating to the location, level of independence and cost of physical
221 activity. The research utilised a novel combination of accelerometer, GPS receiver
222 and diary tools to characterise the context of MVPA in a way that has not previously
223 been performed. The results showed that early adolescents in the first year of Scottish
224 secondary school children recorded the majority of their total daily MVPA during
225 school-time and unstructured leisure-time (both indoors and outdoors). In comparison,
226 the contributions of structured leisure-time contexts to daily MVPA were minimal.
227 Despite this limited contribution overall, multivariate regression analysis revealed that

228 time spent in structured outdoor contexts was most strongly associated with total daily
229 MVPA.

230

231 The finding that on average, 11-13 year olds spent few minutes per day in structured
232 physical activity contexts, and that these periods contributed little towards daily
233 minutes of MVPA, echoes previous research from the Health Survey for England¹⁴.

234 The proportion of youth with no weekly participation in structured physical activity at
235 all (31.4%), also closely matches reports from the Scottish Health Survey, which
236 indicated that 31% of Scottish 2 – 15 year olds did not engage in any sport each
237 week²⁹. It must be noted that results for MVPA in structured contexts, total MVPA,
238 and the yield of MVPA for time spent in structured contexts are all likely to be
239 underestimated due to accelerometer non-wear during swimming and contact sports.

240

241 Limited frequency and duration indicated by diary data highlights structured outdoor
242 physical activity as a potentially fruitful intervention target, especially in view of the –
243 likely underestimated – high yield of MVPA per hour. However, encouraging
244 participation in structured physical activity in those who are more inactive, more
245 overweight, and less affluent than those represented by this sample may be a
246 significant challenge, especially given limited investment in after-school sport³⁰, and
247 that competitive sports-oriented opportunities do not suit some adolescents’
248 preferences³¹. Furthermore, the extrapolation of MVPA accrued during very little time
249 spent in this context to periods of an hour or more may not be justified, because the
250 relationship between time spent and MVPA may not be linear.

251

252 The present study showed that after school time, unstructured indoor contexts were
253 how the majority of time was spent and how most MVPA was recorded. This reflects
254 previous findings indicating that indoor leisure time is a vital contributor of MVPA⁹.
255 However, participants also spent over an hour in unstructured outdoor leisure-time
256 contexts. This was unexpected, given that independent outdoor time is thought to be
257 restricted for today's children^{12,32}, and that the majority of data collection occurred
258 during winter months when outdoor time is less common^{9,10}; in fact, the
259 predominance of winter data likely means that habitual time outdoors is
260 underestimated by this study. Minutes of unstructured outdoor time recorded are
261 therefore encouraging and show that access to the outdoor environment may not be as
262 restricted as feared, at least for this relatively active sample. Furthermore, these
263 periods were almost twice as strongly associated with daily MVPA than the indoor
264 equivalent, reinforcing the importance of outdoor time for physical activity.

265

266 Previously, the activity intensity of informal behaviours such as play has been
267 questioned. For example, Brockman et al.² reported that behaviours such as chatting,
268 computer games or hanging out with friends were identified as 'active' play. The
269 present study supports this hypothesis, indicating that although unstructured outdoor
270 leisure-time contains a higher proportion of MVPA than the indoor equivalent, it must
271 also include large portions of sedentary behaviour and light physical activity.

272 Therefore, whilst fostering social and physical environments that encourage outdoor
273 time might be possible intervention targets, strategies to maximise MVPA once young
274 people are outdoors could also be necessary. More detailed exploration of the
275 contextual components of outdoor time is warranted so that we may understand which
276 environments are most supportive of MVPA. The use of GPS information adds

277 contextual detail to accelerometer data, and more complex analyses are already being
278 conducted to show which geographic locations and features are most supportive of
279 physical activity^{15,33,34}. These sophisticated techniques will continue to provide
280 greater understanding of the location, but still fail to capture some contextual detail.
281 This information must instead come from self- or proxy-report, and the merging of
282 diary data to describe the structured or unstructured nature of physical activity is a key
283 strength of the dataset used here.

284

285 On average, participants in this study met the 60-minute target for daily MVPA, but
286 no single context contributed enough MVPA to meet this guideline. Context-specific
287 information about MVPA contributions is important as it provides guidance as to
288 where and when improvements may be needed, and what level of benefit to daily
289 minutes of MVPA could be expected. Restricted unstructured outdoor time has been
290 proposed as barriers to meeting activity guidelines. Data presented here do not support
291 this hypothesis, and this is common with self-report data for outdoor play from a
292 nationally representative sample in England¹⁴. In fact, these results suggest a potential
293 imbalance in the opposite direction, with structured physical activity contributing very
294 little towards daily MVPA, even in an active and relatively affluent sample that might
295 be expected to have better access to sports clubs, classes and after school activities led
296 by adults. This is more surprising considering the high proportion of females and
297 those from less deprived areas in the sample, characteristics of those reported to have
298 more restricted outdoor time^{6,35-37}. The fact that this sample had relatively high
299 activity levels and low deprivation may mask context-specific barriers to physical
300 activity for the wider population.

301

302 Strengths of this study include the combination of 3 sources of data which allowed
303 detailed analysis of the contexts of physical activity in a way that has not been
304 performed previously. Combining these methods capitalised on the strengths of each to
305 estimate the contributions of different contexts to total daily MVPA, producing a
306 unique physical activity profile. The use of accelerometry does not record swimming
307 and underestimates the contributions of movement during activities such as cycling,
308 upper body exercise and load-bearing, and this must be considered when viewing
309 these results. The GPS receiver used in present study demonstrated limited signal loss,
310 and this means that a very large proportion of valid accelerometer epochs were
311 successfully matched to a GPS record. This proportion of matched data offers greater
312 confidence in the estimation of indoor or outdoor location using the SNR. However,
313 some misclassification is likely and in particular, time indoors and in motorised
314 transport may have been erroneously classified as time outdoors. Steps were taken to
315 remove GPS data with high speed; however, periods spent in slower traffic may have
316 led to overestimation of the total time adolescents spend outdoors. The high
317 proportion of matched GPS and accelerometer data also demonstrates that this group
318 of adolescents were capable of following instructions to charge the GPS unit using the
319 charging device provided. These findings are promising for future studies which seek
320 to use GPS data to determine geographic location in adolescent populations.

321

322 Mean days of measurement per participant are comparable to studies using similar
323 methods in youth of approximately the same age²⁵, however the findings of this study
324 are limited by inclusion of those with only 1 valid day of monitoring. Typically, 4 or 5
325 days of measurement are deemed to be sufficient to provide a reliable estimate of
326 habitual youth physical activity³⁸. In this study, there were no differences in mean

327 daily MVPA or context-specific MVPA by number of valid days of measurement, and
328 so those providing at least 1 day of measurement were retained to maximise sample
329 size. As noted by Klinker et al.³³, it is presently unclear how many days of
330 measurement are required to obtain reliable estimates of context-specific physical
331 activity. This may be a particular concern for structured physical activity which
332 appears to occur less frequently. Increasing focus on context-specific behaviours and
333 determinants highlights further methodological research on the design of studies
334 combining GPS and accelerometry as a priority. Other weaknesses of this work
335 include the small sample size which precluded control for potential clustering effects
336 by school and stratification by sex. Pubertal status is a potentially important
337 determinant of where and how adolescents are active; but these data were not
338 collected. Exploration of the determinants of the distribution of physical activity
339 contexts should be area of future research. Analyses are limited to term-time only data
340 and cannot be generalised to school holidays. A large proportion of participants
341 attended an independent school and the mean daily minutes of MVPA does indicate
342 selection bias towards active individuals. Findings should therefore be treated with
343 caution, as the physical activity profile reported may not be generalisable to the wider
344 population. In particular, it could be expected that the general population has lower
345 involvement in structured physical activity than individuals from less deprived
346 neighbourhoods^{14,39}, and not obtain as many minutes outdoors as the active and
347 predominantly normal weight sample measured here. It is therefore important to
348 reproduce this work in larger samples, particularly with the inclusion of youth from
349 more disadvantaged areas and schools.

350

351 There may be errors in the report of activity and consequent MVPA classification as
352 reported in previous work⁴⁰. The purpose of the study was to examine structured and
353 unstructured physical activities, and by asking for only structured activities to be
354 reported, leisure-time was dichotomised. It is possible that some structured activities
355 may have gone unreported, however, because these activities tend to occur at regular
356 times and that parents were requested to help complete dairies, errors are likely to
357 have been minimised. Steps were also taken to ensure empty dairies were
358 representative of the actual pattern of behaviour. Dichotomisation of leisure-time may
359 be a simplification and ignores the possible existence of semi-structured activity or
360 further subcategories of behaviour. This demonstrates the complexity of measuring
361 the type and context of physical activity and reinforces the need for further work
362 investigating the health-related social and physical environments encountered by
363 young people during their leisure-time.

364

365 **Conclusions**

366 This research used a novel multi-tool approach to ensure MVPA could be recorded
367 throughout the day and simultaneously record difficult to capture contextual detail.
368 The results indicate that research and strategies to increase MVPA in the adolescent
369 population should target multiple contexts and that specific focus may be required to:
370 increase the proportion of adolescents participating in structured leisure-time physical
371 activity (especially outdoors); increase the frequency of these sessions; maximise the
372 time adolescents spend outdoors during unstructured leisure-time; develop
373 environments or opportunities that facilitate greater MVPA participation once
374 outdoors.

375

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385

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503

504 **Tables**

Table 1 *Source of data and decision rules for coding of context-specific physical activity outcome variables.*

Coded variable	Source of data and decision rule		
	GPS	Diary	Accelerometer
Unstructured outdoor MVPA	SNR \geq 212	Time points not included in diary	> 560 counts per ten second epoch
Unstructured indoor MVPA	SNR < 212	Time points not included in diary	> 560 counts per ten second epoch
Structured outdoor MVPA	SNR \geq 212	Time points included in diary	> 560 counts per ten second epoch
Structured indoor MVPA	SNR < 212	Time points included in diary	> 560 counts per ten second epoch
School MVPA	Not applicable	Specified by school timetable	> 560 counts per ten second epoch

Abbreviations: Moderate to vigorous physical activity (MVPA); Global Positioning System (GPS); signal-to-noise ratio (SNR).

Table 2 Context-specific time spent and MVPA per participant per week-day (n = 70).

		SCHOOL	LEISURE TIME			
		TIME	Unstructured		Structured	
			Outdoors	Indoors	Outdoors	Indoors
Total Time	Minutes	333.2 (299.8 – 352.1)	79.8 (50.3 – 114.3)	235.8 (181.8 – 292.7)	0.5 (0.0 – 27.0)	0.6 (0.0 – 12.4)
	% daily minutes	47.2% (40.5 – 53.2)	11.7% (0.8 – 16.2)	35.2% (27.3 – 43.0)	0.1% (0.0 – 4.3)	0.1% (0.0 – 1.7)
MVPA	Minutes	24.2 (18.9 – 30.7)	12.2 (5.7 – 22.5)	14.1 (8.4 – 25.9)	0.0 (0.0 – 7.1)	0.0 (0.0 – 0.9)
	% daily MVPA	42.1% (29.7 – 50.0)	18.2% (11.0 – 31.8)	24.6% (13.9 – 40.4)	0.0% (0.0 – 12.5)	0.0% (0.0 – 1.4)

Abbreviation: Moderate to vigorous physical activity (MVPA).

Note: Figures presented are median (interquartile range) per participant per week-day.

Table 3 *Multivariate linear regression model of hours spent in four leisure-time contexts and minutes of week-day MVPA (n = 70).*

Leisure-time context		<i>b</i> -value	95% CI		<i>t</i>	<i>p</i>
Unstructured	Outdoors	8.26	2.85	13.66	3.05	0.003
	Indoors	4.19	0.47	7.91	2.25	0.028
Structured	Outdoors	34.67	18.09	51.25	4.18	< 0.001
	Indoors	8.71	-11.26	28.67	0.87	0.387

Abbreviation: Moderate to vigorous physical activity (MVPA).

Note: Adjusted for sex and daylight hours. *b*-value: mean increase in minutes of daily MVPA for each hour spent in that context. $R^2 = 0.408$, $p < 0.001$.