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**Physical activity among adolescents with long-term illnesses or disabilities in 15 European countries**

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Peer Review

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1 Physical activity among adolescents with long-term illnesses or disabilities in 15

2 European countries

3 **Abstract:**

4 Physical activity (PA) is an important health-promoting behaviour that adolescents  
5 with long-term illnesses or disabilities (LTID) can benefit from. It is important to monitor  
6 differences across countries in adherence with PA recommendations for health (PARH). The  
7 aim of this study was to compare PA levels among 15 European countries after  
8 disaggregating data by disability. Data from pupils (Mean age = 13.6y, SD=1.64)  
9 participating in the 2013/14 Health Behaviour in School-aged Children (HBSC) study were  
10 analysed to compare adolescents without LTID, with LTID and with LTID that affects their  
11 participation (affected LTID). Logistic regression models adjusted for age and family  
12 affluence, stratified by gender and country group with PARH as the outcome variable. With  
13 the data pooled, 15% (n=9,372) of adolescents reported to have LTID and 4% (n=2566) with  
14 affected LTID. Overall, fewer boys with LTID met PARH than boys without LTID, although  
15 it was not statistically significant at the national levels nor for girls.

16 Keywords: inclusion; mainstream schools; health; chronic conditions, disability

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1           **Introduction**

2           A mass of evidence exists confirming the health benefits from regular physical  
3 activity (PA) among adolescents (Poitras et al., 2016). PA is defined as, “any bodily  
4 movement produced by skeletal muscles that requires energy expenditure” (Caspersen,  
5 Powell, & Christenson, 1985, p. 126) and moderate intensity PA (usually above 3METs) is  
6 considered as health-enhancing PA (Biddle, Sallis, & Cavill, 1998). International PA  
7 recommendations for health (PARH) for children and adolescents aged 5-17 years old is set  
8 to participation of at least 60 minutes of moderate to vigorous-intensity physical activity daily  
9 (WHO, 2010). It is also important for youth with disabilities to engage in PA, and meet the  
10 PARH since regular participation in PA distinctly reduces health complications secondary to  
11 disability conditions (Rimmer, Schiller, Chen, Schiller, & Chen, 2012).

12           According to the International Classification of Functioning, Disability and Health  
13 (ICF; WHO, 2001), people may experience disability because of the interaction between  
14 health conditions and contextual factors, thus influencing the child’s ability to participate in  
15 various activities including PA. Common barriers to participation in PA reported by people  
16 with disabilities include attitudes of others, lack of friends, high costs, low self-determination,  
17 fatigue, as well as accessibility (Ross et al., 2016). The degree to which these barriers exist to  
18 influence levels of PA in adolescents with different impairments may vary, as with  
19 adolescents with other chronic health conditions diagnosed by the doctor (Ng, Rintala,  
20 Tynjälä, Villberg, & Kannas, 2014). Yet, it is difficult to draw conclusions about these  
21 differences when studies use different protocols, instruments, and questions to measure PA.  
22 In addition, only six percent of studies published in *Adapted Physical Activity Quarterly*  
23 between 2004 and 2013 came from multiple samples, rather than subtypes of disabilities  
24 (Haegele, Lee, & Porretta, 2015). The high possibility of conditions and impairments co-

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25 existing in adolescents, makes increasing PA among young people with a disability an  
26 important public health concern (Ding et al., 2016).

27         Public health and health promotion experts often use monitoring and surveillance  
28 studies to assess progress over time between countries and for global evaluations (Brown,  
29 Cueto, & Fee, 2006). Global coverage of PA surveillance has increased from 64% of the  
30 European adolescent population in 2012 to 68% in 2016 (Sallis et al., 2016). However, it is  
31 unknown what proportion, if any, of these surveys involve people with disabilities. The  
32 Active Healthy Kids Global Alliance has recognised this in their most recent report card  
33 (Tremblay et al., 2016) which presented population-level data from 38 countries but  
34 highlighted the need for evidence concerning PA among children with disabilities. These  
35 suggestions are in line with the statements in the 2030 sustainable developmental goals that  
36 support reporting disaggregation by disability (Tardi & Njelesani, 2015).

37         In the most recent PA progress report by Sallis and colleagues (Sallis et al., 2016),  
38 adolescents that failed to meet the PARH (WHO, 2010) were considered as “inactive”. In  
39 other words, for the purpose of surveillance, only adolescents who achieved at least 60  
40 minutes of moderate to vigorous physical activity on a daily basis were considered as active  
41 adolescents. Although this benchmark does not allow for consideration of overall differences  
42 in PA levels, it serves the purpose for analysis against the PARH which is of primary interest  
43 to policy makers for national and international monitoring (Kalman et al., 2015). Due to the  
44 absence of data on adolescents with disabilities in existing reports, it is of great importance to  
45 report PA levels after disaggregation for disability. Furthermore, reporting of PA against  
46 benchmarks used in global surveys is necessary for making comparisons of young people  
47 with and without disabilities. Therefore, the purpose of this study is to use the PARH as a  
48 reference point to compare prevalence of physically active adolescents across Europe after  
49 disaggregating for disability and adjusting for age and family affluence.

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50           **Method**

51           Data were analysed from the 2013/14 WHO Collaborative Cross-national Health  
52 Behaviour in School-aged Children (HBSC) study. The 15 countries in the current analysis  
53 included the same questions on disabilities. All countries participating in HBSC comply with  
54 a standardised international protocol, including back translation of items. The samples were  
55 at the class level to form nationally representative estimates of 11-, 13- and 15-year-olds.  
56 Each team obtained approval to conduct the study through an ethics review board or  
57 equivalent regulatory body. The school administrators, parents and pupils granted consent  
58 (explicit or implicit, varied by country) for pupil completion of a self-report survey in the  
59 classroom without further assistance. Responses from the participants were anonymous, and  
60 participation was voluntary. Response rates varied by country, although was >70% at the  
61 international student level, with a proportion of the non-responses from absentees.

62           The pupils were asked to report their sex, month and year of birth as well as family  
63 affluence, measured using the Family Affluence Scale (FAS III). FAS III is a six-item  
64 assessment of material assets or activities and regarded as a child friendly indicator of social  
65 economic status (see Torsheim et al., 2016). FAS III was divided into three groups, low FAS  
66 (as represented by the lowest 20 percentile), medium FAS (the middle 60 percentile), and  
67 high FAS (highest 20 percentile). A separate analysis was performed for Armenia, since four  
68 (FAS II) of the six FAS III items reported.

69           **LTID status**

70           Two items were used to group adolescents according to their long-term illness or  
71 disability (LTID) status. Two yes or no questions were asked: 1) “Do you have a long-term  
72 illness, disability, or medical condition (like diabetes, arthritis, allergy, or cerebral palsy) that  
73 has been diagnosed by a doctor?” and 2) “Does your long-term illness or disability affect

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74 your attendance and participation at school?” Students were classified into three mutually  
75 exclusive categories, i) adolescents without LTID, ii) adolescents for whom the participation  
76 is not affected by their LTID – grouped as LTID, and iii) adolescents with participation  
77 affected by the LTID – grouped as affected LTID. Guided by the International Classification  
78 of Functioning, Disability and Health (ICF) definition of disability, the affected LTID group  
79 was classified as a group with greater severity of disability to the group of LTID. Data from  
80 Bulgaria and Czech Republic consisted of only the first question. The Finnish team collected  
81 data on this item only from 13 and 15 year-olds.

## 82 **Physical activity measures**

83 A single item assessed the number of days the pupil participated in moderate to  
84 vigorous physical activity (MVPA) frequency of at least 60 minutes during the last 7 days  
85 and was used to measure adherence to the PARH. Text to define PA was included and the  
86 question was as follows

87 *Physical activity is any activity that increases your heart rate and makes you get out*  
88 *of breath some of the time. Physical activity can be done in sports, school activities, playing*  
89 *with friends, or walking to school. Some examples of physical activity are running, brisk*  
90 *walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball,*  
91 *football, & surfing [country specific examples can be given].*

92 *Over the past 7 days, on how many days were you physically active for a total of at*  
93 *least 60 minutes per day?*

94 *Please **add up** all the time you spent in physical activity each day.*

95 Response categories ranged from 0 day to 7 days. Results from validity studies  
96 include correlation coefficient of 0.40 when compared with accelerometer data in clinical  
97 settings (Murphy, Rowe, Belton, & Woods, 2015; Prochaska, Sallis, & Long, 2001) and the

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98 item has been in use in the HBSC study since 2001/2002 survey. The ICC value from a test-  
99 retest was 0.82 (Liu et al., 2010). In accordance with the PARH (WHO, 2010), and the  
100 definitions by the PA progress report (Sallis et al., 2016), responses were dichotomised into  
101 0-6 days as “inactive”, in other words, not meeting the PARH, and 7 days as “active”, as  
102 meeting the PARH.

### 103 **Statistics**

104 Descriptive statistics were conducted on the data stratified by gender and country.  
105 Missing cases from the LTID status were grouped and tested independently against PARH.  
106 Since differences were  $p < 0.05$ , the cases were removed. Differences in prevalence of LTID  
107 between boys and girls were tested using a chi-square test of independence (Table 1). Binary  
108 logistic regression analyses were performed separately by country, with PARH as the  
109 outcome variable and LTID status as the main independent variable. Reporting of odds ratios  
110 (OR), with the 95% confidence intervals, first by the overall sample, then for each country,  
111 were performed. The reference group was those without LTID. All analyses were conducted  
112 after controlling for age categories and family affluence. Analyses were done with SPSS for  
113 Windows (version 24.0)

### 114 **Results**

#### 115 **LTID prevalence**

116 The pooled sample size was 61,329 participants (48.7% boys, mean age=13.6yr  
117 SD=1.7) from the 15 countries (see Table 1 for the list of countries). Less than one in six  
118 (15.3%, n=9,372) of adolescents reported to have LTID. One in twenty (4.2%, n=2566)  
119 reported that their disability affects their participation at school and were therefore classified  
120 as affected LTID. The proportions of affected LTID increased from 11-y (3.4%; 95% CI:  
121 3.1%-3.6%), 13-y (4.2%; 95% CI: 3.9%-4.5%), to 15-y olds (4.9%; 95% CI: 4.6%-5.2%).

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122 Gender differences were only significant in some countries, whereby there were more boys  
123 than girls with LTID or affected LTID (Armenia, Scotland and Ireland), or the prevalence  
124 was greater amongst girls than boys (Bulgaria, Romania). There were no significant  
125 differences in the prevalence across the different FAS groups.

#### 126 **PA recommendations for health**

127 After pooling data from all countries, more boys (24.4%; 95% CI: 23.9%-24.9%) met  
128 the PARH than girls (15.5%; 95% CI:15.1%-15.9%), more 11y- (25.2%; CI:24.5%-25.8%),  
129 and 13y – (19.8%; CI:19.3%-20.3%) met the PARH than 15y –olds (14.8%; CI: 14.3%-  
130 15.3%). In addition, more adolescents from the high FAS group met the PARH (24.3%;  
131 CI=23.5%-25.1%) than medium FAS (18.7%; CI:18.3%-19.1%) and low FAS (18.0%;  
132 CI:17.3%-18.8%). The patterns between age, gender and FAS III were similar across  
133 disability groups.

134 Overall, boys with LTID were less likely to meet the recommendations than boys  
135 without LTID, although differences amongst girls were not significant. At country level, the  
136 proportions of boys with and without LTID meeting PARH were not significantly different.  
137 In one country (Slovakia), a significant association was observed between affected LTID and  
138 meeting the PARH amongst both boys and girls with OR 2.1 (CI: 1.1-4.2) and OR=1.9  
139 (CI:=1.0-3.6) respectively. In Romania, the likelihood of meeting PARH increased in girls  
140 with LTID with OR=1.8 (CI=1.1-3.1) and with affected LTID with OR=3.6 (CI=1.7-7.9)  
141 when compared with girls without LTID (Table 2).

#### 142 **Discussion**

143 Through the same measures reported in the 2016 PA progress report, data in this  
144 study were disaggregated by disability across 15 countries to report proportions of  
145 adolescents who meet PARH. Consistent with the previous reports, meeting the PARH was



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146 more common among boys, younger adolescents, and those from higher affluence families  
147 (Kalman et al., 2015). According to the results from this study, there were no significant  
148 differences in meeting PARH between boys or girls with LTID and those without LTID at a  
149 national level, with two exceptions (Romania and Slovakia). After the data were pooled  
150 together, boys with LTID were less likely to meet the PARH than their peers without LTID,  
151 but this effect was not observed for girls.

152 The results of this study add to the current literature on adolescents that met PARH by  
153 providing data disaggregated by disability on adolescents in mainstream schools, and using a  
154 comparable measure of PA across countries. Previous studies generally report lower levels of  
155 PA in adolescents with disabilities compared to their peers without disabilities (Ross et al.,  
156 2016). In this study, this finding was only observed among boys and after pooling the data  
157 across countries. This may be attributed to the fact that previous studies have often focused  
158 on specific disability subcategories (Haegele et al., 2015) whereas the current study included  
159 data from general schools with multiple samples of various (self-reported) impairments and  
160 health conditions. Although overall, 20% of adolescents reported disabilities or chronic  
161 conditions, less than one in twenty said that their disability affected their daily functioning at  
162 school. As such, the majority of adolescents with LTID reported their conditions were  
163 independent of their ability to participate in school. In addition, this study indicates that the  
164 restrictions felt by adolescents in the affected LTID did not influence meeting PARH when  
165 compared with their peers. Since overall proportions that met the PARH were low in all  
166 countries, it is clear that there needs to be vast improvements in PA levels in all children,  
167 regardless of disability. Practitioners with access to adolescents in mainstream schools may  
168 need to consider the increasing rate of inclusion in schools. Furthermore, practitioners are  
169 encouraged to promote PA to girls, and take care in addressing the divide in PA levels among  
170 boys with and without LTID.

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171 Europe is a culturally diverse area with inclusive practices in Central and Eastern  
172 European countries different from Western European countries (UNICEF, 2012). Despite  
173 such differences, significant differences at the national level were found in only two  
174 countries. In Slovakia (boys and girls) and Romania (girls only), those with LTID or affected  
175 LTID were more likely to meet the PARH. Cultural differences in educational policies,  
176 access to support services and availability of physical activity opportunities may play a role.  
177 For example, both are Central and Eastern European countries and segregated school systems  
178 are still commonplace for children with specific needs. This may mean adolescents with  
179 disabilities who attend mainstream schools are less likely to have severe disabilities, and  
180 those that do, can benefit the most with the existing support services (UNICEF, 2012). These  
181 differences may explain the unexpected increased proportion of affected LTID that met the  
182 PARH over adolescents without LTID

183 The findings from this study were dependent on the way adolescents reported LTID  
184 and PA as well as responded to the questions unaided. As such, there are some study  
185 limitations to consider. PA was measured by self-report and there could be inaccuracies to the  
186 response. However, self-report surveys are considered an appropriate way to collect data  
187 from large population samples on PA for the purposes of meeting PARH (Haskell, 2012) and  
188 all young people participating in this study were asked the same questions in the same way.  
189 In relation to reporting on levels of physical activity, the practice used in this study was  
190 replicated from Sallis and colleagues (2016) which considered young people as active only if  
191 they achieved at least 60 minutes of MPVA daily in line with current international policy  
192 recommendations. However, this may inadvertently mask differences between people (e.g. 0  
193 days vs 2 days vs 6 days) that could be illuminating and should be investigated further in  
194 future research.

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195 In relation to the question used to identify those with a long-term illness or disability,  
196 it should be noted that disability is not synonymous with being ill, although they often co-  
197 exist. Disabilities were measured at two levels and not by impairment types. The first level  
198 was the type of disability that the individual reports. This could be a manageable health  
199 condition, such as asthma or speaking impairments, which might not have a major effect on  
200 physical activity participation. The second level is the type of disability whereby the  
201 disability or health condition affects daily participation. It remains unknown what context,  
202 other than of school participation this was, but in reference to the ICF (WHO, 2001), these  
203 pupils would be expected to have more difficulties in daily functioning. In addition, to  
204 improve the global PA matrix, disability statistics are needed to confirm a systematic method  
205 to compare data (Tremblay et al., 2016). Despite the study limitations, this paper has results  
206 that can be used for international comparisons for PARH and contribute to data sets like the  
207 global matrix.

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Table 1. Prevalence of LTID (%) in different countries in Europe by boys and girls

|                | Boys  |           |        |                 | Girls |           |        |                 | $\chi^2*$ | p-value |
|----------------|-------|-----------|--------|-----------------|-------|-----------|--------|-----------------|-----------|---------|
|                | N     | No LTID % | LTID % | Affected LTID % | N     | No LTID % | LTID % | Affected LTID % |           |         |
| Armenia        | 946   | 92.0      | 4.1    | 3.9             | 1315  | 94.8      | 3.6    | 1.7             | 11.45     | .003    |
| Bulgaria       | 2396  | 90.7      | 9.3    | nd              | 2225  | 88.3      | 11.7   | nd              | 7.80      | .006    |
| Czech Republic | 2367  | 73.6      | 26.4   | nd              | 2619  | 71.7      | 28.3   | nd              | 2.33      | .127    |
| England        | 2311  | 75.6      | 18.6   | 5.8             | 2193  | 76.3      | 17.4   | 6.3             | 1.64      | .441    |
| Finland        | 1454  | 70.4      | 25.3   | 4.3             | 1671  | 68.3      | 26.0   | 5.6             | 3.53      | .171    |
| France         | 2523  | 79.0      | 16.1   | 5.0             | 2553  | 79.4      | 16.3   | 4.3             | 1.21      | .547    |
| Hungary        | 1464  | 76.2      | 20.4   | 3.5             | 1632  | 74.7      | 22.3   | 3.0             | 2.14      | .342    |
| Ireland        | 1320  | 76.0      | 17.8   | 6.2             | 2172  | 80.9      | 14.0   | 5.0             | 12.20     | .002    |
| MKD            | 1417  | 92.3      | 5.3    | 2.4             | 1656  | 93.6      | 4.6    | 1.8             | 2.17      | .337    |
| Poland         | 2182  | 82.8      | 10.6   | 6.6             | 2228  | 81.0      | 11.6   | 7.5             | 2.62      | .271    |
| Romania        | 1248  | 93.3      | 5.5    | 1.2             | 1502  | 90.7      | 6.9    | 2.5             | 8.16      | .017    |
| Scotland       | 2376  | 80.0      | 15.0   | 5.1             | 2493  | 83.2      | 11.4   | 5.4             | 13.48     | .001    |
| Sweden         | 3113  | 75.8      | 16.8   | 7.4             | 3266  | 74.8      | 16.4   | 8.8             | 4.22      | .121    |
| Slovakia       | 2299  | 81.7      | 16.3   | 2.0             | 2476  | 79.6      | 17.6   | 2.7             | 4.42      | .110    |
| Wales          | 1912  | 80.6      | 13.2   | 6.2             | 1987  | 82.9      | 11.0   | 6.1             | 4.65      | .098    |
| Total          | 29341 | 80.5      | 15.4   | 4.1             | 31988 | 80.5      | 15.2   | 4.3             | 1.53      | .465    |

nd – no data

LTID – Long term illnesses or disabilities

$\chi^2*$ Chi-square test of independence of adolescents without LTID between boys and girls

Table 2. Proportion of no LTID, LTID, and affected LTID (%), adolescents who meet PA recommendations for health with adjusted odds ratio and 95% Confidence Intervals

|                       | Boy     |      |             |             |               | Girl |             |             |             |      |      |             |               |             |      |             |             |             |
|-----------------------|---------|------|-------------|-------------|---------------|------|-------------|-------------|-------------|------|------|-------------|---------------|-------------|------|-------------|-------------|-------------|
|                       | No LTID | LTID |             |             | Affected LTID |      |             |             | No LTID     | LTID |      |             | Affected LTID |             |      |             |             |             |
|                       | %       | %    | OR          | LCI         | UCI           | %    | OR          | LCI         | UCI         | %    | %    | OR          | LCI           | UCI         | %    | OR          | LCI         | UCI         |
| Armenia <sup>a</sup>  | 26.7    | 17.9 | 0.55        | 0.23        | 1.36          | 24.3 | 0.59        | 0.24        | 1.45        | 17.3 | 8.5  | 0.45        | 0.16          | 1.27        | 27.3 | 2.03        | 0.76        | 5.39        |
| Bulgaria <sup>b</sup> | 32.9    | 37.8 | 1.28        | 0.94        | 1.74          | nd   |             |             |             | 22.0 | 21.8 | 1.01        | 0.73          | 1.40        | nd   |             |             |             |
| Czech <sup>b</sup>    | 25.4    | 22.9 | 0.92        | 0.74        | 1.14          | nd   |             |             |             | 17.8 | 19.3 | 1.16        | 0.93          | 1.45        | nd   |             |             |             |
| England               | 20.8    | 21.1 | 0.95        | 0.71        | 1.27          | 22.4 | 1.01        | 0.62        | 1.62        | 13.0 | 16.3 | 1.30        | 0.94          | 1.81        | 12.2 | 1.08        | 0.62        | 1.87        |
| Finland <sup>c</sup>  | 23.4    | 26.1 | 1.15        | 0.87        | 1.52          | 27.4 | 1.21        | 0.67        | 2.20        | 17.4 | 17.7 | 1.03        | 0.77          | 1.39        | 13.8 | 0.87        | 0.47        | 1.61        |
| France                | 15.9    | 16.0 | 0.98        | 0.72        | 1.33          | 22.4 | 1.49        | 0.93        | 2.37        | 7.1  | 10.1 | 1.44        | 0.98          | 2.11        | 12.7 | 1.83        | 0.97        | 3.44        |
| Hungary               | 27.9    | 22.1 | 0.75        | 0.55        | 1.02          | 25.5 | 0.86        | 0.44        | 1.68        | 16.3 | 17.3 | 1.07        | 0.77          | 1.47        | 14.3 | 0.91        | 0.40        | 2.07        |
| Ireland               | 32.7    | 32.8 | 1.03        | 0.75        | 1.42          | 31.7 | 0.95        | 0.57        | 1.57        | 15.4 | 17.7 | 1.13        | 0.80          | 1.59        | 15.6 | 1.15        | 0.65        | 2.03        |
| MKD                   | 32.6    | 37.3 | 1.27        | 0.76        | 2.11          | 26.5 | 0.65        | 0.29        | 1.45        | 21.2 | 18.4 | 0.92        | 0.50          | 1.68        | 13.3 | 0.65        | 0.22        | 1.92        |
| Poland                | 29.4    | 31.0 | 1.09        | 0.80        | 1.47          | 28.0 | 1.00        | 0.67        | 1.47        | 18.6 | 17.4 | 0.99        | 0.70          | 1.41        | 16.9 | 0.97        | 0.63        | 1.50        |
| Romania               | 26.6    | 17.4 | 0.60        | 0.31        | 1.20          | 26.7 | 0.48        | 0.10        | 2.27        | 13.2 | 21.4 | <b>1.82</b> | <b>1.06</b>   | <b>3.12</b> | 29.7 | <b>3.64</b> | <b>1.69</b> | <b>7.86</b> |
| Scotland              | 19.3    | 20.8 | 1.00        | 0.74        | 1.34          | 22.5 | 1.10        | 0.67        | 1.82        | 13.5 | 15.4 | 1.11        | 0.77          | 1.60        | 14.8 | 1.27        | 0.76        | 2.12        |
| Sweden                | 15.9    | 14.9 | 0.84        | 0.63        | 1.12          | 13.0 | 0.82        | 0.54        | 1.26        | 10.5 | 11.4 | 1.08        | 0.79          | 1.46        | 10.1 | 0.95        | 0.62        | 1.44        |
| Slovakia              | 30.4    | 30.2 | 0.92        | 0.70        | 1.21          | 40.4 | <b>2.09</b> | <b>1.06</b> | <b>4.15</b> | 19.2 | 20.1 | 1.01        | 0.76          | 1.34        | 25.0 | <b>1.91</b> | <b>1.01</b> | <b>3.59</b> |
| Wales                 | 19.0    | 18.8 | 0.94        | 0.67        | 1.33          | 15.1 | 0.78        | 0.46        | 1.33        | 11.5 | 14.6 | 1.32        | 0.87          | 1.99        | 9.1  | 0.76        | 0.39        | 1.49        |
| Total                 | 24.6    | 23.4 | <b>0.89</b> | <b>0.81</b> | <b>0.98</b>   | 22.5 | 0.91        | 0.78        | 1.06        | 15.4 | 16.6 | 1.09        | 0.98          | 1.22        | 14.2 | 1.06        | 0.89        | 1.26        |



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<sup>a</sup> Armenia used FASII

<sup>b</sup> Bulgaria and Czech did not include data on severity ; nd – no data

<sup>c</sup> Finland did not include data from 11-y

**bold text** p<.05, LCI = Lower Confidence Interval, UCI = Upper Confidence Interval

LTID – long-term illnesses, disabilities or medical conditions

no LTID is reference group, adjusted for age and FAS

For Peer Review

HEADER: PA among adolescents with LTID in Europe

1 Physical activity among adolescents with long-term illnesses or disabilities in 15

2 European countries

3 **Abstract:**

4 Physical activity (PA) is an important health-promoting behaviour that adolescents  
5 with long-term illnesses or disabilities (LTID) can benefit from. It is important to monitor  
6 differences across countries in adherence with PA recommendations for health (PARH). The  
7 aim of this study was to compare PA levels among 15 European countries after  
8 disaggregating data by disability. Data from pupils (Mean age = 13.6y, SD=1.64)  
9 participating in the 2013/14 Health Behaviour in School-aged Children (HBSC) study were  
10 analysed to compare adolescents without LTID, with LTID and with LTID that affects their  
11 participation (affected LTID). Logistic regression models adjusted for age and family  
12 affluence, stratified by gender and country group with PARH as the outcome variable. With  
13 the data pooled, 20.15% (n=11,9389,372) of adolescents reported to have LTID and a quarter  
14 of these reported to 4% (n=2566) with affected LTID. Overall, less fewer boys with LTID met  
15 PARH than boys without LTID, although it was not statistically significant at the national  
16 levels nor for girls.

17 Keywords: inclusion; mainstream schools; health; chronic conditions, disability

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1           **Introduction** ~~(2397/1500-2000-words)~~

2           A mass of evidence exists confirming the health benefits from regular physical  
3 activity (PA) among adolescents (Poitras et al., 2016). PA is defined as, “any bodily  
4 movement produced by skeletal muscles that requires energy expenditure” (Caspersen,  
5 Powell, & Christenson, 1985, p. 126) and moderate intensity PA (usually above 3METs) is  
6 considered as health-enhancing PA (Biddle, Sallis, & Cavill, 1998). International PA  
7 recommendations for health (PARH) for children and adolescents aged 5-17 years old is set  
8 to participation of at least 60 minutes of moderate to vigorous-intensity physical activity daily  
9 (WHO, 2010). It is also important for youth with disabilities to engage in PA, and meet the  
10 PARH since regular participation in PA distinctly reduces health complications secondary to  
11 disability conditions (Rimmer, Schiller, Chen, Schiller, & Chen, 2012).

12           According to the International Classification of Functioning, Disability and Health  
13 (ICF; WHO, 2001), people may experience disability because of the interaction between  
14 health conditions and contextual factors, thus influencing the child’s ability to participate ~~to~~in  
15 various activities including PA. Common barriers to participation in PA reported by people  
16 with disabilities include attitudes of others, lack of friends, high costs, low self-determination,  
17 fatigue, as well as accessibility (Ross et al., 2016). The degree to which these barriers exist to  
18 influence levels of PA in adolescents with different impairments may vary, as with  
19 adolescents with other chronic health conditions diagnosed by the doctor (Ng, Rintala,  
20 Tynjälä, Villberg, & Kannas, 2014). Yet, it is difficult to ~~make~~draw conclusions about these  
21 differences when studies use different protocols, instruments, and questions to measure PA.  
22 In addition, only six percent of studies published in Adapted Physical Activity Quarterly  
23 between 2004 and 2013 came from multiple samples, rather than subtypes of disabilities  
24 (Haegele, Lee, & Porretta, 2015). The high possibility of conditions and impairments co-

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25 existing in adolescents, makes increasing PA among young people with a disability an  
26 important public health concern (Ding et al., 2016).

27 Public health and health promotion experts often use monitoring and surveillance  
28 studies to assess progress over time between countries and for global evaluations (Brown,  
29 Cueto, & Fee, 2006). Global coverage of PA surveillance has increased from 64% of the  
30 European adolescent population in 2012 to 68% in 2016 (Sallis et al., 2016). However, it is  
31 unknown what proportion, if any, of these surveys involve people with disabilities. The  
32 Active Healthy Kids Global Alliance has recognised this in their most recent report card  
33 (Tremblay et al., 2016) which presented population-level data from 38 countries but  
34 highlighted the need for evidence concerning PA among children with disabilities. These  
35 suggestions are in line with the statements in the 2030 sustainable developmental goals that  
36 support reporting disaggregation by disability (Tardi & Njelesani, 2015).

37 In the most recent PA progress report by Sallis and colleagues (Sallis et al., 2016),  
38 adolescents that failed to meet the PARH (WHO, 2010) were considered as “inactive-”. In  
39 other words, for the purpose of surveillance, only adolescents who achieved at least 60  
40 minutes of moderate to vigorous physical activity on a daily basis were considered as active  
41 adolescents. Although this benchmark does not allow for consideration of overall differences  
42 in PA levels, it serves the purpose for analysis against the PARH which is of primary interest  
43 to policy makers for national and international monitoring (Kalman et al., 2015). Due to the  
44 absence of data on adolescents with disabilities in existing reports, it is of great importance to  
45 report PA levels after disaggregation for disability. Furthermore, reporting of PA against  
46 benchmarks used in global surveys is necessary for making comparisons of young people  
47 with and without disabilities. Therefore, the purpose of this study is to use the PARH as a  
48 reference point to compare prevalence of physically active adolescents across Europe after  
49 disaggregating for disability and adjusting for age and family affluence.

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50           **Method**

51           Data were analysed from the 2013/14 WHO Collaborative Cross-national Health  
52 Behaviour in School-aged Children (HBSC) study ~~and currently includes 45 member~~  
53 ~~countries from North America and Europe.~~ The 15 countries in ~~this study~~ the current analysis  
54 included the same questions on disabilities ~~as an optional package~~. All countries participating  
55 in HBSC comply with a standardised international protocol, including back translation of  
56 items. The samples were at the class level to form nationally representative estimates of 11-,  
57 13- and 15-year-olds. Each team obtained approval to conduct the study through an ethics  
58 review board or equivalent regulatory body. The school administrators, parents and pupils  
59 granted consent (explicit or implicit, varied by country) for pupil completion of a self-report  
60 survey in the classroom without further assistance. Responses from the participants were  
61 anonymous, and participation was voluntary. Response rates varied by country, although was  
62 >70% at the international student level, with a proportion of the non-responses from  
63 absentees.

64           The pupils were asked to report their sex, month and year of birth as well as family  
65 affluence, measured using the Family Affluence Scale (FAS III). FAS III is a six-item  
66 assessment of material assets or activities and regarded as a child friendly indicator of social  
67 economic status (see Torsheim et al., 2016). FAS III was divided into three groups, low FAS  
68 (as represented by the lowest 20 percentile), medium FAS (the middle 60 percentile), and  
69 high FAS (highest 20 percentile). A separate analysis was performed for Armenia, since four  
70 (FAS II) of the six FAS III items reported.

71           **LTID status**

72           Two items were used to group adolescents according to their long-term illness or  
73 disability (LTID) status. Two yes or no questions were asked: 1) “Do you have a long-term

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74 illness, disability, or medical condition (like diabetes, arthritis, allergy, or cerebral palsy) that  
75 has been diagnosed by a doctor?" and 2)" Does your long-term illness or disability affect  
76 your attendance and participation at school?" Students were classified into three mutually  
77 exclusive categories, i) adolescents without LTID, ii) adolescents for whom the participation  
78 is not affected by their LTID – grouped as LTID, and iii) adolescents with participation  
79 affected by the LTID – grouped as affected LTID. Guided by the [International Classification](#)  
80 [of Functioning, Disability and Health \(ICF\)](#) definition of disability (WHO, 2001), the  
81 affected LTID group was classified as a group with greater severity of disability to the group  
82 of LTID. ~~The grouping was then determined if this classification of everyday participation~~  
83 ~~restrictions is related to their health behaviour (i.e. PA). Data from Bulgaria and Czech~~  
84 ~~Republic consisted of only the first question. The Finnish team collected data on this item~~  
85 ~~only from 13 and 15 year-olds.~~

#### 86 **Physical activity measures**

87 A single item assessed the number of days the pupil participated in moderate to  
88 vigorous physical activity (MVPA) frequency of at least 60 minutes during the last 7 days  
89 and was used to measure adherence to the PARH. Text to define PA was included and the  
90 question was as follows

91 *Physical activity is any activity that increases your heart rate and makes you get out*  
92 *of breath some of the time. Physical activity can be done in sports, school activities, playing*  
93 *with friends, or walking to school. Some examples of physical activity are running, brisk*  
94 *walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball,*  
95 *football, & surfing [country specific examples can be given].*

96 *Over the past 7 days, on how many days were you physically active for a total of at*  
97 *least 60 minutes per day?*

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98           Please **add up** all the time you spent in physical activity each day.

99           Response categories ranged from 0 day to 7 days. Results from validity studies  
100 include correlation coefficient of 0.40 when compared with accelerometer data in clinical  
101 settings (Murphy, Rowe, Belton, & Woods, 2015; Prochaska, Sallis, & Long, 2001) and the  
102 item has been in use in the HBSC study since 2001/2002 survey. The ICC value from a test-  
103 retest was 0.82 (Liu et al., 2010). In accordance with the PARH (WHO, 2010), and the  
104 definitions by the PA progress report (Sallis et al., 2016), responses were dichotomised into  
105 0-6 days as “inactive<sup>22</sup>”, in other words, not meeting the PARH, and 7 days as “active<sup>22</sup>”, as  
106 meeting the PARH.

## 107           **Statistics**

108           Descriptive statistics were conducted on the data stratified by gender and country.  
109 Missing cases from the LTID status were grouped and tested independently against PARH.  
110 Since differences were  $p < 0.05$ , the cases were removed. Differences in prevalence of LTID  
111 between boys and girls were tested using a chi-square test of independence (Table 1). Binary  
112 logistic regression analyses were performed separately by country, with PARH as the  
113 outcome variable and LTID status as the main independent variable. Reporting of odds ratios  
114 (OR), with the 95% confidence intervals, first by the overall sample, then for each country,  
115 were performed. The reference group was those without LTID. All analyses were conducted  
116 after controlling for age categories and family affluence. Analyses were done with SPSS for  
117 Windows (version 24.0)

## 118           **Results**

### 119           **LTID prevalence**

120           The pooled sample size was 61,329 participants (48.7% boys, mean age=13.6yr  
121 | SD=1.7) from the 15 countries (see Table 1 for the list of countries). OneLess than one in five

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122 | ~~(19.5six (15.3%, n=11,9389,372)~~ of adolescents reported to have LTID. ~~A quarter of this~~  
123 | ~~group (One in twenty (4.2%, n=2566)~~ reported that their disability affects their participation  
124 | at school and were therefore classified as affected LTID. The proportions of affected LTID  
125 | increased from 11-y (3.4%; 95% CI: 3.1%-3.6%), 13-y (4.2%; 95% CI: 3.9%-4.5%), to 15-y  
126 | olds (4.9%; 95% CI: 4.6%-5.2%). Gender differences were only significant in some  
127 | countries, whereby there were more boys than girls with LTID or affected LTID (Armenia,  
128 | Scotland and Ireland), or the prevalence was greater amongst girls than boys (Bulgaria,  
129 | Romania). There were no significant differences in the prevalence across the different FAS  
130 | groups.

### 131 | **PA recommendations for health**

132 | After pooling data from all countries, more boys (24.4%; 95% CI: 23.9%-24.9%) met  
133 | the PARH than girls (15.5%; 95% CI:15.1%-15.9%), more 11y- (25.2%; CI:24.5%-25.8%),  
134 | and 13y – (19.8%; CI:19.3%-20.3%) met the PARH than 15y –olds (14.8%; CI: 14.3%-  
135 | 15.3%). In addition, more adolescents from the high FAS group met the PARH (24.3%;  
136 | CI=23.5%-25.1%) than medium FAS (18.7%; CI:18.3%-19.1%) and low FAS (18.0%;  
137 | CI:17.3%-18.8%). The patterns between age, gender and FAS were similar across disability  
138 | groups.

139 | Overall, boys with LTID were less likely to meet the recommendations than boys  
140 | without LTID, although differences amongst girls were not significant. TheAt country level,  
141 | the proportions of boys with and without LTID in each countrymeeting PARH were not  
142 | significantly different. In one country (Slovakia), a significant association was observed  
143 | between affected LTID and meeting the PARH amongst both boys and girls with OR 2.1 (CI:  
144 | 1.1-4.2) and OR=1.9 (CI:=1.0-3.6) respectively. In Romania, the association-withlikelihood  
145 | of meeting PARH increased in girls with LTID with OR=1.8 (CI=1.1-3.1) and with affected  
146 | LTID with OR=3.6 (CI=1.7-7.9) when compared with girls without LTID (Table 2).



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147           **Discussion**

148           Through the same measures reported in the 2016 PA progress report, data in this  
149 study were disaggregated by disability across 15 countries to report proportions of  
150 adolescents who meet PARH. Consistent with the previous reports, meeting the PARH was  
151 more common among boys, younger adolescents, and those from higher affluence families  
152 (Kalman et al., 2015). According to the results from this study, there were no significant  
153 differences in meeting PARH between boys or girls with LTID and those without LTID at a  
154 national level, with two exceptions- (Romania and Slovakia). After the data were pooled  
155 together, boys with LTID were less likely to meet the PARH than their peers without LTID,  
156 but this effect was not observed for girls.

157           The results of this study add to the current literature on adolescents that met PARH by  
158 providing data disaggregated by disability on adolescents in mainstream schools, and using a  
159 comparable measure of PA across countries. Previous studies generally report lower levels of  
160 PA in adolescents with disabilities compared to their peers without disabilities (Ross et al.,  
161 2016). In this study, this finding was only observed among boys and after pooling the data  
162 across countries. This may be attributed ~~from~~to the fact that previous studies have often  
163 ~~included~~ focused on specific disability subcategories (Haegele et al., 2015) whereas the  
164 current study included data from general schools with multiple samples of various (self-  
165 reported) impairments and health conditions. Although overall, 20% of adolescents reported  
166 disabilities or chronic conditions-~~In all countries~~, less than one in ~~tent~~twenty said that their  
167 disability affected their daily functioning at school. As such, the majority of adolescents with  
168 LTID reported their conditions were independent ~~on~~of their ability to participate in school. In  
169 addition, this study indicates that the restrictions felt by adolescents in the affected LTID did  
170 not influence meeting PARH when compared with their peers. Since overall proportions that  
171 met the PARH were low in all countries, it is clear that there needs to be vast improvements

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172 in PA levels in all children, regardless of disability. Practitioners with access to adolescents in  
173 mainstream schools may need to consider the increasing rate of inclusion in schools.

174 Furthermore, practitioners are encouraged to promote PA to girls, and take care in addressing  
175 the divide in PA levels among boys with and without LTID.

176 Significant Europe is a culturally diverse area with inclusive practices in Central and  
177 Eastern European countries different from Western European countries (UNICEF, 2012).  
178 Despite such differences, significant differences at the national level were found in only two  
179 countries. In Slovakia (boys and girls) and Romania (girls only), ~~where~~ those with LTID or  
180 affected LTID were more likely to meet the PARH. ~~The only country level results that were~~  
181 ~~significant were from Romania and Slovakia, where a larger proportion of adolescents with~~  
182 ~~affected LTID met the PARH than adolescents without LTID. In these countries, the results~~  
183 ~~contrast with previously published differences between adolescents with~~ Cultural differences  
184 in educational policies, access to support services and ~~without participation difficulties (Ross~~  
185 ~~et al., 2016).~~ Inavailability of physical activity opportunities may play a role. For example,  
186 both are Central and Eastern European countries, and segregated school systems are still  
187 commonplace for children with specific needs. ~~which~~ This may mean adolescents with  
188 disabilities ~~that do~~ who attend mainstream schools are less likely to have severe disabilities,  
189 and ~~have been reported to those that do, can~~ benefit the most with the existing support  
190 services (UNICEF, 2012). These differences may explain the unexpected increased  
191 proportion of affected LTID that met the PARH over adolescents without LTID

192 The findings from this study were dependent on the way adolescents reported LTID  
193 and PA as well as responded to the questions unaided, ~~reported LTID and PA~~. As such, there  
194 are some study limitations to consider. PA was measured by self-report and there could be  
195 inaccuracies to the response. However, self-report surveys are considered an appropriate way  
196 to collect data from large population samples on PA for the purposes of meeting PARH

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197 (Haskell, 2012) and all young people participating in this study were asked the same  
198 questions in the same way. In relation to reporting on levels of physical activity, the practice  
199 used in this study was replicated from Sallis and colleagues (2016) which considered young  
200 people as active only if they achieved at least 60 minutes of MPVA daily and is in line with  
201 current international policy recommendations. However, this may inadvertently mask  
202 differences between people (e.g. 0 days vs 2 days vs 6 days) that could be illuminating and  
203 should be investigated further in future research.

204 In relation to the question used to identify those with a long-term illness or disability,  
205 it should be noted that disability is not synonymous with being ill, although they often co-  
206 exist. Disabilities were measured at two levels and not by impairment types. The first level  
207 was the type of disability that the individual reports. This could be a manageable health  
208 condition, such as asthma or speaking impairments, which might not have a major effect on  
209 physical activity participation. The second level is the type of disability whereby the  
210 disability or health condition affects daily participation. It remains unknown what context,  
211 other than of school participation this was, but in reference to the ICF (WHO, 2001), these  
212 pupils would be expected to have more difficulties in daily functioning. In addition, to  
213 improve the global PA matrix, disability statistics are needed to confirm a systematic method  
214 to compare data (Tremblay et al., 2016). Despite the study limitations, this paper has results  
215 that can be used for international comparisons for PARH and contribute to data sets like the  
216 global matrix.

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