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Physical Activity Trends of Finnish Adolescents With Long-Term Illnesses or Disabilities From 2002–2014

Kwok Ng, Pauli Olavi Rintala, Jorma Tynjälä, Raili Välimaa, Jari Villberg, Sami Kokko, and Lasse Kannas

Background: Adolescents' physical activity level is a major source of concern. For adolescents with long-term illnesses or disabilities (LTID), being physically active can prevent secondary conditions. This is one of the first studies reporting trends in physical activity of adolescents with LTID in relation to gender, age, and sports club membership. **Methods:** Data were collected from the Health Behavior in School-aged Children study in Finland during 2002, 2006, 2010, and 2014. In 13- and 15-year-olds (N = 2206), 17.1% reported having LTID. Daily physical activity recall was the dependent variable. Binary logistic regression analysis was conducted separately for sports club members (n = 936) and nonmembers (n = 1270). **Results:** The proportion of physically active adolescents with LTID in 2014 was higher than in 2002 for girls (15.6% vs 8.7%) and boys (26.6% vs 13.0%). Girl sports club members were 2 times more likely to be physically active in 2014 than in 2002. The largest trend between 2014 and 2002 was among boy nonmembers (odds ratio: 4.62, 95% confidence interval, 2.02–10.58). **Conclusions:** More adolescents with LTID took part in daily moderate-to-vigorous physical activity in 2014 than in 2002; however, physical activity levels still remain low. Sports club membership was similar to that of the general population.

Keywords: Health Behavior in School-aged Children Study, organized sports, physical activity recommendations, Finland

In recent years, physical activity (PA) has received much attention in public health.¹ Although adolescence is a time when PA levels decline,² it has been reported that taking part in sports clubs during adolescence in the general population predicts more active adult PA behaviors.³ For adolescents with long-term illnesses or disabilities (LTID), recognition of the benefits from organized sports participation has been established through the coding of the World Health Organization (WHO) International Classification of Functioning, Disability and Health (ICF).⁴

The WHO has also made an evidence-based recommendation for health, whereby adolescents should take part in at least 60 minutes of moderate-to-vigorous physical activity (MVPA) every day.⁵ The recommendation includes adolescents with LTID, who can represent approximately one-fifth to one-sixth of adolescents.^{6,7} For this particular subpopulation, studies have reported PA can reduce the risks of secondary conditions,⁸ improve psychological assets,⁹ and lead to improved functional capabilities that are necessary in the transition from adolescence to adulthood.¹⁰ Moreover, there are a number of organizations that have made PA recommendations for people with specific health conditions,¹¹ however, these recommendations have been noted to target adult populations and have not differentiated recommendations like those of the WHO for adolescents.¹² As such, more studies that provide overall PA levels are needed for adolescents with LTID.¹³

Fewer adolescents with LTID met the recommendation of daily 60 minutes of MVPA in boys (20% vs 30%) and girls (12% vs 18%) when compared with the general 11- to 15-year-old population.^{6,14} It has also been reported that the amounts of MVPA may not differ between adolescents with and without LTID.⁷ Less is known if such inconsistencies are due to changes over time. To perform trend analysis, a reliable instrument must be used and repeated at each data collection

point.¹⁵ The WHO collaborative Health Behavior in School-aged Children (HBSC) study serves as a unique approach to make comparisons between other countries in Europe and North America.¹⁶ The HBSC study is frequently used to monitor trends in adolescent health over time.¹⁷ According to international comparisons, Finnish adolescents aged 11 to 15 years in general schools had the greatest increase in daily MVPA between 2002 and 2010, with a +11.9% increase for boys and +5.7% for girls.¹⁴ However, indications that adolescents with LTID may follow the same increasing pattern in Finland are missing.

Studies often neglect the individual status of membership in a sports club as a possible confounder for MVPA. Reports about the general population have indicated that adolescents who take part in sports clubs are 3 times more likely to be active than nonmembers.¹⁸ Furthermore, although there have been increases in MVPA in Finland,¹⁴ the proportion of sports club membership has remained stable at approximately 45% for boys and slightly increased from 36% to 43% for girls from 1986 to 2010.² There is a lack of research on adolescents with LTID from a public health perspective,¹³ and it is assumed that fewer adolescents with LTID are sports club members than their peers, particularly boys.¹⁹

To our knowledge, this is the first study to report trends in MVPA in adolescents with LTID. Thus, the aims of this study are to investigate the trends of daily MVPA and ≥ 5 days a week of MVPA among Finnish adolescents with LTID in 2002, 2006, 2010, and 2014, in relation to gender, age, and sports club membership.

Methods

This study is part of the WHO collaborative HBSC study in Finland. The HBSC study is based on national representative data collected in

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schools using a self-reported questionnaire. Sampling techniques include regional strata, school size, and then school level. It was conducted every 4 years during the spring between 2002 and 2014, with an overall count of 23,408 respondents aged 11 (fifth grade), 13 (seventh grade) and 15 years (ninth grade) from 1245 participating schools. The same survey questions of interest were used in each data collection period. Overall response rates ranged from 84.3% to 90.4% between 2002 and 2014. The surveys were completed voluntarily and anonymously and were then placed into double-sealed envelopes (sealed once by student, once by the teacher). The study was approved by the Finnish National Board of Education.

A 2-step criteria for this data file included completed surveys of 13- and 15-year-olds ($n = 12,913$) and only individuals who self-reported to have “long-term illnesses, disabilities or medical conditions (like arthritis, allergy, or cerebral palsy) that has been diagnosed by a doctor.”²⁰ Children were also asked not to include learning disabilities ($n = 2206$). The overall prevalence of adolescents with LTID was 17.1%. The grouping variable “taking part in sports club” was used as part of the ICF code for organized sports,⁴ as denoted as sports club members.

PA measures correspond to the PA recommendations for health, which used a widely used preamble¹⁴ that explained what was meant by moderate-to-vigorous intensity and PA before the following question: “Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?”²¹ Response categories ranged from 0 to 7 days. After a series of studies with adolescents in primary care, the reliability of this particular instrument was reported to have an ICC of 0.65 for 5 days and 0.72 for 7-day recall.²¹ A Finnish version was found to have acceptable reliability.²² The validity of this measure was tested with adolescents that enter a primary care setting against an accelerometer over 5 days ($r = 0.46, P < .01$) and 7 days ($r = 0.37, P < .01$).²¹

Statistical Analysis

The dependent variable of MVPA was dichotomized in 2 ways. To correspond with PA recommendations, 1 dichotomized grouping was based on 7 days (“daily”) of at least 60 minutes per day of MVPA or not. Another dichotomized grouping was devised because the original measure was tested for at least 5 days (“5 days”) or not.²¹ Binary logistic regression analyses with adjusted age were conducted. The year 2002 remained as the reference category for differences between subsequent years (2002–2006, 2002–2010, 2002–2014).

A separate analysis was conducted between sports club members and nonmembers. Changes in sports club member prevalence over time were tested using the Pearson χ^2 test for changes in year for both girls ($P = .159$) and boys ($P = .266$). Sports club membership could have been a conditional process that moderates the relationships between year of data collection and the outcome variable. The potential moderating effect (year \times sports club membership) was tested for both daily and 5-days MVPA; however, no interaction was statistically significant, and these results are not reported here.

Odds Ratios (ORs) with 95% confidence intervals (CIs) indicated the likelihood of daily MVPA and 5-day MVPA, with these characteristics relative to the reference group. The reference group for age was 13-year-olds. All statistical analyses were performed in IBM SPSS, version 22.

Results

The prevalence of adolescents with LTID was not constant over the years, with the lowest prevalence in 2010 (14.4%) and the highest in

2014 (19.2%) (Table 1). Further comparisons between adolescents with and without LTID were not conducted. Overall increasing trends were observed (Table 2) in the proportion of adolescents with LTID for both daily PA for at least 60 minutes between 2002 (10.7%) and 2014 (20.7%) and for at least 5 days a week of PA between 2002 (31.2%) and 2014 (52.1%). Changes in sports club membership over the years (42.4%) were not statistically significantly.

Insert Tables 1 and 2 here\

Increasing secular trends of the overall daily and 5-day MVPA for 60 minutes grouped by sports club members and nonmembers are in Figure 1. As age increased, participation in PA decreased in all groups except boy sports club members (Table 3).

Insert Figure 1 here\
Insert Table 3 here\

Trends in Girls MVPA

The proportion of sports club members who were physically active daily was higher than nonmembers for girls (20.9% vs 8.4%) (Table 3). Changes in daily MVPA for nonmember girls between 2002 and 2014 were not significantly different, even after adjusting for age. This was contrasted by the trends of 5-day MVPA, with increases from 2002 (15.3%) to 2006 (29.9%), to 2010 (32.3%), and to 2014 (33.2%). Girl members were 3 times more likely to be active daily in 2010 than in 2002, and were twice as likely to report at least 5 days of MVPA in 2014 when compared with 2002.

Trends in Boys MVPA

The proportion of sports club members who were physically active daily was higher than nonmembers for boys (31.3% vs 12.3%) (Table 3). Boy nonmembers were 3.5 and 4.6 times more likely to be active daily in 2010 and 2014, respectively, than in 2002. However, the proportion of MVPA was never greater than boy members in 2002.

Less than one-half of boy members in 2010 (44.3%) were active daily, which contrasts with the 1 in 4 (24.5%) sports club member boys who reported the same amount of MVPA in 2002. The proportions of daily and 5-day MVPA of boy members in 2014 were no longer significantly different to 2002.

Discussion

In this study, MVPA trends were assessed in relation to sports club membership in Finnish adolescents with LTID. There were more adolescents with LTID who were physically active daily and for at least 5 days in 2014 than in 2002. These increases were not moderated by changes in sports club membership. Almost one-half of the proportions of adolescents with LTID were sports club members.

Between 2002 and 2010, there were increases in the proportion of adolescents with LTID in both measures of daily and 5-day MVPA for boys and girls, members and nonmembers. The findings from our study are similar to reported patterns from studies taken from general school populations.¹⁴ Studies that lack information about adolescents with LTID may find that this minority population could be large enough to be significantly similar to the rest of the sample. In our study, we reported that overall 1 in 6 adolescents reported to have LTID. A previous study that examined the difference between adolescents with

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and without LTID in Canada and Finland reported no statistical differences in PA. These were important findings as they highlighted the similarities in the reporting of MVPA among adolescents in general education when comparing the status of LTID. Should these results be generalizable to other time points or populations, it would be expected that the trends would be the same among adolescents with and without LTID.

The 2014 PA data from the general school population in Finland has not been published yet; however, early indications can be interpreted through another PA behavior online study of adolescents that used the same MVPA questions.²³ In that study, the researchers found that in 2014 the amount of boys that reported 7 days of MVPA had gone down to 23% and for girls it was now 17%. This is a 9% drop in boys when compared with the figures reported in the study by Kalman et al.¹⁴ Similarly, in our study there was a reduction in the number of boys that reported daily MVPA; however, this reduction remains unexplained. In the time between 2010 and 2014, there have been many health promotion activities throughout all of Finland,²⁴ and perhaps 1 indicator could be related to the amount of money available for PA per municipality. The running of adapted sports tends to have financial support from the local municipality. The funding available for PA specifically for people with LTID has decreased between 2010 and 2013.²⁵ More studies are needed to gain a better understanding of the pattern between 2010 and 2014.

The proportion of adolescents with LTID who were sports club members is similar to reports from general adolescent surveys.² This latter finding seems incongruous, as previous research reported sports club participation of adolescents with LTID was lower than their peers.¹⁹ Sports clubs in Finland are mainly operated by voluntary civil activities and the main function of sports clubs is to organize sports activities, which are done with competitive aims and means to improve performance.²⁶ Training frequencies are seldom designed to be sufficient to meet the daily PA recommendations for health, and attention must also include the physical education and school-based PA perspectives.²⁴ The majority of coaches are volunteers, and most of the specialist training comes through informal learning. In addition, >95% of coaches have received at least some level of recognized training.²⁷ However, these training programs often do not include information of how to operate in an inclusive environment, which can cause issues with providing equity for members with LTID.²⁸ To address this lack of knowledge, projects like the health-promoting sports clubs²⁹ are needed to modernize the culture in sports clubs in general, including practices that enable people with LTID to participate.

Since the launch of the ICF in 2001, more professionals are able to use it across multiple domains.³⁰ The ICF manual⁴ lists “d9201” as the code for participation in sports clubs. Individuals who are sports club members are coded through the qualifiers for performance as 0 (no difficulties). Subsequent qualifiers may then depend on contextual factors that could set the scene for participation.³¹ The ICF ontology indicates that taking part in sports clubs is desirable for people to improve their functioning individually and socially.⁴

Public health may need to be reminded to pay sufficient attention to ways to overcome barriers for leisure time activities. There are still many adolescents with LTID who do not meet the current PA recommendations for health,^{6,8} and although more sports club members are more active than nonmembers, less than one-half of members achieve the minimum amount of daily activities. There may be a ceiling effect with the measure of PA since there are no more than 7 days in a week, which has been explained by the underreporting of high-frequency participants and overreporting of low-frequency participants.³²

In this study, the trend pattern was slightly different for the respondent group who were active daily compared with 5 days for MVPA. There were increasing linear trends for nonmembers from 2002 to 2014. Reasons for not taking part in sports clubs may be identified through the ICF performance or capacity qualifiers and may be further influenced by the contextual factors.³¹ Since there are year-on-year increases for taking part in 5-day MVPA, professionals may need to reconceptualize the individual benefits from participation in sports clubs.³⁰ Another important concern is to train adolescents with LTID to be capable of self-management into adulthood through self-directed activities.³³ Guidance on how to avoid risks from excessive PA that may aggravate their condition is available; for example, more recovery may be needed after taking part in PA in adolescents with LTID than in the general populations.³⁴ Further studies are needed on the definitions of MVPA for health that will lead to guidelines for different LTID groups.

PA public health campaigns are a relatively new issue, with the implementation of national guidelines promoting more PA and recently on reducing sedentary behaviors for good health. The promotion of these behaviors is still in its infancy in Finland when compared with the “walk more, sit less” campaign in other countries.³⁵ However, this could be to the advantage of Finns, since the literal sense of “walk more, sit less” may pose societal barriers rather encouraging PA for all. People with functional difficulties related to being able to walk, or not having to rely on the assistance of a chair to sit, may find that public health messages like these actually generate a greater divide between enablers and barriers to physical activities. More attention to the language used in future message campaigns is suggested.

Limitations

This study has some limitations. The time between the first time point and the last was 12 years, and data were collected every quadrennial. Although the information obtained is more detailed than simply observing changes from one time point in 2002 to another in 2014, data within the quadrennial is lacking. Details about sports disciplines were missing from the survey and could provide better insight for making recommendations at local, national, and seasonal level. Data from the HBSC survey are based on the adolescents’ reporting of LTID. This is an important consideration when interpreting the results, particularly since there are known differences in PA levels based on different functional difficulties.⁶ Adolescents with learning disabilities were asked to not report this, thus eliminating concerns for the level of comprehension, and this question was only available for 13- and 15-year-olds. Furthermore, fluctuations in the prevalence of LTID in the population could have been because sampling techniques were not focused on adolescents with LTID. As yet, there are no national data in Finland on adolescents with LTID to base survey techniques or weights on data.

Conclusions

The underlying public health implications from this study are that whereas the overall levels of MVPA have increased in over a decade, they still remain low and much more health promotion work is needed to achieve a higher prevalence in adolescents who meet the PA recommendations for health. Sports club membership is encouraged as the findings from this study were favorable toward increased levels of PA; however, coach-led activities in sports clubs can only contribute to part of the weekly activities and not all members meet the PA recommendations. On a positive note, results for adolescents with LTID who are sports club members are similar to other survey studies,

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but it is important to include inclusion training at all levels of coach and teacher education to maintain and promote more PA in various subpopulation groups.

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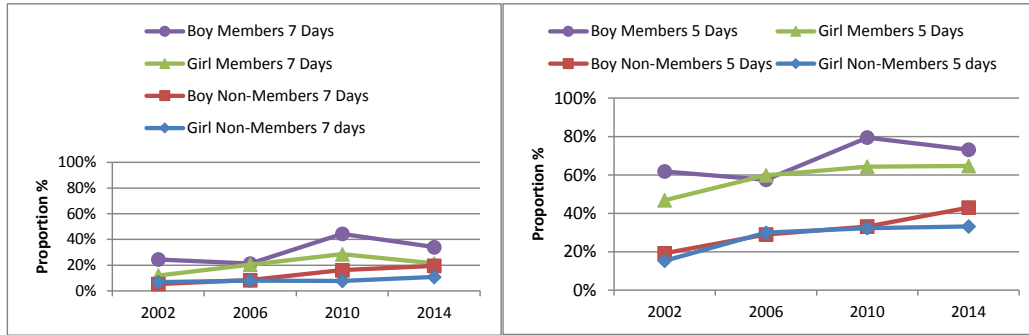


Figure 1 — Trends of 7 days of MVPA (left) and at least 5 days of MVPA (right).

Table 1 Sample Characteristics by Sports Club Membership by Gender and Study Year

	Girls			Boys			Total		LTID ^a	
	13 years	15 years	Total	13 years	15 years	Total	13 years	15 years	Total	%
2002, No.	144	155	299	122	131	253	266	286	552	17.8
Nonmember (%)	54.2	72.3	63.5	53.3	65.6	59.7	53.8	69.2	61.8	
Member (%)	45.8	27.7	36.5	46.7	34.4	40.3	46.2	30.8	38.2	
2006, No.	133	158	291	106	119	225	239	277	516	17.3
Nonmember (%)	54.1	64.6	59.8	53.8	62.2	58.2	54.0	63.5	59.1	
Member (%)	45.9	35.4	40.2	46.2	37.8	41.8	46.0	36.5	40.9	
2010, No.	140	153	293	116	105	221	256	258	514	14.4
Nonmember (%)	50.0	63.4	57.0	46.6	66.7	56.1	48.4	64.7	56.6	
Member (%)	50.0	36.6	43.0	53.4	33.3	43.9	51.6	35.3	43.4	
2014, No.	157	177	334	141	149	290	298	326	624	19.2
Nonmember (%)	49.0	60.5	55.1	41.1	61.1	51.4	45.3	60.7	53.4	
Member (%)	51.0	39.5	44.9	58.9	38.9	48.6	54.7	39.3	46.6	
Total No.	574	643	1217	485	504	989	1059	1147	2206	17.1
Nonmember (%)	51.7	65.0	58.8	48.2	63.7	56.1	50.1	64.4	57.6	
Member (%)	48.3	35.0	48.2	51.8	36.3	43.9	49.9	35.6	42.4	

^a % of LTID in the sample of Finnish HBSC survey of only 13- and 15-year-old respondents.

Abbreviations: HBSC, Health Behavior in School-aged Children; LTID, long-term illnesses or disabilities.

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Table 2 Overall Percentages of Physical Activity Trends of Girls and Boys With LTID

	Girls		Boys		Total	
	7 days (n)	5 days (n)	7 days (n)	5 days (n)	7 days (n)	5 days (n)
2002	8.7 (26)	26.8 (80)	13.0 (33)	36.4 (92)	10.7 (59)	31.2 (172)
2006	13.1 (38)	41.9 (122)	13.8 (31)	40.9 (92)	13.4 (69)	41.5 (214)
2010	16.7 (49)	46.1 (135)	28.5 (63)	53.4 (118)	21.8 (112)	49.2 (253)
2014	15.6 (52)	47.3 (158)	26.6 (77)	57.5 (167)	20.7 (129)	52.1 (325)
All	13.6 (165)	40.7 (495)	20.6 (204)	47.4 (469)	16.7 (369)	43.7 (964)

Note. 7 days: At least 60 minutes per day for the past 7 days of moderate-to-vigorous physical activity; 5 days: at least 60 minutes per day for, at least 5 days in the previous week, of moderate-to-vigorous physical activity.

Abbreviation: LTID, long-term illnesses or disabilities.

Table 3 Trends of at Least 60 Minutes of MVPA for 7 Days and at Least 5 Days in a Week in Adolescents With LTID; HBSC Study 2002–2014

	7 day, % ^a	OR (95% CI)	5 day, % ^b	OR (95% CI)
Girls				
Nonmember				
2002	6.8	1.00	15.3	1.00
2006	8.1	1.19 (0.54–2.62)	29.9	2.38 (1.42–3.98) ^c
2010	7.8	1.14 (0.51–2.55)	32.3	2.66 (1.59–4.45) ^d
2014	10.9	1.66 (0.80–3.45)	33.2	2.77 (1.67–4.57) ^d
Age		0.51 (0.30–0.88) ^e		0.65 (0.47–0.92) ^e
Member				
2002	11.9	1.00	46.8	1.00
2006	20.5	2.00 (0.96–4.19)	59.8	1.71 (1.01–2.90) ^e
2010	28.6	3.07 (1.52–6.18) ^e	64.3	2.06 (1.22–3.48) ^e
2014	21.3	2.09 (1.04–4.23) ^e	64.7	2.10 (1.27–3.47) ^e
Age		0.58 (0.37–0.92) ^e		0.91 (0.63–1.30)
Boys				
Nonmember				
2002	5.3	1.00	19.2	1.00
2006	8.4	1.64 (0.64–4.24)	29.0	1.72 (0.99–3.01)
2010	16.1	3.50 (1.47–8.31) ^e	33.1	2.09 (1.20–3.63) ^e
2014	19.5	4.62 (2.02–10.58) ^d	43.0	3.26 (1.94–5.50) ^d
Age		0.41 (0.24–0.69) ^e		0.65 (0.45–0.94) ^e
Member				
2002	24.5	1.00	61.8	1.00
2006	21.3	0.84 (0.43–1.64)	57.4	0.84 (0.47–1.49)
2010	44.3	2.41 (1.32–4.41) ^e	79.4	2.35 (1.25–4.44) ^e
2014	34.0	1.58 (0.89–2.80)	73.0	1.67 (0.97–2.89)
Age		0.76 (0.50–1.17)		0.84 (0.56–1.28)

Note. Results from binary logistic regression analyses. Cohort from 2002 was the reference group for OR. Adjusted for age with 13-year-olds as reference category.

^a Percentage of participants who were active daily for at least 60 minutes per day MVPA.

^b Percentage of participants who were active for at least 5 days a week of at least 60 minutes per day of MVPA.

^c $P \leq .01$.

^d $P \leq .001$.

^e $P \leq .05$.

Abbreviations: CI, confidence interval; HBSC, Health Behavior in School-aged Children; LTID, long-term illnesses or disabilities; MVPA, moderate-to-vigorous physical activity; OR, odds ratio.