ASSOCIATIONS OF SOCIOECONOMIC POSITION AND SELF-RATED PHYSICAL FITNESS IN FINNISH POPULATION

Kaisa Pulkkinen
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University of Jyväskylä
Department of Health Sciences
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ABSTRACT

Associations of socioeconomic position and self-rated physical fitness in Finnish population
Kaisa Pulkkinen
University of Jyväskylä
Faculty of Sport and Health Sciences
Department of Health Sciences
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Several health indicators establish that those in higher socioeconomic position (SEP) have longer and healthier lives. Health behaviour, such as physical activity (PA), is an important explaining factor for health inequalities. Physical fitness as predictor of morbidity and mortality emphasizes the health-enhancing character of PA, while taking into account also other health-influencing factors such as obesity, smoking, chronic diseases and genetic variability. However, physical fitness is a rarely used measure in population level studies. The association of SEP and physical fitness is hardly studied at all.

The aim of this thesis is to study the socioeconomic differences in self-rated physical fitness (SRPF) in Finnish population. The data were received from The National Institute for Health and Welfare, that collected the data in spring 2007 for a cross-sectional population based National FINRISK Study. The participants were from 25 to 74 years old. The total sample size was 10 000 and 6258 persons filled out the questionnaire and participated in the health examination. The final analyses included 5830 persons, 2722 men and 3108 women. The statistical method was ordinal logistic regression analysis.

Longer educational career was associated with better SRPF, but the differences were largely mediated by health behaviour related factors. The mediating factors were different among men and women. Leisure-time PA mediated fully and body mass index (BMI) partly the fitness-related educational differences among men. The combination of BMI, history of chronic diseases and smoking mediated the SRPF differences between education thirds fully among men and partly among women. The full model with adjustments for age, employment status, commuting PA, leisure-time PA, occupational PA, BMI, history of chronic diseases and smoking mediated all educational differences in SRPF in both genders.

In health promotion, special attention should be paid to those with low levels of leisure-time PA. Including measures of SRPF to epidemiological research is likely to produce more accurate information especially from the participants' physical health level. This thesis provided preliminary information for decision makers in social and health welfare and future studies. More research is needed to specify the character of SRPF and its relation to objectively measured physical fitness and other health indicators.

Keywords: physical fitness, social class, health, physical activity

TIIVISTELMÄ

Sosioekonomisen aseman ja itsearvioidun fyysisen kunnon väliset yhteydet suomalaisessa väestössä
Kaisa Pulkkinen
Jyväskylän yliopisto
Liikunta- ja terveystieteiden tiedekunta
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Useat terveysmittarit osoittavat, että korkeassa sosioekonomisessa asemassa olevat elävät pidempään ja terveempinä. Terveyskäyttäytyminen, kuten fyysinen aktiivisuus, on tärkeä terveyseroja selittävä tekijä. Käytettäessä fyysistä kuntoa sairastuvuuden ja kuolleisuuden mittarina painotetaan fyysisen aktiivisuuden terveyttä edistävää ominaisuutta sekä otetaan huomioon muita terveyteen vaikuttavia tekijöitä, kuten lihavuus, tupakointi, krooniset sairaudet ja geneettiset ominaisuudet. Väestötutkimuksissa fyysistä kuntoa on kuitenkin käytetty mittarina vain harvoin. Fyysisen kunnon sosioekonomisia eroja on tutkittu tuskin lainkaan.

Tämän tutkielman tarkoitus on tutkia itsearvioidun fyysisen kunnon sosioekonomisia eroja suomalaisessa väestössä. Aineisto saatiin Terveyden ja hyvinvoinnin laitokselta, joka keräsi sen keväällä 2007 väestön FINRISKI-poikkileikkaustutkimusta varten. Tutkimukseen osallistujat olivat 25–74-vuotiaita. Otoskoko oli 10 000, joista 6258 täytti sekä kyselylomakkeen että osallistui terveystarkastukseen. Lopullisiin analyyseihin sisältyi 5830 tutkittavaa, joista 2722 oli miehiä ja 3108 naisia. Tilastomenetelmänä käytettiin ordinaalista logistista regressioanalyysiä.

Pitkä koulutusura oli yhteydessä parempaan itsearvioituun fyysiseen kuntoon, mutta eroja välittivät pääosin terveyskäyttäytymiseen liittyvät tekijät. Välittävät tekijät olivat erilaiset miehillä ja naisilla. Miehillä koulutukseen liittyvät kuntoerot välittyivät täysin vapaa-ajan liikunnan ja osin painoindeksin kautta. Painoindeksin, kroonisten sairauksien ja tupakoinnin yhdistelmä välitti koulutuskolmannesten väliset kuntoerot täysin miehillä ja osin naisilla. Täysi malli, jossa vakioitiin ikä, työllisyystilanne, työmatkaliikunta, vapaa-ajan liikunta, työhön sisältyvä liikunta, painoindeksi, krooniset sairaudet ja tupakointi, välitti kaikki itsearvioidun kunnon koulutuserot molemmilla sukupuolilla.

Terveyspolitiikassa erityistä huomiota tulisi kiinnittää heihin, joilla vapaa-ajan liikunta on vähäistä. Itsearvioidun fyysisen kunnon liittäminen epidemiologisiin tutkimuksiin tuottaisi todennäköisesti tarkempaa tietoa erityisesti osallistujien fyysisestä terveydentilasta. Tämä tutkielma tuotti alustavaa tietoa päättäjille ja tulevia tutkimuksia varten. Tarvitaan kuitenkin vielä lisää tutkimusta itsearvioidusta kunnosta ja sen suhteesta mitattuun kuntoon ja muihin terveysmittareihin.

Asiasanat: fyysinen kunto, sosioekonominen asema, terveys, fyysinen aktiivisuus

CONTENTS

1 INTRODUCTION

The well-being of the society can not be measured simply by economic growth (Fair Society 2010, 18) or gross domestic product (Fair Society 2010, 43). "The Black Report" (Townsend & Davidson 1982) contributed significantly in 1980's to the research of socioeconomic health differences. In addition to describing mortality inequalities in England and comparing them to other industrialised countries, it offered explanation models for the reasons leading to these differences. Since The Black Report, the knowledge of health inequalities and explanations has increased and the topic is still current (see: Health21 1999, 7–18, Government Resolution 2001, 18–20, Fair Society 2010, 44–84, Programme of Prime Minister 2011, 7–97).

Despite the economic growth both health (Mackenbach et al. 2008, Koskinen et al. 2009, Rahkonen et al. 2009, Valkonen et al. 2009) and income (OECD 2011, 225258) disparities have widened in Finland since 1980's. Socioeconomic differences in health are evident in commonly used health indicators (Dalstra et al. 2005, Mackenbach et al. 2008, Koskinen et al. 2009, Rahkonen et al. 2009, Valkonen et al. 2009, Klavus 2010). Those in higher socioeconomic position have longer and healthier lives compared to others (e.g. Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 10, Prättälä et al. 2009, Fair Society 2010, 37). The health differences can largely be explained by health behaviour and material and psychosocial living and working conditions (Lynch & Kaplan 2000, Lahelma et al. 2009, Fair Society 2010, 39).

Physical activity (PA) is a well known contributor to good health (U.S. Department of Health and Human Services 1996, 85–141, Kesäniemi et al. 2001, Nocon et al. 2008, Fogelholm 2010) and it can also be used as a treatment for several medical conditions (Durstine et al. 2009b, ACSM's Guidelines 2009, 207–271). PA is also the main way to improve physical fitness (PF) (Caspersen et al. 1985, U.S. Department of Health and Human Services 1996, 61, ACSM's Health-Related 2009, 2–3, Lee et al. 2010). Socioeconomic differences in PA are widely reported (Gidlow et al. 2006, Marshall et al. 2007, Marshall et al. 2007, Borodulin et al. 2008, Helakorpi et al. 2010, 25, Mäkinen et al. 2010, Seiluri et al. 2011). However, the potential associations between socioeconomic position (SEP) and physical fitness have remained largely unexplored.

Health-related PF is a combination of cardiovascular endurance, body composition, muscular strength, muscular endurance and flexibility (Caspersen et al. 1985, The President's Council

2011). In addition to PA, PF is influenced by energy balance, smoking (Lee et al. 2010) and individual training effects and characteristics including genetic variability (Bouchard & Rankinen 2001, Rankinen & Bouchard 2008, Church 2009, Mori et al. 2009). To have an overall picture of health-related PF, all components should be measured (ACSM's Health-Related 2009, 2–3). This is expensive and time consuming and thus rarely possible in epidemiological research. Since questionnaires are often used in epidemiological studies, the use of self-rated PF (SRPF) might be a useful option in population studies. Studies support that SRPF correlates with objectively measured PF rather well (Knapik et al. 1992, Mikkelsson et al. 2005, Germain & Hausenblas 2006, Aadahl et al. 2007a, Aadahl et al. 2007b, Husu & Suni 2011).

Self-rated health is a commonly used health indicator in epidemiological research to predict mortality (Rahkonen et al. 2009). For men SRPF is a more accurate predictor of mortality, while among women self-rated health predicts mortality more precisely (Miilunpalo et al. 1997). Interestingly, those with poor SRPF may report good health but those with good SRPF rarely report poor health (Phillips et al. 2010). In addition, it has been suggested that self-rated health and SRPF are associated with each other (Suni et al. 1998), but they would measure different dimensions of health (Miilunpalo et al. 1997). Since it is evident that good PF is strongly associated with health (Tikkanen et al. 1998, Lakka et al. 2001, Hernelahti et al. 2005, Karjalainen et al. 2006, Wolfe 2006, Sui et al. 2007, Church 2009, Mathieu et al. 2009, Fogelholm 2010, Lee et al. 2010) SRPF is likely to produce such additional information on health that should not be ignored. SRPF is expected to represent physical health level (Church 2009) better than self-rated health. The aim of this thesis is to study socioeconomic differences in SRPF in Finnish population.

2 SOCIOECONOMIC POSITION

Socioeconomic position (SEP) reflects individual's social and economic location in the structures of society. Social hierarchies are often described also with other terms such as social class and social or socioeconomic status (Lynch & Kaplan 2000). Karl Marx (1818–1883) and Max Weber (1864–1920) created the basics for the understanding of socioeconomic differences (Lynch & Kaplan 2000, Lahelma & Rahkonen 2011). According to Marx, the society is stratified into two social classes on the grounds of wealth and productional power (Lynch & Kaplan 2000, Galobardes et al. 2007, Lahelma & Rahkonen 2011). In Marxian tradition, social class is a result of capitalism and the social stratification is mainly defined at birth. Moreover, individual skills or characteristics have no influence on social class (Galobardes et al. 2007). In Weberian sociology, society was seen to form groups where people shared the same circumstances, values and beliefs in life. Those with fewer skills, abilities and goods had less economic opportunities and fewer possibilities in society. In addition to economic power, also social and political power was considered to define the social status (Lynch & Kaplan 2000, Galobardes et al. 2007). Both Marxian and Weberian traditions have contributed to modern research on health and socioeconomic circumstances. The aspects of wealth and working conditions can be seen largely of Marxian and the aspects of non-material resources and inequalities more of Weberian heritage (Galobardes et al. 2007, Lahelma & Rahkonen 2011). In this thesis, the social stratification is described with socioeconomic position (SEP), since it reflects both Marxian and Weberian traditions (Galobardes et al. 2007) and is widely used in health sciences (Lahelma & Rahkonen 2011).

2.1 Units of measurement

The most commonly used measures of SEP are education, occupational status and income (Galobardes et al. 2007, Lahelma & Rahkonen 2011), although a wide selection of other indicators are also in use (Lynch & Kaplan 2000, Galobardes et al. 2007, Fair Society 2010, 45). Education is a widely used indicator of SEP in health-related research (Lynch & Kaplan 2000, Galobardes et al. 2007, Lahelma & Rahkonen 2011). It reflects usually both material and immaterial resources, such as skills, knowledge, attitudes and values (Lynch & Kaplan 2000, Galobardes et al. 2007, Lahelma & Rahkonen 2011). Education can be measured either as the highest degree taken or as the total years of education (Galobardes et al. 2007, Lahelma & Rahkonen 2011).

However, the total years of education does not necessarily reflect education's social or economic values as well as the highest degree achieved (Lynch & Kaplan 2000).

Education is considered to be relatively stable through the life course as education levels are mainly reached in early adulthood at latest (Lahelma & Rahkonen 2011). It is also an important indicator of life course influences, since childhood circumstances often influence adult education levels (Galobardes et al. 2007). In addition, education is a strong determinant of occupational status, working conditions and income in later life (Lynch & Kaplan 2000, Galobardes et al. 2007, Weyers et al. 2010). However, the general development of society and rise of education level may cause interpretation problems in analysis when different age groups are compared (Lahelma & Rahkonen 2011).

Occupation is strongly attached to the structures of society (Lahelma & Rahkonen 2011) and a major link between education and income (Lynch & Kaplan 2000), since education is required for most occupations and occupation defines income level. Occupations have also diverse social appreciations (Galobardes et al. 2007). Compared to other measurements of SEP, occupation may give additional health-related information since both physical (Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 20, Lahelma et al. 2009, Fair Society 2010, 68) and psychosocial working conditions (Karasek 1979, Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 18–19, Lahelma et al. 2009) influence health. Compared to the unemployed, those with an occupation may also have additional health enhancing benefits such as occupational health care, company housing and discount benefits for example to health clubs (Galobardes et al. 2007).

Income is considered to measure especially well material resources (Lynch & Kaplan 2000, Galobardes et al. 2007, Lahelma & Rahkonen 2011), which allow easier access to health-enhancing and health-promoting facilities. High income and wealth are usually also socially appreciated in the society (Galobardes et al. 2007). A one-point measurement of income doesn't necessary represent well the long-time effects for SEP, since the level of income may change during the life course due to various reasons (Lynch & Kaplan 2000, Galobardes et al. 2007). To diminish the flaw, multiple point measures of income are recommended (Lynch & Kaplan 2000). However, even then material wealth can be only partly measured (Lynch & Kaplan 2000, Galobardes et al. 2007, Lahelma & Rahkonen 2011) if other forms of wealth (e.g. real estate, savings, investments) are not taken into account (Lynch & Kaplan 2000, Galobardes et al. 2007, Laaksonen 2011). Overall, gaining reliable information of income and wealth is often problem-

atic (Galobardes et al. 2007, Lahelma & Rahkonen 2011), because people tend to report more reluctantly income or wealth than, for example, education or occupation (Galobardes et al. 2007). Registers, if available, may be used. However, registered and reported incomes are mainly gross income, although disposable income would represent more precisely the actual advantages income provides. Moreover, household income per consumption unit might be a more accurate measure than individual records alone. Still, even within the household, the income-related welfares may not distribute evenly (Galobardes et al. 2007).

As different markers of SEP measure different parameters, measurement units should be chosen carefully. Although education, occupation and income are found to be associated with health status in a similar way (Lahelma et al. 2004, Galobardes et al. 2007, Adler & Stewart 2010, Lahelma & Rahkonen 2011) they are only moderately related to one another (Galobardes et al. 2007, Adler & Stewart 2010). For example, income may not be equally distributed within the same education level especially if it concerns genders, race and/or age groups (Lynch & Kaplan 2000, Braveman et al. 2005). With occupation the multiplicity of job descriptions and professions may present problems while categorising them for SEP (Braveman et al. 2005). In addition, previous experiences and circumstances in life may have cumulative effects on SEP and health (Lynch & Kaplan 2000, Graham 2004). One point measurements of SEP give usually information only from individuals' current situation but do not represent the history of health influencing factors (Lynch & Kaplan 2000). The possible unmeasured SEP factors should be taken into account when drawing conclusions on SEP and health associations (Lahelma et al. 2004, Braveman et al. 2005).

2.2 Health indicators and socioeconomic position

The association between SEP and health is evident. Those in higher SEP seem to have longer and healthier lives compared to the lower SEP groups (Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 10, Prättälä et al. 2009, Fair Society 2010, 37). The health differences between SEPs can be measured e.g. by mortality, morbidity and self-rated health (Fair Society 2010, 45).

Mortality

Mortality or mortality rate is defined as "An estimate of the portion of a population that dies during a specified period" (Porta 2008, 60). Mortality is higher in lower socioeconomic

groups (Mackenbach et al. 2008, Valkonen et al. 2009). In Finland, the socioeconomic differences in mortality were only marginal in 1970's. Since then, although the general life expectancy increased in all socioeconomic groups, mortality rate decreased faster in the higher SEP groups. That widened the occupational and educational differences in mortality (Valkonen et al. 2009). The relative inequalities of death rates in Finland are of European average when studied by education level. When studied according to occupation, mortality inequalities among men seem to be highest in Finland when compared to other Western European countries. In addition, the comparisons between Nordic countries pointed out that the age adjusted mortality inequalities among men were highest in Finland (Mackenbach et al. 2008).

Common causes of death are cancers, cardiovascular diseases, alcohol and smoking related diseases, injuries, accidents, violence (Mackenbach et al. 2008, Valkonen et al. 2009) and suicide (Valkonen et al. 2009). Cardiovascular diseases contribute most for the socioeconomic group differences in mortality (Mackenbach et al. 2008, Valkonen et al. 2009). In general breast cancer seems to be the only cause of death that is more common in higher educational groups than in lower (Mackenbach et al. 2008). Alcohol consumption seems to be the main factor delaying the increase in life expectancy in all socioeconomic groups (Valkonen et al. 2009).

Chronic Morbidity

Morbidity can be defined as "any departure, subjective or objective, from a state of physiological or psychological well-being" (Porta 2008, 158–159). Chronic morbidity refers to morbidity to chronic diseases.

Chronic morbidity is more prevalent in lower educational groups than in higher (Dalstra et al. 2005, Koskinen et al. 2009) with the exception of cancer and allergies, which are reported to be more prevalent in higher educational groups (Dalstra et al. 2005). Since 1970's, the prevalence of chronic diseases has decreased in all educational groups until the early 2000's (Koskinen et al. 2009). Among the working-aged, the differences between educational groups have slightly decreased and among the older people increased during 1978–2001. According to income, the prevalence of chronic diseases continued to decrease after 2004 in all other except in the lowest income group (Klavus 2010). The higher prevalence of myocardial infarction in lower educational groups has contributed the most for the group differences in chronic morbidity. However, it is possible that more developed diagnostic procedures and treatment

methods have contributed to the higher prevalence of cardiovascular diseases and the growth of survival rates (Koskinen et al. 2009).

Self-rated health

Self-rated health represents individual experience of health and it is known to predict accurately institutionalisation and mortality. Self-rated health is commonly used in epidemiological research (Rahkonen et al. 2009) and it is known to correlate positively with physical activity (Okano et al. 2003, Abu-Omar et al. 2004, Södergren et al. 2008). In 2009, 73% of Finnish people reported their health as good or fairly good. There were no statistically significant differences between genders in self-rated health. The quality of self-rated health had lowered among the 65 years or older (Klavus 2010).

Health is reported worse in lower educational (Mackenbach et al. 2008, Rahkonen et al. 2009) and income groups (Mackenbach et al. 2005, Klavus 2010). The differences in self-rated health between educational groups in Finland are of European average. However, when studied according to income, the socioeconomic group differences are exceeding the European average (Mackenbach et al. 2008). In Finland self-rated health has steadily improved since 1979 in all educational groups. Interestingly the improvement was especially fast during the Finnish depression in 1992–1994, but after 1994 it returned to only a slightly higher level than before the depression. After the depression, the gap between socioeconomic groups started to widen again among working aged men, but not among women (Rahkonen et al. 2009). Among the elderly, educational group differences in self-rated health have persist wide throughout the years and they seem to have widened further during the 2000's (Rahkonen et al. 2009).

2.3 Mediators of socioeconomic position and health

Childhood conditions and experiences may have an important role on future health (Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 14–15, Kestilä 2008, Lahelma et al. 2009, Fair Society 2010, 39–40, 60–62). However, the hazards of ill health seem to accumulate further later in life through e.g. living or working environment and health behaviour (Lynch & Kaplan 2000, Lahelma et al. 2009, Fair Society 2010, 39). Although sometimes poor health may have an influence on SEP, more commonly SEP has an adverse effect on health (Wilkinson & Marmot 2003, 10–11, Kestilä 2008, Lahelma et al. 2009, Fair Society 2010, 39).

2.3.1 Material factors

The material conditions of the population and different socioeconomic groups are strongly linked to culture, country and politics. In Western Europe and Nordic countries majority of people is able to have clean water, enough food and adequate housing conditions to meet basic needs. Although the key point may no longer be the basic needs for surviving, differences in income and relative poverty may still have an impact on health and quality of life (Lynch & Kaplan 2000, Fair Society 2010, 39). For example, those with low income level may have fewer possibilities to buy healthy food e.g. fresh vegetables, fruits or low-fat products. This may contribute to socioeconomic health differences. Differences in income may also influence the ability to purchase other goods and services (Lynch & Kaplan 2000, McNeill et al. 2006). For example, a variety of sporting equipment or easy access to different sporting facilities may increase the general interest of participating in sports (Laaksonen 2011).

Also physical working conditions may pose a threat to health (Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 20, Lahelma et al. 2009, Fair Society 2010, 68). Harmful working conditions may include various physical hazards, physically demanding or otherwise dangerous work, long or irregular working hours, shift work or very sedentary work (Fair Society 2010, 72). Poor working conditions seem to accumulate to those in lower SEP (Wolin & Bennett 2008, Fair Society 2010, 72).

2.3.2 Psychosocial factors

<u>Living and working environment</u>

Safe and less deprived neighbourhoods are known to be health enhancing (Lynch & Kaplan 2000, Lahelma et al. 2009, Diez Roux & Mair 2010). People in lower SEP groups tend to live in more unsatisfactory environments (Shishehbor et al. 2008, Fair Society 2010, 78). Multiple safety issues (e.g. crimes, traffic), access to facilities (parks, playgrounds, selection of shops and groceries) as well as actual physical threats (air pollution, noise) pose risks for health (Diez Roux & Mair 2010, Fair Society 2010, 78–81). Living neighbourhood is also a mediator of health-related social attributes and may have either increasing or decreasing effect on physical activity (PA) (Diez Roux & Mair 2010).

Having a job is more beneficial for health than unemployment (Wilkinson & Marmot 2003, 20, Lahelma et al. 2009, Fair Society 2010, 68). However, also psychosocial working conditions seem to have an influence on health (Lynch & Kaplan 2000, Lahelma et al. 2009). Mental strain and job dissatisfaction is expected at work especially if high psychological demand is coupled with low work control and low social support (Karasek 1979, Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 18–19). Poor psychosocial working conditions are more prevalent in lower SEP groups (Lynch & Kaplan 2000, Fair Society 2010, 72). While the improved technology level has decreased the variety on manual work (Theorell 2000, Graham 2004), the psychological demands have increased (Theorell 2000). In addition, as the profile of work has changed into more skill-related, the working opportunities for those of low or no education at all have considerably narrowed creating higher risks for unemployment (Graham 2004).

Social support and exclusion

Social support can be received either from individuals or society and it is a part of individual's emotional and practical resources (Wilkinson & Marmot 2003, 22). The feelings of valued, loved and cared for have a powerful health enhancing (Wilkinson & Marmot 2003, 22, Haukkala 2011) and stress protecting (Haukkala 2011) effect. Social support is known to have positive influence also on health behaviour, e.g. on PA levels (McNeill et al. 2006, Ueshima et al. 2010). Individual social support is often received from friends and family and it involves material, psychological and emotional help and support (Haukkala 2011). Communal level of trust and respect along with shared responsibilities is usually referred as social cohesion (Wilkinson & Marmot 2003, 22).

Social exclusion refers to situations, where the individuals do not have enough resources or other possibilities to fully participate in the society. There are several exposing factors for social exclusion such as absolute or relative poverty, racism, stigmatization or unemployment. Social exclusion is both socially and psychologically damaging and harmful for health (Wilkinson & Marmot 2003, 16).

Stress

Continuous stress may harm health (Wilkinson & Marmot 2003, 12) and it is considered to be an important mediator between SEP and health (Adler & Stewart 2010). Constant stress and physiological alertness is known to contribute negatively to e.g. cardiovascular (Theorell 2000, Wilkinson & Marmot 2003, 12) and immune systems (Wilkinson & Marmot 2003, 12, La-

helma et al. 2009). As a result stress may expose to a variety of diseases and symptoms such as infections, diabetes, high blood pressure, heart attack, stroke, depression and aggression (Wilkinson & Marmot 2003, 13).

Stress can be caused by several social or psychosocial factors such as insecurity, social isolation, low-control working conditions or poor home conditions (Wilkinson & Marmot 2003, 12, Fair Society 2010, 39) or disadvantaged neighbourhood (Adler & Stewart 2010) which all are more common in lower SEP groups (Karasek 1979, Wilkinson & Marmot 2003, 16, Adler & Stewart 2010, Diez Roux & Mair 2010, Fair Society 2010, 78–81). Like other health effects, also stress accumulates through the life course (Wilkinson & Marmot 2003, 12). It has been suggested, that apart from having less stress factors, those in higher SEP may also have more psychological resources to cope with stress (Adler & Stewart 2010).

2.3.3 Health behaviour

Health behaviour is an important health-influencing factor (Byun et al. 2010). The base of health behaviour is adopted already as a child from the family and surroundings (Lynch & Kaplan 2000, Kestilä 2008). The choices to perform optional health behaviour can be enhanced or restricted by knowledge, economic resources (Koivusilta 2011), neighbourhood facilities, social capital, social control and norms (McNeill et al. 2006, Koivusilta 2011). Harmful health behaviour may produce a way to temporarily ease stress and frustration in difficult life situations especially if individual lacks social or cognitive resources to develop other solution strategies (Koivusilta 2011). All in all, damaging health behaviour (e.g. smoking, alcohol use, inactivity) and other lifestyle factors may contribute considerably to health differences between different socioeconomic groups (Lahelma et al. 2009).

Smoking

Tobacco is the sixth largest factor for premature deaths and disabilities. Smoking plays a significant role in several cancers and it is the main reason for nearly 90 per cent of all lung cancers. In addition, smoking inflicts 45 per cent of coronary heart diseases in men and 40 per cent in women. Non-smokers, who are exposed to cigarette smoke, have also increased risk for smoking related diseases (David et al. 2010). In Finland 23 percent of working-aged men and 16 per cent of working-aged women are daily smokers (Helakorpi et al. 2011, 12). In

general, smoking among men has decreased since 1970–1980's, but the amount of smoking women has slightly increased (Vartiainen et al. 2010) or remained the same (Laaksonen et al. 2009).

Smoking is more common in lower educational groups in Finland (Mackenbach et al. 2008, Mackenbach et al. 2008, Laaksonen et al. 2009, Helakorpi et al. 2010, 22) as well as in most of the other European countries (Mackenbach et al. 2008). Interestingly, smoking is more common in higher educational groups in France, Italy and Spain among women and in Portugal among both men and women (Mackenbach et al. 2008). The educational differences in Finland have increased since 1978. Among men the gap has widened largely due to educational differences in smoking cessation. In the higher educational groups smoking cessation has increased faster than in lower educational groups. Among women those in lower educational groups have increased smoking (Laaksonen et al. 2009). Although the trends of smoking in Finland are only researched according to education level, similar socioeconomic differences in smoking can be found also in cross-sectional studies of occupational status or income (Laaksonen et al. 2009).

Alcohol use

Alcohol is the third largest factor for premature deaths and disabilities. Excess alcohol consumption may cause acute or chronic diseases such as alcohol dependence, intoxication or poisoning, various cancers, cardiovascular diseases and neuropsychiatric disorders. The risk of violence or unintentional injuries is also increased. In addition to diseases, heavy alcohol use may have also economic and social consequences if ability to work or self-control is affected (Schmidt et al. 2010). However, the total amount of alcohol intake doesn't necessary correlate with the incidence of alcohol related diseases. Instead the types of alcohol and consumption habits play a significant role. In general, binge drinking or heavy use of spirits is more harmful than consuming smaller amounts of alcohol or milder beverages. According to some studies alcohol related illnesses are more prevalent in lower socioeconomic groups due to alcohol consuming habits, regardless of the total alcohol consumption (Schmidt et al. 2010).

In Finland alcohol consumption has doubled since 1970's. On the whole men drink more than women. Traditionally the use of alcohol has been highest in higher educational groups. However, after the alcohol taxes were lowered in Finland in 2004 the alcohol consumption has increased considerably among the working-aged men in the lower educational groups and the

difference between educational groups has disappeared (Helakorpi et al. 2009). Among the working-aged women the differences between educational groups still prevail. The total alcohol consumption is greatest among the high educated (Helakorpi et al. 2009, Helakorpi et al. 2010, 22), but the most health harming alcohol behaviour, such as binge drinking, is more common among the low educated (Helakorpi et al. 2009). Among the elderly similar educational differences in total alcohol consumption can be found, but the alcohol behaviour is less researched (Helakorpi et al. 2009).

Food behaviour

A healthy diet is a combination of balanced energy intake, adequate amount of vitamins, minerals and fibre, moderate salt intake and limited alcohol consumption (Nordic Nutrition 2004, 13–22). In addition, attention should be paid to quality of carbohydrates, reduction of total and saturated fat and increase of unsaturated fat intake (Suomalaiset ravitsemussuositukset 2005, 6–9).

Healthy diet correlates positively with educational level: the highest educational group has also the healthiest eating habits (Roos et al. 2009, Helakorpi et al. 2010, 23). The greatest differences between groups are seen in vegetable consumption. There are only minor differences in preferable eating patterns and in the total or saturated fat intake (Roos et al. 2009). The educational differences of obesity indicate that also positive energy balance is more common among the low educated (Reunanen et al. 2009). The differences between educational groups have persisted while the overall dietary habits have improved throughout all educational groups. Similar results can be found also between different income and occupational groups (Roos et al. 2009). During 1990–2000 educational differences were seen in also among the older adults. In recent years the differences of dietary habits between educational groups among the elderly have started to disappear (Roos et al. 2009).

Physical activity

Regular physical activity (PA) is proved to reduce mortality and morbidity to several chronic diseases such as cardiovascular diseases (Kesäniemi et al. 2001, Nocon et al. 2008), diabetes (U.S. Department of Health and Human Services 1996, 85–141, Kesäniemi et al. 2001, Fogelholm 2010), some cancers, osteoporosis, obesity (U.S. Department of Health and Human Services 1996, 85–141, Kesäniemi et al. 2001) and some mental health problems (U.S. Department of Health and Human Services 1996, 85–141, Kesäniemi et al. 2001, McArdle et al. 2010, 469). In addition, PA has positive influences on quality of life (U.S. Department of

Health and Human Services 1996, 141–142, Kesäniemi et al. 2001) and health's social dimension (Street et al. 2007, Cerin et al. 2009). Inactivity contributes to the increased prevalence of obesity (Pietiläinen et al. 2008, Waller et al. 2008, Leskinen et al. 2009), which is already a major public health problem (Berghöfer et al. 2008, Vartiainen et al. 2010).

Compared to other European countries, regular sports and exercise is in Finland above the European average. If included those who report attending to sports or exercise somewhat regularly, Finland is sharing the top place in exercise activity with Sweden (Sport and physical activity 2010, 10). With regular recreational PA (excluding actual exercise and/or sports) Finland is placed around the European average. However, when taken into account somewhat regularity in PA, Finland seems to rise again among the most physically active European countries (Sport and physical activity 2010, 15). Among the working aged, 12 per cent of Finnish men and 11 per cent of Finnish women perform adequate levels of PA to gain health benefits (Helakorpi et al. 2010, 18, Husu et al. 2011, 30–40).

Leisure-time physical activity (LTPA) is more common in higher educational groups than in lower (Gidlow et al. 2006, Marshall et al. 2007, Borodulin et al. 2008, Helakorpi et al. 2010, 25), although also contradicting studies exist (Wolin & Bennett 2008). The socioeconomic difference is also seen between occupational groups (Mäkinen et al. 2010, Seiluri et al. 2011). There is some evidence as well, that LTPA would be somewhat less common in ethnic groups when compared to their white counterparts. Nevertheless, the educational differences can be seen also within ethnic groups (Marshall et al. 2007).

Over time, the total amount of LTPA has increased in Finland while commuting PA has decreased (Borodulin et al. 2007). Among women the educational differences in LTPA have remained small (Mäkinen et al. 2009, Helakorpi et al. 2010, 25) while among men the difference has increased (Helakorpi et al. 2010, 25). There seems to be no statistically significant differences between education groups in daily, non-exercise related, PA (e.g. gardening and house repair) (Borodulin et al. 2008). In occupational comparisons the socioeconomic differences in LTPA were reduced when adjusted for smoking and body mass index. Among men also the history of physical workload contributed for occupational differences in LTPA. Those in heavy physical work have less LTPA (Tammelin et al. 2002, Mäkinen et al. 2010).

3 PHYSICAL FITNESS

Physical fitness (PF) is "a set of health or skill related attributes that people have or can achieve" (Caspersen et al. 1985). A person with a good PF integrates the use of the attributes effectively to reach an optimal performance. As a result PF enables "to carry out daily tasks with vigour and alertness without undue fatigue and ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies" and "to achieve the optimal quality of life" (ACSM's Health-Related 2009, 2).

PF has been traditionally divided into skill or health-related sub-categories (Caspersen et al. 1985) although some other sub-categories have also been suggested (The President's Council 2011). Skill related PF components are agility, coordination, balance, power, reaction time and speed (The President's Council 2011) and health-related components are cardiovascular endurance, body composition, muscular strength, muscular endurance and flexibility (Caspersen et al. 1985, The President's Council 2011). Good PF is inversely associated with mortality (Sui et al. 2007, Church 2009, Lee et al. 2010), chronic morbidity (Tikkanen et al. 1998, Lakka et al. 2001, Hernelahti et al. 2005, Venojärvi et al. 2005, Karjalainen et al. 2006, Church 2009, Lee et al. 2010) and directly associated with cognitive function (Deary et al. 2006).

3.1 Health-related physical fitness

Health-related PF components are cardiovascular endurance, body composition, muscular strength, muscular endurance and flexibility (Caspersen et al. 1985, The President's Council 2011). The components of health-related PF are measurable and commonly seen as the result of the history of performed physical activity (PA) and physical exercise (ACSM's Health-Related 2009, 2–3). However, health-related PF is not only a result of PA but influenced also by energy balance, smoking (Lee et al. 2010) and individual training effects and characteristics including genetic variability (Bouchard & Rankinen 2001, Rankinen & Bouchard 2008, Church 2009, Mori et al. 2009, Mustelin et al. 2010). In general, health-related PF is considered to reflect well the physical health level, especially the health of cardiovascular system (Church 2009).

3.1.1 Cardiorespiratory fitness

The respiratory system provides oxygen for muscles. Oxygen is transferred to muscles by cardiovascular system. Normally ventilation increases in physical strain to meet the demands muscles make. Therefore physical performance is usually limited by cardiovascular or muscle cell metabolic mechanisms and not the capacity of lungs. The level where maximum cardiovascular or cellular metabolic aerobic performance is reached is called maximal oxygen uptake or maximal oxygen consumption (VO_{2max}) (McArdle et al. 2010, 457–469).

VO_{2max} is a commonly used measure of cardiorespiratory fitness (CRF). It can be improved by training until the individual genetic maximum is reached (U.S. Department of Health and Human Services 1996, 66, Feitosa et al. 2002, Bray et al. 2009, McArdle et al. 2010, 476–477). If the oxygen consumption is not the limiting factor for physical performance for example due to medical conditions, peak oxygen consumption (VO_{2peak}) is used (McArdle et al. 2010, 235).

CRF can be divided into modifiable and non-modifiable sub-categories (Lee et al. 2010). Modifiable factors such as smoking, obesity and medical condition can be altered, since adequate levels of PA, smoking cessation, optimal weight and treated and/or balanced medical conditions have a positive effect on CRF (Lee et al. 2010). Non-modifiable factors such as age, gender and genotype cannot be influenced. CRF is known to deteriorate with age and objectively measured CRF levels are usually higher among men than among women (Church 2009, Lee et al. 2010).

Good CRF is associated with lower all-cause mortality (Sui et al. 2007, Lee et al. 2010) and lower cardiovascular morbidity (Church 2009). Furthermore, CRF it is associated with better blood lipid and lipoprotein profile (Tikkanen et al. 1998, Lee et al. 2010), lower blood pressure (Lee et al. 2010), slow progression of atherosclerosis (Lakka et al. 2001), improved insulin sensitivity (Borodulin et al. 2006, Lee et al. 2010), better body composition, lower inflammation and improved autonomic nervous system (Lee et al. 2010). Those with good CRF have also less depression symptoms (Sui et al. 2009). However, it has been suggested that those with high CRF levels also have an overall healthier lifestyle (Church 2009). In everyday life, good CRF is perceived as an ability to perform dynamic physical exercise for prolonged periods of time (ACSM's Health-Related 2009, 3).

3.1.2 Muscular fitness

Muscular fitness is a combination of muscular strength and endurance (ACSM's Health-Related 2009, 3). There are three types of muscle tissues: skeletal, cardiac and smooth muscle tissue. Skeletal muscles are the only voluntary controlled muscles and therefore essential in PA and physical exercise to gain good PF (U.S. Department of Health and Human Services 1996, 65). Skeletal muscle fibre type defines the endurance and strength abilities of the muscle. Fibre types can be divided into four categories: type I (slow), type IIa (moderately fast), type IIx (fast) and type IIb (very fast). The slower the cell, the more endurance abilities it has while the faster cells produce strength more effectively (McArdle et al. 2010, 371–374). The ability to endurance type of PA is dependent on the amount and efficiency of aerobic energy production (= mitochondrial oxidative processes) in muscle cells (McArdle et al. 2010, 134–161). Hence, slow type I muscle cells have more mitochondrial resources than other muscle cell types (McArdle et al. 2010, 373–375). Better CRF is associated with those with prevailing type I muscle cells (Tikkanen et al. 1998).

Prevailing skeletal muscle type has a genetic origin, although specific training enables modification in some extent (Bray et al. 2009, McArdle et al. 2010, 374–375). Good muscular fitness is associated to relatively easy completion of activities, which require high amount of force or to perform continuous muscle work for a long time (ACSM's Health-Related 2009, 3). Muscle strength is known to be reduced with age even with healthy and physically active adults (McArdle et al. 2010, 843–845). Maintaining adequate muscular fitness is essential for preserving adequate functional ability among the elderly (Malmberg et al. 2005).

The genetic profile of muscle cell types has an influence also on fitness-related health characteristics (Tikkanen et al. 1998, Hernelahti et al. 2005, Venojärvi et al. 2005, Karjalainen et al. 2006, Church 2009). Slow type I muscle cells seem to predict lower blood pressure (Hernelahti et al. 2005, Karjalainen et al. 2006), more favourable body composition (Karjalainen et al. 2006), less weight gain in adulthood (Karjalainen et al. 2006) and better blood lipid profile (Tikkanen et al. 1998). Those with prevailing muscle cell type I, are prone to be more physically active than those with type II muscle cells (Karjalainen et al. 2006). Since endurance type of PA requires relatively efficient and adequate mitochondrial capacity, developing CRF for those with prevailing type II muscle cell may be challenging (Church 2009). However, those with type II muscle cells may benefit more efficiently from muscle strengthening

type of PA. Resistance and strength training is known to have positive effects on glucose metabolism, which is in key role in development of type II diabetes (Venojärvi et al. 2005, Wolfe 2006). Good muscular fitness is also associated with positive effects on sarcopenia and osteoporosis (Wolfe 2006).

3.1.3 Body composition and flexibility

Body composition refers to the amounts of fat, bone and muscle in a body (ACSM's Health-Related 2009, 3). The excess amount of especially abdominal fat correlates positively with chronic diseases such as obesity, type II diabetes, hyperlipidaemia, hypertension and other cardiovascular diseases (Mathieu et al. 2009, Fogelholm 2010). Fat tissue tends to increase with age (McArdle et al. 2010, 852–853), but PA is known to have favourable effect on both fat amount and distribution (Pietiläinen et al. 2008, Waller et al. 2008, Leskinen et al 2009)

Bone mineral content and density are associated with the risk of the development of osteoporosis (Wolfe 2006). The loss of bone minerals is common with ageing. However, excessive bone mineral loss may pose a major problem especially among postmenopausal women due to hormonal changes (McArdle et al. 2010, 852–853). PA is an affective way to prevent bone loss and improve the bone mineral density also among the elderly (Howe et al. 2011).

Adequate muscle mass has positive associations with blood pressure (Hernelahti et al. 2005, Karjalainen et al. 2006), body composition (Karjalainen et al. 2006), glucose metabolism (Venojärvi et al. 2005, Wolfe 2006), blood lipid profile (Tikkanen et al. 1998) and osteoporosis (Wolfe 2006). Muscle mass has also a significant role in the recovery and survival on diseases and illnesses, weight control and quality of life (Wolfe 2006). Muscle mass is known to deteriorate with age, but the loss may be postponed with resistance type of PA (McArdle et al. 2010, 843–845).

Flexibility is an ability to use joints in their full range (ACSM's Health-Related 2009, 3). Adequate flexibility plays an important role in functional ability and in many daily activities (Vanhees et al. 2005).

3.1.4 Associations with physical activity

PA is defined as "any bodily movement produced by skeletal muscles, that results in energy expenditure". Physical exercise however, is "physical activity, that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is an objective" (Caspersen et al. 1985). Both PA and physical exercise improve health-related PF (ACSM's Health-Related 2009, 2–3) if they are performed regularly in adequate amounts and proper intensities (U.S. Department of Health and Human Services 1996, 71–73, Physical Activity Guidelines 2008 1–9). PA recommendations guide to safe and effective health and fitness promoting PA (e.g. Haskell et al. 2007, Physical Activity Guidelines 2008, 15–34, ACSM's Guidelines 2009, 152–195, O'Donovan et al. 2010, UKK Institute 2010, Husu et al. 2011, 16–17, Tremblay et al. 2011).

Among healthy adults aged 18 to 65 years, minimum of 150 minutes moderate intensity aerobic PA per week is recommended, and it may be partly or completely replaced by more vigorous intensities of PA. (U.S. Department of Health and Human Services 1996, 28–29, Haskell et al. 2007, Physical Activity Guidelines 2008, 21–23, ACSM's Guidelines 2009, 163, O'Donovan et al. 2010, Tremblay et al. 2011). With vigorous intensities, less PA is recommended for gaining health benefits. The estimated amount varies from 60 (Haskell et al. 2007) to 75 minutes per week (Physical Activity Guidelines 2008, 21–23, ACSM's Guidelines 2009, 163, O'Donovan et al. 2010). For the best health effects, the weekly amount of PA should be divided for several days. The minimum exercise bouts should be no less than 10 minutes (U.S. Department of Health and Human Services 1996, 44, Haskell et al. 2007, Physical Activity Guidelines 2008, 22, ACSM's Guidelines 2009, 163, O'Donovan et al. 2010, Tremblay et al. 2011). The same recommendations of aerobic PA apply also for healthy older (> 65 years) adults (Physical Activity Guidelines 2008, 30–31, ACSM's Guidelines 2009, 193). However, especially among the elderly, the types of PA should be chosen carefully to avoid excessive orthopaedic stress (ACSM's Guidelines 2009, 193).

In addition to aerobic exercise, improving muscular fitness is recommended for adults of working age at least twice a week (U.S. Department of Health and Human Services 1996, 44, Haskell et al. 2007, Physical Activity Guidelines 2008, 23–24, ACSM's Guidelines 2009, 168, Tremblay et al. 2011). Resistance training should involve each major muscle groups such as chest, shoulders, upper and lower back, abdomen, hips and legs. The weights or resistance

should be adjusted for each muscle group for the level that eight to 12 repetitions per set can be completed. For each training session, two to four sets of training exercises should be included with resting period of two to three minutes between sets. Training sessions of the same muscle group should be separated by at least 48 hours of rest (ACSM's Guidelines 2009, 168–171). For older adults slightly lighter weights for 10–15 repetitions are recommended. In addition to specific resistance training, muscle strengthening can be performed also with other strengthening activities such as calisthenics, stair climbing or carrying grocery bags (ACSM's Guidelines 2009, 193).

Stretching is also included in PA recommendations. Recommendations of PA suggest also minimum of 10 minutes of stretching in 2–3 days a week. Stretch should be extended to the limits of discomfort but it should not feel painful. Static stretches should last from 15 to 60 seconds and alternatively proprioceptive neuromuscular facilitation stretches from 10 to 30 seconds after six second muscle contraction (ACSM's Guidelines 2009, 171–174). For healthy older people (> 65 years) the same recommendations apply (ACSM's Guidelines 2009, 193).

The amount, type and intensity of PA should be assessed more carefully for those with chronic diseases (ACSM's Guidelines 2009, 18–271, Aikuisten liikunta 2010). Pre-screening is often recommended to provide enough information to produce safe exercise prescriptions (ACSM's Guidelines 2009, 18–271). For those with reduced functional ability also neuromuscular training with balance, agility and proprioceptive exercises are recommended (ACSM's Guidelines 2009, 193–194).

Measuring PA objectively is challenging, since the most accurate measures are very expensive and time consuming. Even the best measuring devices have weaknesses in recognising the different forms of activity. Most of the devices seem to concentrate on endurance type of PA, (Vanhees et al. 2005) while also adequate muscle mass have considerable health benefits (Tikkanen et al. 1998, Hernelahti et al. 2005, Venojärvi et al. 2005, Karjalainen et al. 2006, Wolfe 2006). However, PF as a result of performed PA is not only easier to measure objectively (see: ACSM's Guidelines 2009, ACSM's Health-Related 2009) but it reflects also other health influencing factors such as smoking, obesity and medical conditions (Lee et al. 2010) as well as individual variability in training effects (Bouchard & Rankinen 2001, Church 2009, Mori et al. 2009) and in fitness-related health effects (Mori et al. 2009, Rankinen et al. 2010).

3.2 Self-rated physical fitness

As health-related PF consists of sub-categories, each of them should be measured to have an overall picture of PF (ACSM's Health-Related 2009, 2–6). In epidemiological health research, population level measurements for all health-related PF categories are rarely possible due to high cost and amount of time required for the measurements. Instead, self-administered questionnaires are more common. Although measuring the five-category PF from all participants is rare in epidemiological research, sub-group testing (e.g. Borodulin et al. 2004, Tammelin et al. 2004, Cleland et al. 2009) and comprehensive measures of selected PF categories have been performed (e.g. Dowda et al. 2003, Sanders & Duncan 2006). Self-rated PF (SRPF) might offer an economical way to measure PF-related health in epidemiological research.

SRPF correlates with objectively measured PF relatively well (Knapik et al. 1992, Mikkelsson et al. 2005, Germain & Hausenblas 2006, Aadahl et al. 2007a, Aadahl et al. 2007b, Husu & Suni 2011). However, the physically active are able to estimate their fitness levels better than the inactive (Knapik et al. 1992, Riley et al. 2005). The ability to estimate PF may also weaken with age (Germain & Hausenblas 2006). Despite of some difficulties, SRPF seems to be a relatively reliable variable at the group level (Mikkelsson et al. 2005). Especially the correspondence of self-rated and measured endurance abilities and muscle strength seems to be strong while the estimations and measurements of flexibility may not be as reliable (Knapik et al. 1992). However, the reliability varies somewhat depending on the measurements chosen (Mikkelsson et al. 2005).

PA level is the main factor influencing SRPF (Okano et al. 2003). Especially the association of vigorous PA and SRPF is apparent (Aadahl et al. 2007b). However, in a study of several lifetime factors and their association with health-related PF among men, LTPA and body mass index (BMI) were statistically significantly associated in SRPF. Several other factors e.g. occupational PA (OPA), walking time and psychosocial stress, were associated only with self-rated health but not with SRPF (Okano et al. 2003). Indeed, it has stated that SRPF and self-rated health would measure different dimensions of health. For men SRPF is a more accurate predictor of mortality, while among women self-rated health predicts mortality more precisely (Miilunpalo et al. 1997).

3.3 Socioeconomic position and physical fitness

Population level studies of SEP and SRPF was not found and also the associations of SEP and objectively measured PF are scarcely studied. Instead of PF, the studies are often focused on the association of SEP and PA (e.g. Gidlow et al. 2006, Borodulin et al. 2008, Mäkinen et al. 2010, Seiluri et al. 2011). However, some studies indicate that better PF is associated with higher educational level (Duetz et al. 2003, Cleland et al. 2009) or less deprived neighbourhood (Shishehbor et al. 2008)**.** Interestingly, young adults in heavy physical work seem to have better objectively measured PF than those with less occupational physical strain (Tammelin et al. 2002). This poses a contradiction, since heavy physical work is assumed to be more common in lower socioeconomic groups (Wolin & Bennett 2008, Fair Society 2010, 72).

Duetz et al. (2003) studied the association of SRPF and SEP among the adults aged 56 to 66 years in Switzerland (n=923). PF was assessed with the help of 12-item-questionnaire of muscle strength, endurance, agility and coordination. Education and income correlated positively with SRPF among women, while no associations were found among men. Younger age was associated with better SRPF as well as a male gender (Duetz et al. 2003).

Cleland et al. (2009) studied in a prospective cohort study the influence of childhood SEP and social mobility on adulthood CRF (n=645). CRF was defined by sub-sample ergometer tests. SEP was defined by parental education level and social mobility by the difference of parental and own education levels. Those with high maternal education level maintained their CRF levels better than those with low maternal education level. However, when SEP was defined by both parent's education levels, those in middle SEP were more likely to decrease their CRF levels in adulthood when compared to those in lower SEP. Those in high SEP or with upward social mobility were also more likely to increase PA and improve CRF levels (Cleland et al. 2009).

Shishehbor et al. (2008) have studied the association of objectively measured PF and neighbourhood socioeconomic status in healthy adults aged 25 to 42 years (n=2505). According to the study lower income and educational levels prevailed in economically more disadvantaged neighbourhoods. Also unemployment and ethnic minorities were more common in disadvantaged than other neighbourhoods. The odds ratio for impaired CRF in the most disadvantaged neighbourhoods was 5.2, when compared to those in the least disadvantaged neighbourhood.

After adjusting for health characteristics, the prevalence of impaired CRF was still double in lowest tertile compared to the highest. Interestingly, after adjusting for health and socioeconomic characteristics, the odds for impaired CRF remained still nearly two-fold among those in most disadvantaged neighbourhood when compared to those living in the least disadvantaged neighbourhood. This indicates that the neighbourhood is mediating such factors, which have a negative influence on CRF. The difference was greater among men than women and among those over 35 years compared to younger (Shishehbor et al. 2008).

Tammelin et al. (2002) studied the association of OPA and objectively measured PF among 31 to 32 year-old workers (n=4715). After controlling LTPA, height, weight and smoking habits, they found that men in heavy physical work had better CRF, muscle strength (handgrip) and trunk extensor muscle endurance than those in sedentary work. Among men there was also seen an inverse relationship with occupational physical strain and LTPA. Women in heavy physical work scored better results only in CRF, when fitness levels were compared to those in sedentary work. Among women the inverse relationship between occupational physical strain and LTPA was less evident than among men (Tammelin et al. 2002).

4 AIMS OF THE STUDY

The aim of this thesis is to study socioeconomic differences in SRPF in Finnish population. While the socioeconomic differences in PA have already been reported in detail (e.g.Gidlow et al. 2006, Borodulin et al. 2008, Mäkinen et al. 2010, Seiluri et al. 2011), the association of socioeconomic position and PF has largely remained unexplored. The importance of studying socioeconomic differences in PF is evident, since fitness is an independent risk factor for mortality and morbidity (Miilunpalo et al. 1997, Tikkanen et al. 1998, Lakka et al. 2001, Sui et al. 2007, Nocon et al. 2008, Church 2009, Lee et al. 2010).

4.1 Research problems

1. Is self-rated physical fitness level associated with gender or age?
2. Is socioeconomic position associated with self-rated physical fitness?
3. Does physical activity, body mass index, history of chronic diseases or smoking mediate the possible association of education and self-rated physical fitness?

4.2 Hypotheses

1. Men report better PF levels than women. The young report better PF levels than the elderly.

In both objectively measured (Church 2009, Lee et al. 2010) and self-rated (Duetz et al. 2003) PF men report better PF levels than women. Objectively measured cardiorespiratory (Church 2009, Lee et al. 2010) and muscular fitness as well as body composition (Tikkanen et al. 1998, Hernelahti et al. 2005, Venojärvi et al. 2005, Karjalainen et al. 2006, Wolfe 2006, McArdle et al. 2010, 843–853) are known to deteriorate with age. In addition, the risks for poor health or poor PF may have accumulated among older adults (Lynch & Kaplan 2000, Lahelma et al. 2009, Fair Society 2010, 39–40). Also SRPF is reported to have an inverse association with age, at least in the age group of 55–64 (Duetz et al. 2003).

2. Less educated report lower PF levels than those with more education.

There is some evidence that better PF may be associated with higher educational level (Duetz et al. 2003, Cleland et al. 2009) or less deprived neighbourhood (Shishehbor et al. 2008). However, young adults in heavy physical work are reported to have better PF than those with less occupational physical strain (Tammelin et al. 2002), although heavy physical work is more common in lower socioeconomic groups (Wolin & Bennett 2008, Fair Society 2010, 72). Even if objectively measured PF indicates that OPA has positive effect on PF, it is possible that it does not have influence on SRPF, at least among men (Okano et al. 2003).

3. LTPA and obesity (as indicated by body mass index) mediate the educational differences in SRPF. LTPA has a direct and obesity an inverse association with SRPF.

It is known that PA, smoking, obesity, medical conditions, age, gender and genetics have an influence on objectively measured PF (Lee et al. 2010). It is also reported that self-rated aerobic endurance and muscle strength correlate relatively well with measured abilities (Knapik et al. 1992). However, Okano et al (2003) have studied that only LTPA and obesity were associated with SRPF, which indicates that the significance of other types of PA (e.g. occupational or commuting) or other lifestyle factors may not be very high (Okano et al. 2003).

Both low LTPA levels (Gidlow et al. 2006, Marshall et al. 2007, Borodulin et al. 2008, Helakorpi et al. 2010, 25, Mäkinen et al. 2010, Seiluri et al. 2011) and high BMI (Reunanen et al. 2009) are more common in lower educational groups than in higher. Since PA is a major contributor to PF (Caspersen et al. 1985, U.S. Department of Health and Human Services 1996, 61, ACSM's Health-Related 2009, Lee et al. 2010) and an important element in weight management (U.S. Department of Health and Human Services 1996, 42, Kesäniemi et al. 2001, Pietiläinen et al. 2008, Waller et al. 2008, Leskinen 2009) educational differences in SRPF are likely to be largely explained by LTPA. However, it is likely that also BMI contributes to educational differences in SRPF.

5 DATA AND METHODS

5.1 Study population

The data were collected in spring 2007 for a cross-sectional population based National FINRISK Study and they were received for this thesis from The National Institute for Health and Welfare. The National FINRISK studies have been conducted in five year intervals since 1972 and their purpose is to collect information about the prevalence and risk factors of cardiovascular and other chronic diseases and to serve public health policy and disease prevention in Finland. The National FINRISK 2007 study was financed by the Finnish Ministry of Social Affairs and Health and The National Institute for Health and Welfare (formerly National Public Health Institute).

The sample was a stratified random sample from the population register with stratifications of sex, 10-year age groups and six geographical areas. The study population comprised men and women aged 25 to 74 years. Measurements included self-administered questionnaires and health examinations, which were collected by trained nurses. The total sample size was 10 000 of which 6258 (62.6%) persons filled out the questionnaire and participated in the health examination. Those who had not answered questions concerning chronic diseases were imputed to healthy. Otherwise participants, who had missing information on the questions (Appendix 1) or clinical data used in the analyses were excluded. The final data included 2722 men and 3108 women, total of 5830 persons aged 25 to 74 years.

5.2 Measures

The dependent variable was SRPF. PF was asked with a question of "How do you consider your current physical fitness?" Answer categories were very good, quite good, fair, quite bad and very bad. The categories bad and very bad were combined for the analyses (Table 1).

From the different indicators of SEP, education was chosen because of its unequivocal character and reliability. The independent variable was birth cohort adjusted for years of education, which took into account the changes in educational systems the years. The birth cohort adjust-

ed education thirds were low, medium and high (Table 1). The years of education were assessed by a question of "How many years have you attended school and studied full-time (basic levels included)?".

The confounding factors were age, employment status, different modes of PA, BMI, chronic disease status and smoking status. The information of age and gender was received from the population register**.** Age was used in analyses as a continuous variable. Mean age among women was 49.7 years (SD 13.9) and among men 51.2 years (SD 13.8).

The employment status was based on a question: "What kind of work do you do most of the year?". All of those who reported to work were combined into group of "employed". The second group was formed from the unemployed. The third group was formed from those, who were neither unemployed nor employed such as students, housewives and pensioners (Table 1).

Three types of PA were inquired. Commuting PA (CPA) was measured with a question of "How many minutes do you walk, ride on bicycle or otherwise exercise to get to work?" Additional instructions guided to take into account both travelling to and from work. The answer categories were: 1) I do not work or I use only a motorized vehicle, 2) less than 15 minutes daily, 3) 15–29 minutes daily, 4) 30–44 minutes daily, 4) 45–59 minutes daily, 5) over an hour daily. The answer categories were combined for the analyses into three groups: more than 30 minutes, less than 30 minutes or no CPA at all (Table 1).

The question of leisure time PA (LTPA) combined the type, intensity and amount of LTPA. The question was "How much do you exercise and stress yourself physically in your leisure time?". The additional instructions guided to choose the average PA level, if the activity varies much according to different seasons. The answer categories were: 1) In my leisure time I read, watch TV, and work in the household with tasks which do not make me move much and which do not physically tax me. 2) In my spare time I walk, cycle, or exercise otherwise at least 4 hours per week. This includes walking, fishing and hunting, light gardening etc. but excludes travel to work. 3) In my spare time I exercise to maintain my physical condition, e.g. running, jogging, skiing, gymnastics, swimming, playing ball games or I do heavy gardening or other the like for at least 3 hours per week. 4) In my spare time I regularly exercise several times a week competitive sports such as running, orienteering, skiing, swimming, playing ball games or other heavy sports. The categories 3 and 4 were combined for the analyses (Table 1).

Table 1. Descriptive characteristics of the participants (n=5830)

		Women (n=3108)		Men (n=2722)	
		% or mean	(n)	% or mean	(n)
Age group	25–34	18.1	(412)	15.1	(562)
%	35–44	19.9	(509)	18.7	(619)
	45–54	21.5	(564)	20.7	(668)
	55–64	20.9	(624)	22.9	(649)
	65–74	19.6	(613)	22.5	(610)
Self-rated physical fitness	Poor	11.9	(370)	12.2	(333)
%	Fair	40.1	(1245)	40.2	(1095)
	Good	42.5	(1320)	39.6	(1079)
	Very good	5.6	(173)	7.9	(215)
Education thirds [1]	High	16.88	(3.08)	16.29	(2.79)
mean years	Middle	12.68	(2.71)	11.40	(2.42)
	Low	9.97	(2.50)	9.01	(2.12)
Employment status	Employed	59.7	(1856)	62.3	(1696)
%	Other [2]	35.5	(1103)	32.7	(889)
	Unemployed	4.8	(149)	5.0	(137)
Commuting PA	≥ 30 min	16.7	(520)	10.5	(285)
%	< 30 min	27.1	(841)	25.3	(690)
	Inactive	56.2	(1747)	64.2	(1747)
Leisure time PA	High	25.5	(792)	28.3	(770)
%	Medium	54.9	(1706)	51.1	(1391)
	Low	19.6	(610)	20.6	(561)
Occupational PA	Heavy	16.6	(516)	28.6	(778)
%	Light	27.3	(850)	20.3	(553)
	Sedentary	56.0	(1742)	51.1	(1391)
BMI	< 25	44.4	(1381)	29.6	(806)
%	25–29.9	33.0	(1026)	48.7	(1326)
	≥ 30	22.6	(701)	21.7	(590)
Chronic Diseases [3]	No	58.1	(1806)	53.8	(1464)
%	Yes	41.9	(1302)	46.2	(1258)
Smoking	Never	63.5	(1973)	43.6	(1188)
%	Former	19.6	(609)	32.2	(876)
	Daily	16.9	(526)	24.2	(658)

[1)] education represented in mean years (standard deviation in parentheses)
[2)] student, housewife, pensioner
[3)] asthma, cancer, cardiovascular diseases, diabetes, chronic obstructive pulmonary disease, rheumatoid arthritis, degenerative arthritis of the back or other joint or back related chronic diseases

Occupational PA (OPA) was asked with a question: "How demanding is your work physically?" Additional instructions guided to choose the first alternative if the participant is not working at all. The answer categories were 1) My work is mainly done sitting down and I do not walk much during my working hours (e.g. clock smith, radio mechanic, industrial seamstress, office work at a desk). 2) I walk quite much in my work, but I do not have to lift or car-

ry heavy objects (e.g. a foreman and store assistant, light industrial worker, office work which requires walking). 3) I have to walk and lift much or to take the stairs or go uphill (e.g. a carpenter or cattle minder/dairy work, engineering shop or other heavier industrial work). 4) My work is heavy manual labour in which I have to lift or carry heavy objects, to dig, shovel or chop, etc. (e.g. forestry, heavy farm work, heavy construction or industrial work). The OPA categories three and four were combined for the analyses (Table 1).

The height and weight were measured in the health examination. For body mass index (BMI) the weight in kilograms was divided by squared height in meters. Average BMI was 26.7 kg/m^2 (SD 5.4, range 16.4–53.1 kg/m^2) among women and 27.4 kg/m^2 (SD 4.2 range 16.0–63.3 kg/m^2) among men.

The information of chronic diseases was collected by questions concerning asthma, cancer, cardiovascular diseases (myocardial infarction, stroke, cerebral haemorrhage, obstruction of a cerebral vessel, coronary bypass surgery, coronary angioplasty, hypertension, cardiac insufficiency, angina pectoris), diabetes, chronic obstructive pulmonary disease (COPD), rheumatoid arthritis, degenerative arthritis of the back or other joint or back related chronic diseases diagnosed by a doctor. The participants were divided into two categories: those who reported at least one chronic disease and others (Table 1).

Smoking was assessed by questions of how often and how much participant smoked and when was the last time he or she had smoked. The answers were categorised into three groups: non-smokers, former smokers and daily smokers (Table 1). If participants reported occasional smoking that had never been regular, they were categorized into non-smokers.

5.3 Statistical methods

The analysis of this thesis was performed by ordinal logistic regression. Logistic regression analysis predicts discrete outcomes from a set of variables. The type of independent variables is not strictly defined; they may be continuous, discrete, dichotomous or a mixture of all mentioned. In addition, there are no assumptions for the distribution, linearity or variances of the independents (Tabachnick & Fidell 2007, 437).

The type of logistic multiple regression analysis is to be chosen by the number and type of categories of the dependent variable. If the dependent variable is dichotomous, binary logistic regression is used and in the case of polychotomous dependent variable either multinomial or ordinal logistic regression analysis should be used (Tabachnick & Fidell 2007, 464–468). The main difference while choosing between multinomial and ordinal logistic regression analysis is the relationship of the categories and the assumptions of the dependent variable (Garson 2011a, Garson 2011b). If the categories are independent and not related to one another, multinomial logistic regression analysis is the best choice. If the categories are related to each other in an ordinal sense ordinal logistic analysis has more statistical power (Garson 2011a), but assumptions of e.g. parallel lines and homogeneity of error variance should be valid. Especially the test of parallel lines is critical to ordinal regression. If the parallel lines test give false invalid results due to a very large sample size, a smaller random sample of data may be tested (Garson 2011b).

The statistical strength of ordinal logistic regression analysis is that it takes account the ordinal nature of dependent categories when predicting probabilities. Instead of counting variables' probabilities for outcome of one category as in multinomial logistic regression, ordinal logistic regression calculates cumulative odds for each point of the ordered category line. The cumulative odds refer to the given category's probability or less divided by the probability to be more than the given category. The analysis starts from the lowest category and proceeds step-by-step up the categorical order. Analysis prediction estimates can be also presented as odds ratios if the distribution of the dependent variable categories allows the logit -link function to be used in analysis (Garson 2011b).

The analyses were performed with PASW/SPSS Statistics 18 for Windows (Armonk, NY, USA). Ordinal logistic regression analysis was used with the logit link function. Since PASW/SPSS does not print odds ratios they were calculated in Microsoft Word Excel 2003 for Windows (Redmond WA, USA) by raising the base of the natural logarithm (Neper's figure e) to the power of the estimate's negative value (Garson 2011b). The assumptions for the analysis were tested and fulfilled. The test of parallel lines assumption was tested by a random sample of 3% of the data (Garson 2011b). The descriptives were calculated. Crude odd ratios were calculated for each variable and logistic regression models were created. The results were reported separately for women and men.

6 RESULTS

Gender was not associated with SRPF, but the mediating factors for educational differences in SRPF had gender differences. Age had an inverse association with SRPF among both women and men in the unadjusted models (Appendix 2, Appendix table 1). Education had a direct association with SRPF in the age adjusted models (Table 2: Model 1). Adding employment status in the model didn't offer additional information of the socioeconomic differences (Table 2: Model 2). LTPA was found to mediate all the educational differences in SRPF among men but not among women (Table 2: Model 3b). BMI mediated the educational differences in SRPF between the middle and high educational thirds among men (Table 2: Model 4a), but could not mediate the educational differences among women. BMI, chronic diseases and smoking (Table 2: Model 4d) mediated all educational differences among men and the differences of the middle and high educational thirds among women. The full model mediated all the educational differences in SRPF in both genders (Table 2: Model 5).

6.1 Unadjusted analyses

Gender was the only variable not associated with SRPF (Appendix 2, Appendix table 1). However, the assumption of parallel lines was not fulfilled and thus the result could have been biased. Therefore the gender difference in SRPF was tested also with Kruskall-Wallis non-parametric ANOVA. The result confirmed that SRPF had no gender difference ($H_{(1)}$=0,146, p=0,703). Age was found to be inversely associated with SRPF in both genders. The elderly were more likely to report poor PF when compared to younger adults (Figure 1).

Education and employment status were associated with SRPF in both genders. Those in the high education third or employed reported better PF levels than those with lower education or not working. In education the odds of reporting poor PF were largest among the least educated women and men (OR=1.54 95%CI 1.31–1.81, OR=1.39 95%CI 1.17–1.65, respectively) when compared to those in the high educational third. Those in the middle educational third were also more likely to report poor PF than those in the high educational third (women OR=1.23 95%CI 1.04–1.44, men OR=1.26 95%CI 1.06–1.49) (Figure 1). The unemployed had larger odds of poor SRPF (women OR=2.09 95%CI 1.53–2.86, men OR=2.33 95%CI

1.69–3.23) than students, housewives and pensioners (women OR=1.66 95%CI 1.44–1.91, men OR=1.71 95%CI 1.47–1.99) when compared to those who were employed (Figure 1).

LTPA had a strong gradient association with SRPF (Figure 2). Those with low LTPA levels reported more often poor SRPF than those more physically active. The odds of reporting poor PF was more than 17 times (OR=17.82 95%CI 14.17–22.44) more likely for women with low LTPA than those with high LTPA levels. The strong association was seen also among men (OR=14.72, 95%CI 11.67–18.58). Even with medium LTPA levels, the odds of reporting poor SRPF was higher among women (OR=4.18 95%CI 3.50–4.99) and men (OR=5.02 95%CI 4.18–6.03), when compared to those with high LTPA levels. Also those with low level of OPA and CPA reported poorer PF levels than their physically most active counterparts (Figure 2).

BMI had a statistically significant gradient association with SRPF among both women and men. High BMI increased the odds for poor SRPF. For obese women the odds for poor SRPF was OR=6.0 (95%CI 4.99–7.20) and for overweight women OR=2.28 (95%CI 1.95–2.66) when compared to those with BMI equal or less than 25kg/m^2. Among men the association was similar but weaker. For obese men the odds ratio for poor SRPF was 4.31 (95%CI 3.51–5.30) and for overweight men OR=1.79 (95%CI 1.52–2.12) when compared to those in normal weight (Figure 2).

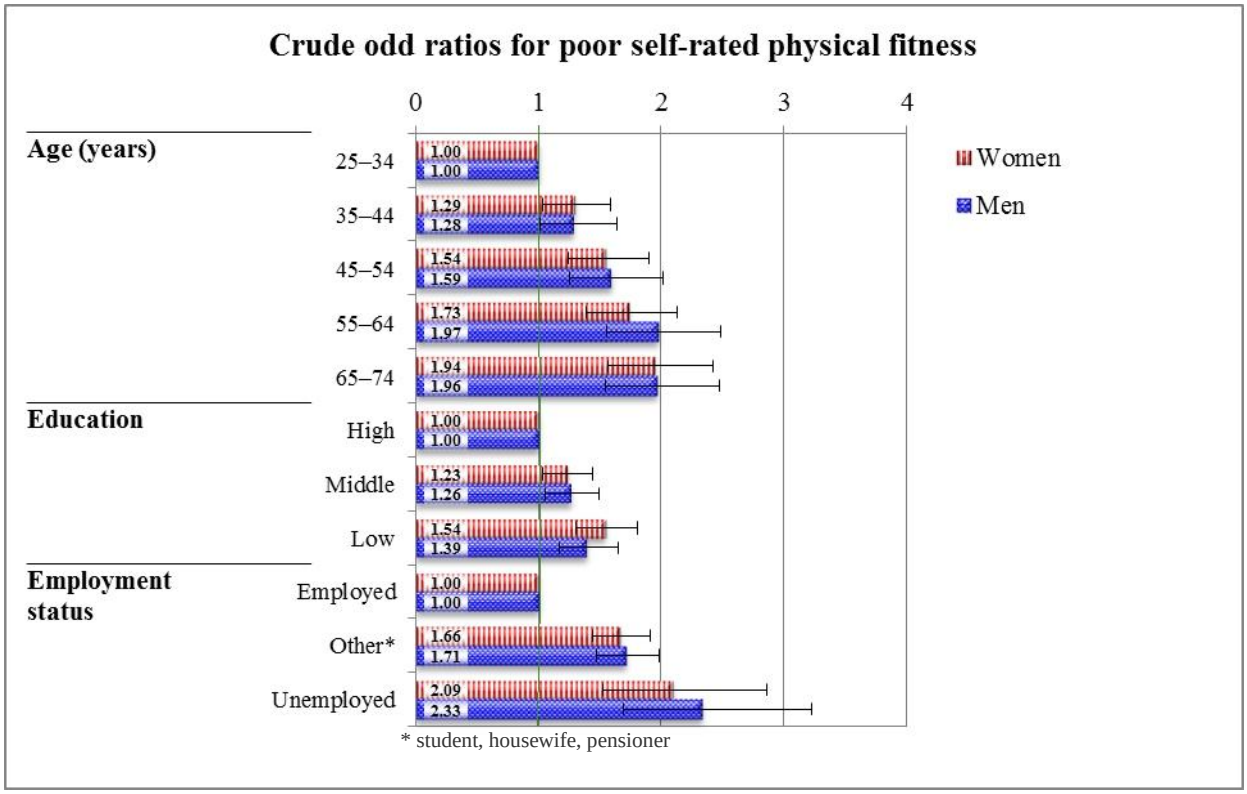

Figure 1. Crude odds ratios (OR) of age, education and employment status for poor self-rated physical fitness.

Those who had chronic diseases were more likely to report poor PF than the healthy (women OR=2.60 95%CI 2.27–2.99, men OR=2.61 95%CI 2.26–3.01) (Figure 2). Regular daily smoking was associated more often with poor SRPF when compared to non-smokers. The association was evident among both men (OR=1.87 95%CI 1.56–2.23) and women (OR=1.32 95%CI 1.10–

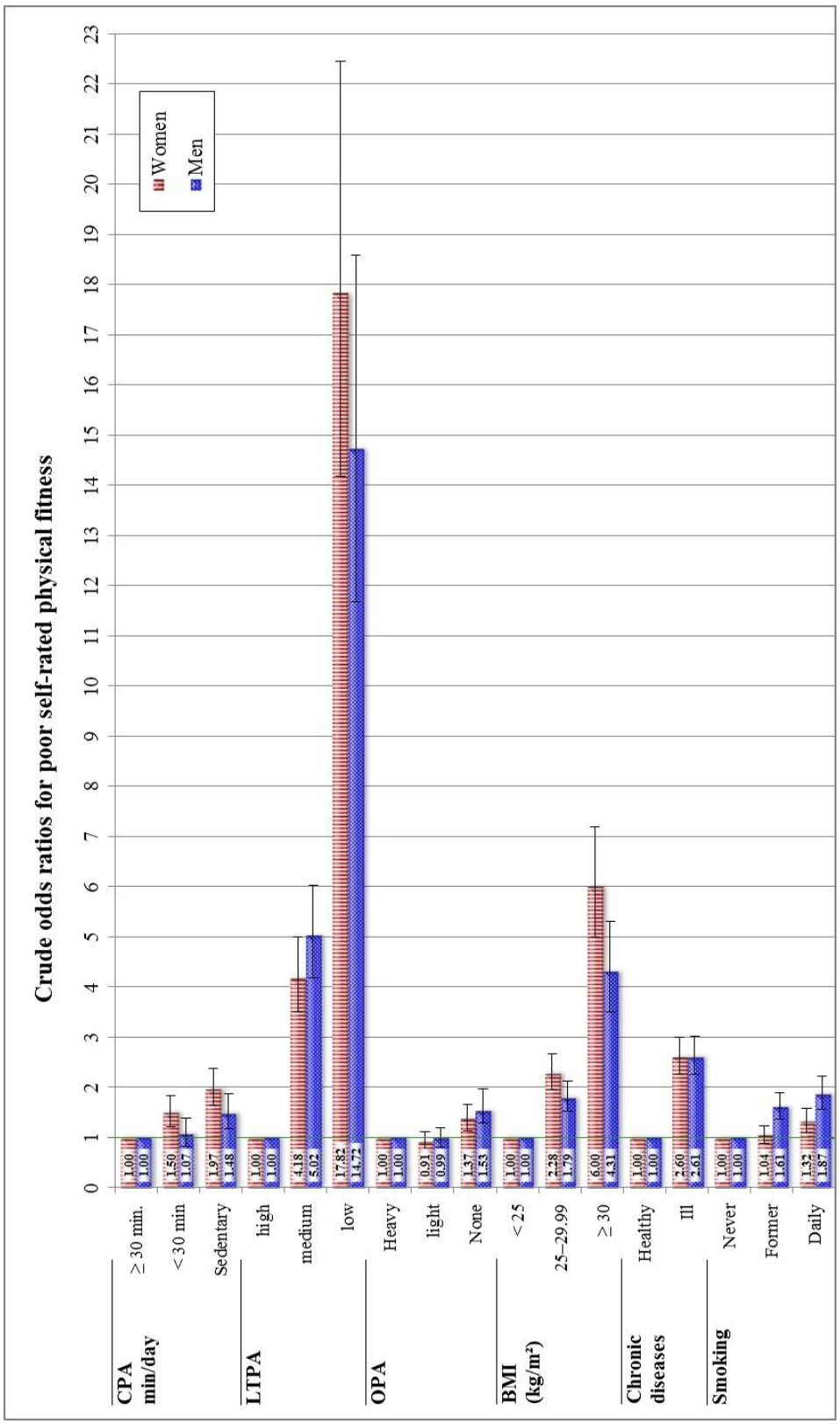

Figure 2. Crude odds ratios of commuting physical activity (CPA), leisure-time physical activity (LTPA), occupational physical activity (OPA), body mass index (BMI), chronic diseases and smoking for poor self-rated physical fitness.

1.58). Among men former regular smoking increased the odds for poor SRPF (OR=1.61 95%CI 1.37–1.90), but among women the association was statistically non-significant. The variables had several statistically significant interactions with each other. However, the interaction effects were in line with the main effects.

6.2 Adjusted analyses

In an age adjusted model, the educational differences remained evident in SRPF (Table 2: Model 1). Those in the low educational third were more likely to report poor PF than those in the high educational third. The age adjusted odds of poor SRPF were 1.42–1.57 times larger (women OR=1.57 95%CI 1.33–1.84, men OR=1.42 95%CI 1.19–1.69) in the low educational third and 1.23–1.26 times larger (women OR=1.23 95%CI 1.05–1.45, men OR=1.26 95%CI 1.07–1.48) in the middle educational third, when compared to the high educational third. After adding employment status to the model (Table 2: Model 2), the educational differences in SRPF remained nearly unchanged (women OR=1.23 95%CI 1.05–1.31, men OR=1.26 95%CI 1.06–1.48).

The contribution of different types of PA for educational differences in SRPF was tested in model 3 (Table 2). LTPA mediated the educational differences in SRPF among men (Table 2: Model 3b). However, among women the educational differences remained statistically significant (low: OR=1.37 95%CI 1.16–1.62, middle: OR=1.21 95%CI 1.02–1.43). While CPA had no contribution to the educational differences in SRPF (Table 2: Model 3a), OPA increased them slightly, especially among men (Table 2: Model 3c). With OPA adjustments the OR for poor SRPF increased from 1.42 (95%CI 1.19–1.69) to 1.57 (95%CI 1.31–1.89) among men and from 1.57 (95%CI 1.33–1.84) to 1.62 (95%CI 1.37–1.91) among women in the low educational third, when compared to the high educational third. However, the crossing confidence intervals indicated the alteration to be statistically non-significant (Table 2: Model 3c). The combined adjustments for all types of PA did not offer any additional information for the LTPA adjusted model (Table 2: Model 3d).

The contribution of non-PA-related health and lifestyle factors such as BMI, (history of) chronic diseases and smoking was tested in model 4 (Table 2). BMI mediated the educational differences in SRPF between the middle and high educational thirds among men. However,

the educational difference remained statistically significant between the low and high educational thirds among men and between all educational thirds among women (Table 2: Model 4a). Chronic diseases (Table 2: Model 4b) or regular smoking (Table 2: Model 4c) did not contribute statistically significantly to the age adjusted educational differences in SRPF although minor decreases were seen especially when adjusted for chronic diseases. However, the combined adjustments for BMI, chronic diseases and smoking mediated all educational differences among men and the educational difference of the high and middle educational thirds among women (Table 2: Model 4d).

In the full model the adjustments were made for age, employment, CPA, LTPA, OPA, BMI, chronic diseases and smoking. After the adjustments educational differences in SRPF were no longer evident in either gender (Table 2: Model 5).

Table 2. Age adjusted associations of education and poor self-rated physical fitness among men and women

	Education thirds					
	Women			**Men**		
	high	**middle**	**low**	**high**	**middle**	**low**
Models and adjustments	**OR**	**OR (95% CI)**	**OR (95% CI)**	**OR**	**OR (95% CI)**	**OR (95%CI)**
Model 1 (M1): Age	1.0	1.23 (1.05–1.45)	1.57 (1.33–1.84)	1.0	1.26 (1.07–1.48)	1.42 (1.19–1.69)
Model 2: M1 +Employment status	1.0	1.23 (1.05–1.31)	1.52 (1.29–1.79)	1.0	1.26 (1.06–1.48)	1.41 (1.48–1.68)
Model 3: M1 + Physical activity (PA)						
3a) Commuting PA (CPA)	1.0	1.21 (1.03–1.43)	1.56 (1.32–1.83)	1.0	1.23 (1.04–1.46)	1.38 (1.16–1.65)
3b) Leisure-time PA (LTPA)	1.0	1.21 (1.02–1.43)	1.37 (1.16–1.62)	1.0	1.01 (0.85–1.19)	0.99 (0.83–1.19)
3c) Occupational PA (OPA)	1.0	1.25 (1.07–1.47)	1.62 (1.37–1.91)	1.0	1.36 (1.15–1.61)	1.57 (1.31–1.89)
3d) CPA + LTPA + OPA	1.0	1.21 (1.02–1.43)	1.39 (1.17–1.65)	1.0	1.08 (0.90–1.28)	1.10 (0.90–1.33)
Model 4 : M1+ Health & lifestyle						
4a) BMI	1.0	1.18 (1.00–1.39)	1.36 (1.15–1.60)	1.0	1.13 (0.95–1.34)	1.29 (1.08–1.54)
4b) Chronic diseases [1]	1.0	1.18 (1.01–1.39)	1.48 (1.25–1.74)	1.0	1.21 (1.30–1.43)	1.34 (1.12–1.60)
4c) Smoking	1.0	1.22 (1.04–1.43)	1.50 (1.27–1.77)	1.0	1.20 (1.01–1.42)	1.28 (1.08–1.53)
4d) BMI + Chronic diseases + smoking	1.0	1.13 (0.96–1.33)	1.25 (1.05–1.48)	1.0	1.06 (0.90–1.26)	1.14 (0.95–1.36)
Model 5: Full Model (M1+M2+M3d+M4d)	1.0	1.13 (0.95–1.34)	1.17 (0.98–1.40)	1.0	0.95 (0.80–1.14)	0.95 (0.78–1.16)

[1)] asthma, cancer, cardiovascular diseases, diabetes, emphysema, rheumatoid arthritis or other joint or back related chronic diseases

7 DISCUSSION

The aim of this thesis was to study socioeconomic differences of SRPF in Finnish population. It was hypothesised that men report better PF levels than women (Duetz et al. 2003, Church 2009, Lee et al. 2010), the young report better PF levels than the elderly (Tikkanen et al. 1998, Duetz et al. 2003, Hernelahti et al. 2005, Venojärvi et al. 2005, Karjalainen et al. 2006, Wolfe 2006, Church 2009, Lee et al. 2010, McArdle et al. 2010, 843–853) and that the low educated report lower PF levels than the high educated (Duetz et al. 2003, Shishehbor et al. 2008, Cleland et al. 2009). Of the mediators it was hypothesised that LTPA has a direct and obesity an inverse association with SRPF (Okano et al. 2003).

SRPF had no statistically significant gender differences. This was the only result contradicting the hypotheses. Age was statistically significantly associated with SRPF. Younger adults reported better PF levels than the elderly. Education was directly associated with SRPF in both genders in an age adjusted model. The mediators for educational differences in SRPF differed for men and women. LTPA mediated fully and BMI partly the educational differences in SRPF among men. Among women no independent mediators were found. The combination of BMI, history of chronic diseases and smoking mediated all educational differences in SRPF among men. Among women the combination mediated the educational differences in SRPF between the middle and high educational thirds, but not between the high and low educational thirds. The combination of age, three types of PA, BMI, smoking status, history of chronic diseases status and employment status (the full model) mediated all educational differences in SRPF in both genders.

It is not known how individuals estimate their PF. It is likely that they compare their abilities with a reference group, which may be co-workers, friends, neighbourhood inhabitants or others of the same gender. However, SRPF may vary a great deal according to the reference group that has been chosen. In some cases, the own evaluation of PF may be largely made within a certain socioeconomic group. For example, Tammelin et al. (2002) found out, that the young adults' objectively measured PF is better if they do heavy physical work (Tammelin et al. 2002), although heavy physical work is more common in lower socioeconomic groups (Wolin & Bennett 2008, Fair Society 2010, 72). This finding is contradicting the results of this thesis, that those in lower SEP have poorer PF levels than those in higher SEP. In fact, when adjusted for OPA, the educational differences in SRPF increased slightly (but not

significantly) indicating, that more straining physical work may be harmful for the SRPF levels. However, when contemplating the reasons for the contradiction, it seems likely that if SRPF would have been measured from the young adults, their reference group might have consisted mainly of co-workers and friends, and those in more sedentary work or other socioeconomic groups could have remained less regarded. Hence, the SRPF estimations could have been based on a very narrow socioeconomic and occupational range with relatively high PF levels. If the average level of SRPF is very high in the refrence group, it may cause underestimations in individual SRPF, if compared to the objectively measured PF. In this case the high averages in PF might have been due to the "healthy worker selection", since it is likely that only the healthiest workers are selected in physically straining occupations and those with health problems and poorer PF end up in more sedentary jobs (Tammelin et al. 2002). However, Tammelin et al. (2002) studied only young adults. It seems also possible that the benefits younger adults gain in PF from physically straining work disappear with age as continuous physical strain at work is likely to be health consuming (Fair Society 2010, 68–72).

In addition to reference groups it is known, that in self-rated abilities different educational groups may report their health inconsistently. For example, in self-rated health lower educational groups report a good health status with higher measured physiological health risks than higher educational groups (Dowd & Zajacova 2010). The consistence of SRPF among SEP groups has not been researched. However, it seems likely that some inconsistence exists, as we already know that the accuracy of SRPF evaluations, when compared to objectively measured PF, are influenced at least by PA levels (Knapik et al. 1992, Riley et al. 2005) and age (Germain & Hausenblas 2006). One theory might be that the PF level is largely estimated by the ability to physically cope at work. In that case it is likely, that those in sedentary jobs report higher SRPF levels than those in more physically demanding jobs. This would partly explain the higher SRPF levels among the high educated. However, it is unlikely that SRPF would be based on physical work strain only.

No population based studies of SEP and SRPF were found. Therefore the results of this thesis are not fully comparable with previous studies. Instead they have to be measured against the results of studies with other research frames. Gender differences in SRPF levels were not found in this thesis although they have been reported in both self-rated (Duetz et al. 2003, Okano et al. 2003) and objectively measured (Church 2009, Lee et al. 2010) PF. Gender dif-

ferences in SRPF are likely to appear, if the reference group includes both sexes. However, if the reference group is mainly comprised of the same sex, gender differences are less likely. Conceptual variation may contribute to the gender and age differences in SRPF. It is possible that men consider PF more as physical performance and women more as general well-being. In different age groups the young adults may see PF more as a maximal performance of physical exercise while the older generation might understand it more as a functional ability and vigour in everyday life. Therefore the gender and age differences in SRPF and fitness-related health may be even wider than this thesis suggests. The estimations of own PF in relation to previous fitness levels may also lead to biased estimations. For example, those previously very active in sports, especially elite athletes, may rate such fitness levels poor which other may consider good or even excellent. On the other hand, those previously seriously ill and now cured or recovering may find their fitness good even if their objectively measured PF would be considered poor. However, these suppositions need more studying to ensure.

The socioeconomic differences in SRPF were evident in age adjusted models according to education. Adding employment status to the model did not produce any additional information. This suggests that employment status offers only minor, if any, additional explanations to education when concerning socioeconomic differences in SRPF. The strongest mediators for the educational differences in SRPF were LTPA and BMI.

LTPA was found to be a strong mediator for the educational differences in SRPF among men, but among women the mediating effect was weaker. It is known, that the high educated have higher LTPA levels than the low educated (e.g. Gidlow et al. 2006, Borodulin et al. 2008, Helakorpi et al. 2010, 25, Mäkinen et al. 2010) and that high PA levels are directly associated with good PF (Caspersen et al. 1985, ACSM's Health-Related 2009, 2–3, Lee et al. 2010). Therefore the mediating effect of LTPA for the educational differences in SRPF is not unexpected. However, the gender difference in mediating factors was not foreseen. The difference in mediating factors may arise either from the different factors influencing SRPF between women and men or from the gender difference within the actual health behaviour. Previously were discussed the conceptual differences of SRPF. If it is a fact that men consider PF more as physical performance and women as general well-being, it is also possible that men perform LTPA more PF oriented, while women's goal in LTPA is more often just having fun and enjoyment. This would explain some of the mediating differences between genders.

The socioeconomic inequality offers also other explanations for the mediating effect of LTPA. The circumstances for those in higher SEP enable overall better PA possibilities. The better material circumstances alone (Lynch & Kaplan 2000, Galobardes et al. 2007, Diez Roux & Mair 2010, Weyers et al. 2010) increase the possibility and variety to participate in LTPA among the high educated when compared to the low educated (Laaksonen 2011). In addition, the beneficial effect of high education on social appreciation and support is known to add participation in PA (Wilkinson & Marmot 2003, 16, McNeill et al. 2006, Ueshima et al. 2010).

BMI mediated men's educational differences between the high and middle education thirds. However, the educational differences remained between the low and high educational thirds among men and between all educational thirds among women. Low education is associated with high BMI (Reunanen et al. 2009), and BMI is known to be inversely associated with objectively measured PF (Lee et al. 2010). This offers explanations for the mediating effect of BMI. In addition, while with different types of PA it is possible to improve all health-related fitness dimensions (ACSM's Guidelines 2009, 152–271) BMI has a different influence on the different PF sub-categories. High BMI is known to be inversely associated with good VO_{2max} but directly associated with good muscular fitness such as grip strength, vertical jump and push-ups (Fogelholm et al. 2006). Besides, BMI is influenced by other health behaviour such as eating habits (Roos et al. 2009, Helakorpi et al. 2010, 23) and the amount of PA performed (Shaw 2009). As well as high BMI, also poor eating habits and a positive energy balance is more common among the low educated (Roos et al. 2009, Helakorpi et al. 2010, 23).

Apart from LTPA and BMI, no other single variables had statistically significant mediating effects for the educational differences in SRPF. For example, regular CPA could not explain them. It has been also previously studied that CPA has no socioeconomic differences (Mäkinen et al. 2009). However, in FINRISK 2007 questionnaire only the amount but not the intensity of CPA was measured. Therefore it is possible that all CPA reported was not contributing to PF. For example, sometimes CPA may be performed out of necessity if other types of commuting are not possible. This is likely at least if the household can't afford to buy and maintain a car and the public transportation facilities are inadequate in the neighbourhood. If CPA is performed out of necessity instead of own motivation, the fitness promoting intensities may even be avoided. Especially, if the working place lacks proper changing rooms and showering facilities. In this assumption the socioeconomic differences would not exist in

the amount of CPA, but in the intensity of CPA. However, this assumption needs to be studied.

The combination of BMI, chronic diseases and smoking mediated all educational differences in SRPF among men and the differences between the middle and high educational thirds among women. As previously discussed, BMI was the strongest single contributor from these three variables. However, educational differences exist also in chronic morbidity and smoking. The high educated are healthier (Dalstra et al. 2005, Koskinen et al. 2009) and more often non-smokers (Mackenbach et al. 2008, Laaksonen et al. 2009, Helakorpi et al. 2010, 22). Although chronic diseases and smoking could not alone mediate the educational differences, combined with BMI they were able to mediate the educational differences more strongly than BMI alone.

The reasons for educational differences in health behaviour remain to some extent unknown. It is known that the base of health behaviour is adopted already in childhood from the family and surroundings. Therefore parental example in childhood and youth is essential when concerning health behaviour and PA (Lynch & Kaplan 2000, Kestilä 2008). As LTPA is more common in higher educational groups (Gidlow et al. 2006, Marshall et al. 2007), the parental example is also likely to explain why children with higher maternal education levels are more likely to maintain or improve their PF levels in adulthood (Cleland et al. 2009).

The lack of social support is known to influence health behaviour. Social exclusion may have adverse effect on self-rated measures such as SRPF either by discouraging to social experiences or by inadequate material resources such as relative poverty or unemployment (Wilkinson & Marmot 2003, 16). In a polarized society social exclusion may stigmatize families in such a way that it endangers also children's future possibilities to fully participate into society. In addition to the lack of parental example, reduced social support and decreased social intercourse outside the family may expose children and youth to narrow and one-sided standpoints and thus diminish the life chances available. In addition, in more deprived neighbourhood health behaviour such as PA may be restricted by feelings of unsafe, inadequate facilities (Diez Roux & Mair 2010) or social control and norms (McNeill et al. 2006, Koivusilta 2011).

Harmful health behaviour may be influenced also by inadequate solution strategies, stress or strain (Koivusilta 2011). It is likely that longer and/or higher education helps individuals to develop better problem-solving abilities and improve cognitive resources to cope in different life situations. Longer educational career is likely also to strengthen individual's social status and enable wider social network for receiving social support. Therefore ensuring study possibilities for those in high risk for social exclusion is especially important. This has been noticed also in government programme (Programme of Prime Minister 2011, 54–58).

The full model with adjustments for age, employment status, CPA, LTPA, OPA, BMI, history of chronic diseases and smoking mediated all educational differences in SRPF in both genders. The variables included in analyses were based on factors, which are known to be associated with objectively measured PF (Lee et al. 2010). Genetic variability (Bouchard & Rankinen 2001, Rankinen & Bouchard 2008, Church 2009, Mori et al. 2009) could not be included into the analyses, but it seems highly unlikely that genes would be associated with socioeconomic differences in SRPF, since other explanations were evident. On the whole, the results indicate that educational differences in SRPF among women are more complex than among men. While among men single factors and several combinations were able to offer explanations for the educational differences, among women the explanations were more difficult to find. Even in the full model, the implications for educational gradient remained among women, although the confidence intervals indicated that the statistical significance of educational differences had disappeared. Social support is known to have at least indirect influence on SRPF since it is known to increase the participation in PA (McNeill et al. 2006, Ueshima et al. 2010). This thesis could not include social influences into analyses. However, it is possible that they would have given additional information and more explanations also for women's educational differences in SRPF. Thus more research is needed to understand the factors influencing and mediating the socioeconomic differences in SRPF.

Strengths and limitations

Strengths of this thesis are a representative population sample and education as the main indicator of SEP. The response rate of FINRISK 2007 study with health examinations was 62.6%. The participation rate was acceptable, but higher response rates might have given even more precise results especially as morbidity and mortality are known to be higher among those who do not participate in population studies (Jousilahti et al. 2005, Harald et al. 2007). With higher participation rate, the inequalities the results suggested may have been even more pronounced.

Education was chosen as the main indicator of SEP because of its diverse ability to reflect different SEP determinators (Lynch & Kaplan 2000, Galobardes et al. 2007, Lahelma & Rahkonen 2011). By choosing the highest educational degree taken instead of the total years of education, some additional information of social appreciation and economic value may have been achieved (Lynch & Kaplan 2000). However, the social appreciations of education may vary also within the education levels according to society values and individual preferences (Lynch & Kaplan 2000, Braveman et al. 2005).

Employment status offered no additional information for SEP differences in SRPF. More detailed occupational status, however, might have offered additional information especially of social appreciation and the effect of working conditions in fitness and health (Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 18–20). However, although the occupational physical strain is measured in the FINRISK 2007 questionnaire, work-related physical hazards, harmful working times (Fair Society 2010, 72) or work-related psychological demands and strain (Karasek 1979, Lynch & Kaplan 2000, Wilkinson & Marmot 2003, 18–19) remained unmeasured. Also the occupation-related social appreciation would have been very difficult to estimate.

Income was excluded from analyses due to classification problems and lack of data. However, it might have offered additional information from socioeconomic differences in SRPF, since the inequalities of wealth and income are a growing problem also in Finland (OECD 2011, 225–258) and material circumstances are likely to have influence on health behaviour (Lynch & Kaplan 2000, McNeill et al. 2006). In addition, at least self-rated health is known to have a strong direct association with wealth and inverse association with mortality (Hajat et al. 2011). The challenge of including wealth and income to the studies, however, would be to gain reliable and representive information.

Other obesity measures than BMI might have offered additional information for the educational differences in SRPF. Obesity can be estimated with BMI, waist circumference, waist-hip ratio or more direct fat mass measurements such as skin fold thickness or bioimpedance (McArdle et al. 2010, 725–758, 793–796). For example, waist circumference is known to have an inverse association with other objectively measured PF categories than grip strength while BMI has an inverse association only with VO_{2max} and direct associations with grip

strength, vertical jump and push-ups (Fogelholm et al. 2006). The obesity measures are also studied to have differences when predicting mortality. Waist circumference and waist-to-hip ratio are known to produce additional information when compared to BMI (Pischon et al. 2008). Although the differences predicting mortality or chronic morbidity are not strong enough for the favour of any specific obesity measure in epidemiological research (Taylor et al. 2010), their relation to SRPF should be studied more carefully.

The factors for SRPF analyses were chosen according to factors that are known to influence objectively measured PF (Lee et al. 2010). Although the results of this thesis indicated that the same factors have influence on SRPF, other influencing factors may also be found. Social influences such as social support or social exclusion may offer additional information for the socioeconomic differences in SRPF. Also self-esteem and self appreciation may have an effect on the self-rated abilities.

In this thesis SRPF was measured with one question only. Since PF has several sub-categories (Caspersen et al. 1985, ACSM's Health-Related 2009, 2–3, The President's Council 2011) it is likely that SRPF can be measured even more reliably with several specified questions. In addition to possibly ignoring some of the sub-categories, asking current PF with one question only may more easily reflect such temporary strains as relatively short illnesses, childbirth, depression, divorce or other stressful situations. With more detailed questions the character of PF might be better introduced to the respondent and the temporary strains influencing the answers better eliminated. Valid assessment procedures have been developed for measuring health-related PF objectively (Vanhees et al. 2005, ACSM's Health-Related 2009, 1–172). However, similar standards for SRPF are not found. A method of several questions concerning PF was used by Duetz et al (2003) in their study (Duetz et al. 2003). However, in addition to measure health-related PF, some of the question measured also skill-related PF. The combination of questions may have reflected more of functional ability than health-related PF. Hence, the association of SRPF and other health measures such as self-rated health and functional ability should be assessed.

Implementations and future directions

The Finnish government have high ambitions to reduce poverty, inequality and social exclusion in Finland. A pledge has been made to reduce income, wellbeing, health and areal inequalities (Programme of Prime Minister 2011, 7–97). The true reduction of inequality de-

mands changes in society structures, since even with the most effective procedures new disadvantaged individuals keep on appearing until the fundamental reasons for inequality has been erased (Laaksonen & Silventoinen 2011). The change in society structures needs a lot of knowledge and courage to execute. The government has goals also concerning PA. The actions include the improvement of the urban infrastructure to enable easy access to sports facilities and to increase the overall participation in PA. Special attention is paid to the PA development of children and youth (Programme of Prime Minister 2011, 60–62). This thesis provided preliminary information for decision makers and future studies. The information will help health and social policies to concentrate the limited resources more effectively.

The concept and character of SRPF needs more research to ensure the most accurate use in epidemiological research. The possible conceptual differences of SRPF among genders and age groups should be studied more, as well as the significance and selection of respondents' reference groups. In addition to the reference groups, also the consistence of SRPF ratings should be assessed. More detailed information is also needed from the association of SRPF and other health indicators such as objectively measured PF, self-rated health and functional ability. Most importantly, a proper validation of the question(s) concerning PF is needed to quarantee the accurate and reliable measures of SRPF.

Socioeconomic differences in SRPF with other indicators than education may offer important information (Lynch & Kaplan 2000, Galobardes et al. 2007, Fair Society 2010, 45). Especially the association of wealth and income with PF or SRPF would be an interesting study topic, since income disparities have lately been increasing also in Finland (OECD 2011, 225–258). Also the association of occupation and PF may give important information, since longer work careers are continuously expected and hoped for and a decline in work capacity is known to be associated with poor muscle or aerobic fitness (Kenny et al. 2008).

Including also other variables than those associated with objectively measured PF to the analyses, may offer additional information of the SRPF. For example, the effect of social influences and self-esteem on SRPF is unknown. In addition to social influences, also neighbourhood influences on SRPF, PF and PA in Finland are largely unknown. Neighbourhood-related analyses are needed to help the national policy to reach the goals of areal equality in PA and PF the best.

Conclusion

SRPF had no statistically significant gender differences. Age was inversely associated with SRPF. Education was directly associated with SRPF with both genders in an age adjusted model. Adding employment status to the model did not produce any additional information for the socioeconomic differences in SRPF. The mediators for educational differences in SRPF differed among men and women. LTPA and BMI were the strongest single mediators for the educational differences in SRPF among men. Among women no independent mediators were found. The combination of BMI, chronic diseases and smoking mediated fully the educational differences among men and partly the educational differences among women. The combination of age, three types of PA, BMI, smoking status, history of chronic diseases status and employment status (the full model) mediated all educational differences in SRPF in both genders.

This thesis provided preliminary information for decision makers and future studies. Special attention should be paid to those with low levels of LTPA. However, more specific information of SRPF is needed for proper allocation of PA facilities for different socioeconomic, age and areal groups.

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FINRISKI 2007: Questions analysed

Sukupuoli
1 Mies
2 Nainen

Kuinka monta vuotta olette yhteensä käynyt koulua ja opiskellut päätoimisesti? Kansakoulu tai peruskoulu lasketaan mukaan.
_____ vuotta

Minkälaista työtä teette suurimman osan vuodesta?
1 maanviljelys, karjanhoito, metsätyö, emäntä
2 tehdas-, kaivos-, rakennus- tai muu vastaava työ
3 toimistotyö, palvelutyö (hoitaja, myyjä tms. työ), henkinen työ (suunnittelu-, johto-, asiantuntija- yms. tehtävät)
4 opiskelu tai koulunkäynti
5 kotirouva, kotiäiti, perheenemäntä
6 eläkeläinen
7 työtön

Oletteko sairastanut lääkärin toteaman sydäninfarktin eli sydänveritulpan?
1 en
2 kyllä, minä vuonna viimeksi: vuonna _____

Oletteko sairastanut lääkärin toteaman aivohalvauksen, aivoverenvuodon tai aivoverisuonitukoksen?
1 en
2 kyllä, minä vuonna viimeksi: vuonna _____

Onko teille koskaan tehty sepelvaltimon (sydän) ohitusleikkausta?
1 en
2 kyllä, minä vuonna viimeksi: vuonna _____

Onko teille koskaan tehty sepelvaltimon (sydän) pallolaajennusta?
1 en
2 kyllä, minä vuonna viimeksi: vuonna _____

Onko teillä viimeksi kuluneen vuoden aikana ollut mitään seuraavia lääkärin toteamia tai hoitamia sairauksia?

	ei	kyllä
Kohonnut verenpaine, verenpainetauti	1	2
Sydämen toimintavajaus	1	2
Rintakipu rasituksessa	1	2
Diabetes	1	2
Syöpä	1	2
Keuhkoastma	1	2
Keuhkolaajentuma, krooninen keuhkoputkentulehdus	1	2
Nivelreuma	1	2
Muu nivelsairaus	1	2
Selän kulumavika, muu selkäsairaus	1	2

Miten rasittavaa työnne on ruumiillisesti? Olemme jakaneet työn rasittavuuden neljään ryhmään. Jos ette tee työtä, ympyröikää 1.
1 Työni on pääasiassa istumatyötä enkä kävele paljoakaan työaikanani (esim. kellosepän, radiomekaanikon ja teollisuusompelijan työ, toimistotyö kirjoituspöydän ääressä).
2 Kävelen työssäni melko paljon, mutta en joudu nostelemaan tai kantamaan raskaita esineitä (esim. työnjohtajan ja myymäläapulaisen työ, kevyt teollisuustyö, liikkumista vaativa toimistotyö).
3 Joudun työssäni kävelemään ja nostelemaan paljon tai nousemaan portaita tai ylämäkeä (esim. Kirvesmiehen tai karjanhoitajan työ, konepaja- yms. raskaampi teollisuustyö).
4 Työni on raskasta ruumiillista työtä, jossa joudun nostamaan tai kantamaan raskaita esineitä, kaivamaan, lapioimaan tai hakkaamaan, jne. (esim. metsätyöt, raskaat maataloustyöt, raskas rakennus- ja teollisuustyö)

Kuinka paljon liikutte ja rasitatte itseänne ruumiillisesti vapaa-aikana? Jos se vaihtelee paljon eri vuodenaikoina, merkitkää se vaihtoehto, joka parhaiten kuvaa keskimääräistä tilannetta.

1 Vapaa-aikanani luen, katselen televisiota ja suoritan askareita, joissa en paljonkaan liiku ja jotka eivät rasita minua ruumiillisesti.
2 Vapaa-aikanani kävelen, pyöräilen tai liikun muulla tavalla vähintään 4 tuntia viikossa. Tähän lasketaan kävely, kalastus, metsästys, kevyt puutarhatyö yms., mutta ei työmatkoja.
3 Harrastan vapaa-aikanani varsinaista kuntoliikuntaa, kuten juoksemista, lenkkeilyä, hiihtoa, kuntovoimistelua, uintia, pallopelejä ja teen rasittavia puutarhatöitä tai muuta vastaavaa keskimäärin vähintään 3 tuntia viikossa.
4 Harjoittelen vapaa-aikanani kilpailumielessä säännöllisesti useita kertoja viikossa juoksua, suunnistusta, hiihtoa, uintia, pallopelejä tai muita rasittavia urheilumuotoja.

Kuinka monta minuuttia kävelette pyöräilette tai kuljette muilla ruumiillista liikuntaa vaativilla tavoilla työmatkoillanne? (Huom! Tarkoitetaan yhteensä meno- ja tulomatkaan käytettyä aikaa)

1 En ole työssä tai kuljen työmatkan kokonaan moottoriajoneuvolla
2 alle 15 minuuttia päivässä
3 15-29 minuuttia päivässä
4 30-44 minuuttia päivässä
5 45-59 minuuttia päivässä
6 yli 1 tunnin päivässä

Millainen on mielestänne nykyinen ruumiillinen kuntonne?

1 erittäin hyvä
2 melko hyvä
3 tyydyttävä
4 melko huono
5 erittäin huono

Oletteko koskaan tupakoinut elämänne aikana?

1 en (siirtykää kysymykseen 101)
2 kyllä (jatkakaa kysymyksestä 88)

Oletteko tupakoinut elämänne aikana vähintään 100 kertaa (savukkeita, sikareita tai piippua)?

1 en (siirtykää kysymykseen 101)
2 kyllä

Oletteko koskaan tupakoinut säännöllisesti (lähes joka päivä ainakin yhden vuoden ajan)? Kuinka monta vuotta yhteensä?

1 en ole koskaan tupakoinut säännöllisesti
2 olen tupakoinut säännöllisesti
_____ vuotta
Tupakoitteko nykyisin (savukkeita, sikareita tai piippua)?
1 kyllä, päivittäin
2 kyllä, satunnaisesti
3 en lainkaan

Koska olette tupakoinut viimeksi? Jos tupakoitte jatkuvasti, merkitkää vaihtoehto 1.

1 eilen tai tänään
2 2 pv – 1 kk sitten
3 1 kk – puoli vuotta sitten (siirtykää kysymykseen 99)
4 puoli vuotta – vuosi sitten (siirtykää kysymykseen 99)
5 1 – 5 v. sitten (siirtykää kysymykseen 101)
6 6 – 10 v. sitten (siirtykää kysymykseen 101)
7 Yli 10 v. sitten (siirtykään kysymykseen 101)

Appendix 2

Appendix table 1. Crude odds ratios (OR) for poor self-rated physical fitness

Variables	Women				Men			
	n	Poor fitness n (%)	OR	95% CI	n	Poor fitness n (%)	OR	95% CI
Gender	3108	370 (11.9)	1.0 (ref)		2722	333 (12.2)	0.981*	0.891–1.080
Age group (years)								
25–34	562	49 (8.7)	1.0 (ref)		412	25 (6.1)	1.0 (ref)	
35–44	619	74 (12.0)	1.29	1.04–1.59	509	56 (11.0)	1.28	1.01–1.64
45–54	668	94 (14.1)	1.54	1.24–1.90	564	76 (13.5)	1.59	1.25–2.02
55–64	649	80 (12.3)	1.73	1.39–2.13	624	99 (15.9)	1.97	1.56–2.49
65–74	610	73 (12.0)	1.94	1.57–2.42	613	77 (12.6)	1.96	1.55–2.48
Education thirds								
High	1079	109 (10.1)	1.0 (ref)		973	108 (11.1)	1.0 (ref)	
Middle	1036	117 (11.3)	1.23	1.04–1.44	963	126 (13.1)	1.26	1.06–1.49
Low	993	144 (14.5)	1.54	1.31–1.81	786	99 (12.6)	1.39	1.17–1.65
Employment status								
Employed	1856	370 (11.9)	1.0 (ref)		1696	159 (9.4)	1.0(ref)	
Other [1]	1103	156 (14.1)	1.66	1.44–1.91	889	142 (16.0)	1.71	1.47–1.99
Unemployed	149	30 (20.1)	2.09	1.53–2.86	137	32 (23.4)	2.33	1.69–3.23
Commuting PA[2]								
≥ 30 min	520	30 (5.8)	1.0 (ref)		285	22 (7.7)	1.0 (ref)	
< 30 min	841	99 (11.8)	1.50	1.22–1.84	690	69 (10.0)	1.07	0.82–1.38
Inactive	1747	241 (13.8)	1.97	1.63–2.37	1747	242 (13.9)	1.48	1.18–1.88
Leisure time PA[2]								
High	792	9 (1.1)	1.0 (ref)		770	14 (1.8)	1.0 (ref)	
Medium	1706	158 (9.3)	4.18	3.50–4.99	1391	139 (10.0)	5.02	4.18–6.03
Low	610	203 (33.3)	17.82	14.17–22.44	561	180 (32.1)	14.72	11.67–18.58
Occupational PA[2]								
Heavy	516	52 (10.1)	1.0 (ref)		778	65 (8.4)	1.0 (ref)	
Light	850	78 (9.2)	0.91	0.74–1.12	553	47 (8.5)	0.99	0.80–1.20
Sedentary	1742	240 (13.8)	1.37	1.14–1.65	1391	221 (15.9)	1.53	1.29–1.80
BMI (kg/m^2)								
< 25	1381	77 (5.6)	1.0 (ref)		806	51 (6.3)	1.0 (ref)	
25–29.9	1026	110 (10.7)	2.28	1.95–2.66	1326	136 (10.3)	1.79	1.52–2.12
≥ 30	701	183 (26.1)	6.00	4.99–7.20	590	146 (24.7)	4.31	3.51–5.30
Chronic diseases [3]								
No	1806	138 (7.6)	1.0 (ref)		1464	97 (6.6)	1.0 (ref)	
Yes	1302	232 (17.8)	2.60	2.27–2.99	1258	236 (18.8)	2.61	2.26–3.01
Smoking								
Never	1973	213 (10.8)	1.0 (ref)		1188	101 (8.5)	1.0 (ref)	
Former	609	77 (12.6)	1.04	0.88–1.24	876	128 (14.6)	1.61	1.37–1.90
Daily	526	80 (15.2)	1.32	1.10–1.58	658	104 (15.8)	1.87	1.56–2.23

Self-rated physical fitness categories are poor, fair, good and very good

* test of parallel lines not valid, Kruskall-Wallis non-parametric ANOVA confirmed that there is no gender difference (H(1)=0,146, p=0,703)

[1)] student, housewife, pensioner

[2)] PA = physical activity

[3)] asthma, cancer, cardiovascular diseases, diabetes, chronic obstructive pulmonary disease, rheumatoid arthritis, degenerative arthritis of the back or other joint or back related chronic diseases