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PHYSICAL ACTIVITY PATTERNS OF ADOLESCENTS WITH LONG TERM ILLNESSES OR DISABILITIES IN FINNISH GENERAL EDUCATION

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Physical activity (PA) of adolescents with long term illnesses or disabilities (LTID) in general education is examined to provide evidence of PA levels from specific population groups. This study describes the PA levels of adolescents with LTID based on recommendations of daily 60mins of moderate-to-vigorous PA (MVPA) and vigorous leisure time PA (VPA) of at least two times a week for at least one hour per week. Finnish data from the Health Behaviour in School-aged Children (HBSC) study was pooled from 2002 and 2010 surveys. 1126 respondents (14.6%) self-reported as having a LTID and details of main categories of LTID were used to examine PA behaviours. Overall, 15.6% of adolescents with LTID reported daily MVPA. In their leisure time, 74.0% of adolescents with LTID had met the VPA recommendation. These figures are lower than other reported literature on PA amongst adolescents. PA of adolescents with LTID in general education can be seen as a complex collection of different categories. Boys were more active than girls. Younger adolescents were more active than older. A closer look into the many domains of LTID demonstrated how various LTID groups differ and share similar PA patterns.

Keywords: breathing difficulties, seeing difficulties, epilepsy, exercise, inclusion, *HBSC, adapted physical activity*

INTRODUCTION

Understanding participation of adolescents with long term illnesses or disabilities (LTID) is becoming of interest to researchers informing policy. Yet, little is known about the physical activity (PA) aspect of participation in adolescents with LTID that attend general education, a place where inclusion takes place (Lieberman, James, & Ludwa, 2004). Within Finnish general education schools there are around 18% of children with LTID (Boyce et al., 2009).

The allocation of inclusion in schools is managed through a two-step process finish. Once an adolescent has been identified to need special educational services, the first step is to do as much as possible to provide opportunities to participate in general education, through an integrated, partly integrated, or a special class. If this type of participation is not possible, then a referral is made to special groups, classes or schools (Finnish National Board of Education, 2012). As a result of this system, the number of special schools is low and similar to the situation in Germany, Switzerland, and Belgium (Saloviita, 2009).

In Finland, the percentage of 13 year olds that reported daily PA for 60 minutes was 24% for boys and 14% for girls (Aira, Kannas, Tynjälä, & Kokko, 2013). Other large scale reports daily MVPA averages for adolescents is 4.3 days per week (Iannotti et al., 2009). Physical activity has been examined in a multitude of ways, although for surveillance studies, cost of research is often a main limitation to the accuracy of measures and self-report is widely accepted (Haskell, 2012). With that in mind, self-reported data on PA is the basis for two widely used PA recommendations for youth. The first is daily 60 minutes of MVPA (Sallis & Patrick, 1994; Strong et al., 2005) and the second is the engagement in vigorous leisure time activities at least two times a week for at about 1 hour a week (Booth, Okely, Chey, & Bauman, 2001). The latter was derived from recommendations of regular strength exercises (Pate, Trost, & Williams, 1998). These two recommendations differ through two main differences, the first being that MVPA is measuring overall PA while though VPA is measured during the leisure time. VPA is also described as vigorous (Samdal et al., 2007). Meeting these PA recommendations has

been shown to help avoid major health diseases, and to promote both physical and mental well-being (Philpott, Houghton, & Luke, 2010), and for adolescents with LTID, it could be important to improve the well-being and reduce the severity of conditions (Michaud, Suris, & Viner, 2004).

Adolescents with Long term illnesses and disabilities

The United Nations Convention of the Rights of Persons with Disabilities (UNCRPD; (United Nations, 2008) has been ratified in over 100 countries around the world and was based on the WHO International Classification of Functioning, Disability and Health (ICF; (World Health Organization, 2001). Article 1 of the UNCRPD (United Nations, 2008) states:

> *Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.*

Furthermore, long-term illnesses are medical conditions that restrict levels of participation, activities, and body functioning. Studies in PA have reported typical types of long-term illnesses may include asthma, allergies, or diabetes (Rintala et al., 2011). This is by no means an exhaustive list, yet studies are lacking in this area. When comparing Article 1 of UNCRPD and the functionality of adolescents with long-term illnesses, there are striking similarities.

To the authors' knowledge, there are a few studies that report PA and compare with different types of LTID (Shields, Synnot, & Barr, 2012). These studies did not study individual's PA behaviours quantitatively, nor were samples analyzed from the same setting PA behaviours, nor were their sample all from the same setting. While Pittet et al reported quantitative results for sports practice, they did not differentiate the types of LTID (Pittet, Berchtold, Akré, Michaud, & Surís, 2009). The possible reasons for the lack of studies include, different definitions of LTID in questionnaires reducing validity of findings (Miller, Mont, Maitland, Altman, & Madans, 2011; van der Lee, J. H., Mokkink, Grootenhuis, Heymans, & Offringa, 2007), which would result in the measures and scales varying (Milton, Bull, & Bauman, 2011), while cross-analysis be deemed impossible (Roberts et al., 2009); different age groups of participants in studies (Simeoni, Schmidt, Muehlan, Debensason, & Bullinger, 2007); small sample sizes (Shields et al., 2012); as well as, different set of standards and procedures used to collect data (Haskell, 2012).

Symptoms across LTID can be particular to the condition, and specific attention is needed to improve knowledge of health behaviours of these adolescents. It has been reported that the 10 most common types of adolescents with LTID were (from highest to lowest); learning disabilities, Cerebral Palsy, Down syndrome, severe disability-delay, Autism, Deafness, rare types of CNS problems, Epileptic Fits, Unspecific Motor difficulties, Learning and Physical disabilities, and Asthma (Petrou & Kupek, 2009). To demonstrate the specific differences, the following sections provide backgrounds of five selected categories of LTID, in alphabetical order, and relationships with PA.

Breathing Difficulties.

Breathing conditions such as Asthma and Cystic Fibrosis can be lethal (Glazebrook et al., 2006). Exercise-induced asthma in adolescents is a risk for adolescents with severe asthma conditions (Haahtela et al., 2006). Much training is required to teach adolescents in how to deal with their condition (Wolf, Guevara, Grum, Clark, & Cates, 2008) and PA should be encouraged for people with breathing difficulties (Savage et al., 2011). Despite this, research has shown that the majority of adolescents with asthma have no different levels of PA to adolescents without asthma (van Gent et al., 2007) although, depending on the severity of the condition, it can be seen as a barrier to PA (Glazebrook et al., 2006).

Communication Difficulties.

Having difficulties in speaking or in hearing does not have a direct effect on the ability to perform a task. However, these communication problems

can impede on the development of skills, the motivation, and self-esteem to be physically active (Andrews, Leigh, & Weiner, 2004). Reported concerns for adolescents with hearing impairments include lower than the 40th percentile of all ranges of motor skills and fitness tests and 20th percentile in cardiovascular and percentage body fat, areas that are strongly linked to secondary conditions from inactivity (Stewart & Ellis, 2005).

Epileptic Seizures.

Common symptoms of Epilepsy include seizures where the body may behave strangely or can go into convulsions. In Finland, there are 7 cases of epilepsy per 10 000 children aged between 0–15 years old (Sillanpää, Kälviäinen, Klaukka, Helenius, & Shinnar, 2006). Self-management, which can include PA, is an important aspect of adolescents with epilepsy (Lindsay & Bradley Peter, 2010). Adolescents that experience regular bouts of epileptic seizures are at a risk of injuries when taking part in PA (Ramirez et al., 2009). The amounts of PA for adolescents with these problems are usually lower in order to reduce the risk of injuries.

Motor Difficulties.

Children with motor difficulties and PA has been a popular area to study, yet often studies have small number of participants (Pannekoek, Rigoli, Piek, Barrett, & Schoemaker, 2012). They could include types of disabilities such as cerebral palsy, juvenile rheumatoid arthritis, and developmental coordination disorder. The range of difficulties can be vast, from gross to fine and mild to severe motor skill difficulties. Investigating between differences deploys many resources through objective measurement tests. Even still, large scale studies of participants with these types of difficulties found paper responses reliable and cost effective (Clanchy, Tweedy, & Boyd, 2011).

Seeing Difficulties.

Adapted sports are usually needed for adolescents with visual impairments (VI). In a Canadian study, 39% of youth with VI were considered to be sedentary (Longmuir & Bar-Or, 2000). Activities for those with VI are often modified so that it is fair and can be played by all. Due to limited senses, adolescents with VI tend to engage in PA that consists of low levels of activity (Lieberman et al., 2004). During the school week, it was reported that adolescents with VI participate in low PA, whereas on the weekends, they may take part in moderate PA, and do not participate in vigorous PA (Aslan, Calik, & Kitiş, 2012; Houwen, Hartman, & Visscher, 2009).

Not-specified difficulties.

The International Classification of Diseases and related health problems 10th revision has over 14,000 codes for various conditions. In order to report data from adolescents with LTID, but have not specified their types of difficulties, any of these codes could be considered. Typical conditions could be diabetes, vomiting, diarrhoea, haemophilia, amongst others (Cooper, 2006). PA recommendations have been made for some of these conditions, while less is known about others. The number of studies were based on a small number of cases, used varying methods, and consisted of different exercise modalities, consistently results show PA programs improves physical and mental well-being characteristics that can reduce severity of conditions (Philpott et al., 2010).

All these findings suggest that PA patterns differ between the various LTID categories. It is not clear, in what capacity do the differences in PA patterns exist. Therefore it is important to take a large sample where multiple types of LTID exist and question their PA patterns.

The purpose of this study was to examine the differences in PA patterns, between gender and age among a variety of LTID categories. Specifically, daily MVPA and regular VPA recommendations were used as markers to determine these differences.

METHODS

Sampling and Data Collection

Finnish data pooled from the 2002 (n=5388 from 195 schools) and 2010 (n=6723 from 225

schools) self-report Health Behaviour in School-aged Children (HBSC) studies were analysed. The same inclusion criteria were used. A cluster sampling method was used to assign schools that took part in this study. From that school, classes were chosen randomly. Schools were stratified by provinces within the country before a second strata was created for urban, semi-urban, and rural types of municipalities. Nationally representative data collection took place in school classrooms during the spring of each year of data collection; 2002, and 2010. The questionnaires were administered by teachers and completed by the adolescents.

Confidentiality was ensured; surveys were anonymous, responding was voluntary, and respondents were assured that only group results would be reported (Roberts et al., 2009). Treatment of the participants was in accordance with the ethical principles of the American Psychological Association (APA). Institutional approval of ethics was received from The Teachers' Union and the Finnish National Board of Education.

The response rate of adolescents in schools participating in the survey was 92% in 2002 and 94% in 2010. Nonresponses consisted of adolescents absent from school on the day of data collection. School principals decided outright whether or not to participate in the survey. Pooling data collected from 2002 and 2010 has been possible between the two sets of questionnaires that used to the same measurements, study protocol, and time of year for completion, while improving sample counts to provide stronger statistical evidence.

Adolescents with a mean age of 13.7 (n=3799) and 15.7 years old (n=3869) who answered yes (n=1126; 14.6%) to having LTID were included into the final analysis. The research data consists of adolescents in general education and no special schools were involved. The group was further split into categories as defined by the types of difficulties the adolescents experience and were grouped into LTID categories.

Measures

The HBSC international protocol (see http://www.hbsc.org for more details) was used for carrying out the data collection, analysis and reporting. Questions relating to PA, used in the questionnaires are considered widely to be acceptable way of reporting PA (Booth et al., 2001; Roberts et al., 2009).

Moderate to vigorous physical activity.

A single item response was used to measure MVPA. The content of the item is aimed specifically for adolescents, as it uses the introduction text and question;

> *"In the following questions, physical exercise refers to all kinds of action which increases the heart rate and makes you get out of breath for a while, e.g., when training, playing games with friends, on your way to school or during physical education classes at school. Physical exercise includes e.g. running, walking briskly, roller-skating, cycling, dancing, skateboarding, swimming, downhill skiing, cross-country skiing, football, basketball and baseball. Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? Please add up all the time you spent in physical activity each day." (emphasis is the same as in the questionnaire)*

Responses were 0 days, 1 day, 2 days, …7 days. This measure has been seen as more retrospective of PA levels than past 24 hour recall of PA (Nusser et al., 2012) and provides a valuable and valid source of information for surveillance studies (Mâsse & de Niet, 2012).

The first recommendation for PA (Strong et al., 2005) suggests a minimum of 60 minutes of PA every day. Therefore, dichotomous groups were formed from this PA question, whereby those who were active every day in the past week were grouped as 'Rec1', and those who were not active every day were grouped 'NoRec1'. Percentages of the population groups that had fulfilled this recommendation were used when reporting results.

Vigorous Exercise.

Two questions were used to measure the frequency and duration of vigorous PA during the leisure time.

Content for vigour was highlighted by defining exercise that makes one "get out of breath or sw eat" and both questions have shown stability across seven European countries between 1986 to 2002 of adolescents that met recommendation 2 (Rec2) and not (NoRec2). The overall VPA was estimated using information on frequency and duration of leisure time VPA, as indicated in Figure 1.

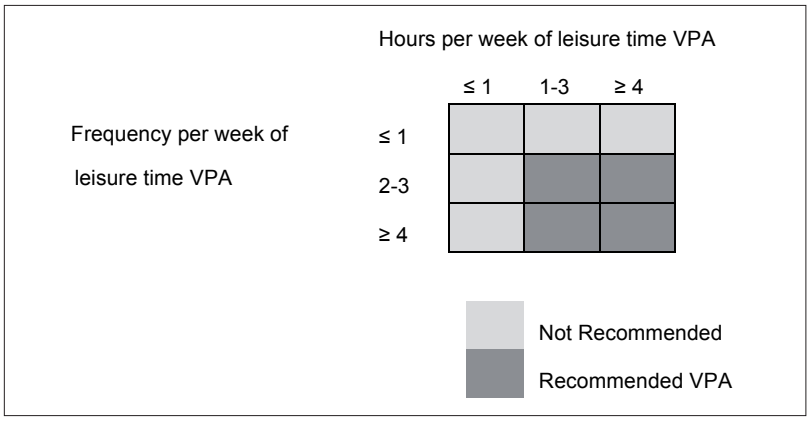

Figure 1 Using VPA Groups to determine meeting PA Recommendation 2

(Samdal et al., 2007). Frequency was asked using the question; "Outside school hours: how **often** do you usually exercise in your free time so much that you get out of breath or sweat?" (emphasis as in the questionnaire). The following responses include; "Everyday"; "4 to 6 times a week"; "2 to 3 times a week"; "Once a week"; "Once a month"; "Less than once a month"; and, "Never". Frequency ranges were used when reporting results with data recoded of "once a week or less" as 1, "2-3 times a week" as 2, and "at least 4 times a week" as 3.

Duration was measured using the question; "Outside school hours: how many **hours a week** do you usually exercise in your free time so much that you get out of breath or sweat?" (emphasis as in the questionnaire). Responses options include; "None"; "About half an hour"; "About 1 hour"; "About 2 to 3 hours"; "About 4 to 6 hours"; and, "About 7 hours or more". Duration ranges were used when reporting results with data recoded of "up to one hour" as 1, "1-3 hours" as 2, and "over 4 hours" as 3.

VPA

Vigorous physical activity (VPA) during leisure time is determined by participation in PA at least two times a week and at least an hour per week. Existing HBSC methodology, based on the frequency and duration of PA questions (Booth et al., 2001), was used to produce dichotomous groups

LTID

A three step procedure was conducted to generate information about LTID. First, the respondents were asked, "Do you have a long-term disability, illness or medical condition like cerebral palsy, diabetes, arthritis, or allergy as stated by a doctor? Please do not include learning disabilities." The response categories were 'yes' or 'no'. The second step was that only if they had answered 'yes' to this question, they were asked, "If you answered yes, does this disability, illness, or medical condition cause you 1) difficulty seeing things (does not include prescription eye glasses), 2) difficulty in hearing what others say, 3) difficulty in speaking to others, 4) difficulty in moving around, 5) difficulty in handling objects, 6) difficulty in breathing, or 7) epileptic seizures (fits)?" For each type of difficulty, the response categories were 'yes' or 'no'.

The third step involved the sorting of data whereby difficulties were grouped into the following mutually exclusive categories; difficulty in breathing into the 'breathing' group, difficulty in moving around and difficulty in handling objects into the 'motor' group, difficulty in hearing what others say and difficulty in speaking to others into the 'communications' group, difficulty seeing things into the 'visual' group, and epileptic seizures into the 'epilepsy' group. Respondents that had not indicated one of these types of difficulties but

had stated that they have a LTID were put into the 'not-specified' group. People with more than one difficulty were also put into distinguished groups, where belonging to both motor and breathing groups had its own group, and both breathing and communication groups had also its own group. The few combinations of multiple categories (n=31) that existed but had not matched these criteria were coded into the not specified category. All in all, there is a theoretical possibility for 32 different combinations of difficulties categories, so minimum criteria for inclusion was based on at least two people from each pooled data set (2002 and 2010) and at least two of each gender.

Statistics

SPSS 20.0 was used for analysing the data. Variables were used to control the analysis included the gender (between boy and girl) and age (13 and 15 years old) variable. No confounder variables were used for analysis such as regression. Descriptive statistics were used to summarize the average number of days active in the last 7 days, and the percentage of the LTID populations that met recommendations 1 and 2 for youth PA. Non-parametric tests with exact models, including Kruskal-Wallis were used for test of independence between the populations of 2002 and 2010. Further, Kruskal-Wallis tests were used for differences between LTID categories for each PA variable and recommendations. Mann-Whitney, for independent samples were used for tests of these descriptive findings to seek out differences between genders. For each gender, Mann-Whitney tests were performed to test differences between ages. A P value of $< .05$ was considered statistically significant.

RESULTS

In this data, there was 14.6% (n=1126) reported as having a LTID.

Moderate-to-vigorous physical activity (MVPA) over seven days between the various categories remained consistent between the two sets of data from 2002 and 2010 (p=.889). Therefore, the two data sets were combined and pooled together. Distribution of the sample appears in Table 1. Just over half (52.8%) of the population had reported having a LTID but did not indicate what types of difficulties they had and belonged to the 'not-specified' category. Having difficulties in breathing was the next largest category with just under a third (30.1%) of the overall sample. Less than a fifteenth (6.2%) came from the motor difficulties category, and the remaining 10% was composed of the other categories, communications (2.8%), visual (2.6%), epilepsy (1.8%), motor with breathing (2.8%), and breathing with communications (less than 1%). There were more girls (56.2%) than boys (43.8%) in the population. Only in the visual category there were more boys (62.1%) than girls (37.9%). There were slightly more 13 year old boys (51.7%) than 15 year old boys (48.3%), whereas there were slightly less 13 year old girls (48.8%) than 15 year old girls (51.2%). All in all, there were just as many 13 year olds as 15 year olds.

Table 1 Distribution of Study sample, gender, age and LTID categories

	Boys (n)			Girls (n)			All (n)		
LTID Category	13yr	15yr	All	13yr	15yr	All	13yr	15yr	All
Non-specified*	145	141	286	156	153	309	301	294	595
Breathing	70	65	135	89	115	204	159	180	339
Motor	13	16	29	22	19	41	35	35	70
Communications	8	2	10	10	11	21	18	13	31
Visual	8	10	18	5	6	11	13	16	29
Epilepsy	6	2	8	9	3	12	15	5	20
Motor with Breathing	4	0	4	14	14	28	18	14	32
Breathing with Comms	1	2	3	4	3	7	5	5	10
All	255	238	493	309	324	633	564	562	1126

* included were adolescents (n=31) with multiple combinations of LTID that were too small in size to be individualised for analysis

Recommendation 1 – Daily PA for 60mins

The overall percentage of adolescents with LTID with 7 days of PA (Rec1) was just 15.6% (Table 2), and an average of almost 4 days per week (mean=3.9, sd=2.05)(Table 3). The distribution between the LTID categories for Rec1 was deemed to be the same (p=.348). Despite this result, PA characteristics differed between categories. The groups with the highest proportion of meeting Rec1 included the Epilepsy (20%) and the breathing with communications category (20%). The breathing category reported the highest mean (4.0, sd=1.96), while the breathing with motor category had the lowest mean (3.7, sd=2.18) of Rec1. The motor (11.4%) and the communication (12.9%) categories represented the smallest group meeting Rec1.

More boys (19.9%) met Rec1 than girls (12.2%, p<.001) overall (Table 2). There were also gender differences from those with not-specified (p=.016) and breathing difficulties (p=.027), whereby more boys met Rec1 than girls. The mean number of days of 60mins of MVPA also differed between the genders. The mean number of days participating in MVPA declined in both boys and girls in the older age group. The number of 15 year olds that were active daily was half (10.5%) of the number of 13 year olds (20.6%). There were similar patterns for each LTID category, although the decline varied from 40% (Breathing with Communication) to 2.4% (Motor with Breathing).

Frequency

Just over two fifths (43.0%) stated they were doing leisure time activity for at least four times a week (Table 4). Another third (34.9%) were doing PA in their leisure time between two to three times a week, leaving under a quarter (21.1%) taking part in PA less than two times a week. The distribution between the categories for frequency groups were the same across LTID categories (p=.231). Further characteristics between LTID categories were explored. Three categories (visual, epilepsy, breathing with communication difficulties) had more participation based on 2–3 times a week than other frequency ranges. Based on these overall results, boys were found to be more active at least two times a week than girls for the whole sample (p=.001), breathing (p=.014), and visual (p=.005) categories. Decline within the sample's percentage of at least two times a week occurred between the 13 and 15 year olds (p<.001).

Duration

Almost half of the adolescents (46.8%) with LTID took part in 1–3 hours per week of leisure time VPA (Table 4). Most of the others (36.1%) were more active, reporting more than 4 hours per week, and just a fraction (14.6%) did less than an hour or none per week. The distribution of duration was not same across the categories (p=.037). Further investigations demonstrated that the range between categories for being active during leisure time for at least one hour in a week was vast. Least number of adolescents with communication difficulties (67.9%) and epilepsy (72.2%) were active for at least 1 hour per week, while the largest proportion were from adolescents with not-specified (86.8%) and breathing difficulties (86.1%). No differences were observed between genders, but 13 year olds were more active than 15 year olds (p=.014).

Recommendation 2 – VPA in leisure time

Almost three quarters (74.0%) of adolescents with LTIDs were active at least twice a week for a minimum total of one hour (Rec2; Table 2). The majority of the time, there were more boys than girls that met this recommendation (p=.006), especially between those with breathing difficulties (p=.011). There were also less young boys with motor difficulties (53.8%) that met VPA recommendations than older boys (75.0%, p=.045) with the similar difficulties.

DISCUSSION

From this study, there were only a few adolescents with LTID that met daily PA recommendations. The mean number of days of being active was lower than results based population surveillance studies. Adolescents in northern European countries have been reported to have a mean of

Table 2 Percentages of 13 and 15 year old adolescents with LTID that met recommendations 1 and recommendation 2, and its differences in gender and age.

		% Recommendation 1. Daily 60mins MVPA			% Recommendation 2. 2 times/wk & 1hr/wk Leisure Time VPA		
All within LTID Categories		13	15	All	13	15	All
Not-Specified	Boy	26.2	11.3**	18.9	81.3	76.1	78.7
	Girl	17.3	5.9**	11.7	78.1	68.9	73.5
	Total	21.6	8.5**	15.1*	79.6	72.3	76.0
Breathing	Boy	28.6	16.9	23.0	88.4	75.0 **	82.0
	Girl	13.5	13.0	13.2	75.6	65.2	69.7
	Total	20.1	14.4	17.1*	81.3	68.8	74.6 *
Motor	Boy	7.7	25.0	17.2	53.8	75.0	65.5
	Girl	9.5	0.0	5.0	81.0	72.2	76.9
	Total	8.8	11.4	10.1	70.6	73.5	72.1
Comms.	Boy	25.0	50.0	30.0	50.0	100.0	60.0
	Girl	10.0	0.0	4.8	66.7	55.6	61.1
	Total	16.7	7.7	12.9	58.8	63.6	60.7
Visual	Boy	37.5	10.0	22.2	87.5	70.0	77.8
	Girl	20.0	0.0	9.1	40.0	16.7	27.3
	Total	30.8	6.3	17.2	69.2	50.0	58.6
Epilepsy	Boy	16.7	0.0	12.5	66.7	50.0	62.5
	Girl	33.3	0.0	25.0	85.7	33.3	70.0
	Total	26.7	0.0	20.0	76.9	40.0	66.7
Motor & Breathing	Boy	0.0	0.0	0.0	50.0	n.a.	50.0
	Girl	21.4	14.3	17.9	76.9	57.1	66.7
	Total	16.7	14.3	15.6	70.6	57.1	64.5
Breathing & Comms.	Boy	0.0	0.0	0.0	100.0	100.0	100.0
	Girl	50.0	0.0	28.6	100.0	33.3	71.4
	Total	40.0	0.0	20.0	100.0	60.0	80.0
Total	Boy	25.5	13.9**	19.9	80.2	75.6	78.0
	Girl	16.6	8.0**	12.2	77.0	65.2**	70.9
	Total	20.6	10.5**	15.6*	78.5	69.6	74.0

* Mann-Whitney Tests of Differences between Boys and Girls >.05.

** Mann-Whitney Tests of Differences between 13 and 15 year olds >.05.

Table 3 Number of 13 and 15 year old adolescents with LTID reporting the number of days they were physically active in the last 7 days, divided by gender separately.

All within LTID Categories		Physically active for at least 60mins during the last 7 days								
		None	One	Two	Three	Four	Five	Six	Seven	Missing
Not-Specified	Boy	9	31	38	36	45	38	35	54	0
	Girl	11	32	53	43	54	50	30	36	0
	Total	20	63	91	79	99	88	65	90	0
Breathing	Boy	4	9	16	18	28	18	11	31	0
	Girl	4	18	31	46	34	29	15	27	0
	Total	8	27	47	64	62	47	26	58	0
Motor	Boy	3	2	5	5	3	3	3	5	0
	Girl	2	5	4	7	7	8	5	2	1
	Total	5	7	9	12	10	11	8	8	1
Comms.	Boy	0	2	1	0	2	1	1	3	0
	Girl	0	4	4	4	3	2	3	1	0
	Total	0	6	5	4	5	3	4	4	0
Visual	Boy	0	1	2	5	1	3	2	4	0
	Girl	0	2	4	2	1	0	1	1	0
	Total	0	3	6	7	2	3	3	5	0
Epilepsy	Boy	0	2	1	1	1	2	0	1	0
	Girl	0	0	2	5	0	1	1	3	0
	Total	0	2	3	6	1	3	1	4	0
Motor & Breathing	Boy	1	1	0	1	1	0	0	0	0
	Girl	1	3	5	3	4	5	2	5	0
	Total	2	4	5	4	5	5	2	5	0
Breathing & Comms	Boy	0	0	1	1	1	0	0	0	0
	Girl	1	0	1	1	1	1	0	2	0
	Total	1	0	2	2	2	1	0	2	0
Total	Boy	17	48	64	67	82	65	52	98	0
	Girl	19	64	104	111	104	96	57	77	1
	Total	36	112	168	178	186	161	109	175	1

Table 4 Adolescents with LTID reporting their frequency and duration of Leisure time VPA. Percentages of reaching cut offs with gender difference (Mann-Whitney) test results.

All within LTID		Groups of Frequency (times/wk)					Groups of Duration (hours/wk)				
Categories		≤ 1	2-3	≥ 4	missing	% ≥ twice	< 1	1-3	≥ 4	missing	% ≥ 1hour
Not-Specified	Boy	47	87	145	7	83.2 %	36	110	131	9	87.0 %
	Girl	70	114	123	2	77.2 %	41	168	97	3	86.6 %
	Total	117	201	268	9	80.0 %	77	278	228	12	86.8 %
Breathing	Boy	19	43	71	2	85.7 %	15	65	53	2	88.7 %
	Girl	52	78	72	2	74.3 %	31	107	60	6	84.3 %
	Total	71	121	143	4	78.8 %*	46	172	113	8	86.1 %
Motor	Boy	6	5	18	0	79.3 %	8	8	13	0	72.4 %
	Girl	9	16	16	0	78.0 %	3	17	19	2	92.3 %
	Total	15	21	34	0	78.6 %	11	25	32	2	83.8 %*
Comms.	Boy	3	2	5	0	70.0 %	2	3	5	0	80.0 %
	Girl	6	7	6	2	68.4 %	7	6	5	3	61.1 %
	Total	9	9	11	2	69.0 %	9	9	10	3	67.9 %
Visual	Boy	2	10	6	0	88.9 %	3	7	8	0	83.3 %
	Girl	7	2	2	0	36.4 %	5	4	2	0	54.5 %
	Total	9	12	8	0	69.0 %*	8	11	10	0	72.4 %
Epilepsy	Boy	3	3	2	0	62.5 %	2	6	0	0	75.0 %
	Girl	2	5	4	1	81.8 %	3	4	3	2	70.0 %
	Total	5	8	6	1	73.7 %	5	10	3	2	72.2 %
Motor & Breathing	Boy	2	1	1	0	50.0 %	2	1	1	0	50.0 %
	Girl	9	9	10	0	67.9 %	4	17	6	1	85.2 %
	Total	11	10	11	0	65.6 %	6	18	7	1	80.6 %
Breathing & Comms	Boy	0	3	0	0	100.0 %	0	3	0	0	100.0 %
	Girl	1	3	3	0	85.7 %	2	1	4	0	71.4 %
	Total	1	6	3	0	90.0 %	2	4	4	0	80.0 %
Total	Boy	82	154	248	9	83.1 %	68	203	211	11	85.9 %
	Girl	156	234	236	7	75.1 %	96	324	196	17	84.4 %
	Total	238	393	484	16	78.6 %*	164	527	407	28	85.1 %

* Mann-Whitney Tests of Differences between Boys and Girls >.05.

4.3 days (Iannotti et al., 2009) and this figure is higher than any of the categories reported in this study. Different characteristics based on LTID categories are evident in the literature, gender differences were noticeable, although it was not as transparent with age. In concurrence with the literature in PA behaviours, boys were more active than girls (Biddle, Atkin, Cavill, & Foster, 2011), and that in most cases 13 year olds were active more frequently than 15 year olds (Aira et al., 2013).

There were also large differences between those who met Rec1 and Rec2. In other studies, it has been found that self-reported MVPA tends to be under reported (Samdal et al., 2007), while proportions of VPA can be threefold of MVPA (Nupponen, Laakso, Rimpelä, Pere, & Telama, 2010). The results in this study exceeds to almost four times as much in most cases. The extent of these differences could have much to do with time commitment, whereby it can be easier for someone to be vigorously active for 20 minutes three times a week, making up the hour of vigorous exercise requirement, than to be moderately active for 60 minutes daily.

Since MVPA measures, and cut off groups were based on internationally consensus on PA guidelines (Strong et al., 2005), they should apply only to self-reported data rather than objective measures (Nusser et al., 2012). Additionally, the two measures used have also be commended for its ease of use, quickness to respond, and provides information from a national population basis, which can be used to track cross-sectional data over time (Haskell, 2012). Further studies are needed that would provide these perspectives for adolescents with LTID. Given that there have been discussions on the barriers in life of persons with LTID (Glazebrook et al., 2006; Houwen et al., 2009; Longmuir & Bar-Or, 2000), there might be plausibility in adjustments in production of PA guidelines within special populations (Philpott et al., 2010). Support in this direction could include detailed examination into the ICF, and how the personal and environmental factors influence the severity of disability in addition to the components of activity limitations, participation restrictions, and individual's impairments (World Health Organization, 2006).

Statistically, the results support a non-category approach to examine PA patterns. Due to the types of differences of each condition, it was necessary to examine results within groups. It is not surprising that the largest category was from adolescents that had not-specified, since the two set question begins with examples of LTID that are not included in the list of categories, for example, allergies and diabetes are not listed. Adolescents with breathing difficulties were the biggest specified category and it has a large effect when reporting all adolescents with LTID. It was found that boys with breathing difficulties were more active than girls, and younger boys were more active than older boys. Similar results in national Finnish adolescents data have been reported (Aira et al., 2013). There are a range of explanations for these findings, and often adolescents with breathing difficulties share similar PA behaviours, regularity, and duration as the general population (van Gent et al., 2007). In light of these similarities, the need to separate these difficulties from general population can provide information of the risks in exercise induced asthma, as their health related behaviours become apparent. Although, the UN definition of disabilities and long term illnesses share many lifestyle traits that "*may hinder their full and effective participation in society on an equal basis with others*" (United Nations, 2008), it is important to also observe these differences when looking at PA patterns as a whole.

Results from other LTID groups were based on small number of cases, and this could make it difficult to produce statistical significance. Rather, in this study, the results can still provide substantial information without bias based on the representative sampling. For example, in this study, both visual and epilepsy categories, had higher percentages exercising daily. Both groups had results quite different from the overall population. It was noticeable that more adolescents with seeing difficulties or epilepsy exercised less frequently than adolescents in other categories. This could be because the difficulties experienced with these two groups are quite different from other groups. It has been

reported that, adolescents with difficulties in seeing, have fewer opportunities to participate in social activities, life skills and communication (Papadopoulos, Metsiou, & Agaliotis, 2011). Also, adolescents with epilepsy seem to have risks far greater than the benefits to exercise (Ramirez, et al, 2009) and this could be another reason for taking part in less PA. However, nowadays, due to advances in medication, PA is encouraged as a means for self-management for epilepsy (Lindsay & Bradley Peter, 2010) when attempting to increase participation with this particular category.

The link between school time and out-of-school activity is also important, particularly for adolescents with LTID. Substantial differences could be a result of the complexity for organising adapted physical activities whereby the facilities, costs, trained personnel, and support to increase leisure time activity is also needed (Houwen et al., 2009). There is the possibility of another perspective, whereby more adolescents with LTID feel that they do sufficient amounts of exercise during school hours. If they already met the widely known first recommendation, they may feel less need to be active during leisure time. If this would be the case, it is important to place a message highlighting the importance of fulfilling the second recommendation.

The reduction of PA amounts, frequency, and duration between ages are quite apparent in this study. These results echo the similar findings in general population studies produced by Aira, et al. (2013). There were only some slight differences to the drop out figures and the results from this study do not show that alarming of a picture for reduced PA as the adolescent gets older. As adolescents get older, the involvement in more activities and independence would be some of the factors that could be explored in future studies.

Finally, in this study, a prevalence of 14.6% of adolescents with LTID was reported. This amount is less that figures from the HBSC study of 18% (Boyce et al., 2009). In this study, data was pooled from both 2002 and 2010, whereas in Boyce's study (2009), only data from 2002 was used, and it combined data from Finland and Canada. It seems that there were fewer adolescents with LTID than in 2002, and further studies on trends over the years are needed.

Methodological issues and limitations.

The study used self-reported data, which requires a trusted sense that the respondents complete the answers as truthfully as possible. Cognitive tests were not performed, however, responses from the data sets were individually entered and cleaned through the HBSC protocol for spoilt data. The HBSC questionnaire has existed for over 30 years and has continually sought for improvements in its research design through pilot testing, reliability and validity testing, and producing protocols on its usage for its researchers (Roberts et al., 2009). Measures of PA were based on self-reported patterns of behaviour which do not preclude to intensity of activities. Rather, the assumption that the participant understands the difference between MVPA and VPA is distinct from the term 'physical activity', rather than 'exercise'. The estimated figures meeting the recommendations seem to be high, and this may be seen as a measurement error as participants that were included self-reported to exercise at least twice a week, instead of at least three times a week (Booth et al., 2001). In combination with the recognition that the occurrence of VPA is over reported in boys (Samdal et al., 2007), studies may want to consider making comparisons based on reported at least 4 times a week.

The complete data set is a nationally representative size, cross-sectional, using stratified sampling and completed in mainstream schools. Although the data does not completely represent the behaviours of adolescents with a number of LTID, it can provide details of health behaviours from individuals whom experience inclusion. The self-reporting of LTID requires substantial validation (Miller et al., 2011), yet addressing this is highly challenging (van der Lee, J. H. et al., 2007). When interpreting the results, it is important to note that the severity of the difficulties was not assessed. The categories were from a selected list and do not cover all types of difficulties experienced by adolescents. Conditions such as allergies, pain or issues

with cognitive difficulties were not separated. In Finland, the placements of adolescents with severe difficulties are often in special education schools, and the HBSC survey does not currently extend to these schools. It is not known if there is a relationship to the PA patterns because the adolescents are part of an inclusion setting or if the results would have been the same if they were taken from special schools. Interpretation of results for generalizability requires careful attention to the small number of cases used in this paper.

PERSPECTIVES

In this study, a national representative data set has given some perspective to the prevalence of LTID in general education. In addition, patterns of PA in and out of school were described, and low amounts of PA were reported. The findings suggest that PA is statistically insignificant between categories of LTID, however the literature suggests that different LTID have non compatible characteristics. Being aware of characteristic differences is important for teachers, as well as knowing how to organise learning when treating the LTID group as a whole. Providing that PE teachers have access to pre- and in-service training, they can become aware of the need to improve PA regularity in a variety of situations. However, this message does not seem to be as transparent within the out of school context. Researchers may want to have a closer look into some of the psychological concerns, such as motivation, adherence, and self-perceptions when examining PA of adolescents with LTID.

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