

Kwok Ng

# Physical Activity of Adolescents with Long Term Illnesses or Disabilities in Reference to ICF Personal Factors



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UNIVERSITY OF JYVÄSKYLÄ

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## ABSTRACT

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Participation and activities are important for adolescents' functioning and health. This is in line with the World Health Organisation's International Classification of Functioning, Disability and Health (ICF). Main areas of functioning include physical activities (PA) and participation in organised sport clubs. To ensure adolescents with long term illnesses or disabilities (LTID) can participate fully in society, functional abilities interact with contextual environmental and personal factors. Because habits and attitudes of adolescents can carry through to adulthood, it is important to assess the personal factors in relation to activities and participation. Therefore, the aims of this study were to describe PA trends and to determine the associations between physical activity and the ICF personal factors in adolescents with LTID.

Finnish data, from a national representative sample from the Health Behaviour in School-aged Children (HBSC) study, of 13 and 15 year olds in 2002 (n=3016), 2006 (n=2979), 2010 (n=3578), and 2014 (n=3250) were used in this study. With all data collections combined, 17% (n=2206, mean age=14.8 years, 55% girls) had self-reported LTID. When possible, descriptions of functional difficulties were included in analyses. All studies used the same HBSC protocol across the different data collection years with analysis of items that measured PA, sports club participation, psychological assets related to PA and educational aspirations. Descriptive statistics, mediation regression and binary logistic regression models were used to identify and report associations between PA and personal factors. Trend analysis was also performed.

Younger (13 year old) boys were the most physically active and older (15 year old) girls the least. Moreover, there has been an increase from 11% to 21% of adolescents that reported daily PA from 2002 to 2014, with a twice likelihood from sports club members. Intentions for future PA was strongly associated with increased PA in both boys and girls. Furthermore, boys with high PA self-perceptions and aspirations not to general upper secondary schools were associated with daily PA. Global self-esteem was reported to be a significant mediator between perceived fitness and intentions for future PA in boys but this relationship was not found in girls.

The results of this study connect with previous studies in that there are similar trends in PA in adolescents with and without LTID. It is important to take into account sports club membership when reporting amounts of physical activity of adolescents with LTID. There is almost one in six adolescents with LTID in general schools and realising this may influence the implementing of guides for inclusion in sport clubs at various levels. Finally, as PA are recommended to be part of daily routines, finding commonalities in personal factors can assist with future classifications of functioning, disability and health of adolescents with LTID.

Keywords: HBSC, ICF, intention, self-esteem, self-concept, organizational affiliation

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*Jyväskylä, September 2016*

*Kwok Ng*



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## LIST OF ORIGINAL PUBLICATIONS

The thesis is based on the following original publications that will be referred to in the text by their Roman numerals I-IV:

- I. Ng, K., Rintala, P., Tynjälä, J., Villberg, J. & Kannas, L. 2014. Physical activity patterns of adolescents with long term illnesses or disabilities in Finnish general education. *European Journal of Adapted Physical Activity*, 7(1), 58-72
- II. Ng, K., Rintala, P., Tynjälä, J., Välimaa, R., Villberg, J., Kokko, S. & Kannas, L. 2016. Physical activity trends of Finnish adolescents with long-term illnesses or disabilities from 2002 to 2014. *Journal of Physical Activity and Health*, Aug;13(8):816-21. DOI: 10.1123/jpah.2015-0539
- III. Ng, K., Välimaa, R., Rintala, P., Tynjälä, J., Villberg, J. & Kannas, L. 2014. Self-esteem and intentions mediate perceived fitness with physical activity in Finnish adolescents with long-term illness or disabilities. *Acta Gymnica*, 44(4) 185-192. DOI: 10.5507/ag.2014.019
- IV. Ng, K., Rintala, P., Välimaa, R., Tynjälä, J., Villberg, J., Kokko, S. & Kannas, L. 2016. Daily physical activity in Finnish adolescents with long term illnesses or disabilities: psychosocial associations with participation in sports club. *Epidemiology Biostatistics and Public Health*. 13(3), online. DOI: 10.2427/11699

## LIST OF ABBREVIATIONS

ACSM	American College of Sports Medicine
ANOVA	Analysis of Variance
ASE	Attitude, Social Influence and Self-Efficacy (ASE) model
BMI	Body Mass Index
CCSQ	Chronic Conditions Short Questionnaire
CRPD	Convention on the Rights of Persons with Disabilities
CI	Confidence Interval
DALYs	Disability Adjusted Life Years
FIC	Family of International Classifications
GMFCS	Gross Motor Function Classification System
GSE	Global Self-Esteem
HBSC	Health Behaviour in School-aged Children Study, a WHO Collaborative Cross-National Study
ICD-10	International Statistical Classification of Diseases and Related Health Problems - 10 <sup>th</sup> Revision
ICF	International Classification of Functioning, Disability, and Health
ICIDH	International Classification of Impairments, Disability and Handicap
LTID	Long term illnesses, disabilities or medical conditions
MICS	Multiple Indicator Cluster Survey
MVPA	Moderate to Vigorous Physical Activity
NAEPP	National (American) Asthma Education and Prevention Program
OLS	Ordinary Least Squares
OR	Odds Ratio
PA	Physical Activities
PAD	Physical Activity for People with Disabilities (PAD) Model
PPS	Probability Proportion to Size
SD	Standard Deviation
SES	Social Economic Status
SPSS	Statistical Packages for the Social Sciences
TGMD-II	Test of Gross Motor Development - II
THL	Terveystien ja hyvinvoinnin laitos (Finnish National Institute for Health and Welfare)
UNICEF	United Nations Children's Fund
VPA	Vigorous Physical Activity
WGDS	Washington Group on Disability Statistics
WHO	World Health Organization
WHODAS	World Health Organization Disability Adjustment Scale

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# 1 INTRODUCTION

Participation and activities are important for adolescents' functioning and health. One such activity is physical activity, and by doing them can lead to improved physical and mental health (World Health Organization, 2010). In addition, participation in sport clubs can increase aspects related to social health (Bauman, et al., 2012). Despite this knowledge, there are still low levels of physical active people. Adolescence is important time in a person's life to form habits into adulthood. Engagement in regular physical activities (PA) is emphasised more in adolescents with long term illnesses or disabilities (LTID) as additional health problems from inactivity may later complicate existing conditions (Rimmer, et al., 2012). Hence, a study that examines the trends of PA in adolescents with LTID is needed. However, before this can be addressed, some background of the term disabilities and its usage in research is presented in the following paragraphs of this introduction.

Early epidemiologists were interested in health related matters such as mortality (numbers of deaths) or causes of death, before progressing on to consider morbidity (numbers of diseases) including chronic diseases (Gaziano, 2010). The importance of epidemiology in sport and health sciences is that it is the study of distribution of diseases within populations and the factors that determine them (Adams, et al., 2009). Advances in the study of disabilities were measured through the expected reduced number of years lived, otherwise known as Daily Adjusted Life Years (DALYs). This has led to a categorical approach to different types of disabilities and the associated DALYs (Murray, et al., 2015). As a result, there has been a strong belief that the medically driven science to understand disease and disabilities were related and hence it is often referred to as the medical model of disabilities.

The World Health Organization (WHO) has been a leader in trying to create a uniform way to classify people for DALYs and mortality statistics. As an attempt to address this, in 1980, the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) was created. It was considered to be a "manual of classification relating to the consequences of disease" (Üstün, et al., 2003). However, users of the ICIDH as well as the people for whom it was in-

tended for reported ongoing problems with the ontology. This led to the revision process of the ICIDH-2 and when it was finalised it was renamed the International Classification of Functioning, Disability, and Health (ICF, Bickenbach, 2012). The ICF is a part of the WHO-Family of International Classifications (WHO-FIC) that includes the International Statistical Classification of Disease and Related Health Problems (ICD-10), and the International Classification of Health Interventions (ICHI, under development). The ICD-10 is currently evolving from version 10 to version 11 and in the ICF, it focuses solely on the bodily conditions. The ICF corresponds with the ICD-10 to enable details of functional status (McDougall and Miller, 2003, Escorpizo, et al., 2013). Since the ICF's launch in 2001, it has been widely recognised as the common language for disability and functioning (Bickenbach, 2012), across multiple domains, settings, and nations. It has furthermore been used by researchers and practitioners and has been applied to the domain of physical activities (PA) (Kipp and Weiss, 2013, Rimmer, 2006).

The ICF is divided into two parts that interact with each other to help classify a person's situation by functional health. The first part is related to functioning and disability and has two components as identified by 1) body functions and structures, and 2) activities and participation. The components have a number of domains, some of which are labelled separately, and some labelled together. For example, the body and functions component describes two domains, body functions and body structures. The activities and participation component is related to the domain of life areas, such as tasks and actions, based on the capacity to execute tasks in a standard environment and based on performance to execute tasks in the current environment. The ICF also describes 'Activity' as "the execution of a task or action by an individual" and 'Participation' as "involvement in a life situation" (WHO, 2001, p.12).

The second part of the ICF is related to contextual factors. There are also two components as identified by 1) environmental factors, and 2) personal factors (WHO, 2001). Contextual factors can have an impact on the individual with a health condition. Environmental factors are external to the individual but are focused on two levels, one at the individual and one at the societal. Personal factors are individual characteristics not part of the health condition and are described in more detail in Chapter 2.3. The model of functioning and disability proposed by the WHO is a set of interactions between the key components of the ICF (Figure 1).

Five of the six components are described in the ICF through an alphanumeric coding system, only personal factors do not have its chapter in the ICF nor does it have codes under the current ontology (WHO, 2010). The alphanumeric coding that is used in the ICF must remain ubiquitous, across all states that adopt the ICF, and can be shared among the various types of conditions that lead to degrees of functions and disabilities. The codes need to be clear, understandable, and provide a common language for people that use the codes, apply the codes, and have the codes applied to them. These types of discussions have an effect on the ontology of the ICF, and in some cases have caused some doubts of its purpose and the way the ICF is aligned (Simeonsson, et al., 2014).

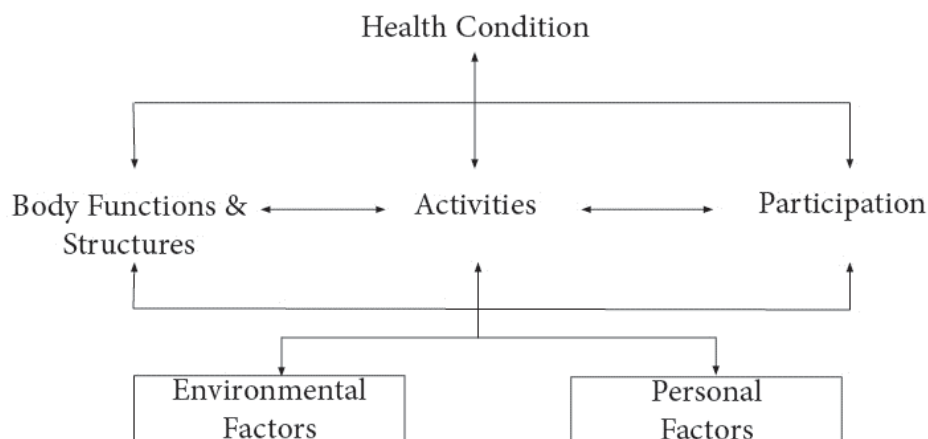


FIGURE 1 Conceptual Model of the interactions between the components of the ICF (WHO, 2001)

Although some studies that use the ICF framework, the component termed “personal factors” is underdeveloped. The ICF also states that future directions of the ICF are to “develop the Personal Factors component” (WHO, 2001, p.264). There have been some criticisms to further develop personal factors as literature often does not address the definition and purpose of the component (Simeonsson, et al., 2014). To avoid this misconception, in this study, the definition of personal factors includes the “background of an individual’s life and living, and comprise features of the individual not part of a health condition or health states.” (p.17) and “are not currently classified in ICF” (WHO, 2001, p.214). The component’s purpose is to allow users to “incorporate in their applications of the classification” (WHO, 2001, p.214).

In these examples of what personal factors may include, there is not so much an issue of the coding of factors such as gender, race, age, etc, but more of the question of how do personal factors facilitate or pose as barriers to a person’s functioning and disability, and to what degree it is. Personal factors are related to the biographical accounts of individuals with disabilities giving valuable meaning to the way the ICF is used (Leonardi, et al., 2015). These types of issues have prompted many researchers to take on a challenge to get a better understanding of personal factors in its relation to functional health and disability (Bickenbach, 2012).

Taking part in PA on a daily basis has been recommended for adolescents without contraindications by the WHO (World Health Organization, 2010). This recommendation included adolescents with long term illnesses or disabilities (LTID) which, in Finland, represent around one-sixth of adolescents (Rintala, et al., 2011). It is important to study this in the context of the ICF as additional



health benefits from PA are evident for this subpopulation. For example, PA can reduce the risk of secondary conditions such as type 2 diabetes, cardiovascular diseases and cancer (Rimmer, et al., 2007), improve psychological assets (Bloemen, et al., 2015), as well as have better functional capabilities that can lead to improved living in adulthood (Raghavendra, 2013).

In reference to the ICF, prominent studies that reported facilitators or barriers to physical activity have included mainly environmental factors (e.g., nature, family, peers, infrastructure, external attitudes, etc). For example, lack of transport, equipment, facilities, trained personnel, opportunities, and money have often cited as barriers to physical activity (DePauw and Gavron, 2005, Bedell, et al., 2013, Heah, et al., 2007, Conatser, et al., 2000) as well as macro nature factors such as differences and similarities between countries (Rintala, et al., 2011). A few studies have reported personal factors in association with PA (van der Ploeg, et al., 2004, Bloemen, et al., 2015) although a lack of comparability among different types of conditions has made such results difficult to interpret with the ICF ontology in mind.

Adolescence is a time in a person's life where the individual undergoes numerous physiological and psychological changes (Hall, 1931). There is a link between physical activity as an adolescent and later in adulthood, particularly if participation is through an organised setting (Telama, et al., 2006). Studies have also shown that during adolescence, there are declines in PA levels (Laakso, et al., 2008) as well as lower levels in self-perceptions (Lintunen, 1999). Furthermore, the progression of LTID with low levels of PA has been widely acknowledged (Durstine, et al., 2013). Adolescents with LTID are often considered to have lower levels of PA than the general population (Rimmer and Marques, 2012), however in the general school context, the adolescents who report they have LTID do not differ for PA (Rintala, et al., 2011). More specifically, the Physical Activity for People with a Disability model (PAD - see Chapter 3.2) postulates specific factors are related to PA. The usefulness of the PAD model was based on inclusion criteria that did not include other health conditions that restrict full participation. The knowledge of transferability across various conditions is important in the advancement of personal factors in the ICF.

The practical relevance for this study is to reinforce the development of the ICF domain of personal factors in relation to taking part in PA for health. The ICF is a key framework for communication across disciplines and sectors in relation to functioning, disability and health. The results from this study can be used to help make guidelines for interventions to provide PA among adolescents with LTID. Implementation strategies can be supported from the findings of this study, such as increasing awareness of the prevalence of LTID in general populations and their PA levels by physical education teacher educators and coach educators. Furthermore, results can be used to inform policy on physical activity levels of adolescents with LTID over time as well as provide insights into the associations with personal factors. In addition, other ICF domains in the context of PA for researchers and practitioners are reported.

## **2 ADOLESCENTS WITH LONG TERM ILLNESSES OR DISABILITIES**

There are many important areas to consider when studying a subpopulation group such as long-term illnesses or disabilities (LTID). In some cases, population group of disabilities has been considered as the largest public health problem (Krahn, et al., 2006), yet there has been several issues when quantifying how many people does this group refer too. Definitions of LTID are presented first in Chapter 2.1. Given that these parameters are bedrock to the way LTID is considered, a review of measurements is presented in Chapter 2.2 and in Chapter 2.3 a literature review of personal factors and PA

Until recently, the prevalence of disabilities around the world was quoted to be 15% (World Health Organisation, 2011) and with this, studies on this population have yielded several reports on the way various levels of functions influence health behaviours. An overview of studies that report commonalities for what are claimed as public health problems can be found in Chapter 2.1. Health behaviours such as physical activity are considered health promoting (Gabriel, et al., 2012, Kokko, et al., 2006), and a growing evidence exists that there are many factors that influence decisions and behaviours to contribute towards the behaviour (Dzewaltowski, et al., 1990, Biddle, et al., 2011). Often, external resources are required to provide appropriate adaptations for PA (DePauw and Gavron, 2005). Importantly, is the social context where PA takes place, because a person may feel stigmatised by peers (Barg, et al., 2010). There are many assumptions that adolescents with LTID are treated the same as one group, whereas studies that focus on specific health conditions have found otherwise (Scambler, 2009). A section to highlight differences among majority functional difficulties groups is presented in Chapter 4.

### **2.1 Paradigm shift in disability discourse**

Many scholars in disability research have yet to agree upon a collective way to write about people with disabilities. some say that it is correct to use the term 'disabled person' (Howe, 2008, Brittain, 2009), whereas others have insisted that

the preferred way of writing about disabilities should be used through a person-first language such as, 'persons with disabilities' (Sherrill, 2004). Recent accounts by the community around disability sports have suggested that authors may like to use their own expressions to convey their style of writing (Peers, et al., 2014), rather than spoiling the fluency of reading (Ng, 2011, Vaughan, 1997). Based on these notions, there is no intention to offend any reader based on the stylistic way of writing. Of all things, this study seeks to advance the discourses around disabilities. Many of these obstacles are reviewed in this chapter, with the first consideration being the definitions that have been used before concluding on what definition is used in this dissertation.

Although there have been advances in the knowledge in DALYs, many people with disabilities started to believe that disabilities were not a cause of only the conditions but rather the bigger issues are related to the way society is constructed (Oliver, 1996, Barnes, et al., 1999). Proponents of the social model continue to report that societies are set up in a way to make people with various conditions to experience limited living and are disabled. A prominent example is when disabled person may not be able get into a building because there are stairs and person relies on a wheelchair for mobility, thus disabling them to enter the building. In many countries, new laws were created to make structures more accessible, but this was not seen to be sufficient. With the care and attention needed to address physical structures, more dialogue had to take place to understand what was needed. Projects that included disabled people in the planning processes of physical structures were praised, whereas projects that assumed they knew what to provide were often criticised and faults were noticed (Barnes, 2003). This led to the importance of inclusion of disabled people into the discussions and a psychosocial model emerged (Oliver, 1996). Once the psychological considerations were incorporated into disability discourse, improved attitudes towards disabilities became a large theme. One concept that confirms disability as a minority model is stigma (Scambler, 2009).

Stigma is problematic in that it is a set of actions that stems from the fear of encountering someone that is different from oneself (Goffman, 1963). Interventions to avoid this type of fear evoking actions have been linked with self-efficacy theory (Bandura, 1977), whereby exposure of positive experiences, verbal persuasions from leading sources, and seeing others conduct behaviour that is not fearful are typical ways to reduce stigma (Barg, et al., 2010). This has later been encouraged to reduce stigma by involving the researched into the research process (Gaskin, 2015).

More understanding of persons with different types of conditions was needed, and the biopsychosocial model emerged to be one of the most recent models of disabilities (Bickenbach, 2012). This biopsychosocial model can also be used to match the three main domains in the WHO's definition of health, that incorporates physical, psychological and social well-being (WHO, 2010).

The momentum in defining disabilities has gone beyond academic discourses and led to policy level changes at the highest level. The United Nations Convention of the Rights of Persons with Disabilities (CRPD, UN, 2006) has

been ratified in over 160 countries around the world. On May 11<sup>th</sup> 2016, Finland ratified this convention and the optional protocol (UN, 2016). The current definition of disabilities appears in Article 1 of the CRPD (UN, 2006) that 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.

It has been reported that while the CRPD was being drawn up, the use of biopsychosocial model of disability was used (World Health Organisation, 2011). The way this definition can be considered is through three main components. The first are the biological, medical conditions (“long-term physical, mental, intellectual or sensory impairments”) that predispose a person to be categorised to have disabilities. The second is the need for those impairments to interact with some aspect that is a “barrier” towards “full and effective participation” which would address the psychological aspect. The third component is the outcome of inclusion whereby, in society, people are treated equally with others based on contextual factors. As this presents a high level and uniform definition, in this study “adolescents with LTID” is used.

During adolescence, individuals attempt to invent their sense of identity. Adolescents go through many changes, requiring constant evaluations of themselves and their surroundings. During this time more self-reflection takes place than others stages in life (Hall, 1931, Trzesniewski, et al., 2003). Adolescents expecting to develop in an environment without tolerance are likely to provide stigmatic attitudes towards others considered to be different. When there is the lack of understanding of why a classmate behaves in certain ways, or without full understanding why it is allowed to miss some school days, a greater sense of uncertainty can arise and can lead to stigmatic actions.

Goffman’s studies on stigma have highlighted prejudices and discrimination experienced by people of minority genders, sexual orientation, transmittable diseases, such as HIV/AIDS, as well as mental illnesses (Pescosolido and Martin, 2015). These oppressed forms also appear in people with LTID, but has received much less attention in research (Grue, 2015). Furthermore, there seems to be a divide of opinion in professionals who work with people with LTID. In some cases, stigma is more likely to occur in cases of adolescents with psychosomatic conditions over somatic conditions (Grue, et al., 2015). Yet, when attitudes of adolescents without LTID were studied when placed in a disability sport context, much positive behaviour was exhibited. Evans and colleagues (2015), reported adolescents who tried disability sports without having a disability themselves had often considered disability sports as inferior. Furthermore, non-disabled adolescents were more likely to get frustrated from their own conceptions of what sport is. However, such experiences were powerful enough to change attitudes as the non-disabled adolescents were less likely to believe differences between children with and without disabilities existed (Evans, et al., 2015).

## 2.2 Challenges to identifying adolescents with disabilities

Another major concern for interpreting reports of the disability population is the way disability is measured. For example, UNICEF (UNICEF, 2013) produced a report that stated they could report a prevalence of between 4% and 19% disabled adolescents in 2006 and 2009 respectively, through the use of different data questionnaires. For global surveys, UNICEF and the Washington Group on Disability Statistics (WGDS) have been working together to produce a better estimate of the prevalence of disability around the world (Mont, 2007). The WGDS has a task to work on disability statistics for census data collection. The census is a population survey collected at least once every 10 years and an accepted version was available for the 2010 collection. UNICEF had assisted in the way that disability statistics could be obtained for children and furthermore provided a substantial way of collecting data through a three step process in their Multiple Indicator Cluster study (MICS) (UNICEF, 2013). The steps included identification (through proxy), screening interviewing and follow up on medical screening. In some countries, there were around 10% whose follow up screening was negative. This means that upon interviewing, they did not state they had a disability, but upon further testing, they would be considered to have difficulties that would be considered to be disabling. Such issues are not necessarily new, as it has been highlighted by a report from the United Nations (UN Department of International Economic and Social Affairs, 1990). In it, indicators for impairment were much higher than responses for disability.

There has been large amount of acceptance in the questionnaires used for the surveys, however it had neglected work on collecting data by self-report. In some cases, the wording of questions had been changed to increase the accuracy of collecting data, but there was no testing for adolescents understanding by self-report. Indeed, there does not seem to be any measurement as yet that has been designed and tested with self-report from adolescents in mind (Cappa, et al., 2015).

There are also at least two ways of measuring disabilities, depending on what is the purpose of collecting data. The WGDS set of questions were aimed at providing information on the number of people that have certain types of functional difficulties. It is based on assumptions that these functional difficulties have direct consequences with disability. Another approach is to measure overall functioning in different domains in life. The WHO Disability Assessment Schedule (WHODAS) is in both short and long versions that measure six domains in life aimed at adults. These domains include cognition, mobility, self-care, getting along, life activities, and participation (Paltamaa, 2014). A child version has recently been tested but only in the developing world context (Scorza, et al., 2013). However, although the items from WHODAS 2.0 are linked with various ICF codes, there is only one item that is related to PA. In the mobility domain there is an item about difficulties in walking long distances however, does not directly coincide with MVPA, nor does it specify duration.

Studies that have focused on physical activity abilities (King, et al., 2004) are a few. The possible reasons for the lack of studies can include, different definitions of LTID in questionnaires reducing validity of findings (Miller, et al., 2011, van der Lee, et al., 2007), leading to varying results from the measures and scales (Milton, et al., 2011). In addition, often studies lack replication and consists of different age groups of participants in studies (Simeoni, et al., 2007), small sample sizes (Shields, et al., 2012), and furthermore, different set of standards and procedures used to collect data (Haskell, 2012). Therefore, cross-analysis can be deemed difficult to perform (Roberts, et al., 2009). The strength of this study is underlined by the possibility of making analysis of data from many different types of LTID after using the same instruments.

Another consideration about measuring adolescents with LTID is their use of medicine. For some conditions, there is the need to take regular medication (Wolf, et al., 2002). This requirement to take medication becomes part of a routine in the lives of the adolescent. Some medication can be easy to administer and is fixed, whereas other medications can require closer monitoring during adolescents. That can lead to more visits to health care professionals during the school day. Hence in cross-sectional studies, school absents could influence the sample size collection.

### 2.3 ICF personal factors and physical activities

The International Classification of Functioning, Disability and Health (ICF) has suggested that disabilities are characterised by the interactions of the components of health condition, body functions and structures, activity and participation, as well as personal and environmental factors. The ICF has an alphanumeric coding system that is used as part of the common language framework for disabilities. Of the two contextual factors, personal factors are not coded in the ICF, rather it is suggested they are components that;

*“... are the particular background of an individual’s life and living, and comprise features of the individual that are not part of a health condition or health states. These factors may include gender, race, age, other health conditions, ness ...individual psychological assets and other characteristics, all or any of which may play a role in disability at any level.” (WHO, 2001; p.17).*

Part of the reasoning for a lack of coding of personal factors in the ICF is due to the complexity of how these factors may differ between cultures (WHO, 2010). This has prompted researchers to attempt to gain a better understanding of personal factors in its relation to functional health and disability.

Under the domain of activities and participation, there is a chapter on “community, social and civil life” with the code d9. In that chapter, the specific code for recreation and leisure is d920, whereby there is a code for organised sports (d9201) (WHO, 2001). By utilising the ICF’s code of organised sports it can be used to represent one of the many ways to describe PA.

A review of literature in personal factors in relation to PA found age and gender as two examining variables consistently used, although less with psychosocial variables (Bult, et al., 2011). Physical skill and fitness have been included in a review about personal barriers and facilitators to physical activity (Shields, et al., 2012) hence factors concerning the self-perceptions and psychological assets have been recommended as identifying factors that impact PA (Rimmer, 2006). Another personal factor that is important for adolescents with disabilities is the concept of intention for future PA (Bloemen, et al., 2015).

There are further studies from general population studies that have reported common patterns amongst adolescence; there is a decline of PA as the individual gets older (Valtion liikuntaneuvoston Julkaisuja [Finnish National Sports Council], 2013) and boys are more active than girls (Kalman, et al., 2015). Studies have also suggested that higher social economic status (SES) is related to levels of more MVPA (Borraccino, et al., 2009) and that educational aspirations may be an early indicator for perceived SES (Friestad and Klepp, 2006). These personal factors are explained in more detail in Chapters 3.2 and 3.3. For adolescents with LTID, previous studies suggest that there are variations in the amounts of PA among different functional categories (Hutzler, 2007).

## 3 PHYSICAL ACTIVITY FOR ADOLESCENTS

### 3.1 Physical activities for health

In recent years, public health attention has increased in PA behaviours (Vuori, et al., 2004, Manini, 2015). When compared with the rest of Europe, the cost of physical inactivity is the sixth highest in Finland, at .76% of total health-care costs (Ding, et al., 2016). Much research from the general population indicates that adolescence is a time where PA levels decline (Valtion liikuntaneuvoston Julkaisuja [Finnish National Sports Council], 2013, Strong, et al., 2005). Furthermore adolescents that take part in sports clubs during adolescence tend to have more active adult PA behaviours (Telama, et al., 2006). The World Health Organisation (WHO) made evidence based recommendation that adolescents should take part in at least one hour of moderate to vigorous physical activity (MVPA) every day for their health (World Health Organization, 2010). This included adolescents with long term illnesses or disabilities (LTID) which represent around one-sixth of adolescents (Rintala, et al., 2011). It has been suggested that PA is even more important for adolescents with LTID as there are many physical, psychological and social health benefits (Rimmer, et al., 2007, Bloemen, et al., 2015, Raghavendra, 2013). Additional health benefits from PA are evident for this subpopulation.

Few adolescents from Finnish general schools meet the recommendations of daily 60 minutes of MVPA in boys (30%) and girls (18%) (Kalman, et al., 2015). It has also been reported that the amounts of MVPA may not differ between adolescents with and without LTID (Rintala, et al., 2011). To perform analysis over time, a reliable instrument must be used and repeated at each data collection point (Schnohr, et al., 2015). The WHO collaborative Health Behaviour in School-aged Children (HBSC) study serves as a unique means of making comparisons among other countries in Europe and North America (Harro, et al., 2006) and is frequently used to monitor trends of adolescents' health over time (Currie and Alemán-Díaz, 2015). International comparative trends of adolescents MVPA have been reported between 2002 and 2010 (Kalman, et al., 2015) however, there have not been any such analyses made from LTID groups.



### 3.2 Physical activity for people with disabilities (PAD) model

The Physical activity for people with disabilities (PAD) model was designed around the ICF components based on a systematic literature review (van der Ploeg, et al., 2004). The PAD model has been extended into the adolescents' population (Bloemen, et al., 2015). In this model, researchers attempted to systematically map results from other studies based on people with physical disabilities into the domains of the ICF. van der Ploeg and colleagues (2004) realised that the Attitude, Social Influence and Self-Efficacy (ASE) model (de Vries, et al., 1988) was commonly referred to from the existing literature. The ASE was presented as a combination of the most commonly used theories in physical activity research at that time, namely the theory of planned behaviour (Ajzen, 1991), self-efficacy theory (Bandura, 1977) and the transtheoretical model (Prochaska and DiClemente, 1983).

Although other researchers have started to use the PAD model in further studies and attempted to apply it for adolescents (Bloemen, et al., 2015), the design is slightly inaccurate to the definitions of the ICF. van der Ploeg and colleagues (2004) have yet to explain how they included issues relating to health condition in the personal factors domain, when, in the ICF, it is considered to "comprise of features of the individual that are not part of a health condition or health states" (WHO, 2001; p.15). Furthermore, in the ICF, health condition is a domain on its own and not just part of personal factors.

Attempts to use the PAD for adolescents were through studies that reported pain, injury and complications within the Personal Factors and health condition domain (Bloemen, et al., 2015). This could be misleading because studies could be related also to the other domains of the ICF and not exclusive to personal factors. Studies have also shown that some psychological constructs have different associations to PA among adolescents from adults, for example in adolescents there are also changes in self-perceptions (Lintunen, et al., 1995). Despite these flaws, the PAD model has been used to highlight the importance of future intention for PA, as well as the social influence that contributes towards self-perceptions (Bloemen, et al., 2015).

Other reviews can confirm the usefulness of the PAD model, but also its incompleteness. Shields (2012), listed the following barriers to physical activity for children with physical disabilities; lack of physical and social skill, preferences to other activities other than PA, fear from stigmatisation, lack of knowledge about PA, or others such as time or discomfort. Disabled children also disliked having to deal with negative perceptions of disability (referred to as the 'stigma of disability') or of attracting unwanted attention. However, in the same study, two themes were reported for facilitating PA participation; child's desire to be fit, and opportunities to practice to gain skills and competence. More studies are needed to confirm PAD model including follow up studies and meta-analyses.

### 3.3 Psychological assets with physical activities

During adolescence, “the self” is an important psychological asset. Most notably, the individual changes during adolescence emphasise the importance on global self-esteem (GSE), which is a value judgement of worth and respect for the self. GSE can be based on feelings of being no better or worse than others (Rosenberg, 1965). Hence, in comparison to their peers, adolescents with LTID often report lower levels of GSE (Shields, et al., 2006). Less evidence is present on the direct relationship between GSE and PA, although indirectly, self-perceptions can increase self-esteem in the physical domain and is associated with more PA (Inchley, et al., 2011). Increases in PA self-perceptions have also been shown to slow down the decline of PA in older adolescents (Craggs, et al., 2011). This has been reported to be a reflection of the way sport is glorified by impressive body images and the actual level of performance when making such comparisons (Ekeland, et al., 2004). One such consequence of low competence is the fear of being teased by peers (Dunn and Watkinson, 1994), particularly boys in PE classes (Hill, 2015).

Fitness is explicitly listed as an example of ICF personal factors (WHO, 2001). Actual and perceived fitness have been correlated well among adolescents in the general population (Huotari, et al., 2009). Several studies have also reported causal relationships whereby no differences and increasing fitness can increase GSE (Spence, et al., 2005, Sonstroem, 1997). Studies that have looked at specific populations with reported lowered GSE have shown that an increase in GSE was achieved from increased PA participation (DeBate, et al., 2009). Therefore, it is likely that self-esteem is seen as a mediator between fitness and PA levels.

One of the most used theories that investigate the relationship between intention and behaviours is the theory of planned behaviour (Ajzen, 1985). Behavioural intention is postulated to be drawn from three constructs; attitudes; subjective norms; and, perceived behavioural control. Concerning PA, of these three constructs, the relationship between perceived behavioural control and intention does not change with age (Chatzisarantis, et al., 2014). Furthermore, reviews have also demonstrated that perceived behavioural control also, although slightly weaker than intentions, influences PA behaviour directly (Hagger, 2014, McEachan, et al., 2011). Perceived behavioural control is a combination of perceived controlling of factors needed for PA and its level of importance (Ajzen, 1985). Following this, self-perceived fitness was used as perceived behaviour control within the theory of planned behaviour because fitness has both principles of control and important in relation to PA.

Both intention for future PA and PA self-perceptions are constructs often in the literature related to motivational factors (Lintunen, 1999, Meiland, 1970). The findings are consistent with other cross-sectional studies (Jones, et al., 2009, Hagger, et al., 2003), interview studies (Ellison and Boyd, 2013), intervention

designs (Viira, 2011, DeBate, et al., 2009), and longitudinal studies (Inchley, et al., 2011, Viira, 2011).

Many studies that have investigated the strength of the theory of planned behaviour with physical activity behaviours than other types of health related behaviours (Mankarious and Kothe, 2015). Furthermore, some studies have pointed out that future intention can lead to behavioural change in overweight and obese populations (Godin, et al., 2011), the overall pattern seems to reject the notion that future intention for more PA is a mere measurement effect (Mankarious and Kothe, 2015).

### 3.4 Sports club in Finland

Contextual factors in the ICF interact with the other components. For example, personal factors will interact in the types of participation available or restrictions in the overall classification of functioning, disability and health. In the PA domain, organised sports are coded in the ICF (d9201) and studies have shown clear differences in PA behaviours for those that take part in or do not in sports clubs (Vuori, et al., 2004).

In Finland, sports clubs are an organised form of leisure-time activities that focus on sports or PA. Almost half of adolescents participate in sport clubs (Valtion liikuntaneuvoston Julkaisuja [Finnish National Sports Council], 2013). Since the 1980s there has been very little change in the percentage of boys that take part in sports clubs (Vuori, et al., 2004). Girls membership has increased slightly, up to a point where there is now no reported gender differences in numbers that take part in sports clubs (Valtion liikuntaneuvoston Julkaisuja [Finnish National Sports Council], 2013). There has also been a noticeable decline in members as adolescents get older and this particularly phenomenon has also been seen in other countries (Bélanger, et al., 2009).

There has been an interest in the way that adolescents take up activities in organised ways and its influence on physical activity behaviour as adults (Powell and Dysinger, 1987). It has been argued that specific activities in an organised way are harder to maintain as an adult, particularly when there is no infrastructure for it. Stronger links that can overcome obstacles between childhood and adult behaviours are needed. As a result there has been a push to promote activities for life during sports club. In Finland, adolescents from the general population that take part in youth sports clubs have shown to be linked with continued PA habits during adulthood (Telama, et al., 2006). However, being part of a sports club alone was not a significant predictor for adult PA as it required the presence of positive self-perceptions with sports club membership during adolescence (Telama, et al., 2006, Wichstrøm, et al., 2013). Studies have yet to report if these findings are the same in adolescents with LTID.

Approximately 40% of sports club administrators in Finland believe they have contact with members that have LTID (Suomen Vammaisurheilu ja -liikunta VAU ry, 2011). In Finland, the volunteers that run and organise ses-

sions in sports clubs, often report insufficient training provision for these coaches or instructors. Formalised training of volunteers tends to be basic, and topics such as working with adolescents with LTID are rarely covered. Enabling this would help facilitate participation as instructors could then use training aids and assistances as well, parents would have more trust in the instructor's abilities (Suomen Vammaisurheilu ja -liikunta VAU ry, 2011).

Although sports systems vary throughout countries, at a local level, the role of sports clubs has a similar purpose which is to provide organised sports (Kokko, et al., 2014). Fundamental to the operations of clubs, particularly in the Nordic region, is the utilisation of volunteers (Kokko, 2014). The success of this way of operationalising has seen over half the number of adolescents involved in sports clubs (Valtion Liikuntaneuvoston [The National Sports Council], 2015). However, this issue has plagued the development of sports clubs, as training of personnel is often through informal learning. As such, adolescents with LTID that take part in sports clubs may face a many barriers, most commonly low levels of expertise (Suomen Vammaisurheilu ja -liikunta VAU ry, 2011). Alternative ways of learning, such as online education, are currently being experimented in providing training for inclusion (Ng, et al., in press). However, studies from entire population groups have shown that once involved in sports clubs, it can foster activity levels of PA three times more active than non-members (Harrison and Narayan, 2003).

## **4 PHYSICAL ACTIVITY IN LONG TERM ILLNESSES OR DISABILITIES**

The ICF has several chapters on body functions and structures, and for each chapter, they cover the main types of functional limitations. Typically, they can include difficulties to breath, see, speak, hear and move. Allergies are by far the most common amongst Finnish children (34%), followed by functional difficulties include body structures impairments (1.2%), Cerebral Palsy (0.3%), hearing impairments (0.3%), visual impairments (0.15%), as well as epilepsy (0.7%) are rarer (Rajantie and Perheentupa, 2005). Cerebral Palsy, Epileptic Fits, unspecific motor difficulties and asthma were also included in the 10 most common types of conditions of Adolescents in England (Petrou and Kupek, 2009). Studies have indicated that adolescents can also have more than one category (Raman, et al., 2007, Boyce, et al., 2009). Despite this, many studies continue to report physical activity types of behaviours based on a singular type of condition (Haegele, et al., 2015).

Symptoms across LTID can be particular to the condition, and specific attention is needed to improve knowledge of health behaviours of these adolescents. To demonstrate the specific differences, the following sections provide backgrounds of five selected categories of functions, in alphabetical order, and relationships with PA. These categories were selected because they cover the main domains of human functioning (Mont, 2007).

### **4.1 Breathing difficulties**

There are various health conditions that can lead to breathing difficulties. To date, the most reported in association with PA among adolescents include Asthma and Cystic Fibrosis. Both can be lethal if not managed correctly (Glazebrook, et al., 2006). Exercise-induced asthma in adolescents is a risk to be taken seriously for adolescent with severe asthma conditions (Haahtela, et al., 2006).

Recommendations have been made from a various special interest groups such as the American National Asthma Education and Prevention Program

(NAEPP) as well as the American College of Sports Medicine (ACSM). In summary, physical activity duration should be limited to bouts between 20-30 minutes of moderate intensity depending upon the extent of the severity of breathing difficulties (Nixon, 2009).

In the majority cases by conditions, there are suggestions that encourage full participation (Rahl, 2010). This may explain how some studies have reported no differences in PA levels between adolescents with and without asthma (van Gent, et al., 2007, Mitchell, et al., 2013). Yet, careful consideration is cautioned for the severity of the condition and can be seen as a barrier to PA (Glazebrook, et al., 2006).

## 4.2 Communication difficulties

Although there are two distinct structures in speaking and hearing, they share a common function of communication. There is a lack of research that proves that difficulties in hearing or speaking have physiological barriers to engage in full participation in PA. Yet, adolescents with hearing impairments have been found to have low motor skills and very low fitness levels resulting in early onset of secondary conditions from inactivity (Stewart and Ellis, 2005). Furthermore, other health benefits such as social health through interaction, support and relationships may be at a disadvantage because of difficulties in communication.

In activities that require spoken and listening communication, it may be hard for adolescents with communication difficulties to take part fully. This may also lead to misbehaviour (Matheson, et al., 2007). The use of sign language is often needed in organised activities and this could be a barrier for adolescents with hearing impairments (Lieberman, et al., 2013). Following these modifications, it is still recommended that a person with communication difficulties meets the recommendation of daily activities for at least 60 minutes of MVPA.

## 4.3 Epileptic seizures

Epilepsy is considered a rare condition that has often been managed through the use of medication (Sillanpää, et al., 2006). The regular uptake of medicine can be seen as a burden on adolescents, hence the use of alternative therapies have been necessary to improve the quality of life (Lundgren, et al., 2006). In addition, using PA as part of self-management strategies can improve control of seizures (Fleeman, et al., 2015). However, adolescents who experience regular bouts of epileptic seizures are at a risk of injuries when taking part in PA (Ramirez, et al., 2009). Furthermore, many people are unaware of what to do when they see a person who has a seizure or convulsion and this has been

found to lead to stigmatic feelings towards people with epilepsy (Scambler and Hopkins, 1986).

#### 4.4 Motor difficulties

Adolescents that express gross movement or fine motor skill difficulties may have the most visible signs of impairments and has led to much research in PA. However, many studies report their low sample sizes as a limitation to their study (Pannekoek, et al., 2012). Medical diagnoses of adolescents with motor difficulties have included, but not limited to, cerebral palsy, juvenile rheumatoid arthritis, and developmental coordination disorder. The wide range of difficulties makes uniform testing PA for health difficult.

Common approaches to account for the motor difficulties in PA include assessments such as the TGMD-II (Ulrich, 2000) and the Gross Motor Function Classification System (GMFCS). Test score cut offs may be use to delimit certain impairment classifications through objective measures of PA. Study reported the use of accelerometers in adolescents within the range of GMFCS 1 and 3, however it was limited to a laboratory setting (O'Neil, et al., 2016, Meijer, et al., 1991).

Assessments of activities have also been collected through self-reported instruments with a battery of questions such as the Children's Assessment of Participation and Enjoyment (CAPE) and Preferences for Activities of Children (PAC) (King, et al., 2007), amongst others (Capio, et al., 2010). These instruments take up much time focusing on the PA domain of health and although informative, are difficult to compare with other groups of LTID. Some studies have reported that in large scale studies of participants with these types of difficulties, paper responses for overall PA levels to be reliable and cost effective (Clanchy, et al., 2011).

People with motor difficulties have been reported to do less PA than their peers without motor difficulties (Seburg, et al., 2015, Rimmer and Rowland, 2008, Steele, et al., 1996). Recently, qualitative data from adolescents with CP reviewed four themes for low PA levels; physiological barriers, psychological concerns, social factors and macro-environmental factors that inhibit PA (Conchar, et al., 2016). Physiological barriers, such as the ability to move and equipment faults are the most visible issues in adolescents with motor difficulties. Moreover, participating in activities with others can be harmful to a person's self-esteem and other psychological assets (Goodwin, et al., 2004). The social factors of attitude and making friends are an important factor in taking part in PA. Often people with motor difficulties are seen as superhuman if they take part in sport (Silva and Howe, 2012), and there is the danger of how the attitudes of other are perceived. The physical structures are also common issues. At times, adolescents with motor difficulties cannot take part because access to the equipment, facilities or trained staff is seen as impossible (DePauw and Gavron, 2005, Conchar, et al., 2016).

## 4.5 Seeing difficulties

Adolescents who have visual impairments differ in physical activity abilities from other sensory impairments in many ways. It has been recognised that, in addition to physical health benefits from PA, social and mental well-being is highlighted for people with visual impairments (Lieberman, et al., 2014). Positive outcomes, such as the feeling of being included and increased confidence by peer support have been reported in adolescents with visual impairments that took part in low levels of activity (Lieberman, et al., 2004). In addition to taking part in low levels of PA during the week, more moderate levels, but not vigorous levels of PA were reported during the weekends (Aslan, et al., 2012, Houwen, et al., 2009).

There are a several barriers towards regular physical activity for adolescents with seeing difficulties. Examples of these include greater safety risks, different ways to achieve development are tend to be unknown, unsuitable guide for assistance, as well as a lack of specific equipment (Lieberman, et al., 2013). As such, activities for people with seeing difficulties may be less accessible than other activities designed to include all.

## 4.6 Non specified difficulties

A rare condition in Europe can be a disease which affects less than one person per 2000 people. Furthermore, in the United States, one in eight people have rare diseases, and it might be as many as six to seven thousand rare diseases in total (US National Institutes of Health, 2013). In addition, the ICD-10 has over 14000 codes for various conditions. This is likely to expand for the 11<sup>th</sup> revision expected to be published in 2018. There are many functional differences in various diseases and conditions however, commonalities in relation to psychological assets allow for studies as a uniform group (Cooper, 2006).

There are quite a few guidelines on how to PA specialists may take into consideration a person's health condition. Details about contraindications, management of conditions and some suggestions for exercise prescription can be found for treatment of disease states such as cancer, cardiovascular disease, arthritis, diabetes, and neuromuscular disorders (Rahl, 2010). The ACSM has also published a book on exercise prescription for persons with chronic diseases and disabilities (Durstine and Moore, 2009), although present mainly for adults.

Studies have reported that PA programs can improve physical health and mental well-being as well as the reduction of severity in some conditions (Philpott, et al., 2010) or not conclusive to be more harmful than no PA (Durstine, et al., 2013).



## **5 PURPOSE OF THE STUDY**

The aims of the study were to describe the patterns of PA among Finnish adolescents with LTID and to determine the associations between physical activity and the ICF personal factors in adolescents with LTID. Since the ICF is used as a conceptual framework, only data after 2001 is used in this study. To our knowledge this is the first set of studies have used the same measurements across the different spectrum of health conditions as well as over time. Furthermore, additional results are reported in this dissertation summary that complements the research questions below.

### **5.1 Study questions**

To address these purposes, four studies with the following main research questions were necessary;

- I. How do the physical activity levels differ among Finnish adolescents with different functional categories? (Study I)
- II. What are the trends in PA between 2002 and 2014 among Finnish adolescents with LTID? (Study II)
- III. What are the roles of psychological assets in PA among adolescents with LTID (Study III)
- IV. What are the psychological assets associated with daily PA after controlling for sports club membership? (Study IV)

## 5.2 Study design

The empirical model for this study is framed around the original interaction components of the ICF and is represented in Figure 2. However, the context used for this study is based on children's self-reporting of their individual health condition and health states. For example, the health condition is based on the reporting of long term illnesses or disabilities (LTID). The body functions and structures is based on the functional difficulties that the individual reports. The specific activity of moderate to vigorous physical activities (MVPA) is identified by the ICF alphanumeric code of d5701; "Managing fitness", based on the recommendation of daily 60 minutes of MVPA by the WHO (World Health Organization, 2010). Participation in organised activities such as sports has an ICF code of d9201 and represents an interactive component for participation. Data used in the study is based on a national representative sample and has an ICF code of e2. Finally, personal factors are not coded in the ICF, but through the background literature key personal characteristics are studied in interaction with the other components.

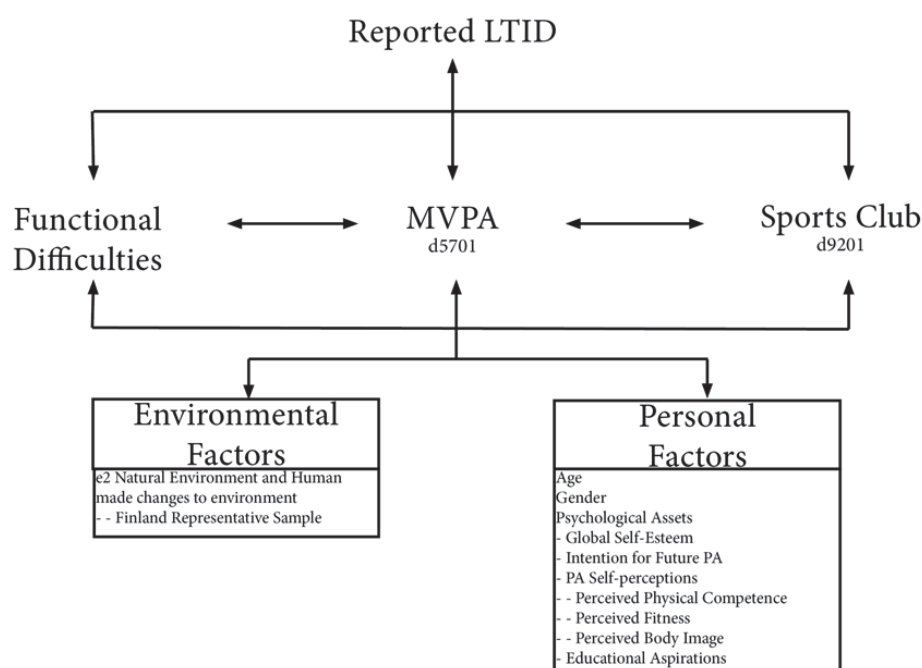


FIGURE 2 Empirical model within the ICF framework

## 6 METHODS

The data used in this study were based on data from the Health Behaviour in School-aged Children (HBSC) study which was carried out in collaboration with the WHO/Europe. Key aims of the HBSC study include making significant contributions to scientific knowledge and understanding of adolescents' health throughout the complex network that surrounds it (Currie, et al., 2009) and have recently been revised to include influence policy and practice through impact of changes in discourse of decision makers (Currie and Alemán-Díaz, 2015). The membership of Finland within the HBSC network began at the very beginning in 1983 and although the network has grown to 44 countries, Finland has maintained constant participation (Currie, et al., 2009).

Within the survey, there are three levels of questions, international mandatory, international optional, and national questionnaire packages. International mandatory questions are used in all countries within the network. They have been the forefront of development from the network members through focus groups. Study background, rationale, instrument validation, and study purposes are included into the international study protocol. International optional items are recommended by the network's focus groups, however only some countries use them. As with international mandatory items, the optional items also have background, rationale and instrument details in the international protocol. National items are the focus of different national members and get forwarded to the focus groups for review and do not appear in the international protocol file.

This study comprised of data only from Finland in 2002, 2006, 2010, and 2014. Explanatory and outcome items were the same in each data collection point. Further details about the instruments used are in the forthcoming sections.

### 6.1 Sampling procedures

Adolescents in grade 5, 7, and 9 in general schools around Finland were represented through a sampling process that mimics the HBSC international survey

protocol. The protocol aims to collect data in three age groups with mean ages of 11.5, 13.5, and 15.5 years old with at least 1500 respondents in each age group. This figure was presented to meet the following requirements of a 95% confidence interval of  $\pm 3\%$ , with a proportion of around 50%, and a design factor of 1.2 (Currie, et al., 2001). To achieve the desired representation of the geographical population spread in Finland, clustered sampling with a basic sampling unit of school class was chosen (Villberg and Tynjälä, 2006). Two level stratum was devised at the level of provincial divisions of Finland (north, central, south, and capital), with a second level for urban, sub-urban and rural communities was included except the capital area because there is a lack of rural communities (Tynjälä, 1999).

Selection of schools was made through a computer generated algorithm that took into account the school sizes. This is a method of Probability Proportion to Size and produced the cluster sampling for the chosen schools. Over sampling took place to ensure sufficient number of schools would yield the required number of respondents to meet the quota for the HBSC protocol. A reserve list was created based on province and urban/rural status for any non-responding schools (Tynjälä, 1999). Swedish speaking schools were sampled in 2006 and 2014, but were removed from the analysis owing to missing data from 2002 and 2010. Schools not part of the general education system, for example special educational needs schools, were never included in the sampling process. Only one class per school per grade was randomly selected to take part in the survey (Tynjälä, 1999).

### 6.1.1 Finnish HBSC surveys 2002 – 2014

To ensure that the sample of this study was comparable with other international reports, only respondents from grade 7 and 9 were obtained representing 13 years and 15 years old age groups. In this way, extremely young 7<sup>th</sup> graders or extremely older 9<sup>th</sup> graders were also not included because their ages were outside the standardised age ranges for these grades. Pupils from both 7<sup>th</sup> and 9<sup>th</sup> grades completed the same questions under the same protocols (Appendices Item 2) and biological age (Appendices Item 3 and 4) were the only variables used in analysis and not educational grade.

The study explores only the behaviours and associations of adolescents with self-reported LTID, so many of the responses from the HBSC data set were not included in the analysis. A flow chart details studied sample from the population in Figure 3. Non-response rates ranged from 4% from 9<sup>th</sup> Graders in 2010 to 16% in both 7<sup>th</sup> Graders in 2014 and 9<sup>th</sup> Graders in 2006. In Studies I and IV, pooled data from 2002 and 2010 were used to answer the research questions. Items concerning functional categories in the 2006 data collection were not collected, and different response categories from the 2014 survey meant no further pooling was conducted for Studies I and IV. More details about the sample population characteristics are reported in Chapter 7.1.

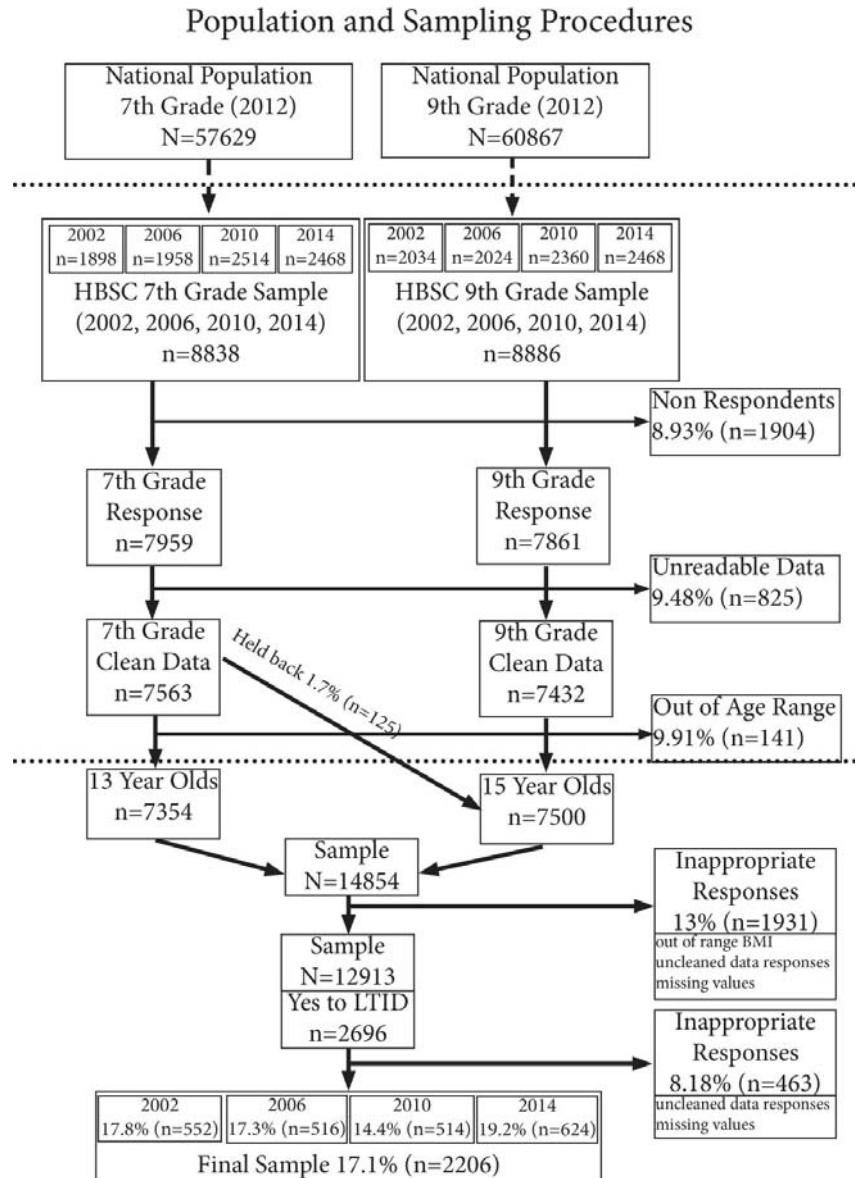


FIGURE 3 Participation sample from Population to HBSC data and Final study sample

### 6.1.2 Ethical agreements and data collection

The Finnish HBSC study was approved by the Finnish Teachers Trade Union when the survey was first approved. It has not been requested in each survey year and no known objections have been raised. Passive consent was used through standardised information about informed consent, confidentiality, and the right to withdraw, whereby respondents were deemed to agree to take part

in the study unless they otherwise indicated they did not. A copy of front page of the survey is in the Appendices. This content concerning consent did not change between 2002 and 2014. The headmasters or principals of the schools agreed to take part in the survey voluntarily and no incentives or rewards for participation were made available.

Paper questionnaires were used in all cases. Selected schools were sent the questionnaires with instructions on how to administer the survey in the classrooms. Respondents were given a questionnaire and an envelope at their desk. Following verbal instructions from the teacher of that class, students began filling out the questionnaire. Once the questionnaire was completed, pupils put the questionnaire inside an envelope. The respondents had to also seal the envelope and take it to the teacher. After the class period ended, the teacher put all the envelopes into a bigger envelope that had the address and pre-paid postage costs included on it, so it could be dispatched back to the Research Centre for Health Promotion at the Faculty of Sport and Health Sciences of the University of Jyväskylä. The researchers then opened the packages and registered information such as when the package arrived, the number of respondents per envelope, and the number of absents from that class. Researchers also provided an index code for each questionnaire for data cleaning purposes. Once this information was saved, the questionnaires were sent to the Computer Centre of the University of Jyväskylä for coding using a photoelectric scanning method for preliminary data file formatting. This file was subsequently sent to the Data Management Centre at the University of Bergen, Norway for the cleaning process and was returned back to the researchers for data analysis. Items from the questionnaire that were used in this study can be found in the Appendices.

## **6.2 Measures**

### **6.2.1 Long term illnesses or disabilities**

There were two inventories used to describe the sample population and report the prevalence of LTID. The first was the Chronic Conditions Short Questionnaire, which has been included in the international optional package since 2005. This was aligned with the ICF Health conditions domain because it required doctor diagnosis. The questionnaire was also included as part of the Finnish national items in the 2002 data collection round. The second was a set of questions based on the functional difficulties which produced functional categories and was only included as part of the national items.

#### **6.2.1.1 Chronic conditions short questionnaire**

The chronic conditions short questionnaire (CCSQ) was used to disaggregate the final working population for the studies. This is part of final phase of the data collection as responses that were not suitable from the CCSQ were not used in the analysis. The first point to note was that respondents from 11-year

olds were not asked this type of question, and thus, analyses from only 13- and 15-year olds were possible. The placement of the CCSQ was placed close to the end as is often recommended for demographic data in large surveys (Bradburn, 1983). The wording of the CCSQ (Appendices Item 17) was as follows;

“Do you have a long-term illness, disability, or medical condition (like diabetes, arthritis, allergy, or cerebral palsy) that has been diagnosed by a doctor? Please do not include learning disabilities.”

More details of diagnosis were not asked in this question so the use of the WHO ICD-10 would not be available for further analysis. The response categories were ‘yes’ or ‘no’. The second part of the CCSQ was to help cross check the original response. The other question (Appendices Item 18) was asked with three response options in the following manner;

“Does your long-term illness, disability or medical condition affect your attendance and participation at school?”

“I do not have a long-term illness, disability or medical condition”, “yes”, and “no” were the response options. Respondents that had responded to “yes” in the first CCSQ and “I do not have a long-term illness, disability or medical condition” were excluded from the sample population for Study I due to the possibility of inconsistencies from the data and the primordial nature of the first question. It was assumed that students have the tendency to respond more accurately the first question than subsequent one because there were explicit examples of conditions included in the item. For Study II, III, and IV, further exclusions from the data were based on extreme BMI calculations as BMI was considered a personal factor. For study II, III and IV, reported BMI outside the acceptable range as defined by the criteria set by Finnish norms per age and gender was used (Vuorela, 2011).

To date, there have not been any reliability or validity tests on the CCSQ. Furthermore, there have not been studies with cognitive testing to check if the adolescents understand the questions. This is partly due to the nature of confidentiality as well as sampling based on the population rather than a specific sub-population, such as the group of adolescents with LTID.

In the autumn of 2013, a class took part in the piloting of the CCSQ and had an opportunity to discuss in a focus group setting. There were no alarming results from the focus group, except the question did not need to have a time reference of ‘at least 6 months’ as in some other epidemiological items designed for adults. As a result, proceedings to continue with the same items for the 2014 data collection went without modification. However, as a demographic type of questions, many assumptions have been made. These have been highlighted in the literature review chapter.

#### **6.2.1.2 Functional categories**

A further refinement process took place for Study I and IV that included a short set of questions on functional difficulties. As with the Body Functions and Body

Structures chapter of the ICF, these items were aligned to the most common functional difficulties in adolescents. The items were used in the 2001 Canadian Physical Activity Limitations Scale (Canadian Council of Learning, 2010). The questions are not part of the HBSC protocol and were included as part of the Finnish national items. For the 2002, and 2010 surveys, respondents were asked to only answer the following questions if they had already answered “yes” to the first question of the CCSQ (Appendices Item 19);

“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’. In conformity with the ICF qualifiers, the items were slightly modified for the 2014 survey (Appendices Item 20) in two ways. The first way was to allow all respondents from 13 and 15 year olds to answer the questions. In previous survey collection rounds, respondents who stated they had a LTID were asked to follow up their responses to this list of functional difficulties. To enable all respondents to self-assess their levels of difficulties, the first part of the original item was “If you answered yes, does this disability, illness, or medical condition cause you” and was replaced with “Do you have difficulties with ...” and a list of the functional difficulties were listed. In the previous surveys, epilepsy was included, however in the 2014 survey “epileptic seizures (fits)” was moved to the end of another item inventory batch called the “HBSC Health Symptoms checklist” (Haugland and Wold, 2001).

The second modification adopted in the 2014 survey was to change the response categories from a dichotomous “yes” or “no” one to a five response categorical approach. This was made in an attempt to align with the way the ICF is coded with a set of qualifiers (WHO, 2001). The revised response categories became, “no difficulties”, “difficulties do not affect functioning”, “difficulties affect functioning somewhat”, “difficulties affect functioning a lot”, “difficulties affect functioning very much”, and were mapped against the ICF descriptors of ‘none’, ‘mild’, ‘moderate’, ‘severe’, and ‘complete’ respectively. An agreement in panel of Health Education experts was made during the mapping process. Earlier HBSC surveys consisted of dichotomous responses hence, the responses from the 2014 survey were dichotomised into “no difficulties” and “difficulties do not affect functioning” to represent “no”, and the other responses as “yes”.

The Functional Difficulty items were also used as part of the cleaning process for the final sample population. Detection of differential item functioning using Mantel-Haenszel method without continuity correction and with item purification indicated that all functional category items were good items with large effects for LTID. In the case whereby a respondent had spoiled their responses, it was possible to decipher this by first checking the unlikely situation where an individual has difficulties in every type of functional difficulty. Then, once this was observed, the index file used for the respondents and the file for



the photoelectric scan copy was observed by two researchers who came to a consensus on whether the file was spoiled or not. The researchers had 100% agreement, a third was not needed.

The aims of converting the functional difficulties items to functional categories were to reduce the number of different categories, to increase the group sizes of each category, and to identify unique cases of functional categories. The following mutually exclusive categories were formed; 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 to have LTID were put into the 'not-specified' group (Table 1).

Respondents with more than one difficulty were also put into distinguished groups. From the data, there were two groups; a group of "motor and breathing difficulties" and "both breathing and communication difficulties" had also its own group. All in all, there was a theoretical possibility for 32 different combinations of difficulty 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 to make it feasible for statistical analyses. The few combinations of multiple categories (n=31) that existed but had not matched these criteria were coded into the not-specified category.

TABLE 1 Mutually exclusive functional categories from questions of functional difficulties

Question of difficulties	Functional Category
Seeing	Seeing
Hearing Speaking	Communication
Moving Handling objects	Motor
Breathing	Breathing
Both Breathing and Motor	Breathing and Motor
Both Breathing and Communication	Breathing and Communication
Epilepsy	Epilepsy
Other	Not Specified

In 2014, the items were slightly modified to reflect on the ontology of the ICF. Other combinations of categories that may arise from the revised questions were not explored further to allow comparison with other data collection years.

### 6.2.2 Physical activities

Physical activities (PA) were measured using the international mandatory items concerning PA and leisure time exercise. There are a number of codes in the ICF that relate to movement, daily routines as well as maintenance of weight and

fitness (d5701). Measurement of PA was a single item, while leisure time activities consisted of two items.

#### **6.2.2.1 Moderate to vigorous physical activity**

A single item was used to measure MVPA and has been part of the mandatory sets of questions since 2002. This was the main outcome variable for all four studies. The content of the item is aimed specifically for adolescents, as it uses the introduction text and question (Appendices Item 8);

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 from an eight point ratio scale from "0 days", "1 day", "2 days", ... to "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 was first suggested by Prochaska and colleagues (2001). This physical activity measure provides a valuable and valid source of information for surveillance studies (Mâsse & de Niet, 2012) as it can be used to reflect on meeting physical activity recommendations (Sallis and Patrick, 1994, World Health Organization, 2010). This widely used PA self-report item has been tested for reliability and validity in Finland (Vuori, et al., 2005) as well as in other countries (Bobakova, et al., 2015).

Recommendations to adhere to school children PA for health were suggested to be a minimum of 60 minutes of PA every day (Strong, et al., 2005, World Health Organization, 2010) hence in Study I and II, the variable was dichotomised into those that met the recommendations of 7 days and those that did any amount of PA but not every day. The value of 7 days is the end response variable and may produce under or over reporting from self-report (Nusser, et al., 2012). Therefore, a second set of dichotomised results were set at five days and over, and fewer than five days in Study II. In Study III and IV, MVPA was used as a continuous variable to describe the associations with increased levels of MVPA.

#### **6.2.2.2 Leisure time physical activity**

Two questions were used to measure the frequency and duration of vigorous PA during the leisure time. The items were part of the mandatory set of questions in all years except the 2006 survey, however in Finland these questions were included in all survey years. In addition, according to the survey protocols for data collection in the 2010 and 2014 surveys, the items were moved to a later part of the survey as the questions were based on out-of-school activities and on vigorous exercise. Content for vigour was highlighted by defining exercise that makes one "get out of breath or sweat" and both questions have shown stability

across seven European countries between 1986 to 2002 (Samdal et al., 2007). When compared with other objective measurements, these items were reported to be moderately appropriate (Määttä, et al., 2016). Frequency was asked using the question (Appendices Item 15);

“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 (Appendices Item 16);

“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.

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 and was used as part of the reporting in Study I. Existing HBSC methodology, based on the frequency and duration of PA questions (Booth et al., 2001), was used to produce dichotomous groups of adolescents that met recommendation 2 (Rec2) and not (NoRec2) in Study I. The overall VPA was estimated using information on frequency and duration of leisure time VPA (Figure 4).

		Hours per week of leisure time VPA				
		≤ 1	1-3	≥ 4	Key	
Frequency per week of leisure time VPA	≤ 1					Not Recommended (NoRec2)
	2-3					
	≥ 4					

FIGURE 4 Using VPA Groups to determine how to meet PA Recommendation 2 (Rec2)

### 6.2.3 Sports club

Within the ICF, there is a code for organised sports as part of the community, social and civic life chapter (d9201). Taking part in organised sports could also confound the dependent variable of MVPA because daily MVPA can take place in and out of school.

A single item question (Appendices Item 9) was used to divide the group for further analysis. Membership of a sports club was asked by “Are you a

member of a sports club"? Responses were "No", "Yes and I am training in a sports club", "Yes but I do not participate in training". Those who indicated being a member of a sports club and participate in training were coded as a sports club member. Some respondents indicated they were sports club members but do not participate (4%) hence, this group was combined with "no" respondents. This latter group of non-active individuals and not a member was renamed "non-members".

## **6.2.4 ICF personal factors**

Currently, personal factors in the ICF remain codeless, although there are some guidelines for what can be considered as personal factors (WHO, 2001). The majority of items considered to be ICF personal factors were national items, and have been studied for many rounds of HBSC surveys. Details of each item are described in from Chapter 6.2.4.1 through to Chapter 6.2.4.5.

### **6.2.4.1 Intentions for future PA**

Intention for future PA was measured using a single item (Appendices Item 10) on the individual's intention to be physically active when the respondent is 20 years old with a four point scale response ranging from "definitely no" (1), "no" (2), "yes" (3), to "definitely yes" (4). The design of the item has followed the guidelines for creating questions for behavioural intentions (Francis, et al., 2004). The difficulty for validity for intention questions are the differences in the intention to do something compared with the measurement of actual behaviour, and the construct of intention has been postulated that its sources are from attitudes, subjective norms, and perceived behavioural control within the theory of planned behaviour (Ajzen, 1991). For intention for future PA, dichotomous groups (binary) were formed from groups of "definite" and "uncertain" (comprised of responses 1-3) intentions in Study III and IV.

### **6.2.4.2 Physical activity self-perceptions**

Self-perceptions specific to PA consisted of three variables, perceived fitness (Study III & IV), perceived competence, and self-rated body image (Study IV). Furthermore fitness is listed as an example of personal factors in the ICF. Measures of perceived fitness were generated from a single item (Appendices Item 12), with the question as worded as; "How fit do you think you are?", responses were "not fit at all" (1), "moderately fit" (2), "fit" (3), "very fit" (4). As a continuous variable in Study III, perceived fitness was also regarded as a means of perceived behaviour control within the theory of planned behaviour (Ajzen, 1991). As a dichotomous variable, "not fit at all" and "moderately fit" were grouped as "low fitness". "Fit" and "very fit" were also grouped as "high fitness".

Perceived competence was asked in the following way (Appendices Item 11); "How good are you at sports compared to others the same age as yourself?", with responses of "Among the Best" (1), "Good" (2), "Average" (3), "Below Average" (4). Perceived competence was dichotomised in Study IV, with

“among the best” and “good” as “high competence”. “Average” and “below the average” were grouped together as “low competence”.

The wording of the item for self-rated body image was (Appendices Item 13); “Do you find yourself..?”, with the following responses, “too thin” (1), “thin” (2), “average” (3), “fat” (4), “too fat” (5). A dichotomy approach was used to group “good image” with responses of “average”, and “low image” with all the other responses grouped together in Study IV.

Similar to earlier studies, the variable of self-perceptions was comprised of a combination of the perceptions of physical fitness, physical competence, and body image (Lintunen, 1994). A risk of combining the three variables is a loss of information on each variable however, the combination of the variables makes a strong division between high and low self-perceptions.

#### **6.2.4.3 Global self-esteem**

The most common measure of adolescent global self-esteem (GSE) is the Rosenberg’s Self-Esteem Scale (Rosenberg, 1965). The original scale consisted of 10 items with half of the items with positive statements and the other half with negative statements. Respondents were asked to indicate the level of agreement on a four point Likert scale. The measure was translated into Finnish and its usage in the HBSC surveys have consisted eight of the ten original items (Appendices Item 14). Earlier studies that found two of the negatively related items were deemed to be difficult to understand to Finnish children (Lintunen, 1994). In addition, studies have reported that 8 item single factor has excellent fit for global self-esteem as a single construct (Tomás and Oliver, 1999).

For the 2014 data collection, the two items were re-included to provide the complete Rosenberg scale (Appendices Item 21). This opened up for greater comparisons with other large national adolescence studies such as the Adolescent Mental Health Cohort (AMHC) Study (Isomaa, et al., 2012) and the Jyväskylä Longitudinal Study of Personality and Social Development (JYLS) Study (Pulkkinen, 1996). Preliminary analysis of the comparability of the items with life satisfaction, only the positive items from the 10 items scale could be moderately compared between the 2014 and earlier questionnaires with only eight items. As a consequence, GSE was not analysed from the 2014 data.

Data from the 2002, 2006 and 2010 surveys was analysed by sum scores of each item in a positive alignment. A continuous variable, with higher scores indicating higher self-esteem was used. The range of the sum score was from 8 to 32 (Study III). It is important to note that this construct is not domain specific, whereas previous mentioned personal factors were specific to PA.

#### **6.2.4.4 Educational aspirations**

Educational Aspirations is a national item as it includes a question that provides options specific to Finland. The question was worded as (Appendices Item 7); “What do you think you will do when you finish comprehensive school?” with the following response categories “apply to general upper secondary school”, “apply to vocational education”, “apply for an apprenticeship/training”, “complete a double exam”, “go to work”, “become unem-

ployed”, “do not know”. Educational aspirations were dichotomised (binary) into those who will try to go to “general upper secondary schools” and “others” including unknown aspirations (Study IV).

#### **6.2.4.5 Body mass index**

Both self-reported height (Appendices Item 5) and weight (Appendices Item 6) appear as international mandatory items. On their own, they do not act as very good independent variables related to health behaviours, however when used as a calculation for Body Mass Index (BMI), they can be used in different ways to determine associations with behaviours, for example PA and obesity. There have been high intra-class correlations between self-reported and objectively measured height and weight in Finland (Ojala, et al., 2012). The calculation for BMI was measured by kg over square of height in metres. In Studies II, III, and IV, BMI was used first as a cleaning variable, whereby values that were considered to be considerable underweight and overweight were removed from the analysis. The limits were set by percentiles after taking into account age and gender based on national data over the last four decades (Vuorela, 2011). Cultural differences exist for interpreting age and gender specific BMI ranges and the widely used international standards set by Cole (2000) were not used.

### **6.3 Statistical methods**

Different statistical methods were used for the four studies to help answer the research questions in this dissertation. The statistical program mainly used was through SPSS 20.0 (Study I) and SPSS 22.0 (Studies II, III, & IV). A p-value of less than 0.05 was used in all studies for results to be considered to be statistically significant. Class level structure was not included due to the randomness of prevalence for children with LTID. No data was imputed for similar reasons.

#### **6.3.1 Between group tests (Study I design)**

This study’s purpose was to describe the amounts of PA from adolescents with self-reported LTID and to report differences based on their functional categories. Differences among functional categories were conducted to test whether there were statistical differences in physical activity patterns and its associations with another functional category. The sample sizes were very different among the groups and the measures of MVPA and VPA did not follow a normal distribution. Hence, a non-parametric approach was conducted to first see if there were differences among groups in the number of adolescents with LTID meeting the physical activity recommendations. The groups were tested using exact models.

SPSS 20.0 was used for analysing the data. Variables 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. Descriptive statistics were used to summarize the average number of days active in the last

seven days, and the percentage of the LTID populations that met the PA recommendations for youth; daily activity of at least moderate-to-vigorous physical activity for 60 minutes; and, at least twice a week of 30 minutes or more out of school vigorous physical activity (Booth, et al., 2001, Samdal, et al., 2007). Kruskal-Wallis tests were used to investigate the differences among functional categories for each PA variable and the PA recommendations.

Mann-Whitney was another type of non-parametric test to sort out difference between genders within each functional category. Furthermore, for each gender, Mann-Whitney tests were performed to test differences between ages.

### **6.3.2 Trend analysis (Study II design)**

This study's purpose was to examine changes in PA amount adolescents that reported to have LTID between 2002 and 2014. Following the divide between sports club and non-sports club members, two types of groupings for the dependent variable of MVPA were made. The first dichotomy was based on meeting the WHO PA recommendations of at least 60 minutes per day, every day (daily) or not daily. The second group was created due to possible ceiling effects as there are seven days in a week, and the division into groups was at five or more days of being active at least 60 minutes per day (5 days) or fewer. This grouping also allowed for sports club members that are involved in high intensity training and required to take at least one day off in the week, but still included in the high MVPA group.

Binary logistic regression analyses with adjusted age were conducted. The year 2002 remained as the reference category for differences between subsequent years (between 2006-2002, 2010-2002, 2014-2002). Separate analysis was conducted between members and non-members of sports clubs.

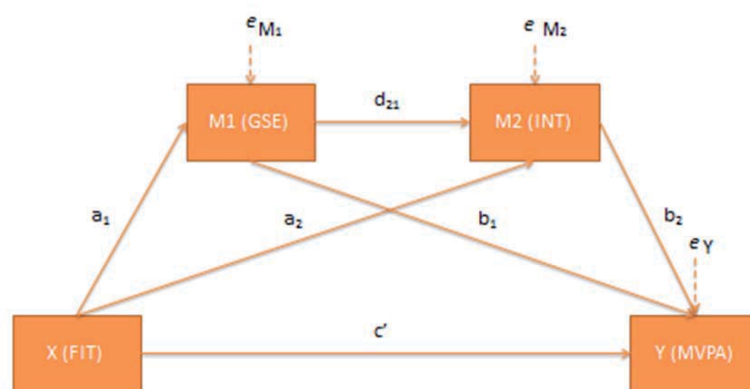
Odds Ratios (ORs) with 95% confidence intervals (CIs) indicated the likelihood of daily MVPA as well as at least five days a week MVPA with these characteristics relative to the reference group. The reference group for age was 13 year olds.

### **6.3.3 Mediation regression analysis (Study III design)**

This study's purpose was to examine the best model of relationships of ICF personal factors in adolescents with reported LTID. The SPSS macro PROCESS (Hayes, 2013) was used for testing serial mediation in linear regression analysis. Model 6 is a serial mediation analysis which can include at least two mediators, an independent variable and a dependent variable. With four variables, there are 6 regressions that are calculated using ordinary least squares regression analysis. The structure of the mediation analysis is in Figure 4.

The mediation analysis uses ordinary least squares (OLS) estimation of model parameters. OLS is considered to be easy to understand and describe among researchers and "advantages of OLS regression far outweigh some of the costs of abandoning it for other, perhaps better but much more complicated and less well-understood methods" (Hayes, 2013, p.53). However, caution in

using serial mediation must be considered. First, there must be a substantial relation between an independent variable and the mediating variable, and there must be a relation between the mediating variable and the dependent variable when accounting for the independent variable. Secondly, by definition, “mediation requires a causal precedence, such that the independent variable precedes and causes the mediator, and the mediator must precede and be a cause of the dependent variable” (MacKinnon and Luecken, 2008). As this is a cross-sectional study, the use of mediation analysis in Study III was based on two widely used theories in physical activity, hierarchy model of self-esteem (Fox, 1988; Haugen, Ommundsen, & Seiler, 2013, and theory of planned behaviour (Ajzen, 1991), to provide causal assumptions for the analysis.



FIT (perceived fitness). GSE (global self-esteem). INT (intention for future PA). MVPA (moderate to vigorous physical activities).

FIGURE 5 Statistical diagram of serial mediation of 2 mediators between perceived fitness and moderate-to-vigorous physical activities

Based on these assumptions, a full serial model with ‘a’ (Perceived Fitness – GSE / Intention for future PA), ‘b’ (GSE / Intention for future PA – MVPA), ‘c’ (Perceived Fitness – MVPA), and ‘d’ (GSE – Intention for future PA). Bias-corrected bootstrap confidence intervals were used to test for significance of the direct and indirect paths. The same regression analysis was repeated for both genders, while age (‘e’) was a controlling covariate. Studied variables were compared with t-test statistic to reveal any statistical significant differences.

#### 6.3.4 Binary logistics regression analysis (Study IV design)

This study’s purpose was to examine the associations between ICF personal factors of adolescents with reported LTID and PA between members and non-members of sports clubs. Descriptive statistics of means and standard deviation were calculated for study characteristics. Chi square tests were used to compare differences between boys and girls in sports club, daily PA, intention for future PA, self-perceptions, educational aspirations and year of data collection. Binary



logistic regression analysis was used to estimate the association among sports club membership, daily PA participation and psychological assets. Categories were fixed so that odds are positively directed for reporting positive odds ratio. Analyses were first performed with the entire sample, and subsequently stratified by gender owing to earlier reports whereby boys and girls have different factors related to sports club membership (Biddle, et al., 2011). Overall analyses were adjusted for age and year of data.

## 7 RESULTS

The results from the studies are presented in the order of the research questions. In order to contextualise it, the first section has descriptive statistics of the sample population. In Chapter 7.2 the main results of the studies are presented. Some additional results were included into the reporting of Study II and IV when deemed important.

### 7.1 Descriptive statistics of sample

From the 2002 data set (n=3106), there were 552 (18%) adolescents with long-term illnesses or disabilities (LTID), leaving 2554 adolescents without LTID. This was similarly reported in 2006 (n=2979), as there were 516 (17%) of adolescents with LTID and 2463 without LTID. In 2010 (n=3578), a lower prevalence of adolescents with LTID 514 (14%) and 3064 without LTID. In 2014 (n=3250), there were 624 (19%) of adolescents with LTID and 2626 without LTID. At the regional level, prevalence ranged from 9% to 23%. Through ANOVA tests, there were significant changes in the prevalence in the South urban, South sub-urban and Middle sub-urban regions from 2002, 2006, 2010 to 2014. The Capital, North and all rural regions remained the similar in each sample from 2002, 2006, 2010 and 2014.

The original data set consisted of half boys and girls, and equal number of 13 year and 15 year old respondents. The results from a t-test of gender differences were statistically significant ( $p < .01$ ) and were consistent for each data collection (2002,  $p < .01$ ; 2006,  $p < .01$ ; 2010,  $p < .01$ ; 2014,  $p < .01$ ). This has given support for the following result; among 13 and 15 year olds, there are more girls than boys with LTID. There seemed to be slightly more adolescents with LTID in 15 year olds, however the differences were not statistically significant.

Over half of the adolescents with LTID (57%) did not report any of the functional difficulties that were listed in 2002 and 2010 and were regarded as 'Not specified' category (Table 2). The largest known functional category was breathing difficulties (25%). Adolescents with epilepsy (2%) were the smallest single functional category group. There was a large increase in the number of

reported communication difficulties based on the way the data was collected in 2014.

Data collected from the 2014 questionnaire provided more details about the non-specified group. There were also high numbers of children that reported having allergies (65%), symptoms of joint pains (46%), and asthmatic symptoms (35%) at least once a month or more frequently, while symptoms for low blood sugar levels (10%) once a month or more frequently as indicators of diabetes was the lowest.

TABLE 2 Sample of different categories of exclusive functional difficulties

Category	2002 <sup>a</sup>	2006 <sup>a</sup>	2010	2014 <sup>b</sup>	Total	Total% <sup>c</sup>
Not Specified	336		294	332	884	57%
Breathing	163		146	111	420	25%
Motor	4		19	36	59	3%
Communications	15		12	49	76	4%
Visual	11		9	30	50	3%
Epilepsy	8		11	10	29	2%
Motor & Breathing	12		17	24	53	3%
Breathing & Communication	3		6	32	41	2%
Total	552	516	514	624	2206	

a. Differences in counts from Study I were due to cleaning process from personal factors (see Chapter 6.2.4.5)

b. Data about Functional categories were not available in the 2006 survey

c. Derived from severity scale and dichotomised from moderate difficulties and more severe.

d. Due to rounding, percentages add up to 99%

Through the methods of collecting data during the 2014 data collection, more functional difficulties categories were observed than in the previous rounds. Three more functional categories were included to represent functions related to intellect. Almost half the children who self-reported as having a LTID indicated they had difficulties in concentration (46%), fewer indicated they had difficulties in remembering (37%). Over half of these adolescents (58%) who reported difficulties in either concentration or remembering had reported difficulties of both concentration and remember. Almost one in three adolescents with LTID reported difficulties in sitting still in the classroom (31%).

## 7.2 Main results from each study

Given that descriptive statistics for the adolescents with LTID has been described, the main results of the study based on the research questions are presented. There are four main studies where further information can be found in the list of publications.

### 7.2.1 Overview of physical activities among functional categories (Study I)

Almost three quarters (74%) of adolescents with LTID from the pooled data from 2002 and 2010 had reported to take part in out of school vigorous physical activities (VPA) for at least 2 times a week and for a total of at least one hour (Study I). There were statistical significant differences between 13 year old (77%) and 15 year old (65%) girls in the reporting of VPA (Study I). Reports of doing VPA four or more times per week were not reported even though comparable with published trends from the general HBSC data (Samdal, et al., 2007).

The range of reported VPA by functional categories was vast from 33% of 15 year old girls with epilepsy to 88% of 13 year old boys with breathing difficulties. Although there were no overall gender differences for VPA, adolescents with breathing difficulties, through a Mann-Whitney tests of differences, boys were significantly more active (82%) than girls (70%) (Study I).

The mean number of days also varied amongst the different functional categories. Adolescents with breathing difficulties reported the most number of days (mean=4.0 days, SD=2.0). This could be further segmented into gender, whereby boys with communication difficulties reported the most number of days (mean=4.4 days, SD=2.4) and boys with motor and breathing difficulties reported the least number of days (mean=2.0 days, SD=1.8). For each category and overall sample, gender differences were statistically significant whereby boys reported more activity than girls ( $p < .001$ ).

The percentage of meeting daily recommendations of at least 60 minutes MVPA for each functional category varied. The largest proportion of boys who reported daily MVPA were those with communication difficulties (30%), whereas none of the boys with both breathing and communication difficulties reported to be active daily. In addition, a small proportion (5%) of girls with communication difficulties reported to take part in daily MVPA. A vast difference appeared between boys and girls with epilepsy, as a quarter (25%) of girls were active daily, and less for boys with epilepsy (13%) (Study I).

### 7.2.2 Trends of physical activities between 2002 - 2014 (Study II)

From 2002 (31%), 2006 (42%), 2010 (49%) to 2014 (52%), there was a linear increase in the number of adolescents with LTID that reported to at least 5 days a week of MVPA ( $\chi^2(3, 2206) = 60.5, p < .001$ ). In 2002, one in ten (11%) adolescents with LTID was active daily. This increased in 2006 (13%) and continued to increase in 2010 to one in five (22%) however, levels plateaued for 2014 (21%) ( $\chi^2(3, 2206) = 35.1, p < .001$ ) (Study II). Nagelkerke  $r^2$  acts as a pseudo  $r^2$  with a range between 0-1. For the analysis of daily MVPA, non-member boys the  $r^2$  was .25, and member boys .24. The  $r^2$  for daily MVPA non-member girls was .20 and for member girls it was .21. These were lower for non-member boys, and both groups of girls that reporting at least 5 days MVPA, however it remained the same (.25) for member boys.

Reported MVPA for at least 5 days in a week by sports club members increased from 2002 (54%), 2006 (59%) and plateaued in 2010 (71%) since, in 2014 there was a non-significant drop (69%). The pattern was similar for sports club members who reported daily MVPA in 2002 (18%), 2006 (21%), 2010 (35%), and 2014 (28%).

Sport club memberships increased from 2002 (38%), 2006 (41%), 2010 (43%) to 2014 (47%). Although sports club members reported more MPVA than non-members (Study II & IV), no mediating effect could be found on the increase of members (Study II). Stratified analysis of sports club members and non-members for patterns of MVPA were conducted because the number of days of sports club members (mean=5.0 SD=1.7) and non-members (mean=3.5, SD=1.9) were statistically different ( $p < 0.001$ ). A linear trend between 2002 and 2014 was present among adolescents with LTID that were not sports club members in 5 day ( $\chi^2(3, 1270) = 37.5, p < .001$ ) and daily MVPA ( $\chi^2(3, 936) = 15.4, p < .001$ ).

The mean number of days for reporting MVPA had been increasing from each data collection in 2002 (3.5 days, SD=2.0), 2006 (4.1 days, SD=2.0), 2010 (4.4 days, SD=2.0) to 2014 (4.6 days, SD=1.8). There was a significant effect of year on the mean number of days of MVPA for the 4 years ( $F(3,2168)=30.832, p < .001$ ).

Additional results complement the main research questions. Differences between adolescents with and without LTID are presented. There were few differences in the mean number of days of reported MVPA between adolescents with and without LTID in 2002, 2006, 2010, and 2014 surveys (Table 3).

TABLE 3 Means and standard deviation of days MVPA in adolescents with and without LTID between 2002 and 2014.

Sports Club	Gender	Year	LTID	No LTID	p-value
Not member	Boy	2002	2.95 (1.7)	2.99 (2.0)	0.967
		2006	3.31 (2.1)	3.77 (2.0)	0.029*
		2010	3.76 (2.1)	3.95 (2.1)	0.369
		2014	4.28 (1.9)	4.10 (2.0)	0.330
	Girl	2002	2.91 (1.7)	2.84 (1.8)	0.616
		2006	3.62 (1.8)	3.43 (1.9)	0.199
		2010	3.60 (1.8)	3.65 (1.8)	0.706
		2014	3.83 (1.8)	3.80 (1.8)	0.752
Member	Boy	2002	4.96 (1.7)	4.59 (1.7)	0.041*
		2006	4.88 (1.6)	5.22 (1.5)	0.061
		2010	5.81 (1.3)	5.39 (1.7)	0.036*
		2014	5.39 (1.6)	5.61 (1.5)	0.129
	Girl	2002	4.14 (1.9)	4.27 (1.8)	0.770
		2006	4.89 (1.6)	4.79 (1.6)	0.524
		2010	4.96 (1.9)	4.85 (1.7)	0.268
		2014	4.98 (1.6)	5.23 (1.6)	0.110

LTID; with long term illness or disabilities, NoLTID; without long term illness or disabilities, p-value from Mann-Whitney test of mean days

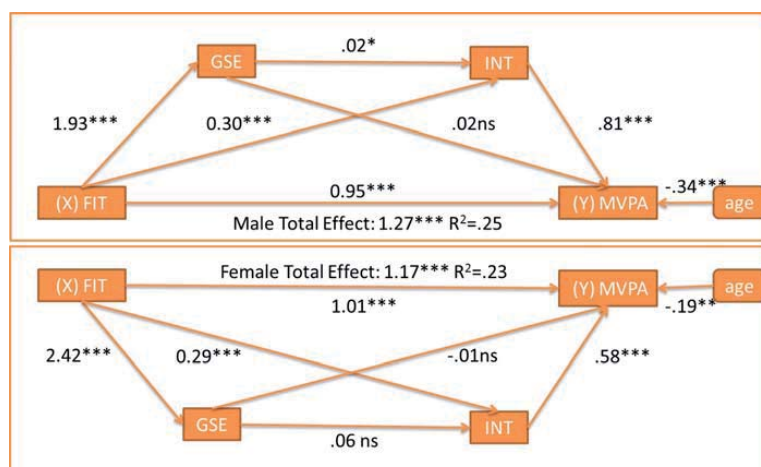
Further tests were conducted for differences in leisure time VPA for at least one hour two times a week using Chi-square and no statistically significant differences were found and are not reported.

Similarly, Chi-square tests were performed on the dichotomised groups for daily and not daily MVPA. There were no statistically significant differences in the sample percentages for daily MVPA across sports club membership, gender and year between adolescents with and without LTID. In addition, there were no statistically significant differences in at least five days MVPA in the past week between adolescents with and without LTID.

### 7.2.3 Mediation of personal factors to physical activities (Study III)

The assumption that the hierarchy model of self-esteem was associated with perceived fitness was moderate ( $r_s=.351$ ,  $p<.001$ ). The main postulates of the theory of planned behaviour were tested and proven significant with the intention for future PA mediating the relationship between perceived fitness and PA behaviour ( $a_1=.201$ , 95% CI=0.139 - 0.277). In addition, the mediating effect of self-esteem on the perceived fitness and intention for future PA link was tested in a serial mediation model was only significant for boys ( $d_{21}=.02$ , 95% CI=0.001 - 0.37). Models for boys and girls can be seen in Figure 5.

Boys' MVPA was predicted by perceived fitness, the mediation of PA intentions from perceived fitness and global self-esteem, and the serial mediation that involved perceived fitness, global self-esteem, PA intentions, and MVPA. While girls' MVPA mediation model was only statistically predicted by perceived fitness and its mediation of PA intentions towards MVPA (Study III).



FIT (perceived fitness). GSE (global self-esteem). INT (intention for future PA). MVPA (moderate to vigorous physical activities. ns (not significant) \*  $<.05$  \*\*  $<.01$  \*\*\*  $<.001$  ns not significant.

FIGURE 6 Regression coefficients of serial mediation model for boys (above) and girls (below)

#### 7.2.4 Psychological assets and physical activities among members and non-members of sports clubs (Study IV)

After stratifying the analysis by gender, psychological assets such as intention for future PA, self-perceptions and educational aspirations were tested against daily PA after controlling for sports club membership and age using binary logistic regression techniques. These psychological assets are considered to be part of the ICF personal factors in the empirical model (see Figure 2) and thorough cleaning was performed on the data. Missing data was checked against non-missing data. The results for the dependent variable - MVPA, was not significantly different, therefore these missing cases were removed from analysis. The final sample size for this analysis  $n=1006$ . Nagelkerke  $r^2$  acts as a pseudo  $r^2$  with a range between 0-1. For the complete model,  $r^2=.2$ , for boys  $r^2=.29$  and for girls it was much lower  $r^2=.13$ .

There were statistically significant differences in MVPA, self-perceptions and educational aspirations between boys and girls. Sport club members were two times more likely to be active daily than non-members. Regression analyses indicate that boys who were more likely to meet recommendations for daily MVPA were younger (13 year old) sport club members with definite intentions, high self-perceptions and had not aspirations for general upper secondary school. In addition, girls who were more likely to meeting recommendation for daily MVPA were young (13 year old) with definition intentions to future PA.

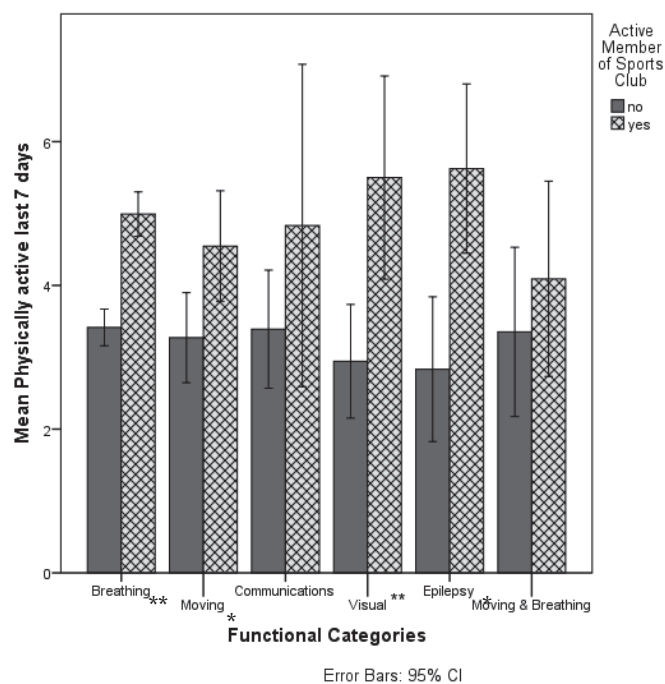
Additional results were explored on the differences in MVPA between sports club and non-sports club members based on functional categories. In this analysis, adolescents ( $n=492$ ) that reported their own functional difficulties in i) breathing, ii) moving, iii), communication, iv) seeing, v) moving and breathing, and vi) epilepsy from the 2002 and 2010 surveys were used. Just over a third (37%) of the sample participated in organised sports and reported significantly ( $p<.001$ ) more days of MVPA (mean = 4.9 days,  $SD=1.8$ ) than non-participants (mean=3.3 days,  $SD=1.9$ ).

Over three fifths (61%) of the sample were girls although there were nearly the same number of 15 year olds (51%) as 13 year olds (49%). The most common functional difficulty group in general school was breathing difficulties (66%) and the least was epilepsy (4%). Boys that participated in organised sports reported significantly more ( $p=.001$ ) days of MVPA (mean=5.4 days,  $SD=1.5$ ) than girls (mean=4.6 days,  $SD=1.9$ ), while there was no significant gender difference among non-members. Younger (13 year old) non-participants reported significantly more ( $p=.04$ ) days of MVPA than older (15 year old), whereas there was no significant age differences among sports club participants.

For each functional difficulty category, participants in sports clubs reported to spend more days MVPA than non-members in their respective category (Figure 7). Of non-members, adolescents with breathing difficulties (mean=3.4 days,  $SD=1.8$ ) and communicating difficulties (mean=3.4 days,  $SD=1.9$ ) reported the highest amounts of MVPA. At the other end of the spectrum, non-member adolescents with seeing difficulties (mean=2.9 days,  $SD=1.6$ ) and epilepsy (mean=2.8 days,  $SD=1.6$ ) reported the lowest amounts of MVPA.

Whereas, adolescents that were sports club members and reported to have epilepsy (mean=5.6 days, SD=1.4) and seeing difficulties (mean=5.5 days, SD=1.7) had the highest levels of MVPA. These means were higher than other functional difficulty groups including difficulties in breathing (mean=5.0 days, SD=1.8) and communication (mean=4.8 days, SD=2.1)

Proportions of meeting recommendation 2 (VPA at least 2 times a week for a total of at least one hour) were significantly higher than not meeting recommendation 2 in categories with breathing difficulties (98% v 66%) and moving difficulties (96% vs 71%) (Table 4).



\* $<.05$ , \*\* $<.01$

FIGURE 7 Means and 95% CI of MVPA within groups of various functional difficulties.

TABLE 4 Functional Categories and Vigorous Physical Activities (VPA) at least two times a week for a total of one hour.

Category	Non-Members (n)		Members (n)		p-value
	NoRec2	Rec2	NoRec2	Rec2	
Breathing	65	128	2	124	$<.001$
Moving	13	32	1	22	0.016
Communications	9	12	0	6	0.050
Visual	9	9	0	8	0.013
Epilepsy	5	6	0	8	0.026
Moving & Breathing	8	9	1	10	0.036



## 8 DISCUSSION

In this study, reported PA behaviour was analysed among adolescents with long term illnesses or disabilities (LTID) through Finnish data collected from the HBSC study between 2002 and 2014. In summary, approximately one in six adolescents around Finland have reported to have LTID and they have similar patterns of PA levels to the general population. Young boys with average age of 13 reported the most amount of PA, and older girls with average age of 15 reported the least amount of PA. Evidence was presented to support the notion that the average PA levels have increased between 2002 and 2014. Furthermore, active sports club members are twice more likely than non-members to meet the current PA recommendations of at least 60 minutes of MVPA every day.

In this chapter, discussions concerning the measurement of adolescents with LTID through the HBSC study are presented first before going into details about the results from this study with regards to PA. This is then followed by some discussions about the ICF framework.

By pooling the data from 2002 and 2010, it was possible to run sufficient large samples of stratified analysis based on gender and sports club membership and the associations with factors related to psychological assets and other personal factors as suggested in the definition of the ICF. Results in this study revealed the strong and significant association with intention with future PA with increased reporting of MVPA as well as the likelihood of taking part in daily MVPA. Also PA self-perceptions were significantly associated with the likelihood of taking part in daily MVPA, most notably in boys. Furthermore, educational aspirations not to general upper secondary school was associated with the likelihood of being active daily in boys with LTID. After further inspection, a mediating effect of global self-esteem in the association between perceived fitness and intention for future PA was present in boys.

In Chapter 5.2 an empirical model was presented to highlight the interaction between the different components of the ICF. The results of the study provide support for the ICF as a framework as a holistic representation of PA behaviours among Finnish adolescents with LTID. More detailed discussions about the personal factors is in Chapter 8.3

## 8.1 Prevalence of long term illnesses or disabilities

The prevalence of LTID was ranged from 14% in 2010 to 19% in 2014, while it was more stable in 2002 (18%) and 2006 (17%). The range is consistent with other national reports, where it has been reported that 20% of children have LTID (Rajantie and Perheentupa, 2005). Another study that might be considered to be comparable is the School Health Promotion study (in Finnish, Kouluterveyskysely) run by the Finnish National Institute for Health and Welfare (THL) collected between 2000 to 2009 (Terveyden ja hyvinvoinnin laitos [National Institute for Health and Welfare], 2010). The item used was worded, "Do you have a long-term illness, impairment or disability that interferes with everyday functioning?" with responses of "no" and "yes" and the prevalence was reported between 10-12%. The wording of the item has a subtle difference to the way LTID was measured in the HBSC surveys. The THL item stipulates LTID interfering with daily functioning, whereas the items used in HBSC were separated into two separate items. The terminology used by the THL is medically driven and adolescents may confuse words with derogatory meanings. This could then also influence the types of response errors (Miller, et al., 2011).

While the THL stopped collecting data about LTID, the items remained the same in HBSC providing the only source of information about this population. However, the validity of the item requires scrutiny, especially since the prevalence of LTID around the country seemed to fluctuate. One plausible explanation for the fluctuating prevalence is the structural changes in schools around the country. There were almost 3600 comprehensive schools in 2005, just under 3000 in 2010 and in 2015 there were less than 2400 in 2010 and 2015 (Statistics Finland, 2011, Statistics Finland, 2016). Between 2010 and 2015, there was a decrease from 6,800 to 4,700 pupils attending 129 and 85 special education schools respectively. Provided that the population remained the same in this 5 year period, the 2,100 pupils had transitioned into comprehensive schools as the number of pupils increased from 524,200 in 2010 to 526,800 in 2015 (Statistics Finland, 2016). This may have led to clustered grouping as a method of inclusion during 2010 (Finnish National Board of Education, 2012). To treat this effect during statistical analysis, one method would be to use multi-level modelling at the class level. This was not conducted because there was a lack of information about changes in schools during the transition period. Future studies may investigate this and the associations when exploring environmental factors.

For each data collection, there were more girls diagnosed with LTID than boys. Some studies have raised the issue that this is related to girls maturing earlier, it is likely for a study carried out for 17 and 19 year olds, this gender difference might not be so apparent (Sawyer, et al., 2007, Suris, et al., 2004). However, to do this comprehensively would be challenging since there are many different modes of education, work and living at these older adolescent ages.

### 8.1.1 Range of functional difficulties

The HBSC study in Finland had items concerning categories of functional difficulties. This enabled the testing of a categorical versus a non-categorical approach towards PA. However, trends were not possible since these particular items were not included in the 2006 study and were revised in the 2014 study. Slightly more than half of the adolescents with LTID (58%) did not report any of the functional difficulty listed in the 2002 and 2010 surveys. However national reports indicated that allergies can represent the health condition of a third of adolescents with LTID (Rajantie and Perheentupa, 2005). The results from the 2014 study were as high as 65% for symptoms of at least once a month. This type of result requires more investigation into the examination of using frequency of symptoms with diagnosis and health behaviours.

A report by Chamie (1994) indicated that childhood surveys for measuring disabilities can be completed through functional limitations, although improvements to a 10 simple screening question set would be needed. Such work that followed the launch of the ICF includes the Washington group on disability statistics (WGDS), a task force from the World Bank. After several years of work, including cognitive testing, collaboration with UNICEF, test-retest, pilot data collections and production into the 2010 round of census collection, eight items were produced for functional difficulties (Mont, 2007). These items were in fact, measuring very similar types of functions as in Durkin et al's (1994) 10 simple screening question set as previously mentioned in Chamie's (1994) report. Furthermore, screening for these particular functions has consistently appeared in other surveys, including the Canadian Health and Activity Limitation Survey (Statistics Canada, 2009) and as far back as the British Census (Dale and Marsh, 1993). The items in the 2002 and 2010 HBSC surveys were built on these earlier surveys and are discussed further in Chapter 8.1.2.

The largest functional difficulty group was related to breathing (31%). The data collected in 2002 also had five asthma related items not reported fully in these studies since there were, according to medical standards (Mukaka, 2012), low correlations between breathing difficulties and doctor diagnosed asthma. Furthermore, another study reported a lack of evidence to support differences in MPVA between children with and without asthma (van Gent, et al., 2007). In addition, adolescents with breathing difficulties could have conditions other than asthma (McKoy, et al., 2012) such as part of a group of allergens (Haahtela, et al., 2008) or less common, Cystic Fibrosis (McKoy, et al., 2012). As the largest category and the stress on aerobic activities, more research is needed in PA.

The next largest functional difficulty group included difficulties in moving around or in handling objects, or both (6%) and were categorised as having motor difficulties. While there are a number of publications on physical activity of children with motor difficulties (Bloemen, et al., 2015, Capio, et al., 2010), they relate to a small known proportion of the HBSC sample. Often these studies report children with moderate to severe motor difficulties, convenience samples

used or insufficient replications of small samples make findings difficult to generalise.

There were 3% of adolescents with communication difficulties include those that reported difficulties in speaking or hearing, or both. Studies into PA for people with even the most severe of these functional difficulties are lacking. In particular, these difficulties are not considered as part of disability in the International Paralympic Movement. Despite this, the history of competitive sport for the deaf spans longer than the sports for people with physical or intellectual impairments (Lieberman, et al., 2013). Rather, research on physical education for children with hearing impairments has referred to ways to raise awareness in how to communicate with this group (Stewart and Ellis, 2005). Tests of different types of physical fitness among children with different severities of hearing impairment and compared with children without hearing impairments demonstrated many similarities in test scores (Winnick and Short, 1986). The amount of PA reported by this category was quite high for boys (30%), but very low for girls (5%) and reasons for this are unknown.

The next largest functional category group included adolescents with difficulties in seeing (2%). This is the not the same as reporting blindness since pupils had the ability to complete the pen and paper questionnaire without the need for an adapted version or an assistant. These figures have however, provided some insight into the number of children that are part of the general education system, and yet feel they have difficulties with seeing. Adolescents in this group had also the lowest amounts of PA (Study I), when compared to all other functional categories.

The last functional category group included adolescents with epilepsy (2%). Compared with national surveys, of 0.7% (Rajantie and Perheentupa, 2005), there seems to be a higher reporting from HBSC data than other sources. In recent years, this type of condition has been a concern for schools in Finland. Adolescents with epilepsy may find they take part in less MVPA because they are afraid of experiencing a seizure during exercise (Ramirez, et al., 2009). To overcome this type of fear and to encourage more healthy lifestyles through PA, health professionals have been advocating PA as a means for self-management for epilepsy (Fleeman, et al., 2015).

It would be naïve to conclude that children have only one type of condition. This was also the case with this study, as the combination of breathing and motor difficulties were common enough to be used for analysis in the study, as was barely breathing and communication difficulties (1%). In fact, other research from HBSC has indicated that children may have more than one LTID functional difficulty (Boyce, et al., 2009, Raman, et al., 2007). From the new items from the 2014 data, almost one in ten adolescents with LTID has at least three conditions. More data is needed before sufficient sample sizes can be found to conduct more research on this type of population.

### 8.1.2 Issues concerning measures

The definitions of disability using the ICF make it difficult to provide a short way of measuring disability. A holistic approach is to use the Disability Adjustment Scale (WHODAS 2.0), but this has not been tested on adolescents in Europe. Previous research in disaggregation of disability has tried to use simple questions targeting a yes or no response to disability, through proxy, through medical records, through DALYS, or some limited functional difficulties (Hvidberg, et al., 2016, Cappa, et al., 2015) or were based on adult survey items without validation (Terveyden ja hyvinvoinnin laitos [National Institute for Health and Welfare], 2010, Dale and Marsh, 1993). While it is important to test the construct validity and reliability of such screening instrument, various challenges need to be overcome.

To accurately report the prevalence of adolescents with LTID, a very large sample is needed. Estimates for disability range from 15% to 20% (World Health Organisation, 2011). To collect data on 15 disabled children, 100 randomly selected children need to be involved. Large sample upscaling may still lead to errors and misreporting may happen. Statistical weights might not be representative of the health behaviours of interest, and measuring severity requires even larger samples.

Some disabled adolescents experience stigmatisation on a regular basis which can make disabilities seen as a negative aspect of life (Scambler, 2012). True negative results may yield from items that are too directed to sensitive issues (Miller, et al., 2011). However, when compared to other forms of data collection in sensitive issues, self-reported questionnaires have been seen to provide higher levels of reporting than face to face interviews (Bradburn, 1983).

Questions that use close responses (yes and no) as opposed to open ended questions have also been found to have increases in reporting prevalence, however, with over 14000 conditions registered in the ICD-10, it is not feasible to include all the main conditions in a large survey such as the HBSC. Computer aided questionnaires may also provide a way of programming codes and responses for analysis. To make use of technology, all schools involved in the study need to organise their survey completion time around a sensitive environment with availability of computers for each pupil.

Irrespective of the mode of completion, there are four stages in responding to surveys; comprehension of the question; retrieval of information; judgement and estimation; and, reporting an answer (Groves, et al., 2004). The first of these components is related to the way the individual understands the survey question from a lexical, semantic and pragmatic way. These questions are based on self-report, so there is the assumption that the individual can respond to the question by understanding what all the vocabulary in the question means, how the concepts in the questionnaire map to their own circumstances, and the responses are intended to be used to report a subpopulation group.

The second component; retrieval of information, requires the respondent to be able to note whether they have been told or not and if they can recall from

their long term memory of the correct response. Examples of retrieval of information include occasions where adolescents with LTID have been informed by a doctor of a condition at a very young age, and it has become so familiar for them, that they have forgotten that a doctor has diagnosed them. Another possible scenario for retrieval error is when a recent visit to a doctor may elevate the possibility of inappropriate responses. This may happen if the pupil was recently told by the doctor they have an infection, like influenza. To avoid these possible errors, a set of cues are written in the item such as examples of certain conditions, as well as stating that a doctor has conducted the diagnosis.

Judgment and estimation is the third component and are sources of error that can take place while providing responses. In this stage, respondents have to consider how the term 'long term' is considered. Compared with the average life expectancy of an adult, the age of adolescents can be between one fifth and one sixth of the life span. Adolescents make a judgement based on the definitions they understand and then estimate if a condition they have is long term before they can respond. The semantics of the questions used have least amount of estimation, without need for recall, and instead seek for clarity on a singular issue. Hence, the final aspect during the creation of the response is the mapping and reporting. At this phase, after each has been completed and has been reflected upon, the individual must provide a 'yes' or 'no' response.

## 8.2 Physical activities among adolescents with LTID

This study builds on previous research that used HBSC data whereby the amounts of PA had no statistical significant differences between adolescents with and without LTID (Rintala, et al., 2011). However, differences were reported in the additional results from Study II. Non-sport club member boys with LTID were statistically significantly less active than non-sport club member boys without LTID. This one group may not have been large enough to affect the overall population collected and analysed by Rintala and colleagues (2011). By examining adolescents that are not already physically active, it reinforces other studies such as those by Rimmer and Rowland (2008) whereby children with LTID are exposed to lower levels of PA and inactivity can lead to lower quality of life and decreased health.

There are a number of observational studies that also found differences between groups of children with and without disabilities. For example, Carlon and colleagues (2013) reported studies consistently demonstrating children with physical impairments were less likely to adhere to daily PA recommendations than their peers without such impairments. In addition, Stewart and Ellis (2005) reported adolescents with hearing impairments had lower motor skills and fitness levels than peers without hearing impairments as a result of not taking part in regular PA. Therefore, the results of this study complement existing research as well as point out the need to take into consideration the ICF when disaggregating for disabilities (Chapter 8.2.2).

### 8.2.1 Demographics associated with physical activities

More boys have reported to be active daily than girls in all years of data collection. There are numerous studies from the general population that have also reported the same (Biddle, et al., 2011, Kalman, et al., 2015), and that more work is needed to increase the amount of girls PA (Whitehead and Biddle, 2008, Pate, et al., 2007, Neissaar and Raudsepp, 2011, DeBate, et al., 2009). The increase for PA has improved over time, whereby there was a larger increase in girls than boys. This would indicate that overall the gap between boys and girls is getting less. However, if the trends continue in the same way as the previous 12 years, the amount of non-member boys would overtake the girl members in the prevalence of meeting PA recommendations. Studies conducted in the future may need to explore this as Chapter 8.2.2 underlines the importance of sport club membership for increasing PA levels. It is important to note that while much attention has been to increase the number of girls taking part in PA in general, work is still needed to improve the overall amounts of PA in both boys and girls, in particular in adolescents with LTID (Rimmer and Rowland, 2008).

An area that could be improved is the way the identity of competitive sports is portrayed. There is more media coverage of male sports than women (Laine, 2016) and that makes it easier for adolescents to form an idea of an athletic identity. There are differences in sport preferences between boys and girls with LTID, whereby boys like team and individual sports, while girls only liked individual activities (Rintala, et al., 2004). These interests from boys can set an inferiority complex whereby boys acknowledge their own identities are different from the athletic identities. Suitable role models can be a source of increasing motivation to do PA (Goodwin, et al., 2004) and perhaps better social support (Suomen Vammaisurheilu ja -liikunta VAU ry, 2011). International PA recommendations were introduced in 2010 (World Health Organization, 2010), which could have made it harder for boys to feel accepted in clubs despite the need to be more physically active. This maybe one of the reasons for an increase in the PA levels of non-member boys between 2010 and 2014. Girls, on the other hand seem to have different reasons to PA and this seems to have applicable for sports club members and non-members. More specifically, the top three reasons for girls with LTID to take part in exercise was to improve their health, to get in a good condition, and to have fun, reinforcing the awareness of health from PA more than the social aspects reported by boys (Rintala, et al., 2013).

In all years of data collection, younger adolescents (13 year olds) were more active than older adolescents (15 year olds). This finding is not a new finding, as a lot of research from the general population has found that participation rates drop after around the age of 11 (Anderssen, et al., 2005, Bélanger, et al., 2009, Kalman, et al., 2015). Other activities, including spending more time on studies have been good reasons for the reduction of PA for older adolescents (Craggs, et al., 2011). Although all students in general education would have the same pressures to complete their compulsory education, there may be other influences that have encouraged the adolescents to keep up with their levels of

PA. Perhaps it could be part of the adolescent's rehabilitation or therapy to remain active (Asbjørnslett, et al., 2014, Durstine and Moore, 2009, WHO, 2007).

In Study I, the amount of PA varied among different functional categories, however, they were not statistically different. In this way, concerning PA and VPA, a non-categorical approach (Stein and Jessop, 1982) is supported for adolescents with LTID that attend general education systems. The non-categorical approach would suggest that behaviours from adolescents with different functional difficulties are, at large, similar to each other (Stein and Jessop, 1982). However, in the results from Chapter 7.3, some of functional categories were more active when they took part in sports clubs 8.2.2.

### **8.2.2 Sports clubs members are clearly more active**

Sports club membership was found to be a confounder in MVPA. Almost half of the adolescents reported that they are active members of sports clubs. The amount of sport club members remained stable among boys and increased among girls over the 12 year period (Study II). Furthermore, the amounts of PA increased over time. Despite a third of sports club members reported to be active daily (Study II), adolescents that take part in sports clubs were twice more likely to meet the recommendations of daily MVPA for 60 minutes (Study IV). The average number of days was also at least one day more in both boys and girls in sports club members. Participants in sports clubs with reported epilepsy were on average 3 days more active than non-members with the same functional difficulties. Similar results were among adolescents with reported seeing difficulties whereby those that participated in sports clubs were 2 and half days more active than their non-member peers.

The management of sports clubs can influence whether boys and girls with LTID are supported sufficiently to maintain sufficient levels of PA. If there are environments that are not welcoming, adolescents can turn to other activities (Hästbacka, et al., 2016). In recent times, availability and access to mobile technology for adolescents has increased. E-sports are a worrying public health concern, particularly as online games or e-sports is predominately participated by males, and conducted while being sedentary (Graves, et al., 2008). More can be done to provide better knowledge for the coaches, trainers, and managers to encourage engagement and continued participation amongst adolescents with LTID. Training programs such as health promoting sports clubs are needed to recruit and retain adolescents in sports clubs (Kokko, 2014).

Participation in sports clubs allows for frequent practice of skills that promote perceived competence, fitness and exercises, all with the potential to improve body image. Furthermore, in sports clubs there are opportunities for social interaction which reinforce these psychological assets (Gísladóttir, et al., 2013). Studies by Telama et al. (2006) and Wichstrøm et al. (2013) report the link between adolescent sports club and adult PA behaviours, however studies like these have yet to disaggregate the data by disability. Valuable information could be seen from these types of longitudinal studies as it would help researchers understand the associations better. In general, adults with LTID re-



quire strong psychological assets to facilitate societal participation in higher education, work, PA and political activities (Hästbacka, et al., 2016). As such, the framework from the ICF whereby there are interactions with MVPA, sports club participation and personal factors could also be useful predictors when goal setting.

### 8.2.3 Personal factors in association with physical activities

The personal factors that were documented in Study III & IV were the best fit univariate factors for PA. These were intention for future PA, PA self-perceptions, global self-esteem (GSE), educational aspirations, as well as gender and age. The HBSC study includes many other items related to personal factors but they were either not found to be supported by the literature or were suitably fit variables in the analyses.

Personal factors are not coded in the ICF. This allows researchers to explore and identify how personal factors can be used in the ICF. Based on the design of the ICF, personal factors should act as either facilitators or barriers (WHO, 2001). However, the statistical models produced results that focus on facilitation. To balance the understanding of PA as an activity in the ICF, a study on barriers is needed. One way would be to explore the associations between other personal factors and low levels of PA.

Intention for future PA and PA self-perceptions were important variables associated with increase PA (Study III & IV). There is also empirical support for these associations in both general population research (Lintunen, et al., 1995, Hagger, 2014) as well as disability specific populations (Lintunen, et al., 1995, Bloemen, et al., 2015). These two variables are consistently reported to be associated with PA, and could be considered as part of an activity specific personal factor. This suggestion has been highlighted in the PAD Model (Bloemen, et al., 2015, van der Ploeg, et al., 2004) and may serve as a suggestion for how to develop the personal factors component of the ICF.

In relation to the PAD model (as mentioned in Chapter 3.2), the results of this study partly support it. However, after synthesizing of the literature by Shields et al (2012) and Bloemen et al (2015) some components were lacking. The results from Study III provide evidence that there are interactions of GSE in boys with MVPA, however GSE is not a characteristic in the PAD model. This could be one of the limitations on systematic reviews owing to some information lost during the collection of studies, exclusion criterion, level of agreements among authors, as well as overlapping studies with various outcome variables (Geyh, et al., 2011). None the less, from literature reviews, one personal factor that seems to be important but is hardly measured is the use of time as a facilitator or barrier towards PA (Bloemen, et al., 2015). Disabled children often consider a lack of time to play, the need to do homework and other activities as other important activities (Hästbacka, et al., 2016). Perceived health was not found to be significant in the models, despite being reported as the main reason to exercise (Rintala, et al., 2013). More studies are needed to explore the interpretation behind perceived health and exercise for health.

GSE in adolescents with LTID tends to be lower than their peers without LTID (Shields, et al., 2006). This would make it an important variable to consider when encouraging non-members to take part in more PA. The regression coefficients from Study III were quite small, and in some cases, they may not be considered worthy to note (Hayes, 2013). The sensitivity of the scale produced by the Rosenberg scale may also play a part in the way it can be interpreted (Marsh, 1996) and was still reported. It was also noted that for boys, GSE was a mediator between the relationship of perceived fitness and intention for future PA (Study III). It is likely that, in the case of boys with LTID, there are higher expectations for all boys to be physically competent from professional sports media (Hagger, et al., 2005). A boy who is not seen as competent is marginalised (Bramham, 2003), or perhaps in the eyes of Goffman's work (1963), is stigmatised. Examples of making fun of less able boys have been reported elsewhere (Hill, 2015). Overcoming the fear of being bullied can be initiated by extra staff and trained instructors to be aware of these situations and create a safe environment for all (Suomen Vammaisurheilu ja -liikunta VAU ry, 2011).

Sport has often been regarded as a masculine culture (Hill, 2015). During adolescence, hormonal levels of boys may lead to behaviours that promote social solidarity on one hand, but also formulate ideas to marginalise others that may not fit into the group (Bramham, 2003). Unlike other school subjects, preparations for the lesson include changing clothes and revealing bodies. The environment can be intimidating, especially if the person has some type of difficulty that is visible in the changing room and then later pronounced during the PE class (Dunn and Watkinson, 1994). There is a big role in society that is needed to reduce stigma of boys that may be less competent to their peers. Often training leads to more competence, while not being able to do something makes it harder to continue participation in PA (Caprara, et al., 2008, Fraser-Thomas, et al., 2008). Encouraged mechanisms of going to clubs with a friend or buddy would be useful mechanism to motive participation (Saari, 2015). Environmental factors were not tested in these studies so to keep the parsimony of the ICF personal factors. Future studies may find risk estimates reported are affected by other uncontrolled confounding variables such as family, peer group, school, and neighbourhood levels.

Educational aspirations were found to be statistically associated with increased MVPA (Study IV). For studies of the general educational system, an aspiration to attend higher quality education has been associated with more PA (Vuori, et al., 2012). This was the inverse of the results from Study IV. It appears that adolescents with LTID who aspire not to general upper secondary schools do more PA. Explanations for this are limited. When utilising ICF terminology, it would appear that aspirations for vocational education are facilitators for increases in PA behaviour. Perhaps, in the instance of attending general secondary comprehensive school, it requires more time to study reducing time to be physically active. On the other hand, adolescents with LTID who prefer to attend vocational education systems may be inclined to take part in more PA without too much studying and exam pressures.

### 8.3 ICF framework for physical activities

The ICF was used as a framework for this study. The research questions were designed around the use of the codes and qualifiers. However, the ICF is not the only model used in disability discourse (Oliver, 1996, Gabel and Peters, 2004), less is it used in the physical activity domain (Rimmer, 2006). The ICF can be applied to all people, as a common language approach, and one that does not delineate people with and without disabilities without taking into account the various interacting components (Bickenbach, 2012). Through the ICF, interactions between functions, activities and participations with contextual factors are used to develop our knowledge in PA in adolescents with LTID.

Much of the prior research on PA has highlighted the importance of one of the contextual factor within the ICF, known as environmental factors (Bult, et al., 2011, Badley, 2008, Rimmer, 2006). These environmental factors could include facilities, family, peers and financial support, however these were not included in this study. Rather, the data was from a national representative sample from Finland, and to interact with the ICF, children are exposed to Finnish curriculum in school PA, and sports activities in Finland outside of school PA.

As written in the ICF, one of the future directions is to develop the personal factors component. Although there is a growing amount of research in relation to a number of life domains, including PA (Geyh, et al., 2011), more studies need to be carried out. Suggestions to modify the ICF are not new. In 2007, the WHO released the children and youth version of the ICF, namely ICF-CY (WHO, 2007). Current work is carried out on the revision of the ICF whereby the ICF-CY will be merged back into the ICF. Suggestions of this process include the introduction of a third qualifier that will capture engagement of activities and participation of children (Granlund, et al., 2012). Although this would enable age reference classifications of individuals over time, another suitable method would be to generate a new qualifier on age. Yet, if these routes are chosen, then more conceptual problems with the selection of choosing personal factors open up. Age, is considered a personal factor. Children do not go to work, they attend school. Retired people do not have to do either. The same may be argued for other personal factors such as gender, education and values, but it is a challenge to delineate what has its own qualifier, its own codes or remains without a code.

As well as connecting the data from this study with the previous literature on the development and ontology of the ICF, the results promote the idea of a second tier of the personal factors based on activities and participation. Currently, the component on Activities and Participation has nine chapters of its own. The alphanumeric coding is hierarchical and ends with notion for barriers or facilitators. A revised version that uses coding for personal factors will need to meet the ontological requirements of; a) phenomena that can be defined, b) phenomena that can have a taxonomy or codes, c) phenomena needs to be specific, d) conditions for classification of phenomena must be specified, and e)

components of the phenomena must be independent and non-overlapping in relation to other components (Simeonsson, et al., 2014).

After taking these requirements into consideration, the evidence from Studies III and IV suggest the possibility of making nested personal factors based on the different activities and participation. To develop a phenomenon that can be defined with its own code without overlapping, psychological assets require a specific relation to be associated with. Self-efficacy was the most cited concept of personal factors (Geyh, et al., 2011) and it has been noted for it to be effective, it must be content specific (Bandura, 2007). This would change the way the contextual factors are interconnected with each other, as personal factors would be nested to the activity and participation component, with environmental factors related more to the activity than the individual. This type of framework may be considered in other activities and participations and personal factors associated with them.

In Figure 2, the code used to illustrate the importance of daily MVPA was d5701. As part of the WHO recommendations of PA for health, children under the age of 18 should participate in MVPA for at least 60 minutes a day. However, in the ICF, there is no specific code that relates to overall physical activity. D570 is the qualifier for “looking after one’s health”, that includes physical comfort (d5700), managing diet and fitness (d5701), and maintaining one’s health (d5702). The ICF recognises the importance of “being aware of the need and by selecting and consuming nutritious foods and maintaining physical fitness” (WHO, 2001, p.165). McPhearson and colleagues (WHO, 2008) presented a combination of physical activity, sedentary behaviour and diet as important components for weight management leading towards health. Other codes related to PA and participation include “Walking (d450)”, “Moving around (d455)”, “Recreation and leisure (d920)”, and for daily routines, “Carrying out daily routine (d230)”.

The ICF currently lacks its own code for maintaining PA for health. This would require a uniformed definition of PA for the inclusion into the ICF. The ICF can use the term of ‘physical fitness’, as this is clearly defined. However, taking part in PA for health is much more than just physical health. There are also short and long term social and psychological health benefits from regular PA, (Lintunen and Kuusela, 2007, Kipp and Weiss, 2013). Therefore, during the revision process of the ICF, the inclusion of PA as a qualifier would be an important milestone to understanding improvements to functioning, disability and health.

## 8.4 Strengths and limitations

The main strength of this dissertation was the compilation of four studies that focused on PA as an outcome variable in adolescents with LTID. The studies were carried out using a national representative study through the self-reporting of adolescents in 2002, 2006, 2010 and 2014. Furthermore, in each data

collection, the measures were the same to allow for trend analysis as well as pooling data to make it possible to run appropriate statistical analysis for rare conditions. Despite these main strengths, some limitations should be raised and discussed further. These limitations may be taken into account to help interpret the results of the study and consider future directions for research.

The first and foremost point is related to sample process, the responses, and the interpretations taken from the data. Fortunately HBSC network members have the support of each other when developing the protocol, which includes collecting national representative data. Finland has a number of Swedish speaking schools, and to include them requires Swedish translated items. The Finnish survey has items that differ from the Swedish national survey and requires extra resources to administer. Because of financial reasons, they were not included in the 2002 and 2010 data collection. This could have changed the representation of the country.

More specifically, the HBSC survey is tailored towards the general schools. Owing to the discussion of this dissertation relying heavily on a sub-population group of disabilities, students with disabilities that do not go to general schools were not included into the study. Furthermore, information about school classroom designs was missing. The classes that took part in the survey had been randomly selected and, by chance, under- or over-estimated the prevalence of disabilities in a class may be present. Class level cluster designs are useful for simultaneous data collection and may be useful to utilise in future studies.

Data was collected through self-reported questionnaires. There were several measures on self-perceptions and self-reporting is a very suitable design. While much effort has been taken in the design of the HBSC questionnaire, there are still the occasional misunderstandings or lack of ability to recall accurately the true responses desired by the questions itself. The strength of the questionnaire is the uniform way the items are laid out. A process of translation through back-translation methods is used (Liu, et al., 2010). However, in some cases, back-translations relies heavily on the understanding of the translators, and perhaps, items on disability may be best served using a contextual translation mechanism (Mont, 2007).

National items used in this study were first from Finnish language and then translated into English for reporting. There may be some error in the way it is interpreted if it were in English. An example of this is the word 'Liikunta' in Finnish, and what the word is for it in English. Researchers believe there is a vast expansive definition in English (Heikinaro-Johansson, et al., 2014). Professional translators were used so that reporting is best interpreted.

Self-reported PA measures have received a lot of attention with its lack of construct validity. There are many studies that use objective measures of PA using devices like step counters or accelerometers (Aro, et al., 2015, Tudor-Locke and Schuna, 2012, Troiano, et al., 2008). Although there is emerging evidence that suggests objective measures provide good indicators of actual physical activity, they also have their own set of limitations, such as cost, ability to track all activities, and in accurate recalls, amongst others (Troiano, et al., 2012).

Some other studies have tried to use both and reported the reliabilities of either instrument (Määttä, et al., 2016, Nusser, et al., 2012, Rangul, et al., 2008). There are ongoing discussions about the appropriate cut off values for alignment to the different intensities. Also, missing data that devices can be problematic when comparison studies take place. As mentioned on page 58, there are also risks with survey response errors.

The measurement of sports clubs was discovered to be a confounding variable for PA, yet there could be other variables that may also be confounders, but were not included in the statistical models. Furthermore, there are known relationships with family wealth, physical environment, as well as peer relationships with PA (Bloemen, et al., 2015, Shields and Synnot, 2016). These variables were not included in the studies as the focus has been on the personal factors from the ICF. Further studies to clarify how the findings from the studies may interact with some of the environmental factors are welcomed. Particularly, many of the personal factors have been seen as significant correlates of physical activity in general populations of adolescents (Bauman, et al., 2012). For adolescents with LTID, the use of some of the ICF codes as areas to measure may provide some results that serve as guidance for macro level interventions. Future studies should focus on this.

The HBSC is an international network that spans Europe and North America, with a few linked projects in other parts of the world. Reports based on HBSC data help inform policy on various health behaviours. The design of the study is to be able to provide comparable information across countries, and the data for this dissertation is from such a study. Caution for interpreting this when comparing other countries as personal factors may be different in other countries. With this, the environmental factor of the country of Finland can be used to present a complete overview of the existing ICF framework. Studies that continue with reporting the amount of PA among different countries within the HBSC network would be a valuable insight into how the results from this dissertation might apply differently in what is coded as e2 'environments'.

Finally, the statistical models that produced associations with physical activity were based from cross-sectional data. In that, theoretical assumptions were made for mediation analysis (Study III) and binary logistic regression analysis (Study II & IV). Acknowledging that there could be some incidences where the direction may go in the other direction is advised. For example, in the mediation analysis, GSE of boys with LTID may also be influenced by the boy's own perception of whether they would be active in the future. For people that do not feel like they will do PA in the future, it may lead to lower GSE. Longitudinal study designs would be advisable to explore if these causal patterns exist. Furthermore, the outcome variables in research question were the PA variables. Studies of morbidity may be interested in using the disability related questions as the outcome variable and consequently indicate the relative risks for adolescents with LTID.

## 9 CONCLUSIONS AND IMPLICATIONS

Many studies and reports highlight the importance of physical activity for health. However, less is known about how active adolescents with LTID are and what some of the factors that are were associated with it. This dissertation has aimed to do this by reporting the prevalence of children with LTID in general schools, the amounts of physical activity, and the ICF personal factors that were associated with that.

- Over a decade, the prevalence of adolescents with LTID was 17%. Slightly more girls were found to report LTID than boys, and there were no statistical differences between 13 and 15 year olds.
- The averages of PA varied among adolescents with different types of functional categories. Boys were more active than girls, and younger adolescents were more active than older adolescents.
- The amount of PA has increased between 2002 and 2014. Little change has taken place between 2010 and 2014 whereby at one in five adolescents meet PA recommendations for health, which consists of, at least 60 minutes of MVPA per day.
- Almost half of the adolescents with LTID are sports club members. Sport club members are two times more likely to meet the recommendations of daily 60 minutes of MVPA
- The psychological assets of intention for future PA and PA self-perceptions were common personal factors associated with PA. More striking findings were found only for boys, as the role of global self-esteem is a significant mediator between perceived fitness and intention for future PA and where educational aspirations not to general upper secondary schools were associated with more PA.

These results from this dissertation can be useful for several stakeholders, at various levels including the individual with LTID, teachers, parents and trainers of PA, as well as policy makers. Therefore, there are three main areas to consider for implementations based on the results of this study; increasing adolescent PA, policy awareness for PA, and updates for the ICF.

## 9.1 Implementation for increasing adolescent PA

Teachers and trainers of PA need to continue to encourage adolescents with LTID to be physically active. The results of this study point towards stronger and effective facilitators for inclusive PA. In this way, encouragement to sustain good PA self-perceptions is needed. Outside of the school context, competitiveness can be good to build character and determination, however for boys this may lead to some stigmatisation.

Encouragement to continue to do activities whether formal or informal may be a topic taken up by parents. Considering that the school time contributes to a proportion of the day, there are other possibilities to keep up with regular PA. Examples include the use of active transport to and from schools. Other considerations for parents are to encourage their children to take part in organised or unorganised sport activities. There are strong associations between being a sports club member and the amount of MVPA and VPA levels. With this, there are more risks to sports related injuries and studies may need to look at the associations between safety promotion of PA and disabilities.

Schools in Finland do not have interschool competitions nor do they have their own clubs. Rather, independent of a school, a local sports club structure that fit into the school system may benefit from access to club members and share of facilities. Programs like 'Schools on the Move' (liikkuvakoulu - <http://www.liikkuvakoulu.fi/in-english>) are in the best place to champion this. Various research designs that disaggregate adolescents with disabilities are needed to continue to build on the findings from this study as well as test out some of these recommendations. Research studies that can track adolescents over time in longitudinal studies would allow these results to be revisited in years to come.

Differences in pedagogy and coach instructions may be needed for heterogeneous groups. Physical activity is a particular type of health behaviour, which requires motor skills, communication and other attributes. Indeed, there are differences among different functional categories for giving instruction, however outcomes of physical activity for health remains the same. Therefore, inside the sports club, better provisions are needed to encourage participation by all people regardless of abilities and discourage stigmatic behaviour.

## 9.2 Policy awareness for physical activities

Adolescents with LTID can find that these results have reflected on their own opinions about health behaviours, in particular PA. Adolescents with LTID have indicated that the phenomenon of taking part in more PA is similar across the various functional categories. It is important for a collective understanding among groups of LTID as each person's intention for future PA and PA self-perception is associated with PA. That is to say, an adolescent is interested to do



PA in the future because they take part in more PA, and vice versa. Future studies may want to extend the models of PA with other health related outcomes, for example life satisfaction, somatic complaints as well as sleep, nutrition and health awareness.

The most recent data shows that the proportion of non-member boys reported daily MVPA is almost the same as sports club member girls. These findings support the need for two distinct policy plans based on gender. Ways to increase the levels of PA in girls is important in both organised and non-organised settings. Encouraging girls to take part in sports clubs can make adolescents with LTID two times more likely to meet international PA recommendations of at least 60 minutes of MVPA per day. The types of sports clubs might start off as informal clubs with the focus to do PA among friends. This safe environment allows self-appraisals based on the actions of other peers and not so much the media. Other types of plan are to facilitate boys to be physically active in a non-organised way and to encourage organised sports to be aware of inclusive methods. National monitoring of School-age PA behaviours (SPA study – Liitu study) need to continue to assess the change in trends for these two routes for increasing PA. Instruments that can evaluate objective PA behaviours as well as adolescent networking are encouraged.

Levels of PA have increased over time and this reassures that work carried out by policy makers has been working well. However, more work is needed. School-aged PA studies that disaggregate disabilities would help shed light into the situation of inclusion in schools and in organised activities. Recommendations for specific health conditions may be something that might be considered as global recommendations were incorporative of all adolescents. Clear statements of the risks of exercise-induced asthma are needed but also supported statements that increases of physical activity for people with breathing difficulties is beneficial for individual's health. There are also similar reports for adolescent with epilepsy, visual impairments and motor difficulties. More empirical studies to determine recommendations for different conditions are needed.

### **9.3 Updates for the ICF revision process and monitoring disabilities**

The ICF is currently undergoing a revision process. It is part of a Family of Classification (FIC) that comprises of the ICD-10 and newly created International Classification of Health Interventions. There have been some discussions about the ontology of the ICF in its current form. Similar discussions took place when the ICIDH was revised before it was formerly known as the ICF. Results from this study indicate that the ICF may benefit from the use of a multi-level component of activities or participation. In this way, the ICF retains its interactions between the components as well as integrates personal factors specific to those components. It would make the ICF clearly organised with qualifiers and

coding separate for each activity. This may, at first seem a bit of an arduous task to do, however, once complete, it would provide codes for personal factors, and it will be in reference to other aspects of functioning.

Self-reporting LTID ranged from one in six to one in five adolescents. This type of data collection used an instrument that was based on the medical model of disability, whereby self-reported medical conditions were asked. The biopsychosocial model of disability, in the form of the ICF, was also included whereby functional categories and condition related symptoms were used to identify how certain types of conditions may be analysed between groups.

The Salamanca Agreement (UNESCO, 1994) is based on the universal rights to education, and education systems have a need to observe if this is actually working. Through the use of the HBSC study protocol and the question on LTID, there is now a reasonable way to approximate the overall picture of inclusive education. Through the HBSC study, refinement of functional categories have been used and analysed and this maybe soon become a defining way to measure disabilities from self-report surveys of adolescents, as there has not been a way to do that yet. This may become even more important as the momentum of disability research gains grounds in the areas of the UN post-2015 goals, whereby one of the key components will include the need to provide disaggregation for people with disabilities (UN, 2014, Article 12). This is also a right within the CRPD and the refinement work that took place to complete the study could be further developed for these purposes.

## YHTEENVETO (FINNISH SUMMARY)

### Vammaisten ja pitkäaikaissairaiden nuorten liikunta-aktiivisuus ICF<sup>i</sup>-luokituksen yksilötekijöiden näkökulmasta

Osallistuminen ja monipuolinen aktiivisuus ovat tärkeitä nuoren toimintakyvylle ja terveydelle. Liikunta-aktiivisuuden on todettu edistävän fyysistä ja psyykkistä terveyttä, ja osallistuminen liikuntaseurojen toimintaan voi myös lisätä sosiaalista hyvinvointia. Vaikka liikunnan terveystyö tunnetaan varsin hyvin, nuorten liikunta-aktiivisuus on edelleen suurelta osin riittämätöntä. Nuorilla, joilla on lääkärin toteama pitkäaikainen sairaus tai vamma (LTSV<sup>ii</sup> myöhemmin tässä tekstissä), on kohonnut riski saada lisäsairauksia tai vammoja vähäisen liikunnan seurauksena. Säännöllinen liikunta voi täten hyödyttää nuoria, joilla on LTSV. Liikunta voi vähentää heidän riskiään sairastua esimerkiksi diabetekseen, syöpään, sepelvaltimotautiin ja masennukseen sekä parantaa heidän sosiaalisia suhteitaan ja lisätä kuulumista erilaisiin ryhmiin.

Nuoruuteen kuuluu suuri määrä fysiologisia ja psykologisia muutoksia. Silloin tytöt ja pojat myös alkavat huomata eroja, jotka liittyvät heidän kehoonsa ja fyysisiin taitoihinsa sekä tiedostavat, kuinka liikunta ja kuntoilu vaikuttavat heihin. Tässä iässä heidän elämänsä kuitenkin tulee useita yksilöllisiä ja ympäristöstä johtuvia liikunta-aktiivisuutta rajoittavia tekijöitä. Nuoruus on tärkeä elämänvaihe, jolloin luodaan pohja myöhemmille elintavoille. Nuoruuden liikunta-aktiivisuus on yhteydessä aikuisiän harrastuneisuuteen, varsinkin jos osallistuminen tapahtuu järjestäytyneessä ympäristössä kuten urheiluseuroissa. Kansainvälisten tutkimusten mukaan LTSV-nuorten liikunta-aktiivisuus on vähäisempää kuin muiden nuorten, mutta suomalaiset, tavallista peruskoulua käyneet LTSV-nuoret eivät eronneet vammattomista koululaisista liikunta-aktiivisuuden suhteen.

Tämän tutkimuksen viitekehyksenä käytettiin WHO:n kansainvälistä toimintakyvyn, toimintarajoitteiden ja terveyden luokitusta (ICF-luokitus). Käytönottovuodesta 2001 lähtien ICF-luokitusta on pidetty vammaisuuden ja toiminnallisuuden yhteisenä kielenä erilaisissa ympäristöissä ja eri maissa toimivien ammattilaisten välillä. Tutkijat ja ammatinharjoittajat ovat käyttäneet sitä, ja sitä on sovellettu myös liikunta-aktiivisuuteen. ICF-luokitus jaetaan kahteen keskenään vuorovaikutuksessa toimivaan osaan, mikä helpottaa toiminnallisen terveydentilan luokittelua. Ensimmäinen osa liittyy toimintakykyyn ja toimintarajoitteisiin, ja siinä on kaksi komponenttia: 1) ruumiin/kehon toiminnot ja ruumiinrakenteet ja 2) suoritukset ja osallistuminen. ICF:n toinen osa kattaa kontekstuaaliset tekijät, ja sen kaksi komponenttia ovat 1) ympäristötekijät ja 2) yksilötekijät. Kontekstuaaliset tekijät voivat vaikuttaa yksilön lääketieteelliseen terveydentilaan. Ympäristötekijät ovat yksilön ulkopuolella, mutta niiden kohteena on joko yksilöllinen tai yhteiskunnallinen taso. Yksilötekijät ovat henkilökohtaisia ominaisuuksia, jotka eivät ole osa lääketieteellistä terveydentilaa; tässä tutkimuksessa keskitytään niihin, koska tärkeinä nuoruusvuosina omaksutut tavat ja asenteet säilyvät usein myös aikuisiässä. Tämän tutkimuksen tarkoituk-

sena on ollut kuvata eri toiminnallisiin kategorioihin kuuluvien nuorten liikunta-aktiivisuuden määrää ja siinä havaittuja muutoksia vuosina 2002–2014. Lisäksi selvitettiin, kuinka liikunta-aktiivisuus, liikuntaseuran jäsenyys ja ICF-luokituksen yksilötekijät ovat yhteydessä toisiinsa nuorilla, joilla on pitkäaikainen sairaus tai vamma.

Tutkimuksessa käytettiin WHO-Koululaistutkimuksessa (HBSC study) kerättyä Suomen aineistoa, joka on kansallisesti edustava otos 13- ja 15-vuotiaista koululaisista vuosina 2002 (n=3016), 2006 (n=2979), 2010 (n=3578) ja 2014 (n=3250). Eri vuosien yhdistetty aineisto osoitti, että 17 %:lla (n=2206, keskimääräinen ikä=14.8 vuotta, 55 % tyttöjä) oli itseraportoitu LTSV. Mikäli mahdollista, toiminnallisten vaikeuksien kuvaukset sisällytettiin analyysiin. Kaikissa eri vuosina tehdyissä tutkimuksissa käytettiin samaa HBSC-protokollaa ja mitattiin osioita, jotka kuvasivat liikunta-aktiivisuutta, liikuntaseuran jäsenyyttä, liikunta-aktiivisuuden koettuja psykologisia hyötyjä ja koulutusorientaatiota. Aineiston kuvailun lisäksi käytettiin sekä lineaarista regressioanalyysiä että binaarista logistista regressioanalyysiä liikunta-aktiivisuuden ja yksilötekijöiden välisten yhteyksien selvittämiseksi. Lisäksi suoritettiin pitkäaikaisia muutoksia liikunta-aktiivisuudessa selvittävä trendianalyysi.

Yli puolet LTSV-nuorista (57 %) ei kertonut omaavansa mitään luetelluista toiminnallisista vaikeuksista vuosina 2002 ja 2010. Suurin toiminnallinen kategoria olivat hengitysvaikeudet (25 %). Epilepsia (2 %) oli pienin yksittäinen toiminnallinen kategoria. Toiminnallisten vaikeuksien määrä kasvoi vuonna 2014, kun vastaukset järjestettiin ICF-tarkenteiden mukaisesti.

Niistä nuorista, joilla oli LTSV, nuoremmat (13-vuotiaat) pojat olivat liikunnallisesti aktiivisimpia ja vanhemmat (15-vuotiaat) tytöt vähiten aktiivisia. Nämä tulokset olivat toistuvasti samoja nuorilla, joilla oli vain yksi toiminnallinen vaikeus. Niistä nuorista, joilla oli useampi kuin yksi esimerkiksi hengitykseen tai motoriikkaan liittyvä toiminnallinen vaikeus, tytöt olivat kuitenkin aktiivisempia kuin pojat (tutkimus I). Vuodesta 2002 vuoteen 2014 niiden nuorten osuus, jotka kertoivat liikkuvansa päivittäin, lisääntyi 11 %:sta 21 %:iin. Eniten lisäystä vuodesta 2002 vuoteen 2014 ilmeni pojilla, jotka eivät olleet liikuntaseuran jäseniä (OR 4.6, 95 %:n luottamusväli, LV: 2.0–10.6). Liikuntaseuroihin kuuluvista tytöistä kaksi kolmasosaa (65 %) ja pojista kolme neljäsosaa (73 %) ilmoitti harrastavansa kohtuullisesti kuormittavia tai rankkaa liikuntaa ainakin viitenä päivänä viikossa. Niiden seuroihin kuulumattomien poikien osuus, jotka vuonna 2014 olivat aktiivisia ainakin viitenä päivänä viikossa, oli lähes sama kuin seuroihin kuuluvien tyttöjen vuonna 2002 (tutkimus II).

Liikuntaseurojen jäsenet (OR 2.0, CI: 1.3–3.0) olivat kaksi kertaa todennäköisemmin päivittäin aktiivisia kuin seuroihin kuulumattomat nuoret. Muita vahvoja ennustavia tekijöitä olivat aikomus olla fyysisesti aktiivinen tulevaisuudessa (OR 3.0, CI: 1.9–4.7) ja liikunta-aktiivisuuteen liittyvät myönteiset käsitykset omasta itsestä (OR 2.0, CI: 1.4–3.0). Lisäksi poikien päivittäinen liikkuminen oli yhteydessä heidän positiiviseen käsitykseensä itsestään liikkujina ja aikomukseen olla jatkamatta lukioon (Tutkimus IV). Vastausten mukaan itsearvostus (global self-esteem) oli merkittävä välittäjä poikien koetun fyysisen kun-

non ja liikuntaharrastusaikeiden välillä, mutta vastaavaa yhteyttä ei havaittu tytöillä (tutkimus III).

Tutkimuksen tulokset vastaavat aiempia tuloksia siinä, että LTSV-nuorten ja muiden nuorten liikunta-aktiivisuuden määrässä on havaittavissa samoja kehityssuuntauksia. On tärkeää huomioida liikuntaseurajäsenyys raportoitaessa LTSV-nuorten liikunnan määriä. Suomessa lähes joka kuudennella yleisopeutuksen oppilaalla on LTSV. Määrä vastaa muiden kansallisten selvitysten tuloksia, joiden mukaan 20 %:lla lapsista on LTSV. Vuoden 2010 jälkeen määrää ei kuitenkaan ole tiettävästi mitattu kattavasti ja systemaattisesti kansallisella tasolla Suomessa.

Liikuntaseuroissa tyttöjen määrä kasvoi, vaikka eniten kuitenkin lisääntyi seuroihin kuulumattomien poikien liikunta-aktiivisuus. Itsearvostuksen vaikutus koetun fyysisen kunnon ja liikunta-aktiivisuusaikeiden väliseen suhteeseen paljasti eroja tyttöjen ja poikien liikunta-aktiivisuuteen liittyvissä yksilötekijöissä. Aiemman tutkimustiedon mukaan tyttöjen suosimat liikuntalajit eroavat poikien vastaavista, samoin kuin heidän raportoimansa syyt ja motiivit harrastaa liikuntaa. Pojilla oli taipumusta harrastaa suurta mediahuomiota nauttivia lajeja, ja tämä saattoi vaikuttaa seurojen jäsenten rekrytointiin ja jäsenyyden pysyvyyteen.

Organisoitu urheiluseuratoiminta voi edistää fyysistä, psyykkistä ja sosiaalista terveyttä. Tämän tutkimuksen tulokset osoittavat urheiluseuroissa harrastavilla olevan enemmän liikunta-aktiivisuuspäiviä, ja seurojen jäsenet olivat kaksi kertaa todennäköisemmin aktiivisia päivittäin kuin seuroihin kuulumattomat. Jos urheiluseuratoiminnasta saavat kokemukset eivät ole riittävän miellyttäviä ja mielekkäitä, nuori voi päätyä muihin harrastuksiin. Tarvitaan 'Terveyttä edistävä liikuntaseura' -hankkeen kaltaista toimintaa, jotta nuoret saadaan liittymään liikuntaseuroihin ja pysymään niissä. Seuratoiminta ei kuitenkaan ole ainoa tapa harrastaa liikuntaa. Sekä kouluissa että niiden ulkopuolella tarvitaan aloitteellisuutta liittyen esimerkiksi fyysisesti aktiivisiin tapoihin kulkea koulumatkat.

LTSV-nuorten liikunta-aktiivisuusaikeet ja käsitykset itsestään liikkujina olivat tärkeitä aktiivisuuteen yhteydessä olevia tekijöitä (tutkimus III & IV). Näitä tuloksia tukevat myös sekä vammattomista nuorista että erilaisista vammaisista tehdyt aiemmat tutkimukset.

LTSV-nuorten itsearvostus on usein alhaisempi kuin heidän ikätoveriensa, joten se on merkittävä huomioitava tekijä kannustettaessa nuoria liikkumaan. Liikuntaa ja urheilua esittelevä media tuottaa enemmän fyysisiin suorituksiin liittyviä odotuksia pojille, mikä voi osaltaan aiheuttaa heikommin suoriutuvien poikien syrjäytymistä, tai jopa leimata heitä. Aiemmat tutkimukset sisältävät esimerkkejä heikommin suoriutuvien poikien pilkkaamisesta tämän vuoksi. Koulutetut opettajat ja muu henkilökunta voivat auttaa LTSV-oppilaita voittamaan kiusaamispelejä, mutta heidän tulee olla tietoisia ongelmaan liittyvistä tilanteista ja luoda kaikille turvallinen ympäristö.

Koulutusorientaation (educational aspiration) havaittiin olevan tilastollisesti merkitsevästi yhteydessä suurempaan määrään kohtuullisesti kuormitta-

vaa tai rankkaa liikuntaa (tutkimus IV). Monissa aiemmissä tutkimuksissa oppilaan korkeampaan koulutustasoon liittyvät aikomukset ovat olleet yhteydessä suurempaan liikunta-aktiivisuuteen. Tutkimuksen IV tulos oli päinvastainen. Tämän tutkimuksen mukaan ne LTSV-nuoret, jotka eivät aikoneet jatkaa luki-oon, olivat liikunnallisesti aktiivisempia. Tämän yllättävän tuloksen varmentamiseksi tarvitaan kuitenkin lisätutkimuksia.

ICF-luokittelua käytettiin tutkimuksen viitekehyksenä. Tutkimuskysymykset suunniteltiin ICF:n koodien ja tarkenteiden pohjalta. ICF:n mukaisesti yksi tulevaisuuden tavoitteista on kehittää yksilötekijöiden 'avaamista'. Kuten useita muitakin ICF:n komponentteja, liikunta-aktiivisuutta on tutkittu runsaasti, mutta lisätutkimukset ovat tarpeen. Kun ICF-luokittelua kehitetään, olisi tärkeää sisällyttää liikunta-aktiivisuus tarkenteeksi, jotta toimintakyvyn ja terveyden edistämistä sekä niiden rajoitteita ymmärrettäisiin paremmin.

Yksi tämän väitöskirjan vahvuuksista on sen tutkimusaihe, johon on kohdistunut vain vähän aiempaa tutkimusta Suomessa. Tutkimuksessa selvitettiin liikunta-aktiivisuutta ja siihen yhteydessä olevia tekijöitä nuorilla, joilla oli lääkärin toteama pitkäaikainen sairaus tai vamma. Tutkimukset tehtiin hyödyntäen kansallista edustavaa tutkimusaineistoa ja nuorten omaa raportointia vuosina 2002, 2006, 2010 ja 2014. Kussakin tiedonkeruussa käytettiin samoja mittareita, mikä mahdollisti trendianalyysin sekä toisaalta myös eri aineistojen yhdistämisen.

Tutkimuksen yhtenä rajoituksena voidaan pitää sitä, että WHO-Koululaistutkimus on tehty vain yleisopetuksen luokissa jättäen erityisluokat ja -koulut pois aineistosta. Tämä tutkimus keskittyi toimintarajoitteisiin oppilaisiin, ja ne toimintarajoitteiset oppilaat, jotka eivät ole mukana yleisopetuksessa, jäivät tutkimuksen ulkopuolelle. Tiedonkeruu toteutettiin itseraportoiduilla kyselyillä. Vastausten raportoinnissa saattaa olla luotettavuutta heikentäviä tekijöitä, jotka liittyvät esimerkiksi muistiin ja LTSV:n ja liikunta-aktiivisuuden mittaamisen tarkkuuteen. Tilastollisia malleja sovellettiin poikkileikkaustutkimusten tietoihin, joten kausaalipäätelmiä ei voitu tehdä. Tuloksista on hyötyä useille eri sidosryhmille ja tasoille – kuten henkilöille, joilla on lääkärin toteama pitkäaikainen sairaus tai vamma, vanhemmille, opettajille, liikunnanohjaajille sekä päättäjille.

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- i Kansainvälinen toimintakyvyn, toimintarajoitteiden ja terveyden luokitus (ICF – International Classification of Functioning, Disability and Health) ICF-luokitus
  - ii LTSV = lääkärin toteama pitkäaikainen sairaus tai vamma (LTID, long term illness, disability or medical condition as stated by a doctor)

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## APPENDICES

English translations of items used from the 2002, 2006, 2010 and 2014 HBSC study used in this Dissertation

### QUESTIONNAIRE FRONT PAGE

Health Behaviour in School-aged Children (the HBSC Study)  
A WHO Cross-National Survey

AN INTERNATIONAL SURVEY ON SCHOOL CHILDREN'S HEALTH AND  
LIFESTYLE 20xx

Dear pupil,

You are participating in an international survey on school children's health and lifestyle, which is coordinated by the World Health Organisation (WHO). The questions are answered by school children in 40 European countries, Canada and the United States. Your answers will add to the existing body of knowledge on adolescents' lifestyles in different countries and cultures.

- All information will remain strictly confidential.
- Answering questions is voluntary.
- Only the research team will see the form.
- You do not have to mention your name at any point.
- Personal responses are kept secret, and dealt as statistical entities.
- Answer questions honestly.

After you have finished answering the questions put your questionnaire into the envelope and give it to your teacher.

The research in Finland is carried out by the Department of Health Sciences, University of Jyväskylä.

Thank you for your help and all the best!

Lasse Kannas and research team  
Professor

## QUESTIONS

### 1. Sex

- Boy  Girl

### 2. What class are you in?

- 5th grade  7th grade  9th grade

### 3. What month were you born?

- Jan Feb Mar Apr May Jun July Aug Sept Oct Nov Dec

### 4. What year were you born?

- 198x 199x 200x (in each survey, a list of years is included)

### 5. Your height \_\_\_\_\_ cm

### 6. Your weight \_\_\_\_\_ kg

### 7. What do you think you will do when you finish comprehensive school?

- Try to enter general upper secondary school  
 Try to enter vocational school or other vocational training  
 Try to get an apprenticeship  
 Double examination (e.g. senior school and vocational school)  
 Get a job  
 Be unemployed  
 Don't know

**8. 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?**

- 0 days  1  2  3  4  5  6  7 days

### 9. Are you a member of a sports club?

- No  
 Yes and I am training in a sports club  
 Yes but I don't participate in training

### 10. Do you think that you will do sports or other physical activities when you are 20 years old?

- Definitely yes  
 Probably yes  
 Probably no  
 Definitely no

### 11. How good are you at sports compared to others the same age as yourself?

- Among the best  
 Good  
 Average  
 Below average

### 12. How fit do you think you are?

- Very fit  
 Fit  
 Moderately fit  
 Not fit at all

### 13. Do you find yourself ...?

- too thin  
 a bit too thin  
 the right size  
 a bit too fat  
 too fat

<b>14. For each statement, tick the box that usually describes you.</b>	Strongly agree	Partly agree	Partly disagree	Strongly disagree
I feel that I am at least as capable and skilful as any other person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think that I have plenty of good qualities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I often feel that I am a failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can manage things as well as most people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel that I am all right	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am satisfied with myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I sometimes feel totally useless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I sometimes think I am no good at all	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**15. OUTSIDE SCHOOL CLASSES: How OFTEN do you usually take physical exercise in your free time so that you lose your breath or sweat?**

- Daily  
 4-6 times a week  
 2-3 times a week  
 Once a week  
 Once a month  
 Less than once a month  
 Never

**16. OUTSIDE SCHOOL CLASSES: How many HOURS a week do you usually take exercise in your free time so that you lose your breath or sweat?**

- None  
 Approx. half an hour  
 Approx. an hour  
 Approx. 2-3 hours  
 Approx. 4-6 hours  
 Seven hours or more

**17. Do you have a long-term illness, disability, or medical condition (like diabetes, arthritis, allergy, or cerebral palsy) that has been diagnosed by a doctor?**

- Yes  
 No

**18. Does your long-term illness, disability or medical condition affect your attendance and participation at school?**

- I do not have a long-term illness, disability or medical condition  
 Yes  
 No

**19. If you answered yes, does this disability, illness or medical condition cause you:**

**Yes/No**

- Difficulty seeing things (Does not include prescription eye glasses)  
 Difficulty in hearing what others say  
 Difficulty in speaking to others  
 Difficulty in moving around  
 Difficulty in handling objects  
 Difficulty breathing  
 Epileptic seizures (fits)

### UPDATED ITEMS FOR FUNCTIONAL DIFFICULTIES IN 2014

20. Tick only one box that best describes you, using the following descriptors

Do you have difficulty ...

	No diffi- culties	Difficul- ties do not affect function- ing	Difficulties affect func- tioning somewhat	Difficul- ties affect function- ing a lot	Difficul- ties affect func- tioning very much
▪ in seeing, even with glasses?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ hearing, even with a hearing aid?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ in speaking fluently?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ in moving?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ in handling objects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ in breathing, for example, shortness of breath?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ in remembering things?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ in concentrating?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ in sitting still during lessons?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### UPDATED ITEMS FOR ROSENBERG'S GLOBAL SELF-ESTEEM IN 2014

21. For each statement, tick the box that usually describes you.

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
▪ I feel that I am a person of worth, at least on an equal plane with others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ I feel that I have a number of good qualities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ All in all, I am inclined to feel that I am a failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ I am able to do things as well as most other people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ I feel I do not have much to be proud of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ I take a positive attitude toward myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ On the whole, I am satisfied with myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ I wish I could have more respect for myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ I certainly feel useless at times	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
▪ At times I think I am no good at all	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **ORIGINAL PAPERS**

### **I**

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

by

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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.

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*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, Akre, Michaud, & Suris, 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 40<sup>th</sup> percentile of all ranges of motor skills and fitness tests and 20<sup>th</sup> 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 10<sup>th</sup> 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 sweat” 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.

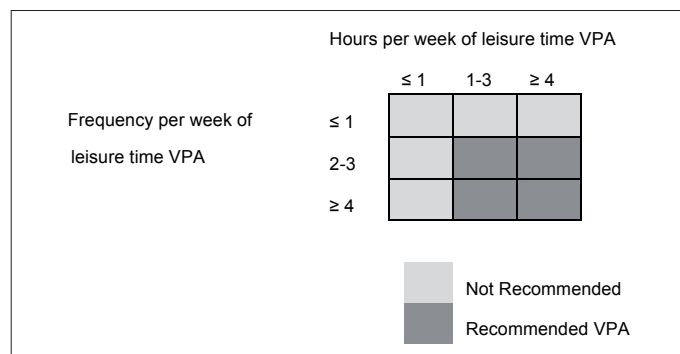


Figure 1 Using VPA Groups to determine meeting PA Recommendation 2

(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

LTID Category	Boys (n)			Girls (n)			All (n)		
	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		
		13	15	All	13	15	All
All within LTID Categories							
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		Physically active for at least 60mins during the last 7 days								
Categories		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 Categories		Groups of Frequency (times/wk)					Groups of Duration (hours/wk)				
		≤ 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 than 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 spoiled 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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## II

### **PHYSICAL ACTIVITY TRENDS OF FINNISH ADOLESCENTS WITH LONG-TERM ILLNESSES OR DISABILITIES FROM 2002 TO 2014**

by

Ng, K., Rintala, P., Tynjälä, J., Välimaa, R., Villberg, J., Kokko, S. & Kannas, L. 2016

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

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**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.<sup>1</sup> Although adolescence is a time when PA levels decline,<sup>2</sup> it has been reported that taking part in sports clubs during adolescence in the general population predicts more active adult PA behaviors.<sup>3</sup> 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).<sup>4</sup>

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.<sup>5</sup> The recommendation includes adolescents with LTID, who can represent approximately one-fifth to one-sixth of adolescents.<sup>6,7</sup> For this particular subpopulation, studies have reported PA can reduce the risks of secondary conditions,<sup>8</sup> improve psychological assets,<sup>9</sup> and lead to improved functional capabilities that are necessary in the transition from adolescence to adulthood.<sup>10</sup> Moreover, there are a number of organizations that have made PA recommendations for people with specific health conditions,<sup>11</sup> however, these recommendations have been noted to target adult populations and have not differentiated recommendations like those of the WHO for adolescents.<sup>12</sup> As such, more studies that provide overall PA levels are needed for adolescents with LTID.<sup>13</sup>

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.<sup>6,14</sup> It has also been reported that the amounts of MVPA may not differ between adolescents with and without LTID.<sup>7</sup> 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.<sup>15</sup> 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.<sup>16</sup> The HBSC study is frequently used to monitor trends in adolescent health over time.<sup>17</sup> According to international comparisons, Finnish adolescents aged 11 to 15 years old 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.<sup>14</sup> 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.<sup>18</sup> Furthermore, although there have been increases in MVPA in Finland,<sup>14</sup> 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.<sup>2</sup> There is a lack of research on adolescents with LTID from a public health perspective,<sup>13</sup> and it is assumed that fewer adolescents with LTID are sports club members than their peers, particularly boys.<sup>19</sup>

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  $\geq 5$  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 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

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(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.”<sup>20</sup> Children were also asked not to include learning disabilities ( $n = 2206$ ). The overall prevalence of adolescents with LTID was 17.1%. A grouping variable, “taking part in sports club,” was used as part of the ICF code for organized sports,<sup>4</sup> as denoted as sports club members.

PA measures correspond to the PA recommendations for health, which used a widely used preamble<sup>14</sup> 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?”<sup>21</sup> 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.<sup>21</sup> A Finnish version was found to have acceptable reliability.<sup>22</sup> 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 ( $r = 0.37$ ,  $P < .01$ ).<sup>21</sup>

### 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.<sup>21</sup> 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. The change in prevalence per year was determined via Pearson  $\chi^2$  test for 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 significant.

Increasing secular trends of the overall daily and 5-day MVPA for 60 minutes grouping by sports club members and nonmembers are

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

	Girls			Boys			Total			LTID <sup>a</sup>
	13 y	15 y	Total	13 y	15 y	Total	13 y	15 y	Total	%
2002 (n)	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 (n)	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 (n)	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 (n)	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 (N)	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	

<sup>a</sup> % 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.

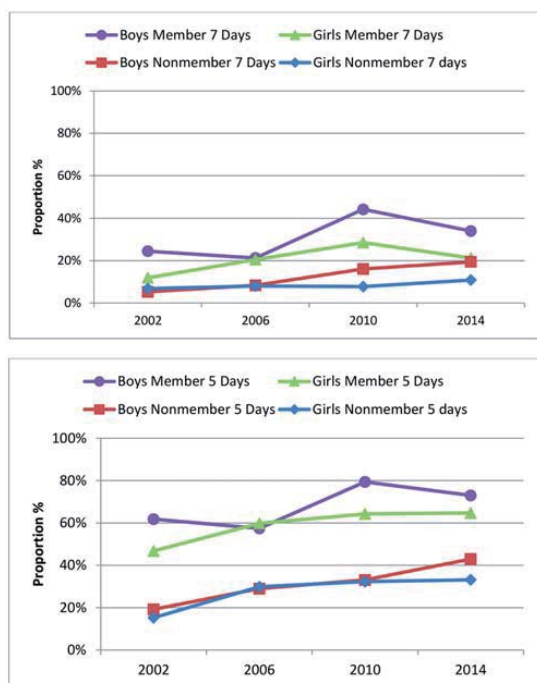


**Table 2 Overall Percentages of Physical Activity Trends of Girls and Boys With LTID**

	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.



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

shown in Figure 1. As age increased, participation in PA decreased in all groups except boy sports club members (Table 3).

### 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.<sup>14</sup> 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 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

**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, % <sup>a</sup>	OR (95% CI)	5 day, % <sup>b</sup>	OR (95% CI)
<b>Girls</b>				
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) <sup>c</sup>
2010	7.8	1.14 (0.51–2.55)	32.3	2.66 (1.59–4.45) <sup>d</sup>
2014	10.9	1.66 (0.80–3.45)	33.2	2.77 (1.67–4.57) <sup>d</sup>
Age		0.51 (0.30–0.88) <sup>e</sup>		0.65 (0.47–0.92) <sup>e</sup>
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) <sup>e</sup>
2010	28.6	3.07 (1.52–6.18) <sup>e</sup>	64.3	2.06 (1.22–3.48) <sup>e</sup>
2014	21.3	2.09 (1.04–4.23) <sup>e</sup>	64.7	2.10 (1.27–3.47) <sup>e</sup>
Age		0.58 (0.37–0.92) <sup>e</sup>		0.91 (0.63–1.30)
<b>Boys</b>				
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) <sup>e</sup>	33.1	2.09 (1.20–3.63) <sup>e</sup>
2014	19.5	4.62 (2.02–10.58) <sup>d</sup>	43.0	3.26 (1.94–5.50) <sup>d</sup>
Age		0.41 (0.24–0.69) <sup>e</sup>		0.65 (0.45–0.94) <sup>e</sup>
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) <sup>e</sup>	79.4	2.35 (1.25–4.44) <sup>e</sup>
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.

<sup>a</sup> Percentage of participants who were active daily for at least 60 minutes per day MVPA.

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

<sup>c</sup>  $P \leq .05$ .

<sup>d</sup>  $P \leq .01$ .

<sup>e</sup>  $P \leq .001$ .

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.

can be interpreted through another PA behavior online study of adolescents that used the same MVPA questions.<sup>23</sup> 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.<sup>14</sup> 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,<sup>24</sup> and perhaps an 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.<sup>25</sup> 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.<sup>2</sup> This latter finding seems incongruous, as previous research reported sports club participation of adolescents with LTID was lower than their peers.<sup>19</sup> 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.<sup>26</sup> 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.<sup>24</sup> 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.<sup>27</sup> 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.<sup>28</sup> To address this lack of knowledge, projects like the health-promoting sports clubs<sup>29</sup> 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.<sup>30</sup> The ICF manual<sup>4</sup> 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.<sup>31</sup> The ICF ontology indicates that taking part in sports clubs is desirable for people to improve their functioning individually and socially.<sup>4</sup>

Public health officials are encouraged to focus on developing 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,<sup>6,8</sup> 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.<sup>32</sup>

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.<sup>31</sup> 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.<sup>30</sup> Another important concern is to train adolescents with LTID to be capable of self-management into adulthood through self-directed activities.<sup>33</sup> 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.<sup>34</sup> 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.<sup>35</sup> 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.<sup>6</sup> 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, 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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### III

#### **SELF-ESTEEM AND INTENTIONS MEDIATE PERCEIVED FITNESS WITH PHYSICAL ACTIVITY IN FINNISH ADOLESCENTS WITH LONG-TERM ILLNESS OR DISABILITIES**

by

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## Self-esteem and intentions mediate perceived fitness with physical activity in Finnish adolescents with long-term illness or disabilities

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**Background:** The International Classification of Functioning, Disability and Health (ICF) is recognised as the common language in disability research. However, personal factors in the ICF are not explicitly coded because of cultural differences that influence physical activity (PA) participation. The ICF suggests using fitness as a personal factor, as well as other psychological assets. Intentions may serve as such psychological assets and studies on the antecedents to intentions which prompts PA behaviours is lacking in adolescent long term illness or disability (LTID) populations. **Objective:** The purpose of this study was to report how ICF personal factors can influence participation in PA. Perceived fitness (FIT), global self-esteem (GSE), and PA intentions (INT) are hypothesised to positively predict PA behaviours among adolescents with LTID after controlling for age. **Methods:** The data from Finnish 13 and 15 years old adolescents from the self-reported Health Behaviour in School-aged Children study from 2002 and 2010 were pooled. Those with LTID as stated by a medical doctor were included ( $N = 1,059$ ). Serial mediation with ordinary least squares path analysis was used. Boys and girls were separately analysed, FIT was the independent variable, GSE and INT as mediators, and age controlled moderate-to-vigorous PA (MVPA) the dependent variable. Bias-corrected bootstrap confidence intervals were used to test for significance of the direct and indirect paths. **Results:** FIT was positively related to GSE and INT for boys and girls. Furthermore, INT were positively related to MVPA for boys and girls. These relationships were statistically significant. Therefore, INT can be seen to mediate the relationship between FIT and MVPA after controlling for age. GSE also acted as a statistically significant mediator for boys, between FIT and INT. Therefore serial mediation was presented with boy's MVPA, whereas in the girl's model, only INT mediated FIT and MVPA. **Conclusions:** Personal factors influence PA participation in adolescents with LTID. Support for increasing self-esteem for boys seems to be important and it should be taken into account when different PA promotion strategies are planned for boys. Differences in PA between genders suggest overall more promotion of PA for girls is still needed.

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*Keywords:* perceived fitness, self-esteem, intentions, MVPA, HBSC, adapted physical activity

### Introduction

Physically active lifestyle is important for adolescents with long term illnesses, disabilities or medical conditions (LTID), however studies including adolescents with LTID have reported lower amounts of physical activity (PA) (Lieberman & McHugh, 2001; Ng, Rintala, Tynjälä, Villberg, & Kannas, 2014; Rimmer, Rowland, & Yamaki, 2007) or no different amounts of PA (Rintala et al., 2011; van Gent et al., 2007) to adolescents without LTID. The inconsistent results have been attributed to a number of methodological reasons,

hence large sample representative data, as in this study, can be used to minimise these reporting errors.

In this paper, the World Health Organisation's International Classification of Functioning, Disability and Health (ICF, see World Health Organization, 2001) was used as a framework to guide the analysis to explain PA participation. The ICF has been widely recognised as the common language for disability and functioning (Bickenbach, 2012), and can be applied to PA (Rimmer, 2006). The ICF is divided into two parts that interact with each other to help classify a person's situation in terms of functional health. The first part is related to the functioning and disability and has two components as identified by 1) body functions and structures, and 2) activities and participation, while the second part is related to contextual factors and have

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also two components as identified by 1) environmental factors, and 2) personal factors (more information: <http://www.who.int/classifications/icf/en/>).

Given that adolescents with LTID have impairments affecting their functioning, much research in adapted physical activity has paid attention to the external environmental component of the ICF (e.g., family, peers, infrastructure, attitudes, etc.), while less is studied about internal personal factors (Adolfsson, 2011). Furthermore, personal factors are not coded in the ICF, rather it is suggested that they are components that:

...are the particular background of an individual's life and living, and comprise features of the individual that are not part of a health condition or health status. These factors may include gender, race, age, other health conditions, fitness ...individual psychological assets and other characteristics, all or any of which may play a role in disability at any level. (WHO, 2001, p. 17)

Part of the reasoning for a lack of coding of personal factors in the ICF is due to the complexity of how these factors may interact and differ between cultures (World Health Organization, 2010), which has prompted researchers to attempt to gain a better understanding of personal factors in its relation to functional health and disability (Bickenbach, 2012).

Fitness (FIT) is explicitly listed as an example of ICF personal factors (World Health Organization, 2001). FIT has been studied as actual and perceived fitness, with correlations showing similarities (Huotari, Sääkslahti, & Watt, 2009). Global self-esteem (GSE) is multidimensional and consists of evaluations of one's value as a person (Fox, 1988). It is often reported that adolescents with LTID have lower levels of GSE than their peers without LTID (Shields, Murdoch, Loy, Dodd, & Taylor, 2006). Several studies have also reported a causal relationship whereby increasing FIT can increase GSE, whereas no differences in FIT were reported with increases of GSE (Sonstroem, 1997; Spence, McGannon, & Poon, 2005). Studies that have looked at specific populations with reported lowered GSE have shown that an increase in GSE was achieved from increased PA participation (DeBate, Gabriel, Zwald, Huberty, & Zhang, 2009). Based on these assumptions, we investigate if self-esteem becomes a mediator of the relationship between fitness and PA participation.

One of the most used theories investigating the relationship between intentions (INT) and behaviours is the theory of planned behaviour (Ajzen, 1985; Ajzen, 1991). INT are drawn from three constructs;

attitudes; subjective norms; and, perceived behavioural control (PBC). Of these three constructs, the relationship between PBC and INT does not change with age (Chatzisarantis, Hagger, Kawabata, & Kamarova, 2014). Furthermore, reviews have also demonstrated that PBC also, although slightly weaker than INT, influences PA behaviour directly (Hagger, 2014; McEachan, Conner, Taylor, & Lawton, 2011). PBC is a combination of perceived controlling of factors needed for PA and its level of importance (Ajzen, 1985). As previously noted (Huotari et al., 2009), self-perceived fitness is strongly correlated to actual fitness levels, indicating the principle of control, and fitness is a major factor in doing physical activities, indicating the principle of importance, thus together, is considered here as PBC.

The aim of this study was to examine how personal factors can be used to predict PA participation. It was done by investigating the relationship between perceived fitness and PA participation. Furthermore, three other possible relationships were investigated 1) global self-esteem (GSE) mediating the relationship between FIT and age controlled moderate-to-vigorous PA (MVPA), 2) INT mediating the relationship between FIT and MVPA, and 3) GSE and INT mediating in a serial manner the relationship between FIT and MVPA. Age was included to control for PA participation as older adolescents reported fewer days of MVPA (Currie et al., 2012) and gender was stratified as there are noticeable differences with reported PA participation of adolescents with LTID (Ng et al., 2014).

## Methods

### Participants

The data consisted of 1,059 students (56.3% girls, mean age = 14.76 years,  $SD = 1.06$ ), from a nationally representative sample of Finnish school children who participated in the Health Behaviour in School-aged Children (HBSC) study in 2002 and 2010. Classes in schools were selected by stratified sampling around Finland. The pupils in school voluntarily took part in the study and completed a paper questionnaire in a classroom. Instructions were given to the teachers who administered the completion of questionnaires. When completed, the papers were placed into an envelope immediately and due to the anonymous nature of data collection, it was not possible to identify the pupil that completed the survey. The ethics of the study was approved by the Finnish Teachers' Union and the Finnish National Board of Education. Specific details about the data collection can be found on the HBSC

questionnaire protocol<sup>1</sup>. Adolescents that reported they have been told by a doctor that they have a LTID were included in the sample. In addition, within this study design, only adolescents whose body mass index was within the range of 15 and 40 were included. This was to eliminate analysis of adolescents with extreme under or over weight based on international recommendations (Cole, Bellizzi, Flegal, & Dietz, 2000).

### Measures

Measures of perceived fitness (FIT) were generated from a single item, taken from the Finnish HBSC questionnaire, "How fit do you think you are?", responses were "not fit at all" (1), "moderately fit" (2), "fit" (3), "very fit" (4). Global self-esteem (GSE) was derived from a composite score of Rosenberg's self-esteem scale (Rosenberg, 1965). Higher composite scores indicate higher levels of self-esteem. Intentions for PA (INT) were measured using a single item on the individual's intention to be physically active when the respondent is 20 years old with a four point scale response ranging from "definitely no" (1) to "definitely yes" (4). Moderate-to-vigorous Physical Activity (MVPA) was based on a self-report item on the amount of days whereby the individual was moderately to vigorously physically active for 60 minutes or more (Sallis & Patrick, 1994). Examples of the types of activities were included within

<sup>1</sup> The HBSC protocol consists of documentation of data collection, sampling, data checking, and sharing of data and can be accessed from the HBSC website ([www.hbsc.org](http://www.hbsc.org)).

the question to help the pupils to quantify their PA and sport participation. This item has been validated in the Finnish language (Vuori et al., 2005).

### Data analysis

Studied variables were compared with *t*-test statistic to reveal any statistical significant differences at .05 or less. Ordinary least squares regression analysis was used to demonstrate how personal factors explain age controlled MVPA participation. Bias-corrected bootstrap confidence intervals were used to test for significance of the direct and indirect paths. The same regression analysis was repeated for both genders. Full serial mediation model with: a (FIT-GSE/INT), b (GSE/INT-MVPA), c (FIT-MVPA), and d (GSE-INT) regression coefficients is in Figure 1. In order to put mediators in serial for the association between independent and dependent variables, certain conditions must be met for serial mediation macro for SPSS [PROCESS model 6 (Hayes, 2013)] to work. First there must be a substantial relation between an independent variable and the mediating variable, and there must be a relation between the mediating variable and the dependent variable when accounting for the independent variable. The correlations between the variables are presented in Table 1.

Secondly, by definition, "mediation requires a causal precedence, such that the independent variable precedes and is a cause of the mediator, and the mediator must precede and be a cause of the dependent

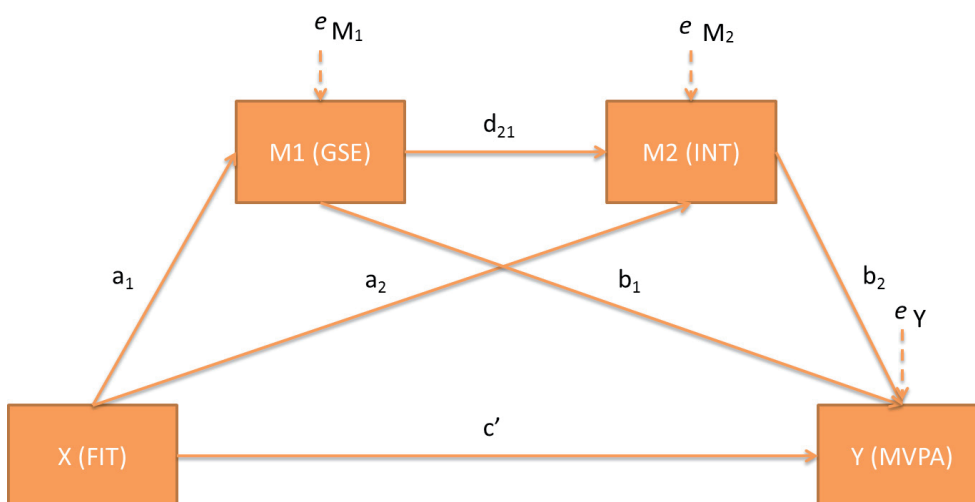


Figure 1. Statistical diagram of serial mediation of 2 mediators: M1 (GSE = global self-esteem) and M2 (INT = physical activity intentions); between X (FIT = perceived fitness) and Y (MVPA = moderate-to-vigorous physical activity)



Table 1  
Variable means, standard deviations, and Spearman correlations ( $N = 1,059$ )

	Mean	SD	Correlation coefficient		
			1	2	3
1. Perceived fitness					
Overall	2.72	0.73	-		
Boy	2.80	0.77	-		
Girl	2.67	0.70	-		
2. Global self-esteem					
Overall	24.53	4.83	.351**	-	
Boy	26.03	4.29	.336**	-	
Girl	23.40	4.91	.344**	-	
3. PA intentions					
Overall	3.44	0.63	.376**	.184**	-
Boy	3.41	0.68	.399**	.247**	-
Girl	3.46	0.60	.365**	.171**	-
4. Moderate-to-vigorous PA					
Overall	3.93	2.01	.455**	.189**	.344**
Boy	4.17	2.08	.465**	.214**	.397**
Girl	3.75	1.94	.436**	.137**	.307**

\*\* $p \leq .01$ , two-tailed.

variable" (MacKinnon & Luecken, 2008). As the data was collected from a cross-sectional study, two widely used theories were utilised to provide causal assumptions. Within the hierarchy model of self-esteem, perceived fitness was a component of global self-esteem (Fox, 1988; Haugen, Ommundsen, & Seiler, 2013). Furthermore, within the framework of the theory of planned behaviour (Ajzen, 1991), perceived fitness was treated as a component of PBC, and that is seen as a direct and indirect predictor of behaviour (Hagger, 2014).

## Results

In this study, there were slightly more girls ( $n = 596$ , mean age = 14.77,  $SD = 1.05$ ) than boys ( $n = 463$ , mean age = 14.76,  $SD = 1.06$ ) with LTID. Boys reported more days in the last 7 days of 60 minutes of MPVA (mean = 4.17 days,  $SD = 2.08$ ) than girls, who reported considerably less (mean = 3.75 days,  $SD = 1.94$ ) with these differences statistically significant ( $t = 3.39$ ,  $p = .001$ ). More boys reported as being "fit", as their fitness scores were higher (mean = 2.80,  $SD = 0.77$ ) than girls (mean = 2.67,  $SD = 0.70$ ), and these differences were statistically significant ( $t = 2.977$ ,  $p = .003$ ). Higher levels of self-esteem, as indicated by higher

self-esteem scores, were reported by boys (mean = 26.3,  $SD = 4.29$ ) than girls (mean = 23.4,  $SD = 4.91$ ), and these differences were statistically significant ( $t = 8.93$ ,  $p < .001$ ). More girls indicated that they would definitely do PA in the future than boys, but the differences were not statistically significant. Spearman's correlation coefficients between the dependent variable, moderate-to-vigorous PA (MVPA), and the independent variable perceived fitness (FIT) were .455, .465, and .436 for overall, boys, and girls, respectively (Table 1) showing sufficient relationships between these variables for linear regression analysis.

In the regression analysis, the regression values were reported with their significance, and total model effects reported using confidence intervals in Table 2. Perceived fitness (FIT) was positively related to global self-esteem (GSE) ( $a_1$ ) and PA intentions (INT) ( $a_2$ ) for boys ( $a_1 = 1.93$ ,  $p < .001$ ;  $a_2 = 0.30$ ,  $p < .001$ ) and girls ( $a_1 = 2.42$ ,  $p = .001$ ;  $a_2 = 0.29$ ,  $p < .001$ ). Furthermore, INT was positively related to MVPA for boys ( $b_2 = 0.81$ ,  $p < .001$ ) and girls ( $b_2 = 0.58$ ,  $p < .001$ ). Therefore, INT can be seen to mediate the relationship between FIT and MVPA after controlling for age.

There was no direct relationship between GSE and MVPA ( $b_1$ ) for both boys and girls. However, when GSE was included in the model, the total effect was significant ( $c = 1.17$ ,  $p < .001$ ) based on 10,000 bootstrap

Table 2  
Direct, indirect, and total effects (and 95% confidence intervals) of moderate-to-vigorous physical activity on perceived fitness, global self-esteem, and physical activity intentions

	MVPA				Total	95% CI
	Direct	95% CI	Indirect	95% CI		
Overall ( $R^2 = .225$ )						
FIT-GSE	2.34	<b>[1.94, 2.74]</b>	0.030	[-0.026, 0.088]		
FIT-INT	0.298	<b>[0.241, 0.355]</b>	0.201	<b>[0.139, 0.277]</b>		
GSE-INT	0.008	[-0.001, 0.017]	0.013	[-0.001, 0.028]		
FIT	0.987	<b>[0.817, 1.16]</b>			1.23	<b>[1.088, 1.373]</b>
Boy ( $R^2 = .246$ )						
FIT-GSE	1.93	<b>[1.37, 2.48]</b>	0.043	[-0.038, 0.131]		
FIT-INT	0.30	<b>[0.209, 0.392]</b>	0.243	<b>[0.138, 0.391]</b>		
GSE-INT	0.02	<b>[0.001, 0.37]</b>	0.032	<b>[0.009, 0.069]</b>		
FIT	0.952	<b>[0.700, 1.20]</b>			1.27	<b>[1.056, 1.485]</b>
Girl ( $R^2 = .201$ )						
FIT-GSE	2.42	<b>[1.86, 2.97]</b>	-0.016	[-0.090, 0.054]		
FIT-INT	0.294	<b>[0.225, 0.362]</b>	0.171	<b>[0.096, 0.261]</b>		
GSE-INT	0.006	[-0.004, 0.017]	0.009	[-0.005, 0.028]		
FIT	1.10	<b>[0.774, 1.24]</b>			1.17	<b>[0.973, 1.367]</b>

Note. MVPA = moderate-to-vigorous physical activity, CI = confidence interval. FIT = perceived fitness, GSE = global self-esteem, INT = physical activity intentions. Confidence intervals not including zero are in boldface.

samples was entirely above zero (0.97 to 1.36). GSE also acted as a mediator for boys, between FIT and INT ( $d_{21} = 0.02$ ,  $p = .017$ ). As such, serial mediation was presented with boy's MVPA, with a significant total effect ( $c = 1.27$ ,  $p < .001$ ) based on 10,000 bootstrap samples was entirely above zero (1.06 to 1.48). Those paths added further to the direct effect between FIT and MVPA ( $c' = 0.95$ ,  $p < .001$ ) for boys (Figure 2).

## Discussion

This study has, through serial mediation modelling, shown that global self-esteem (GSE) can be a mediator of the relationship between perceived fitness (FIT) and physical activity intentions (INT) in boys but not in girls with long term illnesses or disabilities (LTID). As such, for boys, a change in physical activity participation is predicted by changes in intentions for physical activity, which was influenced by slight changes in global self-esteem, which was subsequently influenced by perceived fitness. For girls, PA was significantly predicted only by INT and FIT.

This study also showed that the overall amounts of PA reported by this sample were significantly lower than the Nordic region average of 4.3 days of MVPA (Iannotti et al., 2009). Due to the positive regression

coefficients, we would encourage further studies to extend the relationships between these personal factors and meeting MVPA recommendations for daily participation for adolescents with LTID.

## Personal factors

There are no codes for personal factors within the ICF, yet it is still included into the ICF framework, and some guidance is available by looking at some examples in its definition (World Health Organization, 2001). We looked at these examples and tried to minimise the number of ICF personal factors to perceived fitness (FIT), global self-esteem (GSE), and intentions for PA (INT) with the purpose of demonstrating precursors to PA participation.

Results have shown the importance of FIT in PA participation and GSE are quite established in general population studies (Inchley, Kirby, & Currie, 2011). Even in our sample, with lower levels of PA participation in comparison to the Finnish average, high levels of FIT were directly related to PA participation and GSE in both boys and girls. These findings reinforce utilizing fitness (Rimmer, 2006) and GSE (Shields et al., 2006) as personal factors when attempting to increase PA participation.

The theory of planned behaviour (Ajzen, 1991) fitted well to the data. FIT functioned as a component

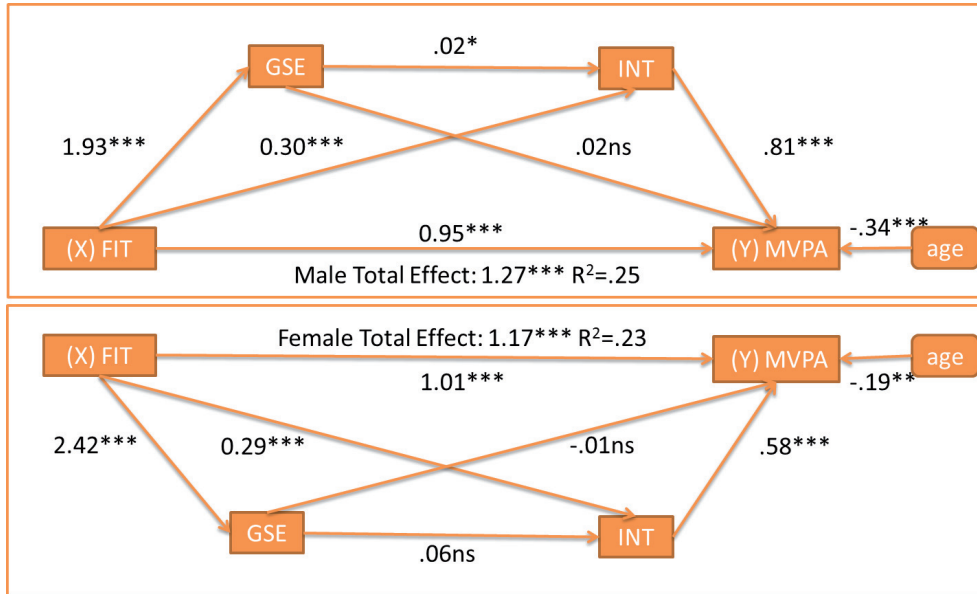


Figure 2. Regression correlations of direct and total effects of 2 mediators: GSE (global self-esteem) and INT (physical activity intentions); between X (perceived fitness) and age controlled Y (MVPA - moderate-to-vigorous physical activity) for boys and girls. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

of perceived behavioural control (PBC) for PA (Ajzen, 1985; Huotari et al., 2009). The results for both boys and girls showed that high level of FIT as PBC was related to high amounts of PA participation, and high levels of INT. It also revealed that INT acted as a mediator between FIT and PA participation. The strength of the changes in levels of FIT when directly influencing PA participation was more than INT, which can be interpreted that FIT was perceived as actual and real barriers towards PA participation (Chatzisarantis et al., 2014).

Our results also demonstrated that GSE is related to INT only for boys with LTID. This is quite an interesting finding, since much literature on the relationship between GSE and PA often reports higher sensitivity for GSE (in relation to PA participation) in girls (Biddle & Asare, 2011). These results have been explained by the findings that adolescent girls have generally lower levels of GSE as they age between 13 and 15 years old, whereas in adolescent boys, GSE tends to increase (Inchley et al., 2011). Girls also participate in lower amounts of PA than boys (Whitehead & Biddle, 2008). Even though FIT is related to GSE (Spence et al., 2005), other components in GSE may be more important for girls, for example, cognitive self-esteem (Fox, 1988), and therefore GSE was not seen

to be a significant predictor for PA intentions. There were further perspectives on self-esteem of girls investigated by Kololo, Guszowska, Mazur, and Dzielska (2012). In their study, girls who reported dissatisfaction with body appearance were suggested that these feelings can be symptomatic of a serious disorder that causes lowered GSE. The authors also reported that almost three-quarters of their sample population felt that, even though they had average appearances, they still participated in insufficient amounts of PA (Kololo et al., 2012). It was suggested that further incentives are needed to promote more PA participation. It is with this notion that provides an insight into how the relationship between GSE and INT is significant for adolescent boys.

For young boys, incentives to be physically active are more present than for girls. Being in the mainstream education system, both boy and girl adolescents with LTID are prone to be abnormal due to blemishes, while self-perceived "felt" stigmatization is more prominent than "enacted" stigma (Scambler, 2012). Furthermore, studies have also shown that adolescents with LTID experience more physicality such as bullying than their peers without LTID (Sentenac et al., 2012). The details of the incentives to be physically active can be considered as follows. The socially constructed world

that defines ability over disability is slow to recognise that everyone has the capability to be classified within the ICF (Bickenbach, 2012), and it could be this that prompts this inner feeling of self-esteem when being able to do more physical tasks. An example of this is, for some adolescents with breathing difficulties such as asthma, the physical barriers to conduct moderate-to-vigorous physical activities for extended periods of time. Yet there are studies that also reported no differences in PA levels between those with and without asthma (van Gent et al., 2007). An increase in self-esteem is likely for those who do the same amounts of PA as their peers without asthmatic symptoms.

### Limitations

Self-reported questionnaires were used to collect data. The question of LTID did not include measures of severity so a wide spectrum of individuals have been included in the study and pooled together. Caution is advised when generalising these results to a disability representative group since the data was collected from mainstream education and does not include special schools. Furthermore, the variables that were used in the study were also collected using self-report questionnaires and mainly single items (with the exception of self-esteem). While studies have shown similar perceived fitness levels to observed fitness indexes of 14 year old Finnish pupils (Huotari et al., 2009), there can be some over reporting of this measure. Other studies have also demonstrated acceptable validity in the MVPA measure (Vuori et al., 2005), although some research has indicated an under reporting (Ridgers, Salmon, Parrish, Stanley, & Okely, 2012) which could have narrowed the regression coefficients. Finally, the intention variable is set in the future, and its strength to mediate a reported behaviour at the time of the data collection may require further analysis. For the time being, the item relates to the intention to be physically active 5–7 years in the future. A longitudinal study might be a feasible way to provide an accurate picture of how well this variable mediates the behaviour by reassessing PA participation in follow up studies.

### Conclusions

Overall, the findings have shown that perceived fitness, self-esteem, intentions, and gender can be regarded as significant personal factors associated with participation in PA. These personal factors are seen as important and related to one another. In accordance with the ICF, personal factors are not explicitly coded, and this leaves researchers with much work to deliver coherence when discussing personal factors. Further development

of questionnaires that includes severity of LTID would provide some specific results needed to refine the ICF, as well as repeated studies across different countries to ensure consistency within personal factors.

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## IV

### **DAILY PHYSICAL ACTIVITY IN FINNISH ADOLESCENTS WITH LONG-TERM ILLNESSES OR DISABILITIES: PSYCHOSOCIAL ASSOCIATIONS WITH PARTICIPATION IN SPORTS CLUB**

by

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# Daily physical activity in Finnish adolescents with long-term illnesses or disabilities: psychosocial associations with participation in sports club.

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## ABSTRACT

**Background:** Physical activity (PA) in adolescence with long-term illnesses or disabilities (LTID) is a public health concern. One way of increasing PA is through participation in sports clubs. Since sports clubs are organised and regular, there are expected to be differences in motivation for physical activity between adolescents that are members and non-members. The purpose of this study is to assess the impact of psychosocial factors on sports club membership and daily PA.

**Methods:** Finnish adolescents with self-reported LTID (n=1006) took part in the WHO collaborative Health Behaviour in School-aged Children (HBSC) study in 2002 and 2010. Daily self-reported moderate to vigorous PA (MVPA) was the outcome variable. Psychosocial variables included intention for future PA, self-perceptions and educational aspirations. Age and sports club membership was included in binary logistic regression analyses. Analyses were done separately for boys and girls.

**Results:** Adolescents with LTID who were sports club members were two times more likely to be active daily than non-members. However, for girls, there was no significant difference between members and non-members. Moreover, definite intention for future PA, higher self-perceptions and educational aspirations to other education or training than general upper secondary school were significant predictors.

**Conclusions:** Adolescents with LTID need encouragement to be active daily. One possible way to achieve this is through sports club participation. Implementing adaptive motivating techniques in sports clubs is especially important for girls in clubs. More research is needed on the associations of daily MVPA with different educational aspirations for adolescents with LTID.

*Key words:* intention, self-perceptions, organised sports, HBSC Study, vocational education, vocational training

## INTRODUCTION

Physical activity (PA) for adolescents with long term illnesses or disabilities (LTID) is an important health related behaviour because it has been demonstrated to reduce the onset of secondary conditions [1], improve mental health [2], advance skills used in self-care as an adult [3], as well as provide opportunities to integrate with their social environment [4]. Much of these benefits can be gained through the adherence of the World Health Organization's (WHO) recommendation of at least 60 minutes per day of moderate to vigorous physical activity (MVPA) during adolescence [5]. More Finnish adolescents have been reported to meet these recommendations than other adolescence elsewhere in Europe and Canada [6]. While the situation seems to be the best in Finland, information about the situation for adolescents with LTID is scarce. Previous studies have reported worrying differences in PA levels in children with LTID as they can be up to four and a half times less physically active than their peers without LTID [7]. The amount of reported PA can range substantially, depending upon the type and the severity of a health condition that can be considered as LTID [8-10].

Earlier studies have reported that adolescents who have the capability to go to the general schooling system, but still report to have LTID, can have similar levels of PA as their peers without LTID [11]. In addition, with this subpopulation group, there are differences in PA levels depending on the reported condition [12]. Due to these differences, studies that focus on interventions, relationships and recommendations have often been based on specific types of LTID [9, 10]. Individual interventions also need to take into consideration the psychosocial factors in order to be successful, particularly in adolescents [13, 14]. This has been argued to be useful for focusing on individual needs required to promote PA. However, individual studies lack the potential to measure prevalence changes over time and the potential for generalizability [15]. The reasons for this could be related to the sampling of a minority population, incomparable results from different data collection methods, as well as difficulties in collecting uniform data across a number of different categories of LTID [16]. As more adolescents with LTID have the opportunity to be included into activities designed for the general population, a clearer understanding of moderating behaviours for PA that may provide health promoting strategies on a whole is needed.

In general, the opportunities for PA in adolescents include physical education classes, school recess time as well as organised and unorganised sports participation [17, 18]. There are some substantial grounds for investigating the components of organised sports participation, also referred to as sports clubs. Firstly, compared with compulsory physical education, not all adolescents take part in sports clubs. Data obtained between 2002 and 2014 revealed a steady rate of 45% of adolescents with LTID who take

part in sports clubs, with one out of five of these adolescents reported to meet the PA recommendations [19].

Secondly, studies have also shown that in general, adolescents that take part in sports clubs are more likely to be active as an adult [20], take part in more PA [21, 22], demonstrate improved mental health [23] when compared with peers that are not part of sports clubs. Furthermore, sports club participation allows adolescents to benefit from social health [24]. However, less is known about whether these findings are applicable for adolescents with LTID. A model for physical activities for people with disabilities (PAD) [25] has been suggested and was created through a systematic literature review based on the World Health Organization's International Classification of Functioning, Disability and Health (ICF) [26]. In both frameworks, results from studies indicate that the ICF personal factors are important facilitators and barriers to PA. These personal factors include intention for future PA, self-perceptions such as perceived fitness, competence and body image, as well as social attitudes. They are addressed as psychosocial factors for the remainder of this paper. Studies that can look at these variables together in a single study design across adolescents with LTID are scarce.

Another reason for studying the associations with sports club membership is to separate adolescents due to the activities they take part in. The ICF lists taking part in sports activities as an important indicator for normal functioning [26]. In general, adolescents attend sports clubs primarily with the main purpose for improving sport ability and positive youth development [13]. The activities in organised sports settings are fixed, structured and predominantly led by coaches that have undergone some basic training [27]. Coaches need to organise these activities as a whole, often with the sacrifice of accounting for large individual differences [28]. As such, there is a risk that adolescents with reported LTID experience difficulties when executing some of the tasks [29]. This has a direct influence on the adolescent's own self-perceptions. The coach takes over the role from the parents to motivate the adolescents to take part in physical activities [30]. This contrasts the intrinsic motivation attributes of individuals that do physical activities but are not members of sports clubs [31].

There has been encouragement for adolescents with LTID to take part in PA successfully without the need for structured settings [32]. In both settings, adolescents can respond to the feelings towards PA by directing their focus on the intention for future PA. Studies from the general population have suggested individuals may find it easier to take up PA as adults through participation during adolescence in organised sports in combination with experiences of positive self-perceptions [33]. These aspects are reported in the PAD model, but lack empirical testing. Individuals without the habit of being part of sports club may later prefer other activities. Hence it is important to know what future intentions adolescents have towards PA as this construct can inform how autonomous motives



combine social norms, attitudes and control of physical activity behaviours [34]. Based on these studies from the general population, studying intention for future PA may be an important predictor for the likelihood of secondary conditions such as cardiovascular disease and diabetes in adolescents with LTID. As well as intention for future PA, attitudes such as educational aspirations have been found to be associated with PA levels in the general adolescent population [35]. In Finland, the majority of pupils make a choice between vocational education and general upper secondary school routes after basic education at 16 years old [36]. In addition, educational aspirations have been treated as an early indicator for perceived social economic status [37], which may influence the overall judgement of self-worth [38]. However, in relation to PA and sports club membership in adolescents with LTID, these psychosocial factors have not been well documented in the literature.

The purpose of this study is to assess the impact of psychosocial factors (specifically, intention for future PA, self-perceptions and educational aspirations) on sports club membership and daily physical activity. Due to different patterns of PA between boys and girls [39-41], this study purpose will also separate boys and girls.

There are two main hypotheses for this study. The first hypothesis stems from the ICF activities component, whereby it is expected that sports club members participate in more physical activity than non-members [28]. The second hypothesis is related to the PAD model [25], whereby increased physical activity is associated with definite intention for future PA, higher self-perceptions and aspirations towards general upper secondary schools.

## METHODS

### Participants and Procedures

Under the Salamanca Agreement [42], more adolescents with long-term illnesses or disabilities (LTID) are part of general education systems. This has allowed meaningful research from surveys like the WHO Collaborative Health Behaviours in School-aged Children (HBSC) study to collect data across national representative samples and study patterns of behaviours from these contexts [43] without the loss of segregated data [44]. The HBSC study is cross-sectional through the use of self-report surveys of adolescents (ages 11, 13, 15) in Europe and North America. In Finland, only general schools were invited to participate in the study. Sampling of the research data were based on regional stratum and at the size of the school through proportion pupil size. At the school level, random sampling took place to select the class. In combination with regional level stratification, the entire sample was intended to be a national representative data set. In order to achieve adequate sample sizes for adolescents with LTID, data have been aggregated from

data collection in 2002 and 2010. Data from 2006 and 2014 studies used different items related to reporting of LTID and could not be used for analysis.

Overall, the number of schools involved in this study was 277 in 2002 and 341 in 2010. Questionnaires with the same investigated items were completed in the spring of 2002 and 2010 from around the country of Finland. The pupils' response rate from the entire samples for 2002 was 92% and for 2010 was 94% with a HBSC sample of 7241 students. Data from 11 years old were not included since they were not asked questions about LTID. Responses were completed anonymously and no personal identifiers could be traced back to the individual. Once the researcher received and scanned the completed surveys, individual responses were checked. The data file was then cleaned according to the HBSC study protocol which remained the same for both the 2002 and 2010 data collection. The study was approved by the Finnish National Board of Education.

## INSTRUMENTS AND VARIABLES

### Long term illnesses or disabilities

The chronic conditions short questionnaire was used to determine selected participants. The brief questionnaire was used in the UK census in 1991 [45] and has been partly included in the HBSC study since 2002. Only participants that had responded 'yes' to the following question were included, "Do you have a long-term illness, disability or medical condition, as stated by a doctor (do not include learning disabilities)."

### Moderate to Vigorous Physical activity (MVPA)

Physical activity was measured using a self-reported single item. The question combined intensity (moderate to vigorous), duration (at least 60 minutes) and frequency (scale response of number of days) [46]. A widely used introductory text to describe intensity of PA preceded the question of "over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?" with responses ranging from 0 to 7 days [47]. This widely used item has been tested [46] for reliability and validity in Finland [48] as well as in other countries [49-50]. Although there have been some studies that recommend caution among the results of self-reported data [51], this particular item has been reported to provide moderate results when administered with adolescents who had been tracked with objective devices and it is particularly appealing when making comparisons with studies [52]. In accordance with the PA recommendations for health [5], PA was dichotomised into groups of "daily" and "not daily" MVPA.

## EXPLANATORY VARIABLES

### Intention for future physical activities

Intention for future PA was measured through a single item, which corresponded to instructions, from the manual to create questions for measuring future behavioural intention [53]. The direct translation of the question from Finnish is, "Do you think you will participate in sports or other physical activities when you are 20 years old?" Responses ranged from 1, Definitely yes, 2, Probably yes, 3, Probably no, and 4, Definitely no. Dichotomous groups (binary) were comprised of definite [1] and uncertain intentions [2 - 4].

### Educational Aspirations

In Finland, compulsory basic education ends at age 16 and more than 90% proceed to continue in either general upper secondary or vocational education through the age of 19 [54]. Educational aspirations were measured through the following question, "What do you think you will do when you finish compulsory basic education?". Categorical responses included "General upper secondary school", "vocational school/training", "apprenticeship", "double examination (both general upper secondary and vocational)", "get a job", "be unemployed", and "don't know". Groups were dichotomised into those who try to go to "general upper secondary school" and those with "other" aspirations.

### Self-Perceptions

Self-perceptions were measured from three single items of perceptions of physical competence, physical fitness and body image. Using scoring procedure from previous studies, individuals with high competence, fitness and body image were grouped into a group of higher self-perceptions, and all other perception scores were grouped as lower self-perceptions (Table 1). These measures have been reported to be valid and reliable for adolescents aged 13 to 18 years [55].

### Sports club membership

Membership of a sports club was measured by a single question "Are you a member of a sports club"? Responses were "No", "Yes and I am training in a sports club", "Yes but I do not participate in training". To fulfil both "doing" and "engaging" dimensions of participation [56], the following groups were set; those who indicated being a member of a sports club and participate in training were coded as a "sports club member". The other

group of non-active individuals and not a member were renamed "non-members". This variable is the objective of the analysis.

### Statistical methods

Descriptive statistics of means and standard deviation were calculated for study characteristics. Separate chi-square test of independence was used to compare differences between boys and girls in sports club, daily PA, intention for future PA, self-perceptions, educational aspirations and year of data collection. In addition, another chi-square test was conducted between members and non-members of sports club, daily PA, intention for future PA, self-perceptions, educational aspirations and year of data collection. Binary logistic regression analysis was used to estimate the association among sports club membership, daily PA participation and psychosocial factors. Categories were fixed so that odds are positively directed for reporting positive odds ratio. Analyses were first performed with the entire sample and subsequently stratified by gender since there have been reports that boys and girls have different factors related to sports club membership [41]. Overall analyses were adjusted for age and year of data. Data analysis was performed using SPSS 22. The level of significance was set at 0.05.

## RESULTS

The sample population represents a prevalence of 18.0% in 2002 and 13.7% in 2010 of adolescents with LTID. Under half (40%) of the sample were sports club members and there were slightly more girls (56.6%) than boys. This did not statistically influence the distribution of the sample ( $\chi^2(1) = 1.15, p = 0.28$ ). The descriptive statistics of sample are shown in Table 2. More boys were active daily, had high self-perceptions and aspired to other education systems than to the general upper secondary school.

In Table 3, sports club members reported more days of MVPA (mean=4.9 days, SD=1.8) and more (22% vs 9%) were physically active daily than non-members (mean=3.3 days, SD=1.9). Sports club members were more likely to have higher self-perceptions (42% vs 17%), definite intention for future PA (75% vs 37%), as well as aspire to general upper secondary school (78% vs 61%).

The results of the binary logistic regression analysis for the association among organised sports membership, daily MVPA and psychosocial factors are presented in Table 4. For the total sample, members of sports clubs were twice more likely to be active daily ( $p=0.002$ ) than non-members. Adolescents had over twice higher odds if they had higher self-perceptions and three times higher odds if they had definite intention for future PA. Furthermore, adolescents with aspirations towards other

**TABLE 1. Explanatory instruments used and how they were grouped into dichotomous groups.**

INSTRUMENT	RESPONSES	CODING	
		0	1
<b>Self-perceptions</b>			
How fit do you think you are?	Not fit at all (1) – Very fit (4)	1, 2	3, 4
How good are you at sports compared to others the same age as yourself?	Among the best (1) – Below average (4)	3, 4	1, 2
Do you find yourself..?	Too thin (1) – Too fat (5)	1, 2, 4, 5	3
<b>Intention for future Physical Activity</b>			
Do you think that you will go in for sports or other physical activities when you are 20 years old?	Definitely yes (1) – Definitely no (4)	2, 3, 4	1
<b>Educational aspirations</b>			
What do you think you will do when you finish compulsory basic education?	General Upper Secondary School (1), Vocational school/training (2), Apprenticeship (3), Double Examination (4) Get a job (5), Be unemployed (6), don't know (7)	2, 3, 4, 5, 6, 7	1
<b>Sports club member</b>			
Are you a member of a sports club?	No (1), Yes and I am training in a sports club (2), Yes, but I don't participate in training (3)	1, 3	2

Note. Self-perceptions scores were grouped based coding of three variables on physical activity self-perceptions. The reference category (lower self-perceptions) was calculated given the condition that at least one of the self-perception items was low. Fulfilling the criteria of all 1's in the self-perceptions was coded as higher self-perceptions. All other variables were dummy coded with the reference category referring to an absent of the event

educational systems after compulsory school had higher odds ( $p=0.013$ ) for daily PA participation.

Boys results were almost represented the same as the overall sample, however, the odds were higher, and for example, definite intention for future PA was almost 4 times more likely to participate in daily PA. For girls, younger age ( $p=0.015$ ) and definite intention for future PA ( $p=0.004$ ) were significantly associated with daily PA. Sports club membership was not significant ( $p=0.055$ ).

## DISCUSSION

In this study, the results suggest sports club members are more active than non-members. Adolescents with long term illnesses or disabilities (LTID) who are sports club members are likely to use these activities towards a target of daily moderate to vigorous physical activity (MVPA), however only a quarter of members reported to do this. Furthermore, after controlling age, as well as year of data collection, reporting daily MVPA was associated with sports club membership and psychosocial factors including intention for future PA, self-perceptions and educational aspirations.

In our first hypothesis we expected that sports club members participate in more PA than non-members. The results from the study reveal girls with LTID and sports club members were not significantly more likely to participate in daily MVPA. The average number of days was however significantly different in girls members than non-members.

In Finland, there has been an increase in girl sports club membership from a third to almost a half between 2002 and 2014, which is still fewer than the constant rate of around half the boys who are sports club members [19]. Sports clubs for adolescents tend to have a competitive nature and this might be less of an incentive for adolescents with LTID. A lack of opportunities for the right activity for adolescents with LTID [57] has been reported to be a barrier for sports participation. This can be a reason for fewer girls to take part in sports club as girls may choose to take part in other leisure time activities such as self-improvement, skill-based, social, or recreation [58]. These activities may take up important time so that the adolescent could be physically active for at least 60 minutes per day.

Our second hypothesis which was increases in physical activity are associated with definite intention for future PA, aspirations towards general upper secondary schools and higher self-perceptions, was also partly demonstrated. The overall result is consistent with the previous studies that were present in the physical activity for people with disabilities (PAD) model [59]. Intention for future PA is confirmed to be a central component in relation to daily MVPA [25]. Unlike the other studies that were reviewed by Bloeman and colleagues [59], this measure of intention for future PA was based on predictions when the adolescent will be 20 years old. This could be five to seven years in the future and there may be questionable validity to the measure. However, one of the main fallacies of the construct of intention is that an intention for

**TABLE 2. Descriptive characteristics of participants by gender and chi-square Test of independence.**

	TOTAL (n=1006) %	BOYS (n=437) %	GIRLS (n=569) %	$\chi^2$	p
<b>Sports Club</b>				1.15	0.284
Non Member	60.2	58.4	61.7		
Member	39.8	41.6	38.3		
<b>Age</b>				1.19	0.275
13	48.6	50.6	47.1		
15	51.4	49.4	52.9		
<b>Data Collection</b>				0.95	0.330
2002	52.5	54.2	51.1		
2010	47.5	45.8	48.9		
<b>MVPA</b>				13.32	<0.001
Not Daily	84.2	79.4	87.9		
Daily	15.8	20.6	12.1		
<b>Intention for future PA</b>				<0.001	0.994
Uncertain	47.8	47.8	47.8		
Definite	52.2	52.2	52.2		
<b>Self-perceptions</b>				23.42	<0.001
Low	73.2	65.4	79.1		
High	26.8	34.6	20.9		
<b>Educational aspiration</b>				14.66	<0.001
Other	37.3	43.9	32.2		
General Upper	62.7	56.1	67.8		

something can happen long before the behaviour or just moments before [60]. Therefore it was not surprising to see how the tendency of this psychosocial construct behaves in the same way as in other studies related to PA. This is particularly important for adolescents who currently have LTID and may need to be active throughout their lives to reduce the onset of secondary conditions such as cardiovascular disease, diabetes, various respiratory diseases and osteoarthritis [61].

Intentions are often comprised of attitudes towards certain behaviours [62]. In this study, attitudes of individuals were measured by educational aspirations, because there are strong associations between higher academic track aspirations and increased physical activity [35]. However, the results in this study were the opposite, where aspirations towards other types of educational track were associated with daily MVPA. This could be related to some of the activities that adolescents with LTID have had to face. For example, since the onset of LTID, adolescents may have had to miss classes due to appointment times with the physician, days off sick, or attend other training for daily living [63]. These absences may contribute towards a preferred educational track of other studies and training. However, this does not explain the significance of this finding and

more results are needed to examine the relationship between vocational school or training aspirations and physical activity in adolescents with LTID [14].

In addition to sports club membership, there was no significant association between self-perception in girls and daily MVPA. Studies from the general population have indicated that adolescent girls tend to have lower self-perceptions and are more sensitive to these perceptions than boys [64], therefore it might be hard to distinguish differences when dichotomising the perceptions into high and low groups. In the context of this study, self-perceptions included attributes of perceived fitness, competence and body image [55] and these have been demonstrated to be important psychological constructs that increases motivation to participate in physical activities [65]. In the sports club setting, the coach is an important authority figure that structures the activity session, manages the tasks that occur and motivates the participants [24]. Targeted interventions where the coach leads a mastery motivational climate and autonomous-supportive behaviours have been shown to increase self-perceptions [13]. However, for the coach to be successful at this, specialised training is required for important motivating methods and awareness of contraindications in populations with LTID [10].

TABLE 3. Psychosocial variables between members and non-members of sports clubs.

	NON-MEMBERS (n=606) %	MEMBERS (n=400) %	$\chi^2$	p-value
<b>MVPA</b>			51.86	<0.001
Not Daily	90.9	74.0		
Daily	9.1	26.0		
<b>Age</b>			19.85	<0.001
13	42.9	57.3		
15	57.1	42.8		
<b>Data Collection</b>			4.23	0.040
2002	55.1	48.5		
2010	44.9	51.5		
<b>Intention for future PA</b>			141.55	<0.001
Uncertain	63.0	24.8		
Definite	37.0	75.3		
<b>Self-perceptions</b>			72.70	<0.001
Low	82.8	58.5		
High	17.2	41.5		
<b>Educational aspiration</b>			25.77	<0.001
Other	38.7	22.5		
General Upper	61.3	77.5		

TABLE 4. Multivariate positive Odds Ratio and confidence intervals for daily physical activity.

	TOTAL		GIRLS		BOYS	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
<b>Sports club member</b>	2.00	1.33-3.00**	1.76	0.99-3.14	2.21	1.24-3.96*
<b>Non-member</b>	1.00		1.00		1.00	
<b>13 year old</b>	2.07	1.41-3.02***	1.96	1.14-3.36*	2.28	1.31-3.95**
<b>15 year old</b>	1.00		1.00		1.00	
<b>2010 Data</b>	1.93	1.33-2.80**	1.68	0.98-2.90	2.34	1.38-3.98**
<b>2002 Data</b>	1.00		1.00		1.00	
<b>Definite intention</b>	3.00	1.92-4.68***	2.56	1.35-4.85**	3.78	2.01-7.11***
<b>Uncertain intention</b>	1.00		1.00		1.00	
<b>High self-perceptions</b>	2.07	1.41-3.02***	1.65	0.93-2.95	2.33	1.38-4.02**
<b>Low self-perceptions</b>	1.00		1.00		1.00	
<b>Other educational aspiration</b>	1.63	1.11-2.41**	1.30	0.73-2.33	1.78	1.03-3.09*
<b>General upper secondary</b>	1.00		1.00		1.00	

OR: Odds Ratio. 95% CI: 95% Confidence Interval \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Considering that the majority of adolescents sports club coaches have a minimal coach qualification [27], training often neglects ways to instruct in an inclusive setting. If this training was provided it would enable more adolescents with LTID to participate [66]. Ever since getting more

adolescent girls into clubs has become more effective, the sports clubs themselves may be lacking the necessary skills to keep the girls there [24] and further, adolescents that take up sports and have negative experiences, may find it harder to take up sports again [67]. Sports club

participation is a partial contributor to the overall daily PA. As such, it is encouraging to see that our results reveal that there are other ways, particularly for girls with LTID to take part in MVPA daily from outside the sports club context.

### Limitations

There are limitations to consider when interpreting our findings. Data was collected in a cross-sectional study design, which eliminates the possibility to infer causality among the variables. Participants used self-report measures and there might be some bias towards desirable responses and recall error [52]. There may have been some measures that have not been empirically validated, yet the study instruments have been accepted throughout an international study design with the consortium of researchers in multiple scientific domains. Therefore additional benefit of self-report has been the ability to capture the perceptions of adolescents themselves rather than reporting through proxy [44]. Another useful insight would have been the nature of sports clubs, as this would help target some barriers regarding choice of activities. Finally, this study looked only at the individual psychosocial factors and to strengthen the findings, future studies may benefit from utilising other biological and social determinants of PA.

### CONCLUSIONS

The gender differences in daily MVPA may be partly explained by participating in sports clubs. For Finnish adolescents with LTID, there was a positive association from taking part in sports clubs for boys, while this is not as clear for girls. However, of the psychosocial factors measured only definite intention for future PA was associated with daily PA after controlling age for boys and girls. Therefore, interventions for increasing PA through motivational techniques should consider the importance of being physically active later in life. It seems to be important for boys to get into sports clubs as a way to meet physical activity recommendations, however sports clubs need to be ready for inclusion of adolescents with LTID.

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