**PHYSICAL FITNESS AND ITS TESTING IN ADULTS WITH INTELLECTUAL DISABILITY**

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Master's thesis

Summer 2005

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Sport Sciences

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ABSTRACT

Kati Karinharju. Physical fitness and its testing in adults with intellectual disability. Department of Sport Sciences, University of Jyväskylä, Finland. Master's thesis. 2005, 76 p.

This study is a part of the longitudinal study of physical performance of individuals with intellectual disability (Lahtinen, Rintala & Malin 2005). The purpose of this study was to investigate the physical fitness level of adults with intellectual disability (ID) and to explore the testing situation itself from the pedagogical view. The participants consisted of 28 women and 35 men with mild to moderate intellectual disability aged 40 – 47. Eighteen of the participants (N= 63) had Down syndrome (DS). The physical fitness level was evaluated from the measurements of BMI, 1-mile walking test, sit-up test, hand grip test, sit-and-reach test, single leg balance test and heel-to-toe dynamic balance test. Each participant performed all test items, except 43 participants performed 1-mile walking test. The pedagogical analysis of test situation was made by observing the videotapes and analyzing the notes of the researcher. Pedagogical items observed were familiarization, guidance and motivational strategies.

The results revealed that the difference between females and males with ID was statistically significant ($p < .01$) in sit-up and hand grip tests and very significant ($p < .001$) in BMI and 1-mile walking tests. Male participants had higher values in sit-ups, hand grip and 1-mile walking test, while females had higher score in BMI. When comparing the differences between participants with and without DS, participants without Down syndrome had higher score ($p < .05$) in static and dynamic balance than participants with DS. However, the participants with DS had higher results in flexibility and the difference was very significant ($p < .001$). More information of the reliability of prediction equations and methods to assess the body composition, cardiorespiratory fitness, muscle strength, flexibility and balance of individuals with ID and DS is needed.

Analysis of the test situation from pedagogical view indicated that familiarization process before and after testing is important and it will ensure more reliable and fluent test measurements. The guidance in test situation has to be planned thoroughly, but different persons and situations require also creative solutions and imagination. Motivational strategies used in this study were mostly based on extrinsic motivation methods. Further research of pedagogical methods in testing adults with ID is warranted.

Key words: Intellectual disability, physical fitness testing, pedagogical testing protocol, familiarization, guidance and motivational strategies

TIIVISTELMÄ

Kati Karinharju. Kehitysvammaisten aikuisten fyysinen kunto ja sen testaaminen. Liikuntatieteiden laitos, Jyväskylän yliopisto. Pro gradu-tutkielma. 2005, 76 sivua.

Tämä tutkimus on osa kehitysvammaisten fyysisen toimintakyvyn 30-vuotis seurantatukimusta (Lahtinen, Rintala & Malin 2005). Tämän työn tarkoituksena on selvittää kehitysvammaisten aikuisten fyysisen kunnon taso sekä tutkia kehitysvammaisten fyysisen kunnon testaamista pedagogisesta näkökulmasta. Tutkimukseen osallistui 63 kehitysvammaista aikuista (40–47 -vuotiaita), joista 28 oli naisia ja 35 miehiä. Kahdeksallatoista osallistuneista oli Downin oireyhtymä. Fyysisen kunnon arviointiin käytetyt testit olivat: kehon painoindeksi (BMI), mailin kävelyaika, istumaannousu testi, kädenpuristusvoima testi, venytystesti istuen, yhden jalan haikaraseisonta ja kantavarvas kävely. Tutkimuksen pedagoginen tarkastelu tehtiin havainnoimalla testitilanteita videonauhalta sekä analysoimalla tutkijan tekemiä muistiinpanoja. Tarkasteltavia pedagogisia aiheita testitilanteissa olivat testattavan perehdyttäminen, ohjaaminen sekä erilaiset motivointikeinot.

Kun verrattiin kehitysvammaisten aikuisten miesten ja naisten tuloksia keskenään, ero tulosten välillä oli tilastollisesti merkitsevä ($p<.01$) istumaan nousu – testissä ja käden puristusvoimatestissä sekä tilastollisesti erittäin merkitsevä ($p<.001$) painoindeksin ja mailin kävelyajan kohdalla. Kehitysvammaisilla miehillä olivat korkeammat tulokset istumaan nousussa, kädenpuristusvoima -testissä sekä mailin kävelytestissä. Naisilla puolestaan oli korkeampi kehon painoindeksi. Ne kehitysvammaiset, joilla ei ollut Downin oireyhtymää, menestyivät tilastollisesti paremmin ($p<.05$) sekä staattisessa että dynaamisessa tasapainossa kuin osallistujat, joilla oli Downin oireyhtymä. Ne henkilöt, joilla oli Downin oireyhtymä, saivat puolestaan korkeammat tulokset venytystestissä ja tulos oli tilastollisesti erittäin merkitsevä ($p<.001$). Lisää tutkimustietoa kehitysvammaisille aikuisille soveltuvista kehonkoostumuksen, hengitys- ja verenkiertoelimistön kunnon, lihaskunnon ja liikkuvuuden sekä tasapainon mittareista tarvitaan.

Tutkimuksen pedagoginen tarkastelu osoitti että testattavien perehdyttäminen testitilanteessa on tärkeä osa itse testaamista. Ennen kaikkea testin luotettavuuden ja sujuvuuden kannalta on tärkeää, että perehdyttäminen huomioidaan sekä ennen testin alkamista että testaamisen päätyttyä. Testitilanteen ohjaaminen ja ohjeiden antaminen on tärkeää suunnitella huolellisesti etukäteen, mutta itse testitilanteessa tulee myös osata mukauttaa ohjeiden antoa yksilön tarpeiden mukaan. Tämä vaatii testaajilta luovaa ajattelua sekä kykyä käyttää mielikuvitusta. Tässä tutkimuksessa käytettiin pääosin ulkoisia motivointikeinoja. Lisää tutkimustietoa kehitysvammaisten aikuisten testaamisessa käytettävistä pedagogisista menetelmistä tarvitaan.

Avainsanat: Kehitysvammaisuus, fyysisen kunnon testaaminen, testaamisen pedagoginen näkökulma, perehdyttäminen, ohjaaminen ja motivointikeinot

CONTENT

# INTRODUCTION

Persons with intellectual disability (ID) live a longer and healthier life than before and there is a notably large increase in their life expectancy. The longer life span is expected to produce new morbidity and mortality predictors for this population (Aalto 2000; Beange, Lennox & Parmenter 1999; Patja 2001, 19). It is important to understand different health issues among older adults with intellectual disability to develop health promotion strategies into the future. Health is often defined as a multifaceted construct that includes physical, mental and social states that incorporates with environmental and behavioural determinants (Cooper 1998; Kickbusch, 1997; Sutherland, Murray, Iacono & Iacono 2002; WHO 1980). Physical fitness and regular physical activity are key factors in health and well being of all individuals. Physical fitness appraisal includes the following components: body composition, cardiorespiratory capacity, muscle strength and endurance, balance and flexibility. These components are essential for independent living and for developing functional skills. (Janicki, Krauss & Seltzer 1988, 218-219; Keskinen, Häkkinen & Kallinen 2004, 125; Rimmer 2000; Temple, Anderson & Walkley 2000.)

People with intellectual disability have more often sedentary lifestyles than people in general. A sedentary lifestyle that results from inadequate levels of physical fitness can contribute to a number of health problems, including obesity, hypertension, low back pain, osteoporosis, coronary heart disease, diabetes, colon cancer, anxiety and depression, and premature mortality. (Auxter, Pyfer & Huetting 2001, 293-294; Evenhuis, Henderson, Beange, Lennox, Chicoine et al. 2000; Horvat, Eichstaedt, Kalakian & Croce 2002, 12; Rubin, Rimmer, Chicoine, Braddock & McGuire 1998.) All people have their own individual fitness needs and physical fitness is as important for the adult with intellectual disability as it is for non-handicapped adult. However, for disabled persons an appropriate level of physical fitness is critical, because their disabling condition itself interferes with the ability to move efficiently. Furthermore, the fitness level of persons with intellectual disability, regardless of the measurement procedures, is generally lower in comparison to general population. (Auxter et al. 2001, 293-294; Horvat et al. 2002, 126 Rimmer 1994, 251.)

Participation in regular physical activity is becoming important issue to maintain vocational productivity and optimal health (Temple et al. 2000). Individuals with intellectual disability need systematic intervention strategies for building their physical fitness. People with disabilities face many challenges that impede their progress to become physically active like architectural barriers, being overprotected, fostering an inactive lifestyle, the potential for obesity and other health concerns. (Prasher & Janicki 2002, 3.) Adults with intellectual disability are often not self-directed enough to learn their options and the motivation to complete a task or an effort to induce a training effort is often lacking (Horvat et al. 2002, 127). Before we can develop the recreation service plan it is important to conduct a systematic, objective assessment of the individuals' health and wellness status and current leisure-time use skills by identifying the level of the physical fitness (Janicki et al. 1988, 218-219).

According to Vesala & Matikka (2000, 6), the well being in people with intellectual disability (ID) is based on the idea that quality of life can be achieved if there are good services available. In order to develop the supply of health related services there has to be enough research information of the matter in question. During my P.E. studies I was working as physical activity instructor for adults with intellectual disability. During that time I noticed that the demand of the health related physical fitness services for people with ID is much bigger than the supply. So I became more interested in to find out how this situation could be improved. In autumn 2003 I got the opportunity to participate in the 30-year performance follow-up study of individuals with ID (Lahtinen, Rintala & Malin 2005). This opportunity brought me the possibility to explore the physical fitness level of adults with ID and find out how the physical fitness level influences on their health in general. While I was completing the pilot test of this research I noticed that different pedagogical issues like the familiarization process, guidance and motivational strategies had a great influence on the test situation itself. Being aware of that, I also decided to study the test situations from these pedagogical aspects.

The aim of this study (Figure 1.) is to investigate the physical fitness level of adults with intellectual disability and to explore the testing situation itself from the pedagogical view. There are variety of assessment tools that can be used to measure the components of physical fitness (Rimmer 1994, 5). However, little information exists of methods for teaching preparatory motor fitness test skills for individuals with intellectual disability (Tomporowski & Ellis 1984). To begin, recent literature and research on intellectual disability are briefly reviewed, followed by consideration how different factors like ageing and physical activity affect on the morbidity, mortality and life expectancy of people with mental retardation. Also, the test protocols of physical fitness components, used in this study, are described in details. In this study the term intellectual disability is used to describe individuals with developmental disability, mental retardation and Down syndrome.

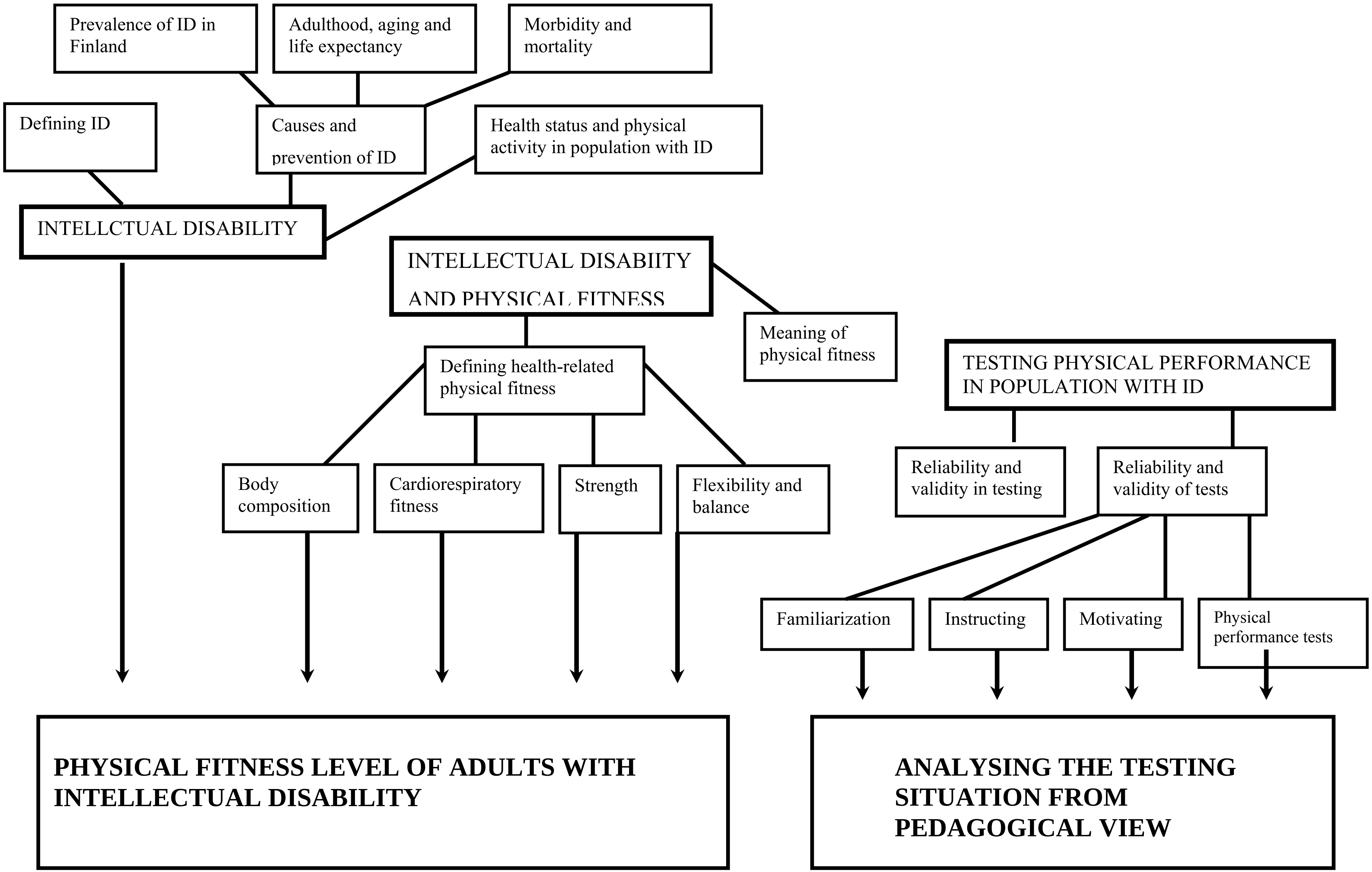


FIGURE 1. Framework of the research

# 1 INTELLECTUAL DISABILITY

## 1.1 Defining intellectual disability

The term intellectual disability (ID) is used as synonym to mental retardation (MR) and it refers to substantial limitations in present functioning. This research follows the same rule by using the term intellectual disability. In the literature, the following terms are used to mean intellectual disability (ID): mental retardation (MR) (emphasis on neurological dysfunction), learning disability (emphasis on difficulties in learning) and intellectual disability (ID) (emphasis on  primary dysfunction). Some prefer the term mentally handicapped. (Patja 2001, 13-15; Steadward, Wheeler & Watkinson 2003, 560.) Different countries prioritize alternative terms and it has become apparent that these alternatives were having different meanings in different parts of the world. At this moment, there has not been identified a single, internationally recognized term. (Steadward et al. 2003, 560.) The use of standardized classification would enhance validity of future epidemiological studies (Prasher & Janicki 2002, 1). In Canada, Australia, and many Western countries intellectual disability has emerged as the most consistently used alternative to the term mental retardation. The term mental retardation is falling out of favor in some professionals and parent organizations. The reason is, that the term mental retardation is a controversial label and inextricably linked with outdated and negative stereotypes. (Steadward 2003, 560.) Terms developmental disability and developmentally delayed are achieving more and more recognition as the word development includes the broader context of social and adaptive behaviours along with performance on intelligence tests (Cratty 1989, 169; Sutherland et al. 2002). The term developmental disability is a broader concept, which includes disabilities like Alzheimers's disease, Asperger's disorder, autism, Down syndrome (DS), fetal alcohol syndrome (FAS) and intellectual disability (ID) (Steadward et al. 2003, 60-62).

Historically intellectual disability classification systems were based on designating the person into an IQ band and as in the classification system of mild, moderate, severe, and profound. By using this classification, participants with ID are grouped by level of impairment. The term intellectual disability should never be used without specifying these levels since individual differences within this special population are far greater than differences within general population. (Kehitysvammaliitto 1995, 9; Patja 2001,19; Sherrill 2004, 40; WHO 1992; Ziegler & Hodapp 1991.) It should be emphasized also that individuals with mild and moderate disability are more like the individuals in general in functional performance than individuals with lower levels of intellectual disability. Generally, they are fully mobile and physically active. (Rimmer 1994, 251; WHO 1992.) In 1992, a new classification system was proposed, in which intellectual disability is defined as significantly subaverage intellectual functioning, existing concurrently with related limitations in two or more of the following applicable adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure and work (AAMR 2002, 7; Kehitysvammaliitto 1995, 11; Luckasson, 1992).

In order to define, intellectual disability has to originate before the age 18 and next five essential assumptions should appear:

a) Limitations in present functioning must be considered with the context of community environments typical of the individual's age peers and culture.
b) Valid assessment considers cultural and linguistic diversity as well as differences in communication, sensory, motor, and behavioural factors.
c) Within an individual, limitations often coexist with strengths
d) An important purpose of describing limitations is to develop a profile of needed supports.
e) With appropriate personalized supports over a sustained period, the life functioning of the person with mental retardation generally will improve

The theoretical model of intellectual disability (Figure 2) shows intellectual disability as a multidimensional disability and each dimension in the model influences on the individual's functioning. Furthermore, each of them is mediated through the supports available to a person. A comprehensive and correct understanding of the condition of intellectual disability requires a multidimensional and ecological approach that reflects the interaction of the individual and his or her environment. (AAMR 2002, 9-11; Kehitysvammaliitto 1995.)

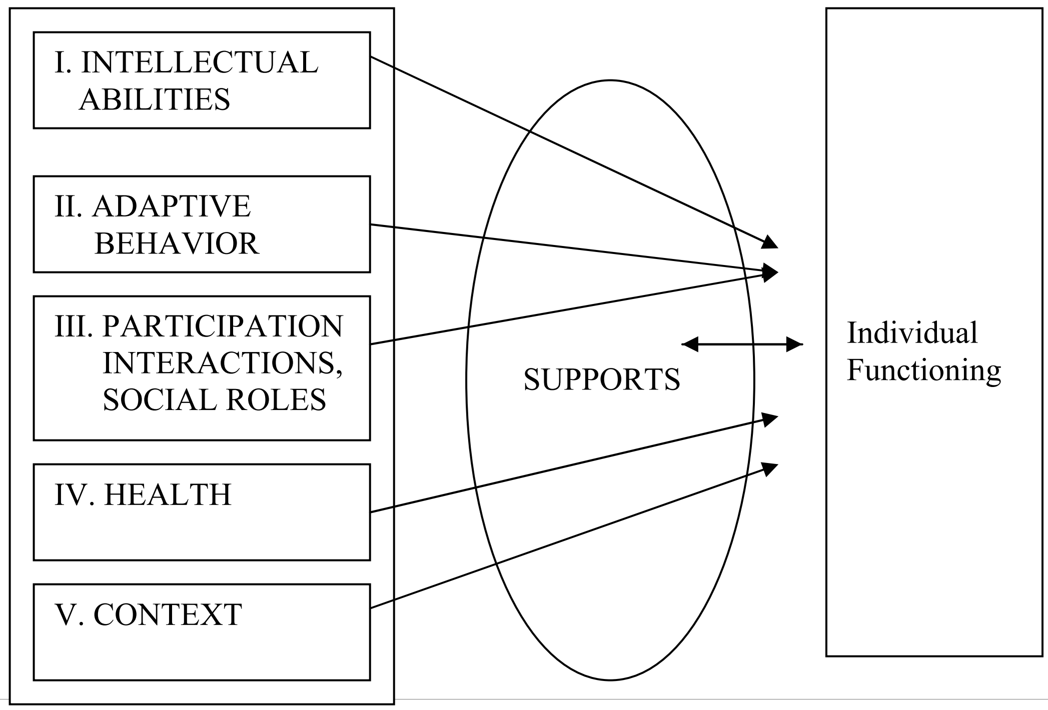


FIGURE 2. Theoretical model of intellectual disability (AAMR 2002, 10).

## 1.2 Causes and prevention of intellectual disability

In 1992 AAMR's manual, etiology of intellectual disability was split into four categories of risk factors that interact across time, including the life of the individual from parent to child. These risk factors are biomedical, social, behavioural, and educational. (AAMR 2002, 125.) Epidemiological studies have shown that as much as 50% of the population of individuals with intellectual disability has more than one causal risk factor. Furthermore, intellectual disability often reflects the cumulative or interactive effects of more than one risk factor. (AAMR 2002, 125.) Although, there is no clear cause of intellectual disability, the most known single risk factors have been identified. There are two distinct types of persons with intellectual disability; those whose retardation has no organic cause (familial or cultural retarded persons) and organically retarded persons (one or more clear organic causes). Familial retarded individuals generally exhibit few biological or behavioural characteristics that distinguish them from general population. Those persons whose retardation has a clear organic cause can be divided as in heredity factors, other prenatal factors like infections and drug exposure, parinatal and postnatal factors. (Wilska & Kaski 1999; Winnick 2000, 118; Ziegler & Hodapp 1991.) Wilska & Kaski (1999) noted that the timing of causative factors is important for understanding the aetiology of intellectual disability. Intellectual disability is not a disease that can be prevented by single-target or one-dimensional strategies. Rather, intellectual disability describes a particular state of functioning in a particular context of time and places that result from these ecological interactions. (Ziegler & Hodapp 1991.)

## 1.3 Prevalence of intellectual disability in Finland

It is estimated that 2, 28 percent of the total population of any society has intellectual disability. In Finland, depending of the level of definition, intellectual disability is affecting approximately 1% of the population. That is about 50 000 persons in Finland. In most western societies institutions are closing and the former residents have become members of their community. Approximately 50 % of individuals with intellectual disability in Finland are living in a family home settings, 25 % with their own parents or with their closest relative and the rest are living independently in their own household. (Hodapp & Dykens 1996; Kaski 2001, 27; Patja 2001; Phrasher & Janicki 2002, 1; Vesala & Matikka 2000, 24; Winnick 2000, 113.)

### 1.3.1 Adulthood, aging and life expectancy with intellectual disability

Intellectual development of persons with ID has been reported to continue throughout the whole life span. The needs of older adults with lifelong intellectual and developmental disability are gaining increased attention as their population grows and their community visibility increases. (Aalto 2000; Eyeman, Grossman, Tarjan & Miller 1987; Patja 2001, 14.) The length of person’s life is unpredictable. However, it is possible to estimate the life span or life expectancy by studying populations. Life expectancy is usually defined as the remaining lifetime in years for a person who has survived from the beginning of indicated time interval to the time of survey. Even tough, Persons with ID are likely to have a shorter life expectancy than the general population, their life expectancy has been prolonged in all western societies, and longevity has increased for all groups of persons with ID. (Parkin and Hakulinen 1991; Patja 2001, 18; Phrasher & Janicki 2002, 7.)

In Finland the survival of persons with ID had improved as the number of persons aged from 40 to 59 years had increased over 30% from 1962 to 1997 (Patja 2001, 18). The rise in life expectancy is even higher for adults with Down syndrome with average age at death rising from 9 years in the 1920s to 56 years in 1993 (Janicki, Davidson, Dalton & Henderson 1999). The present studies of Glasson, Petterson, Montgomery, Sullivan, Hussain & Bittles (2003) showed that the life expectancy for people with DS was 58.6 and the oldest living person in that study was 73 year of age. This had lead to longer life expectancy of survived and larger number of adult persons with ID, although the incidence of ID is not likely to increase (Eyeman et al. 1987; Patja 2001, 19). Researchers have indicated that many different aspect play role in life expectancy among adults with intellectual disability like etiology, severity of the impairment, functional factors and the levels of support (Eyeman et al. 1987; Strauss & Kastner 1996). Persons with intellectual disability live a longer and healthier life than before. This increases the number of aged persons with ID, but as the general population is fast ageing as well, their proportion will remain the same. The improved life expectancy can be interpreted as a result of improved health care and social support and normalisation. The longer life span is expected to produce new morbidity and mortality predictors for this population. (Glasson et al. 2003; Patja 2001, 19.)

### 1.3.2 Morbidity and mortality in population with intellectual disability

The cause specific mortality of people with ID differs from the general population. The most common causes of death for people with intellectual disability are respiratory illness, cardiovascular disease and cancer. (AAMR, 2002 46; Patja 2001; 59; Prasher & Janicki 2002, 7.) Respiratory diseases are three times more common than in the general population and the risk lasts throughout the life span, whereas in general population the risk is cumulative by age. Within the population having intellectual disability, the cardiovascular disease rate increases with age and prevalence of cancer and diabetes are comparable to the general population. The types of mental health disorders are the same in people with and without intellectual disability. The behavioural manifestations of psychiatric illness are likely to differ from one individual to another. (AAMR 2002, 46, 173; Chaney & Eyeman 2000; Patja 2001, 59.)

The age is important predictor of mortality. It has been suggested that age 50 might be the turning point according age and mortality risk in the adult ID population. In Finland, the number of aged persons with ID will increase rapidly in the next ten years. Ageing naturally increases the risk of disease. Based on the study of Patja (2001) this risk was similar to that of the general population after the age of 40 years. However, some differences did exist in the cause specific mortality in this population compared with the general population. Problems of ageing will influence the health care needs of this population in the recent future. Persons with ID may have their special needs for certain diseases or symptoms, but ageing process is similar with the general population. Increasing population of older adults with ID require researchers to give more attention to health interventions and prevention strategies. (Fisher & Ketti 2005; Patja 2001, 56-60; Urv, Warren & Ziegman 2003.)

## 1.4 Health status and physical activity in population with intellectual disability

Health is defined by WHO as a state of complete physical, mental and social well-being. This definition emphasises the positive aspect of health. None of these dimensions are more important than others; all are necessary for optimal well-being. (AAMR 2002, 45; WHO 1980.) The quality of life is influenced by many factors like: healthy habits, such as regular exercise, healthy diet, learning new facts, having meaningful social connections, feeling productive, and getting appropriate routine health evaluations. In detail, quality of life can be divided in four well-being key factors, which are social, cognitive, material and physical well-being. These abovementioned factors are also the best predictors of good health and longevity. (Auxter et al. 2001, 293-294, Janicki et al. 1988; Kehitysvammaliitto 1995, 109; Steadward et al. 2003, 347-348.)

For people with intellectual disability, the effects of physical and mental health on functioning range from greatly facilitating to greatly inhibiting. Some individuals enjoy good health with no significant activity limitations and that allows them to participate fully in social roles, like work, recreation, or leisure activities. Whereas, some individuals have a variety of significant health limitations related to their intellectual ability. Most individuals with intellectual disability are somewhere between these extremes. (AAMR 2002, 45; Edgerton, Gaston, Kelly & Ward 1994.) In general, these adults exhibit high levels of sedentary behaviour and are more vulnerable than the general population to developing secondary complications. Obesity and its health-related problems, poor oral health, osteoporosis, and constipation are prevalent in population of intellectual disability. This has resulted in increased interest in the physical- and mental health-care needs of people with intellectual disability. (Auxter et al. 2001, 434; Center, Beange & McElduff. 1998; Heller, Hsieh & Rimmer 2004; Rimmer 2000; Rubin 1998.)

Recent study of Lin, Yen & Wu (2005) demonstrated that health strategies for people with ID need to be improved. Diet, nutrition and physical activities are key components of health promoting behaviours. These factors have been identified to elevate the risk of cardiovascular disease. People with ID have the same essential need as the general population in terms improving their health and fitness. Individuals with intellectual disability may have difficulty recognizing physical and mental health problems and they might take a negative attitude on their own health care. Taken together, reduced fitness levels of person with ID may be related to a limited understanding. (Draheim, Williams & McCubbin 2002; Phrasher & Janicki 2002, 2-3; Rimmer, 2000.) Many experts agree that the most important single thing that we can do to preserve and maintain our health and well-being is to become more physically active. Health promotion that involves directed physical activities can significantly improve health status in persons with ID. However, it has not yet been translated into an action plan to increase their participation on physical activity programs. That is why; they need health-related supports to promote functioning and participation, to overcome limitations in mobility or safety. Study of Edgerton et al (1994) indicated that individuals with ID, who were living in community residential facilities or relatives' homes, had more adequate health care provided for them than individuals who lived more independently. This challenges for instance, community services to take the responsibility to ensure that all individuals with intellectual disability have equal rights enjoy a high standard of physical well-being. (Rimmer 1994, 251 Temple, Anderson & Walkley 2000; Janicki et al. 1988; Rimmer et al. 2000.)

Participating in community-based physical activity programs has not been shown to improve cardiorespiratory fitness in adults with intellectual disability. That is caused by the fact, that the intensity level of physical activity programs for individuals with intellectual disability are quite often lower than what is needed to elicit increases in cardiorespiratory fitness. (Pitetti, Jackson, Stubbs, Cambell & Battar 1989; Romar, Lahtinen, Rintala, Rusi 1998.) Furthermore, Romar et al. (1998) discussed that organized sport may have more social and recreational purpose than to provide exercise, and that would affect to the intensity level of physical activity program. On the contrary, study of Pommering, Brose, Randolph et al. (1994) indicated that physical activity programs integrated into community recreation could enhance cardiovascular fitness. During that study, training sessions were held four times per week. It has been noted that less than 10% of adults with ID engage in physical activity minimun 3 days a week. In research, Draheim, Williams & McCubbin (2002) showed that adults with intellectual disability who participate in moderate to vigorous physical activity at least five times per week potentially lower their risk for cardiovascular diseases. In the terms of well-being and functional performance, persons with ID have demonstrated to benefit more from balance and muscle strength training than a general activity training (Carmeli, Zinger-Vaknin, Morad & Merrick 2005). Screening tools that can be used to identify individuals who would likely benefit the greatest from these programs are needed. Research must identify more closely factors that promote fitness levels in persons with ID and enhance their well-being throughout the lifespan. Key research areas include examining the effects of exercise differences among various etiologies of ID, and how to best promote physical fitness through exercise. (Draheim et al. 2002; Heller et al. 2004; Rimmer, Braddock & Marks 1995.)

# 2 INTELLECTUAL DISABILITY AND PHYSICAL FITNESS

Since the late 1960's perhaps no other disability group has received more attention by physical activity professionals than individuals with intellectual disability. Following the first Special Olympics in 1968, the public and those working directly with individuals with ID, including teachers and parents, have become more aware of the physical capabilities of people with intellectual disability, as well as the social and emotional benefits they derive from participating in sports and physical education programs. (Cratty 1989, 169; Pitetti et al. 1989.)

## 2.1 Defining health-related fitness

Physical fitness is defined as a physical state of well-being that allows people to perform daily activities with vigor, reduce their risk of health problems related to lack of exercise, and establish a fitness base for participation in a variety of activities. In literature, any physical activity that benefits one's general health can be considered as health-related physical fitness. Physical fitness can be divided into health-related and skill-related components of fitness. Health-related fitness includes those components of physical fitness that are most directly related to good health and well being. (Horvat et al. 2002, 125; Rimmer 2000; 7.) The most important components of health-related physical fitness are: body composition, general cardiorespiratory endurance, muscular strength and endurance, and flexibility. In more detail, flexibility and balance are not the main goals for health-related fitness, but the lack of them may in fact be harmful in some cases. The concept that underlies health-related physical fitness is that better status in each of the components is associated with lower risk for development of disease and / or with functional capacity. (ACSM 2000, 57; Horvat et al. 2002, 125; Keskinen et al. 2004, 125; Oja & Tuxworth 1995, 59.)

### 2.1.1 Body composition

Body composition refers to the relative proportions of fat to lean body mass and it is important health-related characteristic. The body fatness is associated with increased risk for hyperlipidemia, hypertension, coronary heart disease and disabilities. The pattern of fat distribution is important and body composition gives more detailed data of individuals' tissues than weight alone (ACSM 2000, 59; Keskinen et al. 2004, 45; Oja & Tuxworth 1995, 18). Studies have reported that adults with ID are tend to have higher body mass index (BMI) and the percentage in the obese category was higher than for general population (Pitetti, Yarmer & Fernhall 2001; Yamaki 2005). Individuals with Down syndrome have a different body shape and body proportion than individuals in general population or other individuals with ID. Moreover, women with DS are more likely to be overweight or obese than other individuals with ID. (Kelly & Rimmer 1987; Usera, Foley & Yun 2005; Melville, Cooper, McGrother, Thorp & Collacott 2005.)

Only a few studies have evaluated the effects of exercise on body composition with population with ID. Those studies found no significant effects of exercise on body composition. To have more effective results, it is recommend to combine programs of exercise and nutrition diet. However, more research in areas of body composition and persons with ID are needed. (Chanias, Reid & Hoover 1998; Fox, Burkhart & Rotatori 1983; Pitetti, Rimmer & Fernhall 1993; Pommering et al. 1994.)

### 2.1.2 Cardiorespiratory fitness

A person's total capacity for physical performance is determined by his capacity for aerobic ($VO_2$ max) and anaerobic performance. $VO_2$ max is shown to be linked with morbidity, mortality and several disease risk factors. More accurately, low aerobic capacity (peak $VO_2$) is known to be associated with high risk of coronary heart disease and increased blood pressure. (Auxter et al. 2001, 434; Horvat et al. 2002, 126; Oja & Tuxworth 1995, 16.) For many people with ID the lifespan is substantially reduced by cardiovascular and / or cardiorespiratory problems. Moreover, fitness is complicated by obesity in many retarded persons. (Koh & Watkinson 1988; Sherrill 2004, 739.) In using the bicycle ergometer to assess cardiorespiratory fitness of adult males with intellectual disability, researchers found that their fitness was 20 to 30% below that of general peers. Pitetti & Yarmer (2002) also reported that adolescents with ID have lower exercise capacity and lower cardiorespiratory fitness than their peers without ID and, like their leg and back strength, these fitness indices are leveling off or declining between early to late adolescence. However, there is strong evidence that physical fitness, including cardiorespiratory endurance, can be developed through training regimens in persons with intellectual disability. (Auxter et al 2001, 434; Horvat et al. 2002, 126.)

### 2.1.3 Strength

Muscular strength as a basic component is the ability of the muscle or muscle group to apply force and refers the maximal one-effort force or strength endurance, where muscles apply force repeatedly for certain period of time. The muscle strength and endurance appear to have little relationship to the management of specific disease. However, good muscular performance is fundamental for producing efficient movement for individuals with and without disabilities. (ACSM 2000, 81-84; Horvat et al. 2002, 132; Keskinen 2004, 125; Oja & Tuxworth 1995, 19; Pitetti & Yarmer 2002.) Moreover, muscular fitness improves or maintains 1) the fat free mass and resting metabolic rate, which is related to weight gain bone mass, 2) bone mass, which is related to osteoporosis and 3) glucose tolerance, which is related to type 2 diabetes. Based on a related study, Pitetti & Yarmer (2002) reported that for all age groups, males and females without ID were significantly stronger than their same-gender peers with ID for all isometric strength measurements. For individuals with ID, particularly decreasing leg and back strength is a serious health and social concern. Muscle strength, especially lower body muscle strength, for persons with intellectual disability is fundamental for overall health, for improving vocational productivity and for gaining independence in activities of daily living. (Pitetti & Yarmer 2002; Rimmer 2000.) Pitetti, Fernandez, Pizarro & Stubbs (1988) observed that there is a relationship between upper body strength and aerobic capacity. The significant positive relationship has also demonstrated between maximal aerobic capacity and isokinetic leg strength and it is noted to be substantial especially for individuals with DS (Pitetti & Boneh 1995). Poor muscle strength has also been linked to a higher incidence of osteoporosis and grater risk of falling among individuals with ID (Pitetti & Yarmer 2002).

Systematic and well-designed training can elicit increases in muscle strength and endurance in adolescents with ID. In addition, to be able to improve and normalize the muscle strength level, especially in lower extremities, people with ID are in need of progressive resistance exercise programs. (Croce, Pitetti, Horvat & Miller 1996; Horvat, Groce & Roswall 1993; Tsimaras & Fotiadou 2004.)

### 2.1.4 Flexibility and balance

Flexibility is the ability of body segments to move through typical ranges of motion. Maintaining flexibility is lifelong need and it is important to locomotor system, balance and coordination. Flexibility gives physical support to the everyday living activities and decreases the incidence of accidents. Poor flexibility may cause musculo-skeletal problems, especially around the shoulder, lumbar and hip regions. (ACSM 2000, 87; Horvat et al. 2002, 135; Keskinen et al. 2004, 180-181; Oja & Tuxworth 1995, 59.) Individuals with disabilities, who are often inactive, lose flexibility and that often complicates the ability to move. Although some individuals, like persons with Down syndrome, may have more muscle flexibility than the others. (Horvat et al. 2002, 136: Winnick, 2000, 118.)

Balance is not a goal for health-related fitness but it is important in many physical activities and it also has health implications. Balance is needed in every day activities like in walking and climbing stairs, so it is important to have good balance to stay mobile and prevent falls. (Oja & Tuxworth 1995, 24.) Balance is one of the abilities in which persons with Down syndrome are the most deficient. For example, many persons with DS can balance on one foot only a few seconds, and most of them cannot perform balance at all when eyes closed. (Eichstaedt & Lavay 1992, 316.) However, it is concluded that adults with DS, among the other individuals with ID, can improve their balance ability with systematic and well-designed training program (Carmeli, Merrick, Kessel & Bar-Chad 2004; Tsimaras & Fotiadou 2004).

## 2.2 Meaning of physical fitness

Poor health-related fitness profiles of adults with ID are pointing out serious health and social implications for the following reasons:

a) high levels of cardiorespiratory fitness are important for children and adolescents because cardiorespiratory fitness declines with age
b) low levels of cardiorespiratory fitness are major risk factor for metabolic and cardiovascular disease
c) childhood obesity is associated with several risk factors for adult heart disease and other chronic diseases including hyperlipidemia, hyperinsulemia, hypertension, early atherosclerosis and
d) muscle strength of the lower extremities for persons with ID has been demonstrated to be directly related to bone mineral density. (Pitetti & Yarmer 2002.)

Not only do persons with ID desperately need exercise, but they benefit greatly from the persons and places they see and meet while performing fitness. Physical training has also been reported to have effects on general well-being and self-image in people with ID. (Carmeli et al. 2005; Sherrill 2004, 584.) Studies have demonstrated that adults and elderly people with ID experienced improvement in physical functioning after participating in physical activity program. It is certified that any type of physical activity is causing health benefits. Moreover, if an individual is capable of exercising within a certain range of his or her own maximum heart rate, the benefits will be greater. (Horvat et al. 1993; Podgorski, Kessler, Cacia, Peterson & Henderson 2004; Rimmer 2000.)

Delays in motor development, to varying degrees, negatively impact individuals' motor and physical capabilities. Motor delays are common among persons with intellectual disability and they may be less capable in motor tasks, which demands strength, flexibility, agility, coordination and balance. The greater the intellectual deficit is, the more pronounced the motor deficiency. (Auxter et al. 2001, 433-434; Rimmer 1994, 251; Sherrill 1986, 464.) One does not cause the other, but they are related. The motor tasks that correlate highest with intelligence are balance items and test of fine visual-motor coordination (Sherrill 1986, 464). Furthermore, Seung-Oh, Meeuwsen, French & Stenwall reported (2001) that the low peak acceleration and slow movement time also suggest that individuals with ID are less capable of generating large neuromuscular impulses.

People with Down syndrome (DS) have many similarities in their physical features, which may affect their participation in physical activities like hypotonia (low muscle tone) and congenital heart disorders (Steadward et al. 2003, 61). People with DS have demonstrated to have lower perk heart rate and peak oxygen consumption than other individuals with ID. Moreover, persons with Down syndrome exhibit more flexibility than other persons with ID. These characteristics together with weak ligaments and muscles, places them to have greater risk of injury during physical activities. (Baynard, Pitetti, Guerra & Fernhall 2004; Winnick 2000, 118.)

# 3 TESTING PHYSICAL FITNESS IN POPULATION WITH INTELLECTUAL DISABILITY

The components of physical fitness can be tested with laboratory tests or field tests. Laboratory tests typically require specialized equipment and training on the part of the test administrator. The alternative to laboratory tests is field test. Field test requires no expensive equipment and little, if any specialized training. In addition, they are time-effective, in that they can often be administered to a group of individuals simultaneously. (ACSM 2001, 68-69; Keskinen et al. 2004, 212.)

According to Prasher & Janicki (2002, 33) " The physical assessment of adults with intellectual disabilities may be, at the same time, extremely rewarding and challenging". One of the most difficult problems of testing individuals with intellectual disability is determining whether poor comprehension or poor motor development is the reason for their inability to perform a specific task. It is difficult to determine whether a client with intellectual disability understands directions given during test situations. (Auxter et al. 2001, 435.) The more retarded a person is, the less likely he or she will understand for example the concepts of speed and endurance. Lavay, McCubbin & Eichstaedt (1995) listed factors that may affect on field-test assessment of people with intellectual disability. These factors were: limited ability to understand and follow test directions, poor movement proficiency, limited motivation, lack of proper pacing techniques, low levels of training experiences and limited familiarity with tests. There are also other factors to be considered in the evaluation, such as body size, body composition, and predisposition of the participants' respiratory infection. All these factors may negatively affect assessment of people with intellectual disability. (Rintala, McCubbin & Dunn 1995.)

## 3.1 Reliability and validity in testing individuals with ID

Little information is available on the reliability of the fitness testing for individuals with intellectual disability. The persons with intellectual disability are a very heterogeneous group. The test that are considered reliable, easy to carry out and which do not require complicated equipment are not always the best options for individuals with ID. To be able to monitor effectively the physical fitness level of persons with ID we need valid, reliable and administratively feasible test instruments. (Lavay et al. 1995; Reid, Seidl & Montgomery 1989.) Test preparation, familiarization, participant-tester confidence, and emphasis on pacing are essential components of reliable physical fitness testing for individuals with ID. By using appropriate assessment tools it is possible to create more effective programs for individuals with ID and through them enhance their physical well-being (Lavay et al. 1995; Seung-Oh et al. 2001.) Cratty (1989, 184) gives instructions to ensure valid test results. During all testing a) provide enough time for individuals to become familiar with the test procedures, environment, and staff, b) tailor the test procedures to the individual (allow staff members to adjust the testing procedures, to ensure validity of test results and safety of the person being tested), c) provide an environment in which the individual feels like participating member. Moreover, the pilot test before conducting an actual test should always be done (Rintala et al. 1995).

### 3.1.1 Familiarization process and guidance

In addition to variation in test methodology, factors that affect the valid assessment of physical fitness of individuals with intellectual disability include: judgement of test termination by the participant and difficulty in adherence to cadence; physiological efficiency; motivation, and understanding of test requirements by the participant. To help control these items, practice session and familiarization before actual testing are imperative with this population. In the dictionary familiarization is defined as “the experience of becoming familiar with something”. Familiarization allows both: a) the person being tested to become familiar with the test protocol, the test environment, and the staff performing the test; and b) staff members to adjust the protocol to ensure the safety of the person tested and validity of the test result. (Rintala et al. 1995.) Besides that, it is also important to explain afterwards to the participant what does the test results mean and give to a participant further information how he / she should act from now on (Reid et al. 1989).

It should be noted that one of the most critical elements in the utilization of familiarization protocols is to ensure that participants understand the testing procedures and significance of informed consent (Pitetti et al. 1993; Reid et al. 1989; Rintala et al. 1995). In general, guidance is a cycle of teacher prompt, student response and teacher feedback. For example, in test situation tester provides a brief prompt (“ walk as fast as you can”). The participant attempts a response. The tester assesses the response and provides feedback (“ keep up walking, you are doing great”). When testing participants with ID it is of great importance that the actual examination procedure is explained and gone through slowly and thoroughly. In the test situation, the cue can be a sign, signal, request or information that serves the person to activate or energize behaviour and give it direction. The cue can take a form of any instructional materials like verbal, visual or manual. The tester can use one of these forms but in some cases, the total communication is needed. Then the cue contains all; verbal, visual and manual guidance. Furthermore, if participants are expected to stay on task and to be motivated to improve their performances testers need to build accountability into their task progressions. That accountability should be integrated with the instructional task itself. Eventually, if instructional tasks are designed with meaningful terminal goals, participants will be more motivated by performing the task itself. (Dunn, Morehouse & Frecricks 1986, 8-9; Javanainen 1999; Siedentop & Tannehill 1999, 17, 276.)

### 3.1.2 Motivational strategies

Motivation is defined as the direction and intensity of effort and it usually gives the reason why individuals are doing different things (Horn 2002, 101-102). The majority of individuals with intellectual disability does not usually engage in habitual physical activity and therefore, need a great deal of motivating and encouragement during a test. Motivation can be divided in intrinsic (internal to the person) and extrinsic (outside to the person) motivation (Huitt 2001; Kozub 2003). Intrinsic motivation for physical activity is associated with pleasure and enjoyment and to cognitive and affective factors. To improve intrinsic motivation individual needs explanations why the particular skill is important and personal experience of particular performance. On the contrary, extrinsic motivation deals with the issue of external rewards as praise or rewards from others. The methods to raise extrinsic motivation are providing clear expectations, give corrective feedback and provide valuable rewards and make them available. (Huitt 2001; Kozub 2003.) Motivation is believed to be in relation to inactivity and low level of fitness. It has also noted to cause variation in a physical fitness test score. (Kozub & Spencer 2002; Reid et al 1989; Tomporowski & Jameson 1985.) When testing individuals with ID, a real concern is that participants with ID do not always interpret such verbal reinforcement in the same manner as those without disability. It is apparent that in test situation participants are usually verbally encouraged to give their best effort or go all out. Testers need different motivational strategies to get and keep participants motivated. Alternatively, methods may be monetary, verbal, social and individual like snacks or drinks, group ritual-handshake and high fives. (Cratty 1989, 185; Metzler 2005, 60; Rintala et al. 1995.)

## 3.2 Reliability and validity of physical fitness tests

A number of observational rating forms and physical ability test batteries have been specifically designed for use with population with intellectual disability. As has been pointed out, individual scores should be interpreted with discretion because of the variations within this population relative to inherent motor capacities. (Auxter et al. 2001, 435.) Although there are tests to assess the areas of physical fitness of individuals with intellectual disability, there has been increased interest in the validity of using general physical fitness tests within this population. More or less the same test items are used as for general population. Preference should be given to measuring physical fitness, locomotor skills, object handling skills, and balance. (Auxter et al. 2001, 435; Rimmer 2000.)

### 3.2.1 Body composition tests

Body composition cannot be measured directly in field circumstances. All methods used are descriptive models and based on statistically derived prediction equations against a mechanistic reference method. (ACSM 2000, 60; Saris et al. 2003.) According the study of Kelly, Rimmer & Rosentswieg (1987), there are several different equations that have a great predictability and they are recommended for use in estimating the percentage of body fat of adults with ID. Descriptive methods are known as anthropometric measurements, which include body weight, height, skinfold thickness and circumferences. The sum of 3-4 skinfold thicknesses is used by many researchers to assess body composition of individuals with ID. (Fox & Rotatori 1982; Kelly, Rimmer & Ness. 1986; Pitetti et al. 1988.) The accuracy of skinfold measurements is dependent the measurements itself and the characteristics of the equation (Kelly et al. 1987; Usera et al. 2005). The reliability of the measurements is dependent on the skill of the measurer (ACSM 2000, 63; Saris et al. 2003). Pitetti et al. (1988) stated that skinfold measurements are easy to perform in participants with ID and it would be logical method to use for field evaluation of bodyfat.

When gender is taken into account, body composition may be predicted from equation of body mass index (BMI) that includes weight, height and age. Body mass index is not valid measurement to indicate the amount of participant's body fat mass but it is a good index of obesity and it can be used to get guideline and direction of individual's relative fatness. (ACSM 2000, 63; Borg, Fogelholm & Hiilloskorpi 2004, 162; Deurenberg, Weststrate & Seidell 1991; Graham & Reid 2000; Oja & Tuxworth 1995, 81-82; Pitetti et al. 2001; Saris et al. 2003.) The study of Usera et al. (2005) demonstrated that there is a lack of validity in the use of the different field-based methods to assess the body composition of persons with DS. As the bodily proportions among people with DS differ from the other individuals with ID, it is suggested that prediction equations specific for individuals with obesity could offer the accurate estimation of percent body fat. Moreover, the prediction equations of anthropometric girth measurements are better predictions of percent body fat than skinfold -based equations for individuals with DS.

### 3.2.2 Cardiorespiratory tests

Cardiorespiratory fitness is normally determined through either maximal or submaximal laboratory tests or field tests. The maximal cardiorespiratory test in standard laboratory procedure is expressed in measurements of maximum oxygen uptake ($VO_2$ max). (ACSM 2000, 68-69.) Assessing cardiorespiratory fitness of people with intellectual disability is difficult. Many sportsmen with intellectual disability will have difficulties with this test because one is supposed to make a maximum effort on the ergometer cycle or the treadmill, and persons with ID mostly do not really understand what maximum effort is. (Rimmer 1994, 257; Sherrill 2004, 578.) Furthermore, there can be a problem with maintaining adherence to a set cadence or in motivation necessary to produce a maximal effort. Many sedentary participants, including some individuals with intellectual disability, may be poorly motivated as well as unaccustomed to strenuous exercise. The influence of learning factors and movement limitation may also have a negative effect on the validity and reliability of aerobic exercise testing. (Rintala et al. 1995.) The direct measure of max $VO_2$ involves the use of different equipment like treadmill or cycle ergometer and equipment to measure respiratory gases. The process is time-consuming, expensive, and impractical for fitness program usage, particularly when a large number of participants are to be tested. Therefore alternatives have been developed that can estimate aerobic capacity from submaximal field test protocols. (ACSM 2000, 69-70; Keskinen et al. 2004, 227-228.)

Following field tests are the most frequently recommended for participants with intellectual disability: the 1.5-mile run, 1- mile walk, bicycle ergometry testing using the Schwinn Air-Dyne cycle, the modified Leger and Lambert shuttle run, and the modified Canadian step test (Fernhall, Millar, Pitetti, Heusen & Vukovich 2000; McCubbin, Rintala & Frey 1997; Montgomery, Reid & Koziris 1992). Each test type has advantages and disadvantages with regard to ease of administration, economy (expensive equipment) and the ability to predict $VO_2$ max. It is not known if such tests are equally valid between populations of people with varying degrees of intellectual disability. Recent studies have stated that progressive cardiovascular endurance run (PACER) test had a high reliability and it can be used for surveillance of aerobic capacity in population with ID (Beets, Pitetti & Fernhall 2005; Fernhall et al. 2000). The PACER test is reported to be easy to understand since it is paced with audio signals, but because the test relies on maximal effort, people with ID may have motivation problems to perform it (Fernhall, Pitetti, Vukovich, Stubbs, Hensen, Winnick & Short 1998). The 1-mile Rockport Fitness Walking Test has only been validated for males, whereas the 1.5 mile run/walk test has been validated for all participants. The Groningen Fitness Test for Elderly (GFE) has reported to be feasible and reliable test for seniors with ID. (Kittredge, Rimmer & Looney 1994; Lavay et al. 1995; Rintala, Dunn, McCubbin & Quinn 1992; VanWijck 2003.) According to study of McCubbin et al. (1997), 1-mile walk time was demonstrated to be the best indicator of cardiovascular fitness for men with ID and it appears to be the most suitable alternative to laboratory-based assessments. In general, walking tests are safe and effective tests for participants with ID because they do not require maximal effort (40-80% of max VO) and because the tests can be performed at varying paces and intensities. In conclusion, walking even for long distances is a familiar activity for many people with ID. Therefore, participants can often be prepared for such a test on short notice. (McCubbin et al. 1997; Oja & Tuxworth 1995,42.)

### 3.2.3 Muscle strength and muscle endurance tests

The strength can be tested by means of strength tests where a maximum strength effort is performed once (maximum strength) like hand grip test or during a maximum number of repeats within a defined period (muscle strength endurance) like number of sit ups in 1 minute (ACSM 2000, 81; Keskinen et al. 2004, 125). Reliable strength measures can be obtained from individuals with intellectual disability. Here too, we must try to get the person with intellectual disability understand that they must try to exert the greatest possible strength to move the heaviest possible weight once, or that they must repeat the strength exercise as many times as possible in certain time. Lavay et al. (1995) concluded that strength tests like hand grip strength, sit-ups, isometric push-ups and bench press test were reliable for use with male and female adolescents with mild to moderate intellectual disability.

### 3.2.4 Flexibility and balance tests

Flexibility can be assessed by various goniometers, flexometer, inclinometers and tape measures. The range of motion can also be estimated visually. The estimates can include neck and trunk flexibility, hip flexibility, lower extremity flexibility, shoulder flexibility and postural assessment. General flexibility can not be measured by one test such as sit-and-reach and no health-related criterion values are available (ACSM 2000, 86; Oja & Tuxworth 1995, 59-61). When testing flexibility in persons with ID, the most valid and reliable test is sit-and-reach test. Bending the knees, jumping of the slide mechanism, and improper positioning were the most commonly noted procedural deviations of participants with ID during the sit-and-reach test. (Lavay et al. 1995; Pizarro 1990.)

The development of static balance is a basic characteristic of normal motor development. Most of the developmental motor tests include a measure of static balance. (Geuze 2003.) Little research has been conducted on the reliability and validity of balance tests among people with ID. Generally, balance can be evaluated as the ability to balance on one leg eyes open or closed. (Oja & Tuxworth 1995, 63.) The dynamic balance can be measured by heel-to-toe walking test or balance beam walking test. Both of these tests are noted to be reliable when testing dynamic balance of individuals with ID. (Lahtinen 1986.) In addition, some studies have used the Timed Up and Go Test (TUGT) to measure the dynamic balance and gait speed. It has also noted to be reliable test for individuals with ID. (Carmeli, Barchad, Lenger & Coleman 2002; Carmeli et al. 2004.)

# 4 PURPOSE OF THIS STUDY AND RESEARCH QUESTIONS

The purpose of this study was to investigate the physical fitness level of adults with intellectual disability (ID) and to explore the testing situation itself from the pedagogical view. The first part of the study focused on the level of physical fitness and the differences between genders and between participants with and without Down syndrome. The other part of this research is qualitative where the test situation of participants with ID is described from a pedagogical view.

Research questions

1. Physical fitness level of adults with intellectual disability
    a. What is the physical fitness level of adults with intellectual disability?
    b. What are the differences of physical fitness level between genders?
    c. What are the differences of physical fitness level between adults with and without Down syndrome?

2. Test situation description from a pedagogical view
    a. How were participants familiarized in each test item?
    b. How were participants guided in each test item?
    c. How were participants motivated in each test item?

# 5 METHOD

## 5.1 Participants

This study is a part of the longitudinal study of physical performance of individuals with intellectual disability (Lahtinen et al. 2005). This 30-year performance follow-up research started in 1973 in middle Finland where the data for the study were collected (Lahtinen 1986). The data in 1973 included all participants with ID who were at age between 11-16 years, living in the district of middle Finland and willing to participate. Those participants who had additional disabilities hindering cooperation in motor testing situation like sensory, physical or psychotic disorders were excluded. (Lahtinen 1986; Lahtinen et al. 2005.) The number of participants in 1973 study was 77.

This study included all individuals with ID who were still alive and willing to participate in year the 2003. The sample of this study consisted of 63 adults (28 females and 35 males) with intellectual disability, aged 40-47. The IQ of the participants was measured in 1973 and the mean IQ was 46 ± 12 (Lahtinen et al. 2005). Furthermore, in this research 18 of the participants were diagnosed as having Down syndrome. All participants were living in different environments in the area of Central Finland like in their own homes, in group homes, in their parental homes or in one institution. In the year 1996, 40% of participants were in sheltered employment and about 25% worked in work shops. 16% worked with different tasks at home and only a few were unemployed. (Romar et al.1998.) Measurements for this study were done in most of the cases where the participants worked, but also in their own home, group home, parental home and institution.

## 5.2 Research procedures

As a writer of this study, my participation for this research started in summer 2003. There was another physical education teacher who administered the test sessions of this study together with me. During that time, the other teacher was familiar with the whole test procedure, since he participated in measurements in 1996. I was familiar with individuals with ID, but the test battery was unfamiliar to me. That is why I administered a pilot study a few weeks before actual test measurements. The pilot study included two adults with ID (one male and one female participant) who were selected randomly from a sheltered workshop in the area of Western Finland. To improve the reliability and validity, the pilot study was videotaped (with participants' agreement) and all measurements and results were recorded.

The measurements were completed in autumn 2003. While the participant was performing the tests, my duty was either to give instructions, demonstrate the tasks, and motivate the participant or to write down the results. I also took care of the videotaping, which was mainly set to record automatically during the test situations. That gave us testers free hands to carry out the measurements. Moreover, after the all participants were tested, my responsibility was to type down the results for later data analyzing.

The physical fitness test items used in this study were weight and height, 1-mile walking, dynamic sit-up, hand grip-strength, sit-and-reach flexibility test, static stork stand and dynamic heel-to-toe walk (Appendix 1). These test items were also included in the 30 year follow up test battery and were also tested in 1996. Furthermore, these test items give a possibility to evaluate the results in relation to standard population norms (Oja & Tuxworth 1995, 5). All of the participants were familiarized with each test protocol before and during measurements. To get desired performance, verbal instructions and demonstrations were given to the participant before and during every trial. Different forms of motivating techniques were also used like corrective feedback and verbal encouragement.

### 5.2.1 Reliability and validity of physical fitness test protocols

A physical performance test must be reliable and valid. The validity of the test refers to the extent to which an individual's test performance reflects true performance. The reliability refers to the consistency of performance when an individual performs the test repeatedly. A test with poor reliability is unsuitable for tracking changes in performance between trials and only tests with high reliability can have high validity. To find out small but relevant differences in test results a test protocol need to be very reliable. (Hopkins, Schabort, Hawley 2001.)

Body mass index, 2km- walking, sit-up, hand grip, sit-and-reach, static stork-stand and dynamic heel-to-toe -balance are generally noted to reliable and valid tests for assessing health related fitness for general population. Research on the evaluating body composition in individuals with ID has primarily employed either height and weight standards or the sum of three to four skinfolds and age (Kelly & Rimmer 1987; Kelly, Rimmer & Ness 1986; Oja & Tuxworth, 1995, 5.) Fox et al. (1983) examined that use of the equation with height and weight (BMI) resulted in misclassifications in participant with ID and is not as accurate as measuring skinfolds for evaluating body composition in these individuals. However, BMI is a good index of obesity and it is easy to carry out in field circumstances (Pitetti et al. 2001).

2-km walking test is most suitable assessment of aerobic fitness for mixed groups of adults (Oja & Tuxworth 1995, 42). Since the reliability and validity of 2km-walking test for adults with ID needs more research and evaluation, the 1-mile walking test is used in this study. 1-mile Rockport Fitness Walking Test has only been validated for males with ID, whereas the 1.5 mile run/walk test has been validated for all participants (Lavay et al. 1995). Rintala, McCubbin, Downs & Fox (1997) developed the equation to estimate the cardiorespiratory efficiency of men with ID. The equation was: Peak $VO_2$ [ml· kg (-1) min ·(-1) = 101.92 – 2.356 (mile walking time) - 0.42 (weight)]. By measuring walking time and weight, it provides direct information on walking fitness and can be used to predict maximal oxygen uptake. (Oja & Tuxworth 1995, 42; Rintala et al. 1997.) However, this above-mentioned equation has been reported to underestimate the measured $VO_2$ values for the majority of participants with ID. 1 –mile walking test is valid and reliable, but the statistical validity of the formula is questionable. (Rintala et al. 1997.) Being aware of the fact that one-mile walk test is valid and reliable test only for males with ID, the test was used in this study.

There is only a little information about reliability and validity of muscle strength measurements for individuals with ID. Both sit-up test and hand grip test have been noted to be reliable and appropriate measurements for males with ID. Furthermore, hand grip dynamometer is found to be easily performed with persons with ID and it is observed to have high test-retest score in relation to laboratory testing. (Pitetti et al. 1988.) Mac Donncha, Watson, McSweeney & Donovan (1999) noted that procedural differences do exist when testing individuals with ID, but reliable results can be still obtained. The data appear to be lacking also with respect to measurement of the static and dynamic balance ability of these participants. The dynamic heel-to-toe walking test and balance beam walking test are reliable when testing dynamic balance of individuals with ID. (Lahtinen 1986.)

### 5.2.2 Description of test battery

In this research the following procedures (Table 1) were used to measure physical fitness level of adults with intellectual disability:

Body Mass Index (BMI) was used to determine relative fatness in body. BMI was calculated as body weight in kilograms divided by the square of the height in meters (Oja & Tuxworth 1995, 81; Saris et al. 2003.) Weight was measured with a scales and height with a wall-measuring tape. Both measurements were done a participant wearing normal clothing and no shoes.

The 1-mile walking test was carried on a track (yard or road occasionally length at least 300 meters). The pulse rate was monitored with a heart rate recorder but since the formula of peak $VO_2$ max does not include the results of heart rate, they are not reported in this study. The participants were instructed to walk as fast as possible. Kunde & Rimmer (2000) recommend using pacer when having adults with ID performing a walk test to assure maximum performance. In this study, to ensure that walking speed was as fast as possible, one tester was walking all the way beside the participant. The walking time and heart rate were measured at the start, after every lap and at the finish line.

The trunk muscle strength was measured by dynamic sit-up test where participant lays on his/her back with both knees bent. The tester holds participants' feet. The sit-ups were done with arms straight, palms resting on the thighs. The aim of each sit-up is to reach midpatella with both hands (wrists over the knee). (Oja & Tuxworth 1995, 56.) Handgrip strength was measured with a hand dynamometer, which is noted to be easy to perform with participants with ID (Pitetti et al. 1988). The grip of the dynamometer was adjusted to the size of hand with each participant. The participant was asked to stand straight and to hold the instrument straight down by the side and without touching the body and to squeeze as hard as possible. Each participant was given two trials for both dominant and nondominant hands and the better of each of the two results was recorded.

The trunk flexibility and hamstring tightness were evaluated by sit-and-reach test. The participant sits on the floor with straight legs and reaches as far as possible forward (Oja & Tuxworth 1995, 61). The participant was allowed to practice movement two times. When the test began, the tester held his hands on the participants knees to ensure that the legs are kept straight. The aim of this test was to bend slowly forward and push a little marker with fingertips at the same time. The result was measured at the point where the marker stopped.

The static balance was evaluated as the ability to balance on one leg on a flat firm surface. Free foot was lifted on the same level with ankle and both arms were on the side. Movement of the arms was allowed. The time was measured as soon as the participant lifted his/her foot. When participant lost his / her balance, the clock was stopped. Each participant was given three trials for both legs and the best times for both legs were recorded. The dynamic balance was evaluated as the ability to walk on a line with heel-to-toe walk. The participant was asked to walk the line heel-to-toe, distance of 15 steps. If the participant stepped off the line prior to completing the task, the score was the number of steps he / she had prior to the step-off. Two trials were given and the best effort was recorded. (Francis & Rarick 1960.)

TABLE 1. Structure of the test –battery

| DIMENSION | COMPONENT | FACTOR | TEST |
|---|---|---|---|
| Antropometry | Height<br>Weight | Body Mass Index | Weight/ height$^2$ |
| Cardiorespiratory fitness | Maximal aerobic Power | Maximal aerobic power | 1-mile walk |
| Musculoskeletal fitness | Muscle strength & Endurance<br><br>Flexibility | Trunk muscle strength<br>Hand muscle strength<br><br>Trunk flexion | Dynamic sit-up<br>Hand grip<br><br>Sit-and-reach |
| Motor fitness | Balance | Whole body balance | Stork stand<br>Heel-to-toe |

## 5.3 Research analysis

### 5.3.1 Statistical analysis

Statistical techniques are used for describing and finding relationships among variables and to detect differences among groups (Thomas & Nelson 2001, 93). In this study all statistical analyses were made using the SPSS for Windows statistical software (version 11.5). Data are expressed as mean (M) and as ± standard deviation. The comparisons between means of the groups were done by t- test for independent samples. Independent t-test is the most frequently used test to determinate weather two sample means differ reliably from each other. T-test can be used if; observations are made from normally distributed populations and represent random samples from populations. Also if, the numerator and denominator are estimates of the same population variance and their t-ratios are independent. (Thomas & Nelson 2001, 135-137.) The participants in this study were normally distributed in an interval scale and the variances homogeneity between groups were tested by Levene's Test for equality of variances.

### 5.3.2 Descriptive analysis

The second aim of this study was to describe the familiarization, guidance and motivational strategies used in the test situation. The data was collected by observing the test situations from the videotape. Data analysis in qualitative research is quite different from that of quantitative research. First, in qualitative research analysis is done during and after data collection and second, data are generally presented through words, descriptions, and images. (Thomas & Nelson 2001, 340.) Qualitative research does not have preconceived hypothesis but inductive reasoning is stressed, where the researcher seeks to develop hypothesis from observations. The validity of qualitative analysis is depending on the ability of the researcher to capture "what is really happening", to evaluate the descriptions and analysis and make the final conclusions. (Thomas & Nelson 2001, 350-351.)

Direct observation is an informal technique to design to gather information on the specific performance characteristics. Observations may be related to physical functioning, motor performance, or behaviour, such as communication. The observed data was collected on the checklist (Appendix 2.). The checklist was based on the earlier studies and literature of familiarization process, guidance and motivational strategies in testing persons with intellectual disability. According to Rintala et al. (1995) familiarization should always be done before testing. In addition, it is also important to explain and communicate the findings to the participants after the testing. Therefore, the familiarization process is divided in two parts: familiarization before and after the testing. (Reid et al. 1989.) Cues are the things in the test situation that set the occasion for the participant to perform. During the test situation the level of guidance depends of the participants' ability to understand and perform desired tasks. The quality of guidance can be divided in three level 1) Verbal guidance, 2) verbal guidance + demonstration, 3) verbal guidance + demonstration + manual guidance. If the participant does not react on pure verbal instruction, the demonstration is also used. If the participant still does not understand the cue verbalization, demonstration and manual guidance altogether must be used. (Dunn et al. 1986,6-9; Rintala 2002.) People with ID are believed to be highly extrinsically motivated. There are several different extrinsic motivational strategies that testers can use. (Huitt, 2001; Kozub 2003.) In this research motivational strategies are divided in three categories: 1) clear expectations 2) corrective feedback 3) encouragement. Qualitative data is used to explore how familiarization, guidance and different forms of motivation are used when testing components of physical fitness.

# 6 RESULTS

## 6.1 Physical fitness level of adults with intellectual disability

The variables used to evaluate the level of physical fitness were body composition, cardiorespiratory fitness, abdominal muscle endurance and hand muscle strength, flexibility and static and dynamic balance. Means, standard deviations and ranges for BMI, 1-mile walking, sit-ups, hand grip, stork stand, heal to toe -walk and sit-and-reach tests are found in Table 2. The range of all scores is large and the standard deviation is high.

TABLE 2. Means, standard deviations, and range of physical fitness level measurement

| TEST | N | Mean | Standard deviation | Range (min-max) |
|---|---|---|---|---|
| BMI | 61 | 28.8 | 7.2 | 18.1 – 57.7 |
| 1-MILE WALK (Peak $VO_2$ ml / kg/min.) | 43 | 29,8 | 9.0 | 7.88 – 48.1 |
| SIT-UPS (times) | 63 | 14.6 | 13.2 | 0 – 50 |
| HAND GRIP (Nt /kg) | 63 | 2.9 | 1.3 | 0.8 – 6.3 |
| FLEXIBILITY (cm) | 63 | 25.5 | 12.7 | 3 – 53 |
| STORK STAND (sec) | 63 | 13.6 | 20.8 | 0 – 60 |
| HEAL-TO-TOE WALK | 63 | 4.8 | 6.1 | 0 – 15 |

### 6.1.1 Physical fitness measurements between genders

In this study one purpose was to find out if there is the difference in physical fitness level between male and female adults with intellectual disability. Mean scores for each test component of physical fitness were calculated. Comparison between male and female participants was made by using independent t test. Results are found in Table 3. There was no indication of statistically significant differences between genders for stork stand, heal-to-toe walk and sit-and reach. The difference in sit-ups was statistically significant ($p < .01$) and very significant ($p<0.001$) in BMI, 1-mile walking (peak $VO_2$) and in hand grip measurements between females and males. Females had higher score in BMI than males. Furthermore, male participants had higher values in sit-ups, hand grip and peak $VO_2$. (Figure 3).

TABLE 3. Physical fitness level between genders

| | FEMALE | | | MALE | | | |
|---|---|---|---|---|---|---|---|
| TEST | N | M | SD. | N | M | SD. | p-value |
| BMI | 27 | 32 | 7.2 | 34 | 26.2 | 6.1 | .001*** |
| 1-MILE WALK (Peak $VO_2$ (ml /kg/min.) | 18 | 24 | 7.4 | 25 | 34 | 8.2 | .001*** |
| SIT-UPS (times) | 28 | 9.8 | 9.9 | 35 | 18.5 | 14.6 | .008** |
| HAND GRIP /Nt/kg) | 28 | 2.2 | 0.8 | 35 | 3.5 | 1.3 | .001*** |
| SIT-AND REACH (cm) | 28 | 25.6 | 10.3 | 35 | 25.4 | 14.5 | .958 |
| STORK STAND (sec) | 28 | 9.5 | 16.7 | 35 | 17.7 | 23.3 | .132 |
| HEAL-TO-TOE WALK(steps) | 28 | 3.4 | 5.5 | 35 | 5.8 | 6.4 | .122 |

* $p < 0.05$
** $p < 0.01$
*** $p = 0.001$

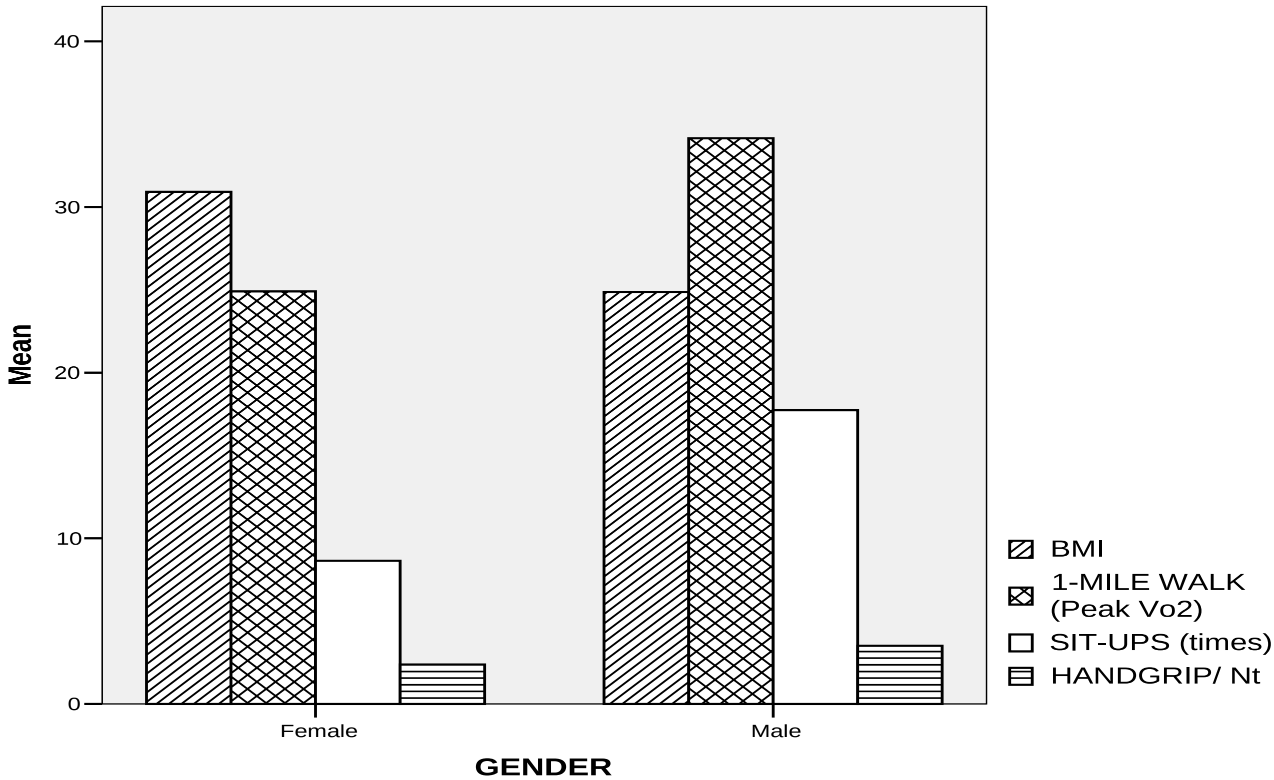


FIGURE 3. Physical fitness test components with significant differences between genders

### 6.1.2 Physical fitness between adults with and without Down syndrome

The difference in physical fitness level between adults with and without DS was also investigated. Mean scores for each component of physical fitness were calculated. Comparison between participants with and without DS was made by using independent t test. Results are found in Table 4. There was no indication of statistically significant differences between groups for BMI, 1-mile walk, sit-ups and hand grip. The findings indicated that there was statistically significant ($p < .05$) difference in stork stand and heal-to-toe walk measurements between participants with and without DS. Participants without DS (Figure 4.) had higher score in stork stand and heal-to-toe walk than participants with DS. However, the participants with Down syndrome had higher scores in sit-and reach measurements and the difference was statistically very significant ($p < .001$).

TABLE 4. Physical fitness level between adults with and without Down syndrome

| Variable | Down syndrome | | | No Down syndrome | | | |
|---|---|---|---|---|---|---|---|
| TEST | N | M | SD | N | M | SD | p-value |
| BMI | 18 | 28.6 | 5.7 | 43 | 28.7 | 7.8 | .883 |
| 1-MILE WALK Peak $VO_2$ (ml / kg / min.) | 11 | 29.9 | 8.1 | 31 | 29.7 | 10 | .947 |
| SIT-UPS (times) | 18 | 16.4 | 14.2 | 45 | 13.9 | 12.9 | .489 |
| HAND GRIP /Nt/kg) | 18 | 2.7 | 0.9 | 45 | 3 | 1.4 | .225 |
| SIT-AND-REACH (cm) | 18 | 33.8 | 9.2 | 45 | 22.2 | 12.4 | .001*** |
| STORK STAND (sec) | 18 | 4.7 | 9.3 | 45 | 17.4 | 23 | .003** |
| HEALT-TO-TOE WALK (steps) | 18 | 2.4 | 4.7 | 45 | 5.7 | 6.4 | .030* |

* $p < 0.05$
** $p < 0.01$
***$p = 0.001$

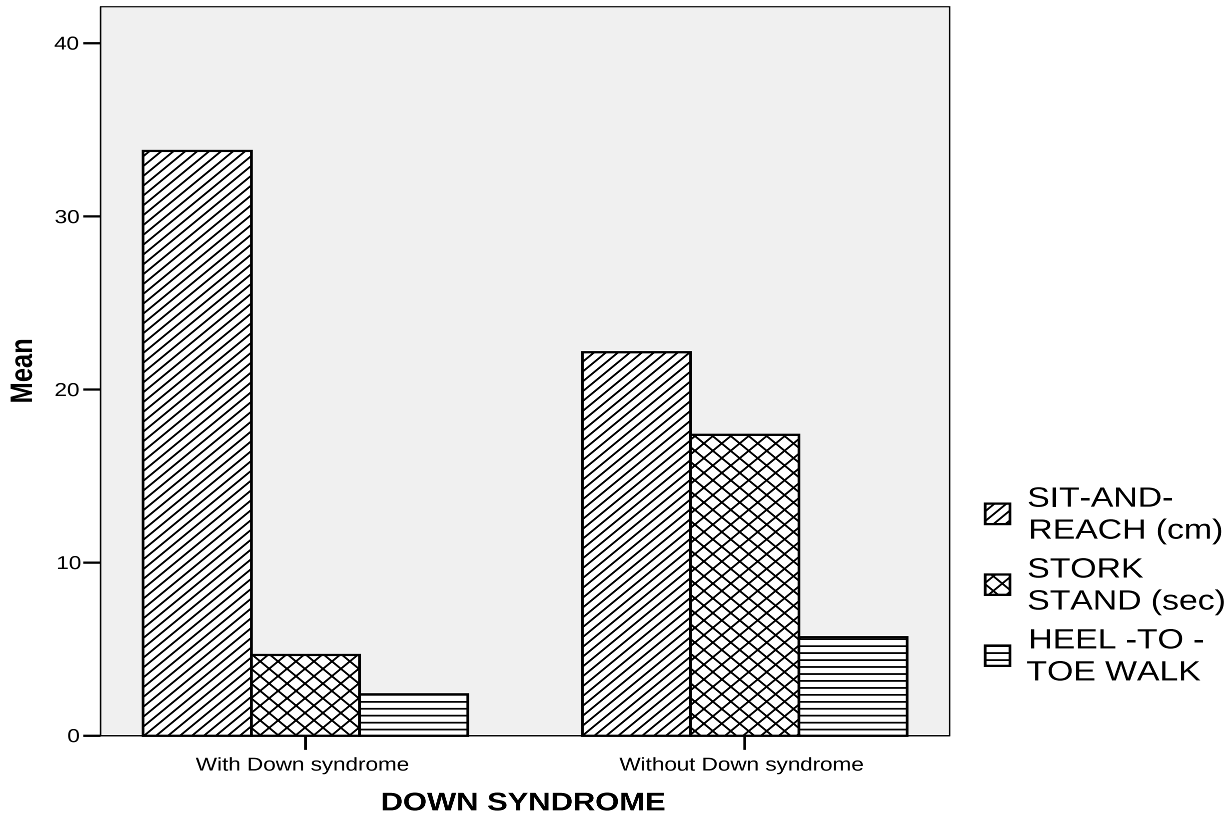


FIGURE 4. Physical fitness test components with significant differences between adults with and without Down syndrome

## 6.2 Describing the test situation from pedagogical view

The observed data was collected via checklist (Appendix 2.). The checklist was divided in three categories: familiarization process, guidance and motivational strategies and each of these categories were divided in greater detail. All results are gathered in Table 5.

### 6.2.1 Familiarization process in test situation

Before any testing was performed the testers made a phone call either to sheltered workshops or to participants' family home and informed beforehand significant others about the forth coming testing. At first, the participant and the testers were introduced to each other. The testers made some questions for participants to get to know her / him better and also tried to lead the participants' interest into the following theme. The questions asked such as: "What kind of hobbies do you have?" "Do you like sports?" " Have you done any sports lately?" After a short discussion the testers showed the test equipment for the participant and explained shortly the whole test procedure. Then, the participants were allowed to touch and try any testing instruments and make some questions from the testers. Before performing the test item the participant had the opportunity to practice the task under consideration. In most of the cases, the familiarization process took a short time until the participants were ready to perform the tasks. However, in some cases familiarization process lasted a couple of hours. The length of familiarization process was depending on the participants' ability to understand why they had to perform the desired tasks. Furthermore, some participants were suspicious about the testers and the test equipment and they needed more time to get familiar with them. In that case, the testers left the equipment on a table / floor and the participant was able to explore them on their own. After the each test item was concluded the testers explained to the participant what the result meant and how did she / he succeed. The testers also educated the participant how she / he could improve or maintain his / her physical fitness condition in the future. The more detailed description of each test item familiarization is described in Table 5.

### 6.2.2 Guidance in test situation

In performing the test items the verbal guidance was used. Only in some cases, pure verbal instruction was enough to get the desired performance. However, to improve the reliability of the measurements, the demonstration along the verbal instructions were given in all testing situations. To be explicit, one tester was explaining the task and the other one was demonstrating simultaneously. Most of the participants understood the desired task from verbal guidance and demonstration, but in some cases, the testers also needed to use manual guidance. The more detailed guidance examples are given in Table 5.

### 6.2.3 Motivational strategies in test situation

The qualitative data of motivational strategies used in this study indicated that the most apparently participants were verbally encouraged to give their best effort. Even though the quality of verbal encouragement was mainly similar in all cases, the motivation was in each test item related to particular performance. In addition, the amount of encouragement and feedback was determined personally. In all test items the clear expectations were given at the beginning of the test. Corrective feedback and encouragement were used regularly to make sure the participant was doing her / his best. The duration of 1 mile walking test was the longest of all test items and it required constant encouragement from testers to make sure the participant did not drop out the performance. Furthermore, sit up testing which measures muscle endurance was another test item in which the constant motivation was important. The more detailed motivating examples are given in Table 5.

TABLE 5. The qualitative description of each physical fitness test item from the pedagogical view

| TEST | FAMILIARIZATION 1.Before | 2. After | GUIDANCE 1.Verbal | 2. Demonstration | 3.Manual | MOTIVATING 1.Clear expectations | 2. Corrective feedback | 3.Encouragemenrt |
|---|---|---|---|---|---|---|---|---|
| 1. Weight<br>2. Height | " When was the last time you measured your weight / height?" | " The BMI result tells your are in a good shape"<br>"You have gained weight a little since last time, have you noticed? | "Step on the scales and stand there for a while"<br>"Stand back straight and head up" | Tester showed how to stand on the scales | Both testers supported participant from the sides and helped her/him to step on the scales | " Now we are measuring you weight" | " Let's see how your weight has changed since last time" | "This is easy, you just stand on the scales" |
| 2. 1-mile walk | "Do you know where the sport field is? "Have you ever been there?" Participants were allowed to try the heart rate monitor and keep the watch on their wrist. | " Well done, you manage to walk all the way to the end" You're in a good shape" | "walk as fast as you can" | Tester showed how to walk fast; long steps and hands swinging on the side | Tester "pulled" her / him from the hand during the walking | " Walk four laps as fast as you can without breaks" | " Walk little bit faster"<br><br>"What are the numbers in the heart rate watch?" | " Few more laps to go"<br><br>"You're doing great" |
| 3. Sit-up | "Do you know where your stomach muscles are?" "Have you ever exercised them or seen some one else exercising like in TV?" | "Your abdominal muscles are in a good shape"<br>"This is something you should be exercising more often like few times a week!" | One tester was explaining : " rise up by using your abdominal muscles and do as many as you can" | The other tester was demonstrating how to do it: lying on back knees bent. Every time one gets up the wrists have to reach over the knees | 3. To make sure that the performance was done properly without a break, other tester gave prompts onto participant's shoulder when to get up every time his/her upper back touched the floor | "Now try how many sit-ups you can do, 50 is the maximum" | Participant was asked to clap her / his hand to testers hands (hand were on the top of the knees) every time they got up | "Few more times"<br><br>"Go for it, I'm sure you can do few more" |

TABLE 5. (Continues)

TABLE 5. (Continues)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4. Hand grip | Testers explained how the muscle strength is going to be measured<br><br>The participant was allowed to try the hand grip dynamometer | Testers explained what the result means and participants were allowed to compare their results with testers results.<br>If the result was good tester praised him / her: ”have you been working out?”<br>Or the tester gave some instructions how participant could exercise the muscle strength. | The tester was explaining: “ keep your hand straight and squeeze the grip as hard as you can” | The other tester was demonstrating how to do it: stand straight, hold the instrument straight down by the side, without touching the body | To make sure that the performance was done properly the other tester helped the participant to hold the dynamometer in her / his hand.<br><br>If the tester still did not understand how to squeeze the dynamometer, the other tester took a handshake grip from participants hand and asked him / her to squeeze it | “ to get a good result male participant should get the result as high as.” | “Squeeze harder!”<br>“Can you get the number in dynamometer to rise even more?” | “Show us how much power you have in your hands”<br><br>“The best result is xx, try to get better!” |
| 5. Sit-and reach | Testers were stretching together with participant and then participant was allowed to try sit-and-reach test a few times | Testers explained what the result means and participants were allowed to compare their results with testers’ results.<br>Tester gave some instructions how participant could improve his / her flexibility | “ Keep your legs straight and try to push the marker as far as you can at the same time | The other tester was demonstrating how to do it: first sitting back straight and then pushing the marker with both hands and fingers straight | To make sure that the performance was done properly the other tester kept participant’s knees straight and the other was giving the signal on to the back | “ Try to push the marker further than the tester did” | “ Keep your knees straight”<br>“Push the marker slowly” | “ Well done” |

TABLE 5. (Continues)

TABLE 5. (Continues)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6. Static balance | Participants were asked to stand on one leg. They were allowed to try both legs and the better was chosen. Some of the participants were familiar with this because they had seen it on TV. | Testers explained what the result means and gave some instructions how participant could improve his / her flexibility. | “ Try to stand on one leg as long as possible” “ One minute is the maximum” “ If you loose your balance, you can try again” | The tester was standing face to face to the participant and demonstrated the task. | The tester was standing behind the participant and held her / him from the waist or both arms. When participant found the balance, tester let go and test begun. | “Don’t stop until we say you’re ready” | “ Keep your eyes on one spot and try to concentrate” | “ just try to be calm and focus on the task” |
| 7. Dynamic balance | Participants were asked to walk normally on the line. After that they were asked to walk as heel-to toe walk. Then they were allowed to try the correct performance a few times. | Testers explained what the result means and gave some instructions how participant could improve his / her flexibility. | “15 steps are maximum, if you loose your balance, you can start over” | The tester demonstrated the task by walking heel-to-toe steps on a line. Tester also demonstrated what happens if participant looses his/her balance. | One tester or both were supporting participant from the sides and helped her/him to get the beginning position to make heel-to-toe steps on a line.<br><br>Testers also put participant legs on a right position so she/he understood the desired task. | “ this is not a race, the calmness will be rewarded” | “ Five more steps to go” | “ You’re doing just fine”<br><br>“ Just try to be calm and focus on the task” |

# 7 DISCUSSION

The purpose of this study was to explore the physical fitness level and its testing in adults with intellectual disability (ID). There were two specific research aims for this study. The first aim related to determining the physical fitness level of adults with ID, in which the differences between female and male participants and between participants with and without Down syndrome (DS) on body composition, cardiorespiratory fitness, muscular strength, flexibility and balance were compared. It has been noted that familiarization, communication and motivation have great influence on the reliability and validity of physical fitness test results. (Reid et al. 1989; Tsimaras & Fotiadou 2004.) Therefore, the second aim of this study was to describe the familiarization, communication and motivation process used in the test situations.

## 7.1 Measurements and their applicability

Eurofit physical fitness test items were chosen in this research for the following reasons: (a) they are noted to be reliable measures for males with and without intellectual disability, (b) they are relatively inexpensive and (c) easy to perform in field situations (Mac Donncha et al. 1999; Oja & Tuxworth 1995, 38). The most common body composition assessment methods used in individuals with ID are skinfold thickness, antrophometric girth measurements and a height-weight index (BMI). However, these methods may result in large errors in individuals with ID who may have different body proportions, tissue densities, or fat distributions than individuals in general. (Kelly et al. 1987 ; Usera, et al. 2005.) In this study, the body composition and the level of obesity was measured with the index of body mass (BMI). It is noted to be a reliable and valid method to assess the body composition in population with ID. The BMI was used, because it was simple and time saving way to measure participants' body composition. After all, the results of body composition and estimates of body fatness would have been more reliable if the skinfold thickness measurements had been used in addition to BMI. However, the skinfold thickness measures require a great deal of skill to conduct and neither of the testers in this study had experience with skinfold measurement techniques.

The level of cardiorespiratory fitness was measured with a 1-mile walking test, which is found to be reliable and valid test to assess cardiorespiratory fitness for male participants with ID (Kittredge et al. 1993; Rintala et al. 1992). In this research, 43 of 63 participants completed this walking test. There were only a few participants who refused to walk at all. Moreover, those ones who did not manage to walk the whole mile were willing to walk as long as they could. For those participants, the walking distances varied between 400 meter and 1 kilometer. The motivation for walking test was quite high. The participants were interested to travel by car to sports field and walking itself was easy and familiar to perform for these individuals. Even though the instructions to walk as fast as you can were given, it was noted that the test result is more reliable if one tester was walking all the way beside the participant. If the tester noted that participants' speed was getting too low, he / she used a verbal encouragement or "pulled" her / him from the hand. In most cases, the "pulling from the participants' hand" lasted only a short time and it was used to give a sign to participant to speed up his/her walking. However, in some cases the tester needed to "pull" the participant from his / her hand for longer distances. The question arises whether the result of one-mile walk test is reliable in those cases in which manual guidance was needed almost constantly? After all, some of the participants in this study required a constant physical contact from the tester to maintain and keep up their performance. This requirement appeared only in long lasting performances like one-mile walk. Eventually, all of those participants who performed the one-mile walk test were willing to participate and the test was carried out on their condition.

The trunk muscle strength and endurance was measured with dynamic sit-up test. This test among the 1-mile walk test needed a lot guidance, assistance and motivation. For some participants even the laying down on the floor was difficult and unpleasant which was, in most cases, due to high body weight and clumsiness. Caused by that the sit-up test and sit-and-reach test were always performed one after another. Almost all participants understood the desired task in sit-ups from the demonstration. However, in some cases testers needed to give manual guidance before the performance: the participant was lying on the floor with both knees bent and the testers lifted his/her upper body up from hands and upper back, so the participant got the idea of the correct movement. In general, the current verbal praise and motivation were needed during the performance. For some participants the verbal encouragement was enough, but in most of the cases the testers gave the prompts onto participants' shoulder as to get up every time his/her upper body touched the floor. In addition, to make sure that the participants' wrists reached over his/her own knees, he/she was asked to clap testers hands, which were placed on the level of the participants' knees. That was noted to be simple and stimulating method.

The upper body strength was measured with the electric hand grip dynamometer. Pitetti et al. (1988) observed that the hand grip field test had a high test-retest reliability compared to the laboratory test and they recommend to use hand grip method to evaluate arm strength in individuals with ID. In our study, the handgrip test was found to be quite easy to perform. Nevertheless, some participants did not realize to squeeze as hard as they could. That's why the testers took a "handshake" grip from participants' hand and asked him / her to squeeze it. After that, they realized to do the same with the dynamometer. Some participants still did not do their maximal effort. Moreover, a few of them were first afraid to take the dynamometer in their hand, because they thought it might cause an electrical shock. The motivation of male participants was higher than females and it appeared that male participants were more willing to show how much power they have in their body.

The sit-and-reach test was easily understood from the demonstration. The procedural deviations during the test were concurrent with Pizarro (1990). To make sure the participant did not bend his / her knees during the performance, the other tester was holding participants' knees with hands. Also, the participant was counseled to reach forward slowly without any sudden movements. It was noted that this task was unpleasant to perform, because hamstring tightness usually caused the feeling of pain. To avoid that feeling the testers were stretching together with participants before the performance.

As the sit-and-reach test, both of the balance tests were easily understood. However, the balance tests were one of the most difficult tasks to perform among these participants. When performing the static stork stand, some participants needed the tester to hold their body still, so they could found the balance. After the participant was ready the tester let go his/her hold. It was noted that during this task the participants were extremely sensitive on any kind of disturbances. Among these participants the concentration on the task was difficult. The participants were counseled to focus their eyes on one spot and in some cases that advice worked. In dynamic heel-to-toe test some participants needed manual guidance before the performance: the other tester was supporting the participant from the side and the other was removing participants' foot on the right place. During this task it was very common that a participant touched the floor between steps, which was interpreted as incorrect performance.

## 7.2 Physical fitness level of adults with intellectual disability

Prevalence of obesity and overweight is higher in population of ID than in general population and it has been found to be a major health problem among this population (Emerson 2005; Melville et al. 2005; Yamaki 2005). The obesity-related health problems increase beyond a BMI of 25 and the higher the BMI gets the higher is the risk for type 2 diabetes, hypertension, and cardiovascular disease. In this study, the mean value of all participants BMI was 28.8. According to classification of ACSM (2000, 63-64) BMI level of 25.9 to 29.9 is considered overweight and a BMI of equal or greater than 30 is considered the level of obesity. From all participants in this study, 22 % had BMI between 25.9 and 29.9 and 38 % of all the BMI was more than 30. This means that about 60 % of all participants in this study had at least increased or even high risk to catch secondary diseases. These results are congruent with the findings of Moran, Draine, McDermot, Dasai & Scurry (2005), who indicated that 35.2 % of participants with ID between the ages 50 and 59 years had BMI over 30. They also found that an increasing proportion of individuals with ID are obese, but obesity is not a chronic state and many people loose weight, as they get old.

Cardiorespiratory fitness is considered health-related because low level of cardiorespiratory fitness are associated with markedly increased risk of premature death from all causes. Also increases in cardiorespiratory fitness are associated with reduction in death. Furthermore, high level of cardiorespiratory fitness is associated with higher level of behavioral physical activity, which is associated with several health benefits. The level of individual's cardiorespiratory fitness can be measured as maximal oxygen uptake $VO_2$ max. (ACSM 2000, 68.) People with ID usually demonstrate lower level of cardiorespiratory fitness compared to individuals without ID (Fernhall 1992; Fernhall, Tymeson, Millar & Burkett 1989). As an example, variation in peak $VO_2$ max values between different groups can be seen in table 6. In general population, the average value of peak $VO_2$ with untrained females is 39,5 (ml/kg/min) and with untrained males 44 (ml/kg/min) (ACSM 2000; Keskinen et al. 2004, 51-55). Pitetti & Tan (1990) reported that the average $VO_2$ peak values range from 25-45 (ml/kg/min) within the population with intellectual disability. In this study the mean value of all participants in $VO_2$ peak was 29.8 (ml/kg/min) and the range was from, 7,88-48,8 (ml/kg/min). When compared to normative values, $VO_2$ max below the 20$^{th}$ % for age and gender is associated with an increased risk of death from all causes. In this research, both female and male participants were below the average. (ACSM 2000, 76-77.) Unlike those results, data of Pitetti, Millar & Fernhall (2000), showed fewer differences in peak $VO_2$ capacities between participants with and without ID. On bases of those results, they concluded that lower physiological values, reported for persons with ID, could be related to their lifestyle. However, runners with mild ID have indicted to be able to achieve high level of physical fitness comparable to individuals without ID (Frey, McCubbin, Hannigan-Downs, Kasser & Skaggs 1999).

TABLE 6. Values for maximal aerobic power in different groups (ACSM 2000, 76-77; Keskinen et al. 2004, 51-55.)

| | Female | Male |
|---|---|---|
| Untrainable (ACSM 2000, 76-77) | 39 (ml/kg/min) | 44 (ml/kg/min) |
| Athlete; cross-country skier (Keskinen et al. 2004, 51-55) | 65 (ml/kg/min) | 84 (ml/kg/min) |
| The level of increased risk of death (ACSM 2000,76-77) | 25.1 (ml/kg/min) | 33 (ml/kg/min) |
| Participant with ID in this study | 24 (ml/kg/min) | 34 (ml/kg/min) |

In this study, the peak $VO_2$ max was calculated with formula Peak $VO_2$ max = 101.92 − 2.356(mile-1 time) − 0.42(weight) (Rintala et al. 1992). Rintala et al. (1997) found systematic prediction errors in their own formula. Among this study, the peak $VO_2$ max value was under 16 ml/kg/min in five cases of 43 participants and the range of those low values was from 7.9 to 15,8. It is questionable if this formula is valid in these cases. Only one of those low peak $VO_2$ max values was for male participant and the rest four were values of female participants. These low peak $VO_2$ max values seemed to be related to high body weight and high walking time. After all, even if these low values were excluded from the results, the mean value of the peak $VO_2$ max among females with ID would be 26.4

ml/kg/min and for males with ID 34.8 ml/kg/min, which are still considerate as low levels of cardiorespiratory fitness.

Participants with ID present lower level of muscle strength than individuals without ID. Muscle strength of individuals with ID, is of fundamental importance to their overall health and is necessary for the activities of daily living and work-related skills. (Pitetti et al. 1988; Pitetti & Boneh 1995; Pitetti & Yarmer 2002; Tsimaras & Fotiadou 2004.) In this study, muscle endurance was assessed with sit-ups and muscle strength with handgrip dynamometer. Compared to general working population at the same age both values are remarkably below the average (Keskinen et al. 2004, 175; Oja & Tuxworth 1995, 102). Poor abdomianal strength or endurance in conjunction with poor lower back and hip flexibility contribute to development of muscular low back pain. Compared to general population. the results of sit-and-reach test in this study puts female participants with ID in category: "below average" (percentile ranking 30%) and male participants in category: "average" (percentile ranking 50%) However, it should be noted that the third of the whole participant pool consists of individuals with Down syndrome. Individuals with DS are noted to have more muscle flexibility than the other individuals with ID and that may affect the results. (ACSM 2000, 87-88; Horvat et al. 2002, 136: Winnick, 2000, 118.) In the end, persons with ID demonstrated lower level of body posture and kinetic control and especially balance ability. These results were concurrent with the study of Tsimaras & Fotiadou (2004).

## 7.3 Physical fitness level between genders

This study findings showed that a statistically significant difference existed between genders at body composition (BMI), cardiorespiratory fitness (1mile walking test), muscle strength (hand grip test) and a significant difference at muscle endurance (sit-up test). Females with ID are noted to exhibit higher level BMI and attended to have more often obesity than males with ID (Fox et al. 1983; Kelly et al. 1986; Pitetti et al. 2001; Rimmer 1994). In this study, female participants' mean BMI was 32 that is classified as obese and its disease risk for type 2 diabetes, hypertension, and cardiovascular disease is high. The mean value of BMI of male participants was 26 which is on the edge of normal weight and overweight and the risk for above mentioned diseases is low. Female adults with ID demonstrated lower level of cardiorespiratory fitness compared to males. This is consistent with other findings that females have lower $VO_2$ peak values than males with ID (Fernhall 1992; Frey et al. 1999; Pitetti & Tan 1990). It is demonstrated that low cardiosrespiratory fitness is as important predictor of mortality as obesity and inactivity (Blair & Brodney 1999). In addition, the level of muscle strength and endurance were significantly lower in female participants than in male participants with ID. Based on the earlier studies and results of this study, it seems that female individuals with ID experience greater burdens of morbidity and mortality than males with ID. What is more, women with ID are noted to be at risk of osteoporotic fracture as they age (Foster, Walkley & Temple 2001). Aware of these facts, WHO (Walsh, Heller, Scnupf, van Schrojenstein Lantman-de Valk et al. 2000) has targeted its efforts toward health systems by making them more responsive to the needs of women with ID. Moreover, active lifestyle changes can provide health benefits for women with ID who have not lived healthy lives, even at a later age (Walsh et al. 2000). Therefore, women with ID should be encouraged to participate in instructed physical activity programs to improve their physical fitness level.

## 7.4 Physical fitness level between participants with and without Down syndrome

The performance of individuals with Down syndrome on health-related fitness items did not differ significantly from performance of individuals without Down syndrome. In this study, the differences between groups with and without DS were significant only in flexibility and in balance tests. Earlier studies report that obesity is more prevalent in individuals with Down syndrome than individuals with intellectual disability (ID) not associated with DS (Kelly et al. 1987, Usera et al. 2005). Unlike those results, our data indicated no significant difference in BMI between DS and without DS groups. Furthermore, the mean value and distribution of BMI were even greater in participants without DS. Melville et al. (2005) reported that there was a grater prevalence of obesity amongst females with DS but not men. The results of this study were concurrent with that study. The result of BMI for female participants with DS was 32 and for male participant 26.8. The research of Carmeli et al. (2004) demonstrated that older persons with Down syndrome were more obese than other older persons with intellectual disability.

Furthermore, the functional performance of older adults with DS was more impaired than in older adults with and without ID.

This study indicated that participants with Down syndrome demonstrate lower level of balance ability. The difference between participants with and without DS was significant in both static and dynamic balance tests. These findings are concurrent with previous studies. (Carmeli et al. 2002.) In the terms of dynamic balance ability, the delay of the maturation and relatively small size of cerebellum and brain stem in persons with DS may be responsible for the disturbance of balance (Tsimaras & Fotiadou 2004). Moreover, the performance of individuals with DS in flexibility, was significantly higher than individuals without DS, which was consistent with earlier explorations. After all, the participant pool of individuals with DS in this study was small. Any true differences in physical fitness level between individuals with and without DS may be more evident with a larger sample. Furthermore, the differences between males and females with DS were not compared in this research, since there were only 6 female and 12 male participants in this study.

## 7.5 Familiarization, guidance and motivational strategies in test situation

Internal and external validity are important concepts in the research. In this study, the qualitative description was used to improve validity and reliability of the data collection. Descriptive data indicated that familiarization process is time consuming and it has to be done personally. The quality and duration of familiarization depends on the individuals' ability to understand the given instructions and her / his earlier experience on physical fitness test items. During this research, it was noted that the more the tester used time at a beginning for familiarization the more co-operative the participant was during the test situation. Even though, prior familiarization is noted to be vital, it is agreed with Reid et al. (1989) that familiarization process after the test performance is also needed. It gives to the tester the possibility to explain to the participant about the meaning of the results and to give her / him further instructions how to improve his/her physical fitness condition. That is one method how testers can add the individuals' knowledge about physical activity and raise their interest toward it.

In all test items, verbal guidance and demonstration were used to improve and clarify instructions. In such a case that the participant did not understand the desired task, the testers were using also manual guidance. Even though all these forms of guidance were planned before, there were cases when testers needed to use their imagination and adapt the guidance in order to reach the proper performance. In a light of guidance, the group testing was noted to be a good working method. Sometimes, by observing each other's performance the participant seemed to understand the desired task better. Motivation was also higher when they encouraged each other and competed against others results. However, the group testing did not always improve participants' performance and performing together with others' caused sometimes shyness, frustration and low level of concentration.

Motivation is a complex phenomenon (Kozub, 2003) and analyzing the quality of motivational strategies was the most difficult part of this study. Since there is a lack of proper and systematic method to observe the quality of motivation in test situation, it was decided to focus on observing the different forms of extrinsic motivation. Individuals with intellectual disability are believed to be highly extrinsically motivated (Kozub 2003). The level of intrinsic motivation in this study was impossible to assess. The analyzed data indicated that individuals with ID needed constant encouragement and feedback before and during their performance. Those test items that required long sustained work (1 mile walking test) or working at the level of discomfort (sit up test) required plenty of motivating. Reid at al. (1989) stated that teaching individuals with ID to tolerate certain degree of discomfort during exercise is not easy and, in test situation, this should be considered already in pre-test familiarization. Individuals in this study were motivated to try to reach the highest level. Also competing against others' results or with testers were noted to improve the motivation. In some cases external rewards were needed like awarding the diploma or offering a cup of coffee or pizza slice for a good work.

It is important for researchers to study motivation in conjunction with physical activity. Motivational factors alone may not explain inactivity and low fitness level in population with ID but low fitness coupled with low skill might also lead to inactivity in persons with ID. (Kozub 2003.) To achieve physically active lifestyle and positive attitude toward physical fitness, a person needs motivation that will arise from intrinsic reasons. Lancioni & O'Reilly (1998 ) suggested to employ various reinforcing events to increase the persons' motivation to exercise and also taking account the persons opinion about exercise by allowing them to choose between various exercise options. Individuals with ID also need to have more experiences and knowledge of physical activity and fitness. By providing information will motivate and enable individuals with ID to change their behavior and to maintain that change over time. Information should include basic things of physical activity and its benefits for individuals' general well-being. Also, information how to exercise, where and when are needed. These above-mentioned factors increase individuals' sense of empowerment, which is one important factor of quality of life.

To increase the level of physical fitness among this population will require innovative and systematical programs. A great number of adults with ID in Finland are working. One opportunity to enhance their daily activity level is including physical activity programs into their workdays. These daily activities could be composed of short walking tours, gymnastics breaks and different forms of exercises. The question is who will organize these physical activities? One solution is to use cooperation and the physical activity instructor could be arranged from the municipality. Moreover, those people who are working with individuals with ID could also instruct the daily physical activities. Apparently, these professionals should get some education and guidance how to instruct and carry out different physical activities. Most importantly, the education of employees on physical activity should be started already during their education. This requires that physical activity courses like general physical education and adapted physical activity are included in all education programmes education in schools of health and social sciences.

## 7.6 Limitations of the study

There were two kinds of research problems in this study. The quantitative research problem explored the level of health-related physical fitness in adults with ID and the qualitative research problem was associated with pedagogical items of physical fitness testing in populations with ID. One weakness of this study is associated with the physical fitness test items. In this study one-mile walk test was used to assess the level of cardiorespiratory fitness. It has noted to be valid only for male participants with ID but not for females with

ID. In addition only 43 individuals of all 61 participants participated in that test. There are also limitations in the qualitative data collection process. Since the idea to explore the pedagogical side of testing aroused during the data collection, there was no structured observation table formulated beforehand. Reid et al. (1989) recommend collecting observational data during test situation regarding the participants' cooperativeness, coordination and the level of prompting necessary. It was noticed that observing above-mentioned pedagogical factors from the videotape was difficult. Also some situations were impossible to record while driving to the sports field. However, in those informal situations testers had their opportunity to familiarize and motivate participants. Now afterwards, it would have been more reasonable to make more notes during the test situation. With regard to the pedagogical analysis, this is one thing that is recommended to be done differently. Moreover, by having more than one observer would have increased efficiency and objectivity of this study.

The test situations themselves also had some weaknesses. First of all, the test place should always be quiet and undisturbed. During this research the physical fitness tests were conducted mainly in sheltered working places or in few cases at participants' home. The test places were quite often small and noisy. This might be one factor that affected participants' performance and the test results especially in those tests, which required much concentration such as one leg stork stand. Since the test schedule was very tight, there was not always enough time to chat and spend time with all participants. As a part of familiarization, it is important to allow enough time for each participant. Moreover, during the test situation it is important to allow the participant to keep breaks between the test performances.

Working together with individuals with ID requires clear and structured mode of action (Huovinen 2003). To achieve participants attention and increase their motivation it would be useful to make an own test form for each participant. That form could include all test items with pictures, so that participant could follow the test process. This could increase on participants' concentration level and keep up their motivation.

## 7.7 Conclusions

In conclusion, the group of individuals with ID in this study performed on all physical fitness variables "below the average" or "remarkably below the average" categories. It has been clearly demonstrated that components of physical fitness are reliable indicators of health and according this research, it is likely that individuals with an intellectual disability have a greater risk of certain health risks such as cardiovascular diseased, diabetes, hypertension, osteoporosis, low back pain, cancer and mental disorders. (Evenhuis et al. 2000.) These components of physical fitness are not only vitally important for people's health but they are valuable for recreation, sport and activities of daily living. Therefore it is essential that professionals working with individuals with ID provide them opportunity for exercise programs that improve cardiorespiratory fitness, muscular strength, flexibility, and strength and decrease obesity. Romar et al. (1998) among several other researches have indicated that individuals with ID can improve their physical fitness by exercising and along that decrease his or her risk for secondary diseases.

There is a relationship between the age and physical activity level in person with ID. As the age increases the activity level decreases. This relationship was explained by the lack of social networks and transportation. (Kozub 2003.) In addition, even more adults with ID are living in community settings (Prasher & Janicki 2002, 1). Researches have indicated that individuals living in community settings have increased risk of sedentary lifestyles and they are even less active than persons living in institutional settings (Pitetti & Campbell 1991). As a result, aging and the low physical fitness level reinforce the fact that adults with intellectual disability are in great need of instructed physical activity programs.

The Eurofit test battery is noted to be valid and reliable for male participants with intellectual disability. However, some test items still need more research on their reliability and validity for females with intellectual disability. Moreover, even if these test items are suitable assessment tools for both genders with ID, it is still questionable if they are valid for individuals with Down syndrome. For example, it is well known that individuals with Down syndrome have a different body shape and body proportion than individuals in general population or other individuals with ID. One prediction equation has been validated on individuals with ID but not specifically for individuals with DS. Therefore, new prediction equations of methods to assess the body composition, cardiorespiratory fitness, muscle strength, flexibility and balance of individuals with ID and DS are needed. (Kelly & Rimmer 1987; Usera et al. 2005.)

Further research should focus more on education strategies in test situations in which physical fitness programs are seen, not only from the point of health-related fitness but also from the cognitive and emotional point of view. Moreover, adequate pedagogical methods ensure that participants with ID become familiar with the test situation and protocols, understand instructions, and gain positive experiences from their efforts. Standardized methods to observe these educational strategies are also needed. Especially information of motivational strategies for participants with ID would increase the motivation level in test situation and improve the validity of the measurements.

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# APPENDIX

## Appendix 1. Checklist for testing components of physical fitness

PHYSICAL PERFORMANCE TEST

Number :_________ Date:__________ Name:______________________
Age:_____________
Weight___________ Height___________ BMI:___________

1. Dynamic sit-up I

Participant lays on his/her back with both knees bent, arms straight, palms resting on the thighs. The tester holds participants' feet. The aim of each sit-up is to reach midpatella with both hands (wrists over the knee).

1._____________ number of cases

2. One leg stork stand I

Free foot is lifted on the same level with ankle and both arms were on the side. Movement of the arms are allowed. The time is measured as soon as the participant lifted his/her foot. When participant loses his / her balance, the time stops. Each participant gets three trials for both legs and the best times for both legs were recorded.

Max 60 sek

1._______sec 2._______sec 3._______sec

3. Heel-to-toe walk, max 15 steps

The dynamic balance is evaluated as the ability to walk on a line with heel-to-toe walk. The participant is asked to walk the line heel-to-toe, distance of 15 steps. If the participant steps off the line prior to completing the task, the score is the number of steps he / she had prior to the step-off. Two trials are given and the best effort is recorded.

1. ____steps 2.____steps 3.____steps

4. Pearls to bowl **NOT USED IN THIS RESEARCH**

1.____sec 2.____sec

5. Purdue peg Board **NOT USED IN THIS RESEARCH**

1.____ 2.____

6. Hand grip test

The participant stands straight and holds the instrument straight down by the side without touching the body and to squeezes the dynamometer as hard as possible. Each participant gets two trials for both dominant and nondominant hands and the better of each of the two results are recorded.

1.____kp 2.____kp Dominant

1.____kp 2.____kp Nondominant

7. Sit-and-reach

Participant sits on the floor with straight legs and reaches as far as possible forward. The participant is allowed to practice movement two times. When the test begins, the tester holds his hands on the participants' knees to ensure that the legs are kept straight. The aim of this test is to bend slowly forward and push a little marker with fingertips at the same time. The result is measured at the point where the marker stopped.

1.____cm 2.____cm

8. One leg stork stand II **NOT USED IN THIS RESEARCH**

1._______s 2._______s 3._______s , max 60 sec

9. Dynamic sit-up II **NOT USED IN THIS RESEARCH**

1.______ Number of cases

10. 2-km walk test **NOT USED IN THIS RESEARCH**

Time: ______ Pulse: _______

11. One-mile walk test

Time: ________

Appendix 2. Observation checklist for familiarization process, guidance and motivational strategies.

| TEST | FAMILIARIZATION | | GUIDANCE | | | MOTIVATION TECHNIQUES | | |
|---|---|---|---|---|---|---|---|---|
| | 1. Before | 2. After | 1.Verbal | 2. Demonstration | 3.Manual | 1. | 2. | 3. |
| BMI<br>1.Weight<br>2. Height | | | | | | | | |
| 1-mile walk | | | | | | | | |
| Sit-up | | | | | | | | |
| Hand grip | | | | | | | | |
| Sit-and reach | | | | | | | | |
| Static balance | | | | | | | | |
| Dynamic balance | | | | | | | | |