Associations between parental socioeconomic position, conscientiousness, and health among Finnish vocational upper secondary school students

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Tiivistelmä – Referat– Abstract

Denna avhandling belyser sambandet mellan socioekonomisk status, personlighetsdraget samvetsgrannhet och hälsa. Även om den positiva associationen mellan socioekonomisk status och hälsa har bekräftats, är mekanismerna bakom associationen fortfarande dels okända. Målet för denna avhandling är att empiriskt undersöka effekten av föräldrarnas socioekonomiska status på ungdomars och unga vuxnas hälsa, genom den medierande variabeln samvetsgrannhet hos ungdomar och unga vuxna.

För att studera sambanden mellan dessa variabler, utfördes korrelations- och regressionsanalys. Som data i denna avhandling utnyttjas data från Let's Move It -interventionen, vars mål var att öka fysisk aktivitet hos unga studeranden i yrkesskola.

Genom att utnyttja datan från Let"s Move It interventionen, skapades en variabel av föräldrarnas högsta socioekonomiska status som den högsta föräldrarnas utbildningsnivå av föräldrarna. För att mäta personlighetsdraget samvetsgrannhet skapades en summavariabel av två frågor från TIPI (ten-item personality inventory) mätinstrumentet för personlighetsdrag. Hälsa mättes med hjäld av självuppskattad hälsa (self-rated health). Korrelations- och regressionsanalys utfördes för att undersöka associationen mellan de tre variablerna.

Ingen statistiskt signifikant association hittades för hypotesen att föräldrarnas utbildningsnivå skulle förutsäga ungdomars och unga vuxnas samvetsgrannhet. I linje med tidigare forskning visades personlighetsdraget samvetsgrannhet förutse för hälsa hos ungdomar och unga vuxna. Till sist, och i motsats till tidigare studier, tydde analysen inte på att föräldrarnas utbildningsnivå skulle förutse självuppskattad hälsa (self-rated health) hos ungdomar och unga vuxna. Eftersom analysen inte hittade stöd för alla ovannämnda hypoteser, undersöktes inte effekten av föräldrarnas socioekonomiska status på ungdomars och unga vuxnas hälsa genom den medierande variabeln samvetsgrannhet hos ungdomar och unga vuxna.

Resultaten av denna avhandling och tidigare studier tyder på att, sambanden mellan samvetsgrannhet, hälsa och föräldrarnas socioekonomiska status kan vara mångfacetterade komplexa och kan även bestå av kedjor av medierande och modererande variabler. En orsak till att resultatet i denna avhandling är motstridiga jämfört med tidigare studier, kan vara att mekanismerna mellan variablerna innehåller okända medierande och modererande variabler. För att öka förståelsen för dessa komplexa associationer i framtiden, behövs både explorativ forskning och studier som prövar tidigare forskning.

Tiivistelmä – Referat– Abstract

This thesis sheds light on the associations between socioeconomic position, the personality trait of conscientiousness and health. While the positive association between socioeconomic position and health has been established, the mechanisms connecting the two remain to some part unclear. The goal of this thesis is to empirically assess the effects of parental socioeconomic position on adolescent and young adult health, through the mediator of adolescent and young adult conscientiousness.

To explore these associations, correlation and regression analysis were utilized. This thesis utilizes data from the Let's Move It intervention trial, a cluster-randomized parallel group trial intervention made to increase physical activity and reduce sedentary behavior of vocational upper secondary school students in the Helsinki metropolitan area.

Utilizing the data from the Let's Move It intervention trial, a measurement of parental socioeconomic position was formed as the highest parental educational attainment of either parent. To measure the personality trait of conscientiousness, a sum variable of two conscientiousness items from the ten-item personality inventory (TIPI) was constructed. General health was measured with self-rated health. Correlation and regression analysis between the three variables were conducted to investigate the associations.

This thesis didn't find statistically significant support for the hypothesis that parental educational attainment would predict adolescents' and young adults' conscientiousness. However, in line with previous research, the personality trait of conscientiousness was found to be a predictor of health for adolescents and young adults. Finally, and contrarily to the previous studies, the analysis found that parental educational attainment does not predict self-rated health in adolescents and young adults. As the analysis didn't find support for all of the aforementioned hypotheses, the effect of parental socioeconomic position on adolescent and young adult health through adolescent and young adult conscientiousness was not assessed with a mediation analysis.

The results of this thesis indicate that, as earlier studies have pointed out, the associations connecting conscientiousness, health and parental socioeconomic position are multifaceted, with many of them being bidirectional or having been indicated to form longer chains of variables acting as mediators and moderators. One reason for the results of this thesis being contrary to earlier studies might be unknown mediating and moderating effects. To increase the understanding of these complex relations in the future, both explorative research and studies that test earlier research are needed.

Contents

1. INTRODUCTION

Good health is declared a human right and should be available for everyone, despite where, to whom, or when one is born (World Health Organization, 1948). However, one fundamental quality of societies is that they develop and maintain systems of social stratification on many different levels (Galobardes et al., 2007). An unequal local and global distribution of resources leads to unequal social, economic, political, and cultural positions between groups and creates inequality that results in health disparities (ibid.).

The positive association between socioeconomic position (SEP) and health has been proven in a vast number of studies and on all levels of socioeconomic position, ranging from high to low (Adler et al., 1994; Adler & Ostrove, 1999). We know that a higher socioeconomic position also correlates with longer life (Lager & Torssander, 2012) and higher life satisfaction and well-being (Kahneman & Krueger, 2006). One group suffering especially from social stratification and unequal socioeconomic conditions are children and adolescents (Adamson et al., 2007). There have also been results indicating accumulating and cluster effects of socioeconomic disadvantage on health (Seabrook & Avison, 2012), with childhood and adolescent inequalities influencing health throughout the life span (Hertzman et al., 2001). Despite the declared association between SEP and health, and extensive interest in the relationship between the two, the mechanisms connecting the two are still to some part unclear (Adler & Ostrove, 1999) (Laaksonen et al., 2005). While targeting policies to improve health via changes in socioeconomic hierarchies is inefficient (Galobardes et al., 2007), understanding the connections through which a higher SEP influences health may provide a more effective and clear-cut way to improve health.

One variable that has been indicated to be linked to both SEP and health is the personality trait of conscientiousness (Shanahan et al., 2014; Sutin et al., 2017). Earlier studies on health inequality suggest that the associations between conscientiousness, SEP and health are of complex nature, consisting of mechanisms, pathways or even "chains" of mediators (Shanahan et al., 2014). Shedding light on the associations between conscientiousness,

socioeconomic position and health could help decrease and solve some health disparities associated with lower socioeconomic position.

In this thesis, I will empirically explore the effects of parental socioeconomic position on adolescent and young adult health, through the mediator of adolescent and young adult conscientiousness. As my data, I utilize the Let's Move It trial (LMI), an intervention made to increase physical activity and reduce sedentary behavior (i.e. excessive sitting) of vocational upper secondary school students in the Helsinki metropolitan area. I will only use the data from the start of the intervention and will not be evaluating the LMI intervention trial in this thesis.

The LMI intervention trial data was chosen as data for this thesis due to being the only accessible data including measures of parental socioeconomic position, adolescent conscientiousness and health gathered in the last ten years. In this thesis parental socioeconomic position is measured by parental highest achieved education, health via self-rated health of the adolescent and conscientiousness with the TIPI ten-item personality inventory (Gosling et al., 2003).

Next, I present the order in which my thesis will proceed. First, I discuss prior research regarding the key concepts of my study and their measurements. The prior research chapter includes health, parental socioeconomic position, and The Five-Factor personality model focusing on the trait of conscientiousness and the intersections of these three research areas. Second, I define the aim and research questions of my thesis. In the third part, I describe the methods, data, and analysis used in this thesis. Fourth, I present the results of my study. In the fifth part of my thesis, I discuss the meaning of these results.

2. PRIOR RESEARCH

In this chapter, I introduce prior research connected to the subject of this thesis. The research areas presented in this chapter include health, socioeconomic position, and personality, focusing on the personality trait of conscientiousness. The research in this chapter is presented in an order that allows for me to also discuss the appropriate

intersecting research, combining different subjects of research needed for this thesis. The order of the research areas in this chapter is therefore in the opposite order of the proposed model of influences between the variables used in my thesis (for visualization of influences between variables, see Figure 1). The first area of research discussed in this chapter is health and the measurement of self-rated health. After that, research on personality, focusing on the personality trait of conscientiousness and personality measurement is presented, followed by the intersecting research area of personality, conscientiousness, and health. Lastly, socioeconomic position, with a focus on the measure of educational attainment is presented, together with intersecting research of socioeconomic position, personality and conscientiousness, and research regarding the socioeconomic position, educational attainment, and health.
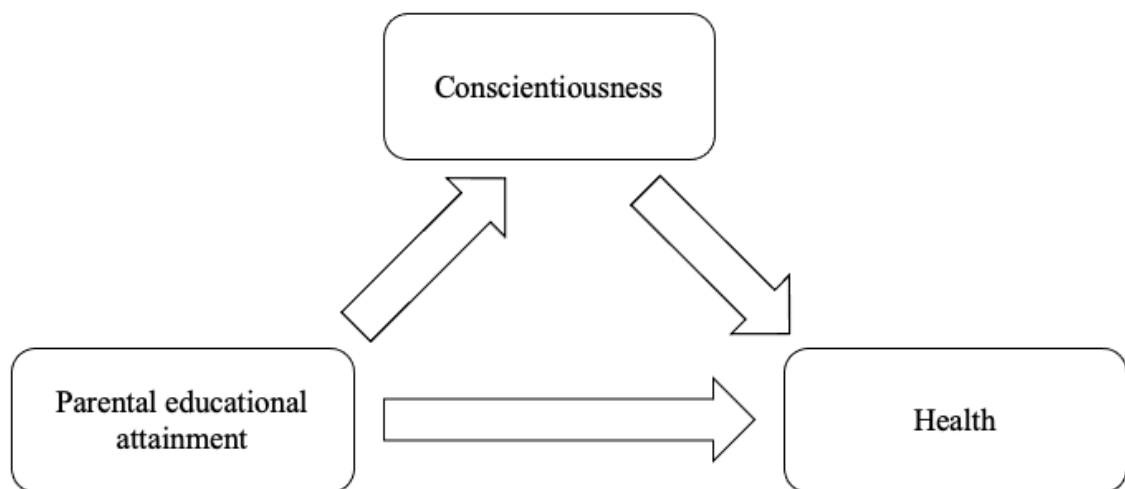
Figure 1. *A visual representation of the influences between variables and intersecting areas of research in this thesis, including associations between parental educational attainment and conscientiousness, conscientiousness and health, and parental educational attainment and health.*

2.1 Adolescent health and the measurement self-rated health

Studying adolescent health is important because health and behaviors connected with health accumulate with age and can influence health later in life (Quon & McGrath, 2014). Research on life course health suggests a chain-of-risks model, indicating that "early disadvantages increase the likelihood of subsequent risks, a mediational sequence

that in turn diminishes health" (Bauldry et al., 2012, p. 1312). Differences in health often start to show in adolescence and young adulthood (Bauldry et al., 2012).

Self-rated health (SRH) is a subjective measurement of health, usually measured with just one question, such as "How would you rate the status of your current health?", with answers on a four- or five-point scale (Quon & McGrath, 2014). Self-rated health is one of the most used measurements of general health, with a good test-retest reliability, even better than with more specific health indicators (Lundberg & Manderbacka, 1996). It has been shown to predict mortality, even with many other variables controlled (Benjamins et al., 2004; DeSalvo et al., 2006; Jylhä et al., 2006)

The indicator seems to be stable and have high validity in describing health in adolescence and young adulthood, despite being self-assessed (Breidablik et al., 2009). Studies on SRH indicate that it is a valid and stable measurement of health, even in populations such as adolescents, where the mortality is not yet present in the same way as in the older populations (Kestilä et al., 2009). Results from a longitudinal study of SRH among youth in Norway show that over 11 years, SRH stayed the same for 57% of respondents (Vie et al., 2014). The quality of SRH as a measurement of health in youth has been connected to the nature of the subjective measurement as a wide evaluation of current health (Jylhä, 2009). SRH has been suggested to be a more comprehensive measure than many other health measurements, with reasons for this including that it is able to "pick up" other psychological aspects that correlate with mortality, such as outlook on life, and that it seems to comprise also aspects of "family history, health behavior, and social and psychologic resources", in contrast to many other, more objective measurements of health (Jylhä et al., 2006, p. 465). Self-rated health is used as a measurement of adolescent health in this thesis (see chapter 4.1.2.).

Self-rated health has also been found to have independent associations with physical health. In a systematic review and meta-analysis, including 59 cross-sectional and nine longitudinal studies on children and adolescents, SRH was found to be associated with higher physical activity and lower sedentary behavior (i.e. sitting for long periods of time), even when controlling for gender, age, body weight status, mental health and family socioeconomic position (Zhang et al., 2020). The same meta-analysis also found

a direct dose-response causality of physical activity leading to better self-rated health (ibid.).

2.2 The Five-Factor Model of personality and the trait of conscientiousness

The Five-Factor Model (FFM) by Costa & McCrae is the most researched and used personality trait theory today (John & Srivastava, 1999). The model is hierarchical, with five universal traits on the highest level: *openness to experience, conscientiousness, extraversion, agreeableness,* and *neuroticism* and lower level facets associated with each factor (McCrae & Costa, 1987). Openness to experience is likely to manifest as broad interests, openness to feelings and originality (ibid.). Extraversion can show as being sociable, cheerful, fun-loving, active and sensation-seeking (ibid.). Agreeableness relates to being selfless, helpful, forgiving, trusting, and non-conflict-seeking (ibid.). Neuroticism is connected to worrying, negative affect, emotional distress, and being self-conscious (ibid.). Conscientiousness manifests as being well-organized, persevering, dutiful and capable of self-discipline (McCrae & Costa, 1987). Other qualities linked to high conscientiousness include being responsible towards others, orderly, and following rules (Leary & Hoyle, 2009).

The Five-Factor Personality model, including the trait of conscientiousness, by Costa and McCrae (1992) has earlier been measured with the 240-item NEO Personality Inventory, Revisited (NEO PI-R), which takes approximately 45 minutes. In classic studies of the five-factor model, measurements have been given either by self-ratings, partners or peers, using an agreement dependent 5 points Likert scale ranging from "*strongly agree"* to "*strongly disagree"* concerning the statement in question (Costa & McCrae, 1992). Other measurements of the Big-Five framework include the 44-item Big-Five Inventory (John & Srivastava, 1999), the 60-item NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992) and the ten-item personality inventory TIPI (Gosling et al., 2003). The TIPI takes about one minute to complete and is based on a 7-point Likert grade, with two questions per personality trait, with the second question negatively inverted (ibid.). Short inventories are used when personality traits are not the main focus of the study and when it is important not to tire out the respondent (ibid.). The TIPI is used in this thesis as a

measurement of consciousness, due to it being a measure of personality traits in the LMI intervention trial data.

It is acknowledged that the traits of FFM continue to develop and change throughout the life span (Lucas & Donnellan, 2011; Roberts et al., 2006; Roberts & DelVecchio, 2000) and that mean-levels continue to change during the life span among all five traits (Roberts et al., 2006). The development of traits in childhood is influenced by both genetic and environmental factors (Chapman et al., 2014) and works as a base upon which adult personality continues to develop (Caspi et al., 2005). Stability of personality (rank-order stability, referring to rank orders between individuals in a group) increases with age and is at its highest at approximately 50 years of age (Roberts & DelVecchio, 2000).

The biggest changes in personality take place between ages 18 and 30, coincidently with psychological maturing (Roberts et al., 2006). During late adolescence and young adulthood, there are many changes in trait levels on the group level (also referred to as mean-level change), including increases in conscientiousness and agreeableness and decreases in neuroticism (Lüdtke et al., 2011; Roberts et al., 2006). It is also during this time that many normative transitions and experiences take place, such as starting a new relationship, becoming independent and moving away from home (Leikas & Salmela-Aro, 2015). Entering work-life or starting a relationship have both been found to be associated with increases in conscientiousness or conscientiousness-like temperament traits (Bogg & Roberts, 2004; regarding the Finnish population: Leikas & Salmela-Aro, 2015; Roberts et al., 2003).

Some results have even suggested that higher increases in conscientiousness take place in adolescents and young adults choosing a more vocationally oriented path (Lüdtke et al., 2011). The mechanisms of these personality changes are not yet clear, but it might be that individuals change their behavior as a result of these life changes (Leikas & Salmela-Aro, 2015, p. 118). In contrast to normative life decisions, nowadays there are also possibilities of non-conforming life paths, and differences in transitions. According to Salmela-Aro, Kiuru and Nurmi (2014) this can be seen as some young adults engaging in these life transitions a lot later than peers, with some not transitioning at all. Research results on the Finnish cohort by Leikas and Salmela-Aro (2015) indicate that those who

are in work life by the age of 20 tend to be more conscientious than those who are not, and being in university at 20 predicts higher conscientiousness at the age of 23.

2.2.1 Personality and health

Conscientiousness stands out as a robust predictor of health across the life course (Reiss et al., 2014). High conscientiousness has been shown to be associated with higher self-rated health (Stephan et al., 2020), health-related quality of life (Chapman et al., 2006), and it is positively connected to beneficial health behaviors, and negatively to risky health behaviors (Bogg & Roberts, 2004). Higher conscientiousness has also been associated with lower mortality (Friedman et al., 1993; Jokela et al., 2013; Kern & Friedman, 2008), while below median conscientiousness has been connected to a higher risk of mortality and disability (Jokela et al., 2020). There has not yet been a consensus regarding the central facets of conscientiousness linked to health. Some studies underline the importance of achievement (persistent, industrious) and order (organized, disciplined) (Kern & Friedman, 2008) in increasing longevity, whereas others highlight responsibility and self-control (Bogg & Roberts, 2004).

According to a variety of studies, conscientiousness might influence health through both health behaviors and additional pathways (Friedman et al., 1993; Hampson et al., 2007). Shanahan and colleagues (2014) have found that some of the mediators or "chains" linking conscientiousness to health include socioeconomic attainment, including education, income and occupation (Phelan et al., 2004), avoidance and neutralization of stressors (Donnellan et al., 2009), health behaviors and risk-aversiveness, medication adherence and other disease management (Bogg & Roberts, 2004). However, also negative effects of conscientiousness on health have been shown. For example, individuals who smoke and have high self-discipline, a facet of conscientiousness, smoking and drinking more coffee when confronting days with a lot of hassle (O'Connor et al., 2009). Excessive smoking and coffee drinking could in this case be argued to be an attempt to keep their focus on the challenges they are facing (ibid.). Research also suggests that adult smokers have lower conscientiousness than those who do not smoke and that a lower conscientiousness is connected to the initiation to smoking (Hakulinen, Hintsanen, Munafò, et al., 2015).

High alcohol consumption and increasing alcohol consumption has been suggested to be more common for individuals with low conscientiousness (Hakulinen, Elovainio, Batty, et al., 2015). Low conscientiousness has been associated with depressive symptoms both in cross-sectional and longitudinal analysis (Hakulinen, Elovainio, Pulkki-Råback, et al., 2015). Depressive symptoms can also predict changes in conscientiousness in the future, which indicated a bidirectional association (ibid.) Individuals high in conscientiousness could also react more severely to failures, such as long unemployment or other financial issues (Boyce et al., 2010).

One of the problems concerning prior research on conscientiousness and health is that the methodology of the research does not account for complex mechanisms such as the association between conscientiousness and health. According to Shanahan et al. (2014, p. 1412), the methodological issues can be divided into three sections, the first of which entails that associations of conscientiousness are often studied in pairs only including the association of these two concepts, such as conscientiousness and one mediator of its effects or between conscientiousness and one aspect of health, for example smoking, instead of longer "chains of influence" (ibid. 1412). This kind of research confirms associations but does not answer the question to which extent the effect of conscientiousness is mediated on the dependent variable, for example, the effect of conscientiousness mediated by medication adherence on health, due to the research not covering the whole mediation "chain" (ibid 1412). The second category of methodological issues is longitudinal studies that don't include appropriate mediation analysis. As their third category Shanahan et al. define that the majority of research on conscientiousness is cross-sectional, with a small sample lacking heterogeneity, thus resulting in a smaller statistical power (Shanahan et al., 2014, p. 1412).

2.3 Socioeconomic position (SEP) and parental educational attainment

Societies create and sustain social stratification across many different dimensions, one of the most influential being socioeconomic conditions (Galobardes et al., 2007, p. 1). These socioeconomic conditions can be measured by using variables such as socioeconomic position (SEP), also called socioeconomic status (SES). Socioeconomic position is a

"multidimensional theoretical construct that covers a variety of social and financial circumstances" that measures the position of the individual in the socioeconomic hierarchy (Laaksonen et al., 2005, p. 1403). The measure of SEP can be for example education, income, wealth, occupation, unemployment, or housing characteristics (ibid. p.7).

Educational attainment as a measurement of socioeconomic position on individual level is suggested to categorize individuals into different positions that also influence the tasks and rewards in work life, thus reflecting access to material resources and choice of lifestyle (Laaksonen et al., 2005, p. 1403). Through material resources education also influences the opportunities for healthy behaviors such as diet and living conditions (ibid.). Occupation-based indicators have lost some of their importance due to the decrease of low-level service occupations and the financial effects of such occupations in advanced societies (Galobardes et al., 2007, p. 8). Socioeconomic position measures based on household income reflect direct access to material resources such as faster access to health and other services, such as higher education, nutrition, housing, and leisure activities (ibid. 9).

Socioeconomic position can be measured by many different measures that correlate with one another on an individual level, because they all capture some aspect of socioeconomic stratification (Galobardes et al., 2007, p. 6). Many of the SEP measures also correlate on a generational level, as the level of parental education is associated with offspring education, both through environmental (Davis-Kean, 2005) and genetic connections (Okbay et al., 2016). The positive effects of education benefit, not only the individual, but also their offspring. A higher educational level of the parents is associated with higher scores on tests regarding executive functioning (Sarsour et al., 2011). Even though SEP is often seen as an individual level measure, it is always to some extent dependent on group level structural social aspects of society and affordances, the opportunities of the individual (Galobardes et al., 2007, p. 4).

As socioeconomic position consists of many dimensions that change throughout life, it is difficult to measure fully (Laaksonen et al., 2005). One way to form a more comprehensive picture of the socioeconomic conditions is to increase measuring points. This means that instead of just one measure, it would be preferred to measure

socioeconomic position in a variety of dimensions so that there are multiple measures of socioeconomic position available in the study. Another way is to combine measures into just one index or composite, but this often means that the measurements of SEP must be weighed in some way to be combined (Elgar et al., 2016). Due to there not being an absolute answer to how the influences of different SEP measures compare to one another, the weights of SEP measures used in an index are based on arbitrary decisions of the researchers, which reduces the validity of SEP measure indexes (ibid.). Therefore, including many separate measures of SEP in a study is encouraged (Elgar et al., 2016; Galobardes et al., 2007).

In the case of children or adolescents, socioeconomic status is often measured by qualities acquired by their parents rather than themselves, as many of their own educational, occupational, or financial decisions have not yet taken place (Adler et al., 1994). It is of great importance to adjust the measurement of SEP with the study objective (Galobardes et al., 2007). Among researchers, there is not a consensus on which SEP measure should be preferred when measuring family SEP with adolescents as respondents (Elgar et al., 2016).

One solution for measuring socioeconomic conditions in the case of adolescents and children is to measure subjective social status (SSS), which entails the individual placing their family on a 10-point scale or ladder to represent their current and earlier socioeconomic standing (Goodman et al., 2001). Subjective social status is suggested to possibly be better than objective SEP measures, such as household income, at explaining health differences, but is not a strong correlate of objective SEP, such as household income (Quon & McGrath, 2014). This stems from the slightly differing aspects of the two measures, with SSS measuring aspects that have a stronger connection with the social circumstances adolescents live in (ibid.).

Subjective social status has been indicated to have larger effects in the UK, Finland, and Sweden, than in Canada, US and Australia (Quon & McGrath, 2014). This highlights the benefits of combining objective and subjective SEP measures to reach a full understanding of socioeconomic conditions (Elgar et al., 2016, p. 1171). It could also be that subjective social status, as a measure, is able to pick up the aspects that are of significance to adolescents, such as the social status they have acquired at school (Elgar

et al., 2016, p. 1178). It has been suggested that SSS is able to reflect also bidirectional influences of health, thus taking into account a vaster variation of subjective social conditions (Elgar et al., 2016, p. 1176). A proof of the benefits of using SSS as a measure of SEP in adolescents is that in a study by Goodman and colleagues (2007) low SSS in adolescents continued to significantly predict poor self-rated health even when parental educational attainment was controlled for.

In this thesis, socioeconomic position will be measured only by parental educational attainment. The data used in my thesis contains three different measures of educational attainment, the highest acquired education level of mother and father, respectively, and the level of educational attainment of the participant. All participants are first- or second-year students at a vocational upper secondary school, which means that the individual educational level could be seen as a constant and will not be included as a variable in the analysis, due to there being no other educational attainment of participants to compare with.

2.3.1   Socioeconomic position and personality

On individual level, there is research confirming an association between level of education and personality. Individuals higher in openness are more likely to achieve a longer education (Goldberg et al., 1998; Sutin et al., 2017). Emotional stability, translating to lower neuroticism, has been associated with longer education (Mortensen et al., 2014; Sutin et al., 2017).

Higher conscientiousness has been indicated to be associated with a longer attained education on individual level (Sutin et al., 2017). The connection of individual level conscientiousness in educational attainment has not been straightforward, even though the conscientiousness facets, including being dutiful, organized and orderly, sound like they by themselves, are clear correlates of educational success (Sutin et al., 2017). According to some studies, openness and neuroticism seem to be of more importance than conscientiousness when it comes to educational attainment (O'Connell & Sheikh, 2011), whereas other studies report conscientiousness as the strongest of all FFM traits to predict

both college GPA and high school educational achievements (Noftle & Robins, 2007; Poropat, 2009).

Suggested mediating variables between educational attainment and conscientiousness include increased academic effort and perceived academic skills (Noftle & Robins, 2007), or being motivated by education itself or external rewards that come with succeeding (Komarraju et al., 2009). Other suggested mechanisms for connecting conscientiousness and individual level educational attainment have been that individuals high in conscientiousness might be more likely to strive for higher education (Damian et al., 2015), while other studies have not found this connection (Leikas & Salmela-Aro, 2015; Lüdtke et al., 2011).

Also support for the associations between higher education in young adulthood and conscientiousness has been both found (Damian et al., 2015) and not found (Leikas & Salmela-Aro, 2015). In the Finnish cohort, starting your university studies before 20 years of age had an association with conscientiousness, but an association with conscientiousness in later onset university studies (at age 23) was not found (ibid. p.123). The direction of causality is not clear in individual level connections between educational attainment and conscientiousness, due to that certain personality types might be more likely to navigate towards a longer education path, but education in itself might also increase levels of conscientiousness (Sutin et al., 2017), indicating bidirectional causality. Some results also imply that there is a resource substitution model that indicates the personality traits to be stronger predictors of educational attainment of the individual if the parents of the individual have a lower socioeconomic position compared to individuals with parents of higher socioeconomic position (Ayoub et al., 2018; Damian et al., 2015).

A clearer causality direction, although not certain causality, can be found in studies regarding parental education and offspring conscientiousness. This causality direction relies on the premises that having children does not increase parental education levels, and that parents usually have completed their education before the development of the offspring personality (Sutin et al., 2017).

Associations between parental education and offspring conscientiousness have been found in some studies (Damian et al., 2015; Kaiser & Diewald, 2014; Lechner et al., 2021), while eliminated in others (Flensborg-Madsen & Mortensen, 2014). Some studies have indicated that parents with a longer education are more likely to have offspring adolescents with higher conscientiousness, with the suggested mediator of effects being parental support and material investments in learning (Conger et al., 2021). Other studies have indicated that parents with higher education are more likely to have adult children with higher extraversion and openness, with paternal education being connected to lower neuroticism and higher conscientiousness in adult offspring (Jonassaint et al., 2011). More research is needed on how parental educational attainment influences offspring conscientiousness (Sutin et al., 2017).

In a sample of more than 60 000 Americans, Sutin and colleagues (2017) found that the strongest of the significant associations between parental educational attainment and the adult offspring was the personality trait of openness. Offspring of parents with a longer education had a higher score on the openness trait. Longer parental education was also associated with higher extraversion and lower neuroticism in adult offspring. Parental education did not show an association with adult offspring conscientiousness or agreeableness. In the meta-analysis, age was not found to be a moderating variable of parental education and offspring personality. However, the study revealed that in the younger samples (approximately 14-30 years old), longer parental education was associated with lower levels of conscientiousness in the offspring, but the connection was missing in the older samples (ibid. 151). Cohort based regressions indicated that the connection between maternal education and offspring conscientiousness was positive in the older cohorts, whereas negative in the recent cohorts. Based on this study it is not clear if the change is dependent on age or cohort (ibid. 158). Household income, sometimes also used as an indicator of SEP, was found not to be connected to offspring personality (ibid 153).

Mechanisms connecting educational attainment to conscientiousness could, and most likely are, several (Shanahan et al., 2014; Sutin et al., 2017). Offspring education might mediate the effect of parental education on offspring personality (Furnham & Cheng, 2014; Sutin et al., 2017). Parents with higher education might have a larger and more versatile inventory of resources that support certain personality traits while growing up

(Conger et al., 2021). Parental style might also affect the connection between parental education and offspring personality (Sutin et al., 2017, p. 158). Due to shared genes and shared environment between the parent and offspring when the child is growing up, it is also possible that connections between parental education and offspring personality are caused by underlying genetical factors or the shared environment (Okbay et al., 2016; Sutin et al., 2017).

Other mechanisms that can influence the association between parental education and offspring personality are life span and cohort issues. The connection between the education of parents and offspring personality could be stronger in early adulthood and childhood, and it may diminish with offspring age (Sutin et al., 2017). The association can also be moderated by cohort due to changes in society (Sutin et al., 2017), such as the availability of education and social security. With the majority of research on the subject being from the United States, it might also be that the associations and pathways look different in the United States compared to northern Europe and Finland. Due to there not being any recent research on this subject from the Finnish cohort, it is unclear if the results from the US cohort can be applied to the Finnish cohort.

2.3.2   Socioeconomic position and health

Individual socioeconomic position is a correlate of self-rated health (Wang et al., 2013), health disparities such as premature morbidity and mortality (Mackenbach et al., 1997) and poorer general health (Adler et al., 1994). Educational attainment has been suggested to have direct effects on health, separately from health behaviors (Hampson et al., 2007). Education, as a dimension of SEP is associated with health on many levels: a longer education is associated with longevity (Lager & Torssander, 2012), fewer symptoms of depression (Sutin et al., 2013), and higher well-being (Kahneman & Krueger, 2006), compared to a shorter attained education. Studies of the Finnish cohort show that the likelihood of poor self-rated health is higher in individuals with just a basic level education than among individuals with higher educational attainment (Kestilä et al., 2009). Additionally, circumstances in childhood have been suggested to have a substantial contribution to the health differences between those with just basic education and those with higher educational attainment (Kestilä et al., 2009).

The association between socioeconomic position and health is present during the whole life span. The social pathway model describes the process in which disadvantageous childhood environments predict a lower SEP in adulthood, with the lower SEP increasing the risk of lower self-rated health and other health problems (Hertzman et al., 2001). Stressors experienced early in life could create changes in stress reactivity (Chen, 2010), which could then in turn cause the individual to be more sensitive to react to feelings of discomfort, also influencing the sense of health, showing up as lower self-rated health (Jylhä, 2009).

Another model describing the effects of earlier socioeconomic conditions on later life is the accumulation of disadvantage model, where socioeconomic difficulties in childhood increase the later risk of health problems (Seabrook & Avison, 2012). The model also indicates that health disparities caused by socioeconomic inequalities increase and cluster during the lifetime, due to different exposure to risks and unhealthy behavior, and resources benefiting health, such as health care (ibid.). Despite of this, associations between SES and health have been found to show up as inconsistent in adolescence, with the importance of peer influence and social positioning in school suggested as one reason for the weaker connections (West, 1997), and accumulation of socioeconomic conditions as a strengthening aspect of these connections (Chen et al., 2002).

As in other areas of research discussed in this thesis, here too, the association has also been indicated to be bidirectional. Longitudinal research in the Finnish cohort has suggested selection regarding individual health and level of attained education. Adolescent health problems have been found to influence negatively individual level educational attainment, with every type of health problems decreasing the likelihood of secondary education, and mental health showing up as the strongest connection (Mikkonen et al., 2020). In secondary education, high parental education showed up as a buffer for these effects, but not in tertiary education, indicating complex pathways between parental educational attainment and offspring education and health (ibid.).

Regarding parental educational attainment and offspring health, children of parents with a longer education are less likely to smoke (Fagan et al., 2005), suffer from depressive symptoms (Park et al., 2013) and are more likely to be in better physical health (Lundborg

et al., 2014) than children of parents with a shorter education. Parental socioeconomic position, with parental educational attainment included, has been found to have a gradient association with adolescent self-rated health, depression and obesity in the US population (Goodman, 1999). A gradient association means that the lower the socioeconomic position or status, the lower the self-rated health, the more depressive symptoms, and the more obesity, ranging in all levels of socioeconomic position (Adler et al., 1994; Goodman, 1999). In the US population, parental educational attainment has also been shown to be connected to changes in self-reported adolescent physical health (Wickrama et al., 1998) and adolescent life satisfaction (Ash & Huebner, 2001).

In contrast to this, in some of the studies done in the Finnish cohort, the effect of parental socioeconomic position and health has become non-significant when controlling for the individuals' own educational attainment (Huurre et al., 2003; Laaksonen et al., 2005). Other Finnish cohort studies have shown that socioeconomic disadvantages in childhood were associated with later health when controlling for individual educational level, but that the effect of parental education was mediated by individual education (Rahkonen et al., 1997). In some of the research done in Finland, the effect of the individual's own educational attainment has had a stronger association with health than parental educational attainment (Laaksonen et al., 2005). It has been suggested that the reason for this would be the increase of longer education in the population during the few last decades (ibid. 1408).

Although these results from the Finnish cohort seem to be in line with each other, it is important to notice that all of these results are from the adult population and that the influence of parental education is expected to fade gradually when the educational attainment of the individual has been formed and the individual is financially independent of their parents. In the data used in this thesis, the participants are still in their first or second year of vocational upper secondary school and thus it is unlikely that they are independent of the socioeconomic position of their parents.

2.3.2.1 _Parental educational attainment, conscientiousness, and health_

There has not been any research including a combination of all three variables of this thesis; family or parental socioeconomic position, offspring conscientiousness, and offspring health and the mediating effect of conscientiousness. There are some remotely connected studies on parental style, indicating that in the Japanese cohort, the effect of parental socialization of responsibility (such as telling the child to clean their room, obey the rules and always be on time) is mediated on offspring health by offspring conscientiousness (Takahashi et al., 2012). According to the study, in all age groups, parental socialization of responsibility is associated with higher conscientiousness in offspring, which has positive associations with offspring health (ibid.). The study, as most studies presented in this chapter, is cross-sectional and not longitudinal, implying that causality can not be ensured. The connection of this study to the subject of my thesis would still require there to be an association between parental socioeconomic position and parental socialization of responsibility, even in the Finnish cohort. However, in a study of the German cohort, the effect of parental SEP on the conscientiousness facet of focus has been indicated to be partially mediated by authoritative parenting (Kaiser & Diewald, 2014).

3. AIMS, RESEARCH QUESTIONS, AND HYPOTHESES

In this thesis I explore how parental socioeconomic position, measured as parental educational attainment, and the personality trait of conscientiousness is connected to adolescent or young adult health. I investigate whether the personality trait of conscientiousness is a partial mediator of the effect of parental educational attainment on adolescent or young adult health. Prior research suggests that the connections between these three variables are of complex, rather than simple nature (see chapter 2). In scientific studies these connections have been described as pathways, mechanisms, or even "chains of influence" (Shanahan et al., 2014). However, due to the short length of this thesis and the nature and variables of the data available for this thesis, I study these connections through regression analysis and a simple mediation model if the regression analyses results confirm my hypotheses. With the help of three regression analyses and a mediation analysis, I explore whether the personality trait of conscientiousness is a mediator of the

effect of parental socioeconomic position on adolescent or young adult health (visualization of my research questions and hypotheses can be found in Figure 2.).
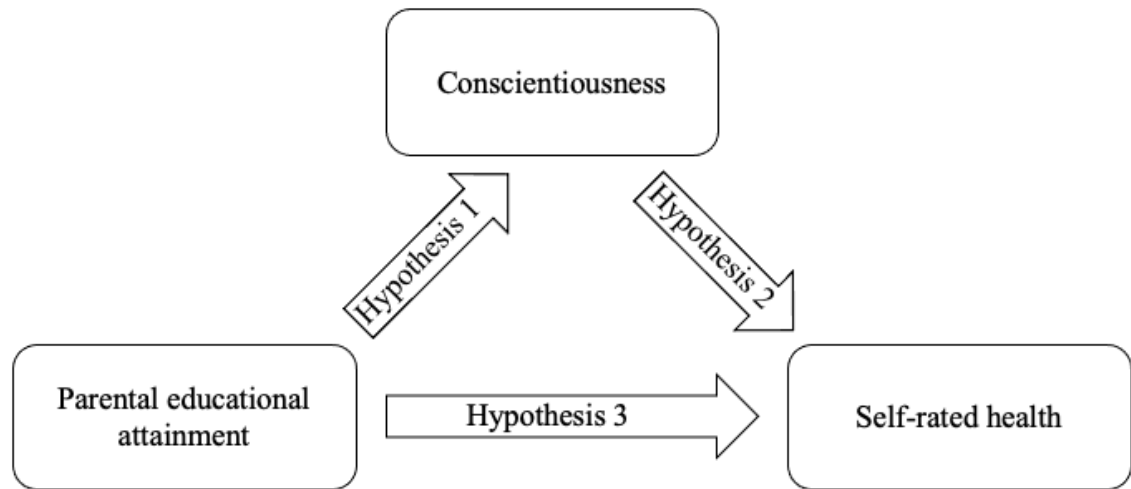
Figure 2. *Visual representation of the aims, research questions and hypotheses of this thesis.*

Positive associations between parental education and offspring conscientiousness have been found in some studies (Conger et al., 2021; Damian et al., 2015), while eliminated in others (Flensborg-Madsen & Mortensen, 2014; Sutin et al., 2017). Concerning adult offspring, higher paternal education has been connected to higher conscientiousness in adult offspring (Jonassaint et al., 2011). Some larger sample studies (N>60 000) have had some implications that there might be a cohort based moderation involved, with longer parental education being associated with lower conscientiousness in the younger subsamples, yet missing in the subsamples of older respondents (Sutin et al., 2017). In the same sample there was also found a positive connection between maternal education and conscientiousness in the older cohorts, but a negative connection in the younger cohorts (ibid.). More research is needed on how parental educational attainment influences offspring conscientiousness. With most of the research on the subject being from the United States, it might also be that the associations and pathways look different in the United States compared to north Europe and Finland. My explorative research question and hypothesis in this thesis regarding parental socioeconomic position and adolescent conscientiousness is the following:

RQ1. Does parental educational attainment predict adolescent conscientiousness?
H1. Parental socioeconomic position predicts adolescent conscientiousness.

Conscientiousness has been found to be a robust predictor of health across the life course (Reiss et al., 2014) and its self-reported measure, self-rated health (Stephan et al., 2020). However, the mechanisms relating conscientiousness and health are not yet clear. Some of the suggested mechanisms include health behaviors (Bogg & Roberts, 2004; Friedman et al., 1993), and avoidance and neutralization of stressors (Donnellan et al., 2009). My research question and hypothesis regarding adolescent conscientiousness and health is the following:

RQ2. Does conscientiousness predict health?
H2. Adolescent conscientiousness predicts health.

Parental socioeconomic position, with parental educational attainment included, has been found to have an association with adolescent self-rated health (Goodman, 1999), self-reported adolescent physical health (Wickrama et al., 1998) and adolescent life satisfaction (Ash & Huebner, 2001) in the US population. However, in the Finnish population, the connection between parental educational attainment and health has often been found to be mediated via the individuals' own educational level in adulthood (Huurre et al., 2003; Laaksonen et al., 2005). Yet, there is very little research on connections between adolescent health and parental educational attainment and the meaning of parental educational attainment could decrease simultaneously while the adolescent becomes independent. In this sample, the participants are first- and second-year vocational school students and are therefore not expected to be independent of the socioeconomic position of their parents and their family. Due to this, my third research question and hypothesis is as follows:

RQ3. Does parental educational attainment predict health?
H3. Parental educational attainment predicts adolescent health.

If all the earlier hypotheses are confirmed, I will explore the associations of parental educational attainment, conscientiousness, and self-rated health further with a mediation analysis. My research question and hypothesis for the mediation analysis is the following:

RQ4: Is the effect of parental educational attainment on health mediated by conscientiousness?

H4. The effect of parental educational attainment on health is mediated by conscientiousness.

4. METHODS

The data used in this master's thesis is from the Let's Move It trial, a cluster-randomized parallel group trial intervention. The data I will include in my thesis is gathered via computer and filled in by the participants themselves. This makes all of the data in this thesis self-rated. In my analysis I will include measures of socioeconomic position (SEP) as the highest level of education received by mother and father, respectively, the Big-Five Personality trait of conscientiousness measured with TIPI, the ten-item personality inventory (Gosling et al., 2003), and the general health measure of self-rated health.

4.1 Data and measures

Next, I define and describe the variables of the Let's Move It Trial, that I use in my thesis. The Let's Move It trial is a randomized controlled trial to increase physical activity and decrease sedentary behavior of vocational secondary school students, usually between 15 and 18 years of age. The LMI trial took place in 2015 in six schools in the Helsinki Metropolitan area and included 57 classes. The participants of the LMI trial were 1166 vocational school students in their first or second year (Heino et al., 2019). Preregistered hypotheses, measures, analyses and visualizations, including the source code can be found online in the Open Science Framework online: https://osf.io/rvj43 (Hankonen et al., 2018) (see also Heino et al., 2019, p. 272). Due to that the data used in my thesis is gathered in the LMI trial, and well documented in open online sources, the openness of the data is not a matter of concern for this thesis.

Educational tracks were chosen for the trial based on four inclusion requirements. First, the students of chosen classes reported lower physical activity levels and second, higher levels of sedentary behaviors (e.g. sitting for long times) when compared to average values provided by the Finnish National School Survey. Third, the student intake of the class is high, which enables large samples. Fourth, the student's presumed future occupations demand either a lot of sitting or a good physical condition. The programs that were chosen for intervention were information and communications technology, business and administration, hotel, restaurant and catering services, and social and health care. (Hankonen et al., 2016). The questionnaire used in the trial can be found at Open Science Framework: https://osf.io/e5rty/. The first survey was filled in at time point T1 at the start of the intervention. In this thesis I will only use the data from T1, the baseline measurement of the Let's Move It RCT.

The question about age was answered by 1104 participants and missing from 72 participants, (M=17.95, Mdn=17.00, SD=3.40, Variance=11.57, Skewness=3.78, Kurtosis=20.33, Min=15 and Max=49). According to the answers, 3.6% (N=42) of the participants were 15 years of age, 27.9% (N=328) were 16, 31.0% (N=365) were 17, 12.4% (N=146) were 18, 4.3% (N=50) were 19, 3.8% (N=45) were 20, 2.3% (N=27) were 21 and 9.4% (N=101) being older than 21 years of age.

When screening the data for outliers, participants older than 21 years of age showed up as outliers in the box plot, (see Figure 3). As I wish to analyze how the socioeconomic status of parents affects the health of the vocational upper secondary school student, it is important that the sample used in my thesis mainly includes adolescents and young adults that live at home and are dependent on their parents' income to some extent. As adolescents become adults and finish their education, they usually move away from home and become more dependent on their own socioeconomic statuses such as their own education and the salary it brings them. Due to the nature of my research questions and participants older than 21 showing up as outliers, I will limit the participants used in my analysis to between 15 and 21 years of age. In the statistical tests of this thesis there were 590 participants (further participants were removed after examining the measurement of parental educational attainment, see chapter 4.1.1) (N=590, M=17.18, Mdn=17.00, SD=1.37, Variance=1.87, Skewness=1.09, Kurtosis=0.78). A bar plot of the final age

distribution is presented in Figure 4 and information concerning the participants in Table 2.
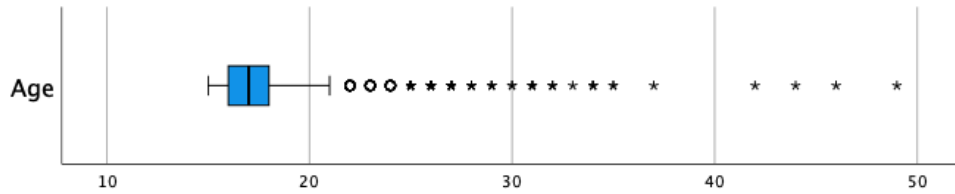
Figure 3. *Boxplot of participant age in the complete dataset. Outliers (extension of more than 1.5 box-lengths) marked as circles, extreme cases (extension of more than 3 box-lengths) as stars.*
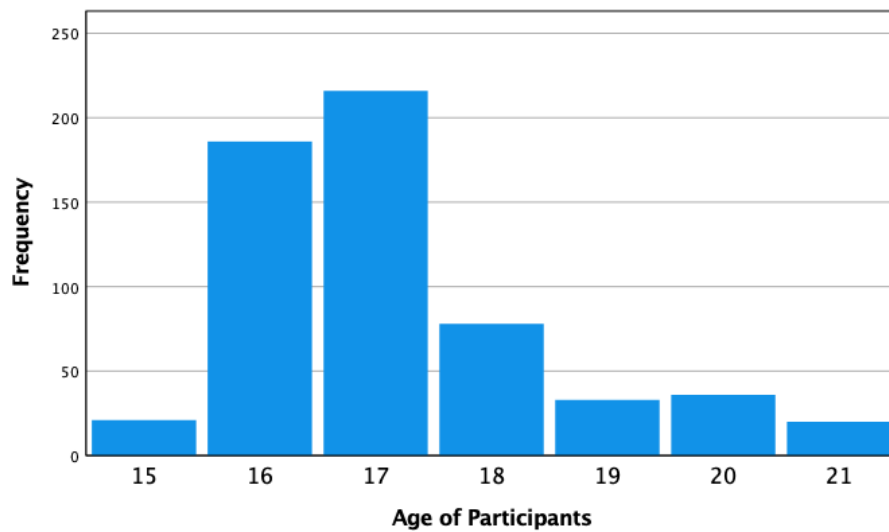
Figure 4. *Bar plot describing the age of participants after excluding outliers from the data.*

Table 2. *Participant gender and age information. Study track abbreviations: ICT=information and communications technology, BA=business and administration, HRC=hotel, restaurant and catering services, SHC=social and health care.*

Participant information	Baseline T1
Gender	
Male	245 (41,5%)
Female	345 (58.5%)
Study track	
ICT	75 (12.7%)
BA	161 (27.3%)
HRC	142 (24.1%)
SHC	212 (35.9%)
Age	
M	17.18
Mdn	17.00
SD	1.37
Variance	1.88
Range	15 to 21

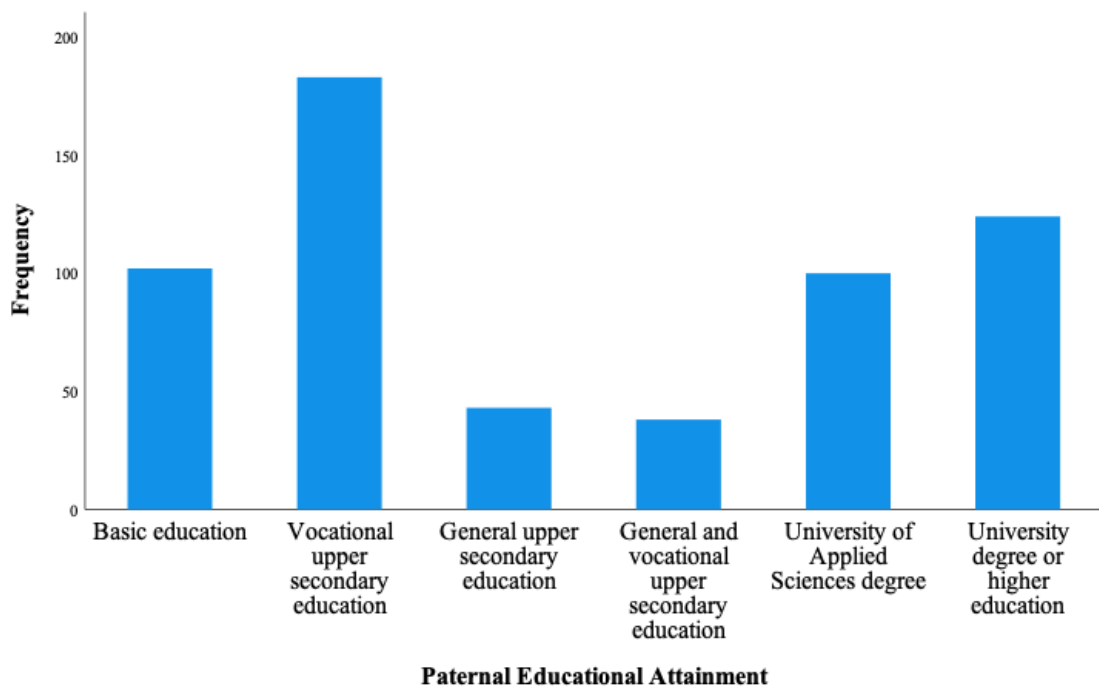### 4.1.1 Parental educational attainment

Socioeconomic position was measured by assessing the education level of both the mother and the father of the participant, separately. The participant answered the questions: *What is the highest level of education that your mother/father has received?* The education was assessed on a categorical, nominal scale ranging from 1 to 7, with "Basic education"=1, "Vocational upper secondary education"=2, "General upper secondary education"=3, "General and vocational upper secondary education"=4, "University of applied sciences degree"=5, "University degree or higher education"=6, and "I don't know"=7.

Due to parental educational attainment being used as a variable in this thesis, the "I don't know" responses were deleted from the data because they were not of interest. In the subsample of 15–21-year-old participants, the survey questions on parents' highest received education level were both answered by N= 590. According to the survey

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answers, the highest education of the mothers of participants was basic education for 15,1% (N=89), vocational upper secondary education for 25,1% (N=148), general upper secondary education for 11,4% (N=67), general and vocational upper secondary education for 8,8% (N=52), university of applied sciences degree for 14,7% (N=87), and university degree or higher education for 24,9% (N=147). The highest education of the fathers of participants was basic education for 17,3% (N=102), vocational upper secondary education for 31,0% (N=183), general upper secondary education for 7,3% (N=43), general and vocational upper secondary education for 6,4% (N=38), university of applied sciences degree for 16,9% (N=100), and university degree or higher education for 21,0% (N=124).
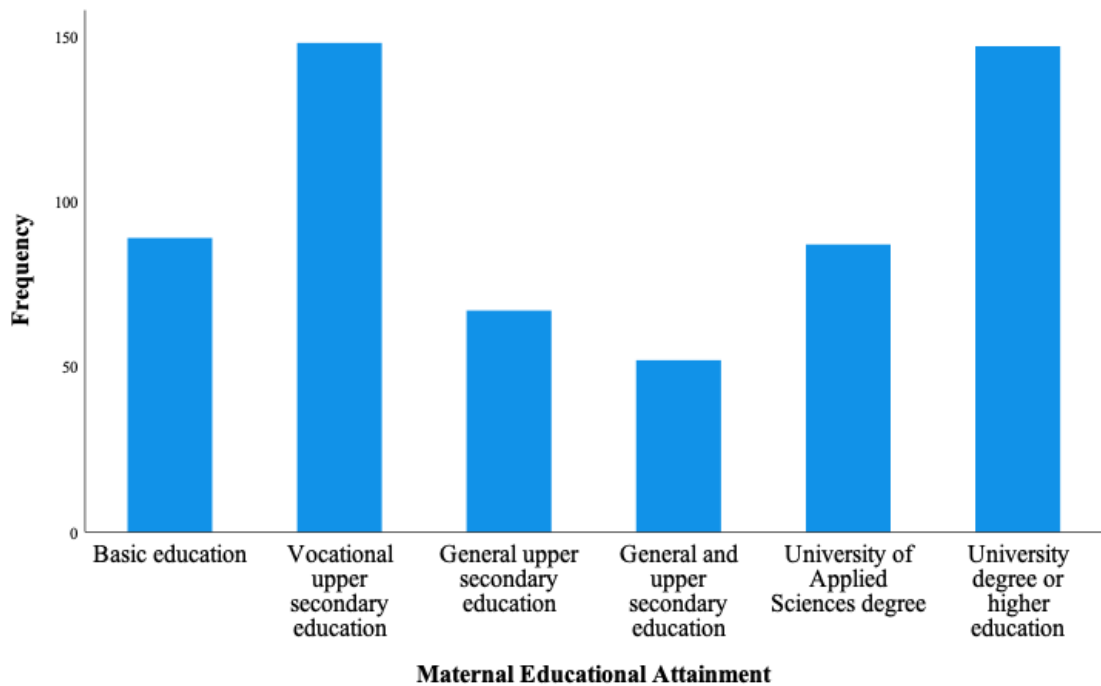

Figure 5. Bar plot of highest maternal educational attainment.

Figure 6. *Bar plot of highest paternal educational attainment.*

4.1.2 Self-rated health

Self-rated health was assessed by the participants and measured at baseline with the question: "*I find my current health status to be…*" where the participant then assessed their health on a Likert grade on an ordinal scale ranging from 1 to 5, with 1 meaning "very good", 2 meaning "quite good", 3 meaning "average", 4 meaning "quite poor", and 5 meaning "very poor". The question was answered by N=590 (M=2.01, Mdn=2.00, SD=0.77, Variance=0.59, Skewness=0.47 Kurtosis=-0.07). Of the participants, 25.6% (N=151) answered that their general health was "very good", 51.7% (N=305) that their health was "quite good", 19.0% (N=112) that their health was "average", 3.7% (N=22) that their health was "quite poor", and 0.0% (N=0) that their health was "very poor". Even though the worse health option was left without any participant answers and there were very few answers on the option of "quite poor", the shape of the distribution in this data (see Figure 7) is not unusual. Other studies including self-rated health measurements of youth have also found similar response rates among the self-rated health spectrum, with very few adolescents answering with "very poor" or "quite poor", even in the Nordic countries (Vie et al., 2014).
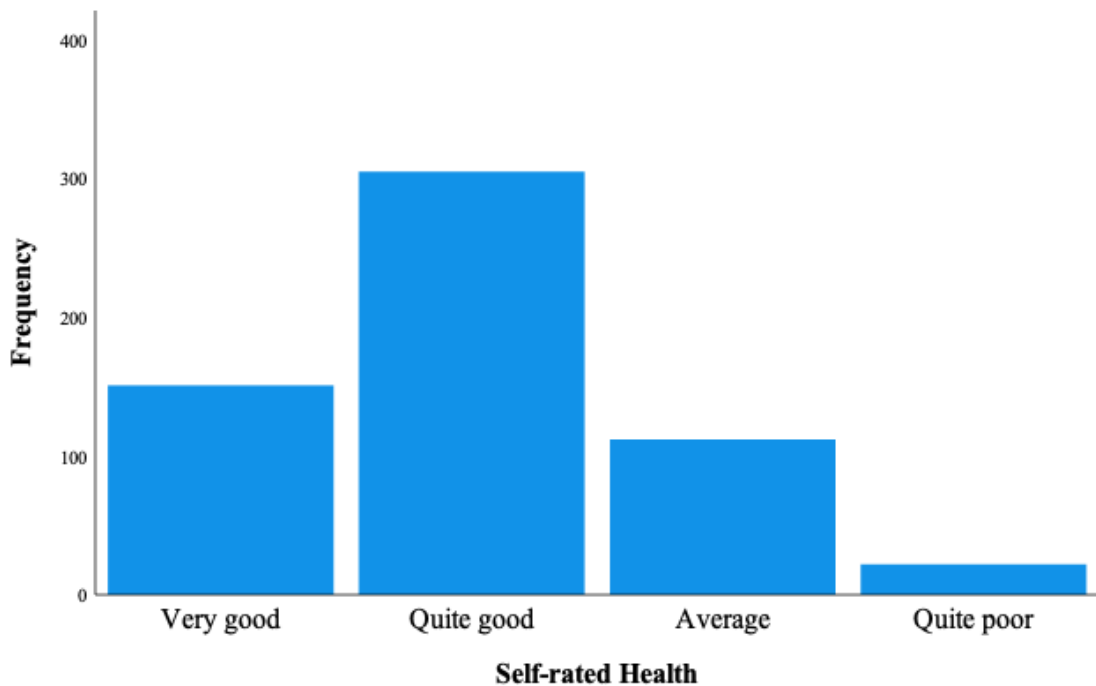
*Figure 7. Bar plot of self-rated health among participants.*

4.1.3 Conscientiousness

The measurement of conscientiousness used in the LMI trial and my thesis is borrowed from a short 10-item inventory (TIPI) measuring the big five personality domains (Gosling et al., 2003). Of the TIPI items I use the two that are connected to the personality domain conscientiousness. The measurements are agreement-based, with the answer scale ranging from 1, meaning "completely disagree" to 7, meaning "completely agree". The statements of the regarding conscientiousness in the questionnaire are: "How would you describe yourself? Choose the answer that best applies to you. I see myself as…" with the first statement being: "... Dependable, self-disciplined." and the latter "... Disorganized, careless."

The first conscientiousness measurement, describing the participant as dependable was answered by 590 participants and missing from 6 participants, (see Figure 8) (M=5.44, Mdn=6.00, SD=1.47, Variance=2.16, Skewness=-0.97 and Kurtosis=0.47). Of the participants 1,9% (N=11) answered with 1, meaning that they completely disagree, 3,2% (N=19) answered with 2, 5,4% (N=32) answered with 3, 12,4% (N=73) answered with 4

meaning that they neither disagree nor agree, 19,3% (N=114) answering with 5, 28,6% (N=169) answering with 6, and 27,3% (N=161) answering with 7, meaning that they completely agree with the statement.

The second conscientiousness measurement, describing the participant as disorganized was answered by 590 participants and missing from 5 participants, (see Figure 9) (M=3.34, Mdn=3.00, SD=1.85, Variance=3.40, Skewness=0.37 and Kurtosis=-0.93). Of the participants 20,2% (N=119) answered with 1, meaning that they completely disagree, 20,7% (N=122) answered with 2, 10,2% (N=60) answered with 3, 22,0% (N=130) answered with 4 meaning that they neither disagree nor agree, 10,7% (N=63) answering with 5, 8,3% (N=49) answering with 6, and 6,6% (N=39) answering with 7, meaning that they completely agree with the statement.
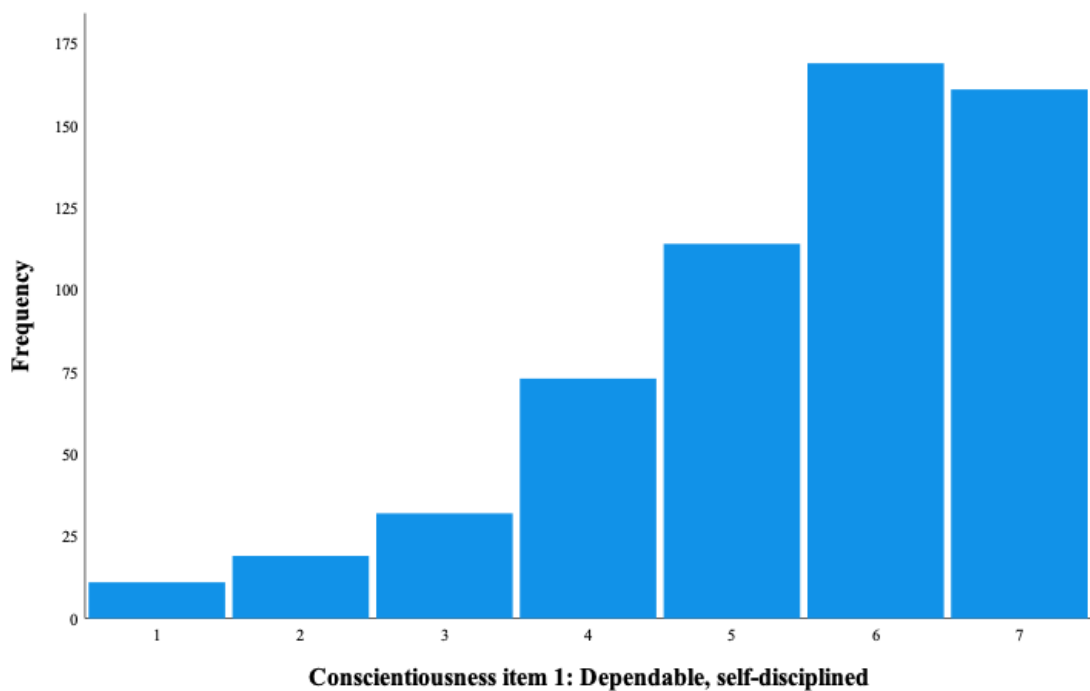
Figure 8. Bar plot of conscientiousness item 1.
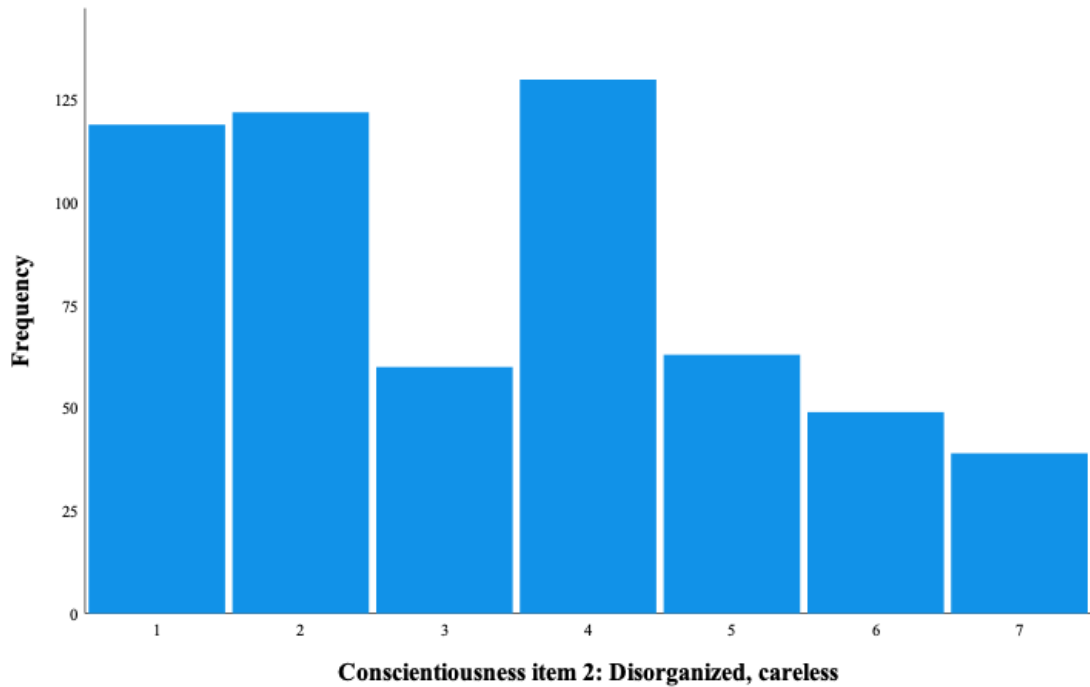
***Figure 9.*** *Bar plot of conscientiousness item 2.*

4.2 Analyses

IBM Statistics SPSS version 28 with the packet PROCESS macro 4.00 by Andrew F. Hayes was used for the analyses. Variables were prepared for data analysis. Correlation analysis of the regression variables was conducted. Three regression analyses were conducted to test the three first thesis hypotheses: H1. Parental socioeconomic position predicts conscientiousness. H2. Conscientiousness predicts health. H3. Parental socioeconomic position predicts health. Simultaneously with regression analysis, tests to analyze the normality, linearity and homoscedasticity of residuals were conducted. If all hypotheses are confirmed, a mediation analysis testing the fourth hypothesis: H4. The effect of parental socioeconomic position on health is mediated by conscientiousness. is conducted. Simultaneously with regression analysis scatter plots of residuals, Cook's distances and predicted values were examined to assess assumptions of normality, linearity, and homoscedasticity.

Mediation analysis is a form of regression analysis which means that the association is not only analyzed on the level of a correlation, but also regarding causation. A mediation analysis tests causal hypotheses that include mediation, the research question is therefore

of the form: "What is the mechanism,… …by which X influences Y?" (Hayes, 2017, p. 78). This means that the analysis is seeking through which *mediating* variable an effect from one variable is transmitted to the other "outcome" variable. The analysis will measure to which extent the effect of the independent variable (IV) on the dependent variable (DV) is direct (IV to MV) or indirect (IV to MV and MV to DV). In the case of an indirect effect, the effect of the independent variable is mediated through the mediator variable (MV) to the dependent variable. Mediation analysis includes three different regression steps, each having their own hypotheses (see Figure 10).
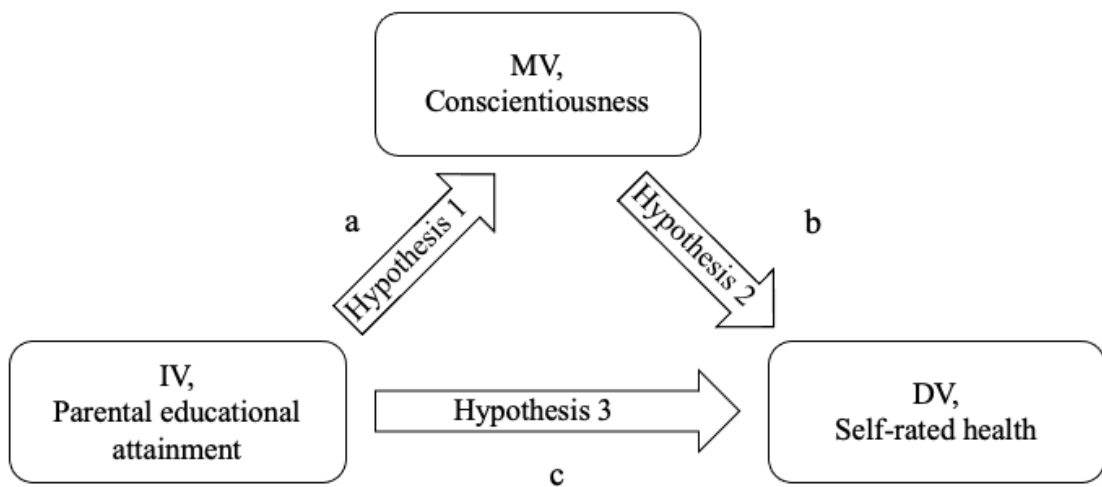
***Figure 10**. A visual representation of regression analyses and mediation analysis in this thesis, with a and b referring to the indirect effect of the independent variable parental educational attainment on the dependent variable of self-rated health, and c referring to the direct effect of parental educational attainment to self-rated health.*

To reach a conclusion regarding the role of the mediating variable, the mediation analysis is set to consist of several regression models all analyzed together. I will now present these regressions in the same order as they are in the statistical mediation analysis. The first regression answers the question: Is parental socioeconomic position (SES) (IV) a significant predictor of conscientiousness (MV)? The second regression examines the relationship between the MV and the DV: Is conscientiousness (MV) a significant predictor of self-rated health (DV)? The third regression studies whether the parental socioeconomic position (IV) is a significant predictor of self-rated health (DV)? Of these regressions the first and second describes the indirect effect in mediation analysis (marked as a and b in Figure 10) and the third regression describes the direct effect (marked as c

in Figure 10). In addition to the mediation analysis, I will also perform bootstrapping with the help of the PROCESS macro packet as a resampling method to further analyze the quality of my mediation analysis results, to ensure the likelihood of my results.

Due to mediation analysis being a series of regression analyses, the limitations and assumptions for a mediation analysis are the same as for regression analysis. The regression analysis is assessed under the assumption that the variables do not include any error. However, due to the complex nature of social and humanistic science, it is not possible to obtain data without measurement error. (Tabachnick & Fidell, 2013).

Regression analysis is very sensitive to outliers. Both too small and too large discrepancies in cases cause problems in regression analysis. When the scattering of cases in the sample is too small, the standard errors of the regression coefficients are too small. When the scattering of cases in the sample is too large, the standard errors of the regression coefficients are too large. Both situations described cause problems with generalizing to the population. In low discrepancy the variable should be transformed and in high discrepancy the outliers should be deleted or rescored. Screening for outliers is possible to conduct either prior to performing of a regression analysis or after, in a residual analysis. When performing the residual analysis prior to regression analysis there is a possibility for overfitting. (Tabachnick & Fidell, 2013).

Lastly, also normality, linearity, and homoscedasticity of residuals are requirements for regression analysis, if all of these are fulfilled, the residuals do not make any kind of form, but are randomly scattered in the scatterplot. All of these three can usually be screened in statistical programs before performing a regression analysis or by examining a scatterplot of residuals. If the three requirements defined above are met, there are no outliers, regression analysis can be performed on only one run. In addition to these, errors of prediction should be independent and there should be no outliers in the solution. (Tabachnick & Fidell, 2013).

Missing data is excluded pairwise from this data, meaning that even if a participant has missing data in one section, they are not excluded from the analyses regarding variables in which they have the necessary data (Pallant, 2016, p. 58).

4.2.1 Preparation of variables

Socioeconomic position was measured in the data as parental educational attainment, on a nominal scale. If the measurement of highest achieved education by mother and father, respectively, would have been measured on a more precise scale, differentiating between a lower and higher university of applied science degree, lower and higher university degree, and a Ph.D., and other higher educations, it would have been possible to transform the parental education measure to a more precise scale. The transformation would then have included changing the scale to a continuous scale, converting education or degree to years studied (for example, see Sutin et al., 2017), so that basic education would have been recoded to 9 years of education, general or vocational upper secondary education to 12 years of education etc. Unfortunately, neither this, nor a recoding to ordinal scale was possible due to imprecise measurement of years of education and variations in degree length in Finland, with the duration of lower university of applied science degrees ranging from 3,5 or 4,5 years and upper university of applied science degrees from 1,5 years to 2 years (Finnish National Agency for Education, 2022).

Parental educational attainment was transformed to achieve one variable to describe the acquired educational level of both parents. The highest achieved education level of mother was transformed so that it included only three options, with 1 referring to basic education, 2 referring to general and/or vocational upper secondary education, also called secondary education, 3 referring to a university of applied sciences degree, a university degree or higher education, comprising tertiary education. The same transformation was done to the measure of highest achieved education level of father. After this, a measure reflecting the highest parental educational attainment was computed by creating a measure that reflected the highest degree of the parents together, with the same three options as described earlier (N=590, M=2.44, Mdn=3, SD=0.63, Variance=0.39, Skewness=-0.67, Kurtosis=-0.52). Similar measurements of parental education have been used in studies concerning Finnish adolescents by Kestilä and colleagues (2009).
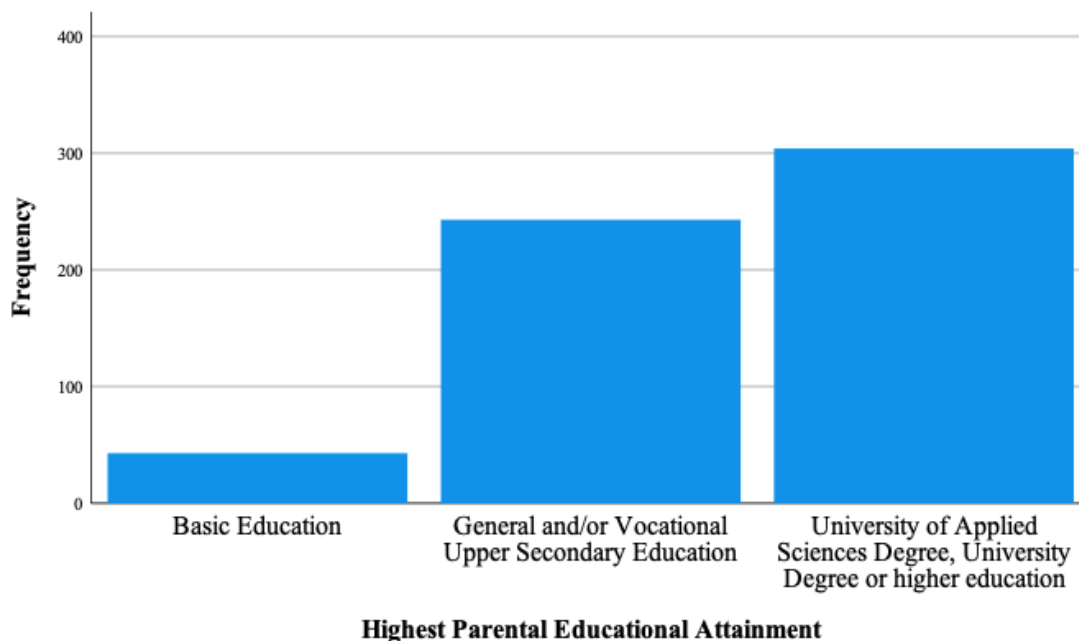
Figure 11. *Bar plot of the highest parental educational attainment measurement.*

As a measure of conscientiousness, the two items from TIPI (Ten-Item Personality Inventory) regarding conscientiousness are utilized (Gosling et al., 2003). The 10-item inventory questionnaire is not as robust at measuring the big-five personality factors as is the longer Big-Five Inventory (BFI) (John & Srivastava, 1999). The correlation between the measurement of conscientiousness from the 44-item questionnaire (BFI) and the 10-item inventory (TIPI) is $r=0.75$ and $p<0.01$ and with NEO-PI-R $r=0.68$ (Gosling et al., 2003). The TIPI measurement emphasizes content validity (as test-retest correlation) instead of inter-item correlation, which means that the Cronbach alphas are unusually low, being .50 for conscientiousness (Gosling et al., 2003, p. 516). "Therefore, researchers wishing to correct TIPI correlations for unreliability should base their corrections on reliability estimates that are less biased by our efforts to retain content validity or the small number of items on each scale; one such estimate would be the test–retest reliability correlations." (Gosling et al., 2003, p. 516).

To achieve a sum variable to describe conscientiousness, the second conscientiousness item, describing the participant as "disorganized, careless" was inversed so that a higher score on the measure reflected a higher level of conscientiousness. This was conducted by computing a 1 on the original scale to be a 7, a 2 to be a 6, and so forth. Due to the qualities of the TIPI measurements, and that there were only two items, instead of a Cronbach's Alpha, a Pearson's correlation coefficient was computed, even though this is

not the preferred measure for this variable. There was a positive correlation between the two variables, r(575) = .163, p<.001. After this, the two conscientiousness items were added together to form a sum variable varying between 2 and 14, with higher sums indicating higher conscientiousness (N= 584, M=10.03, Mdn=10.00, SD=2.59, Variance=6.73, Skewness=-0.25, Kurtosis=-.48).
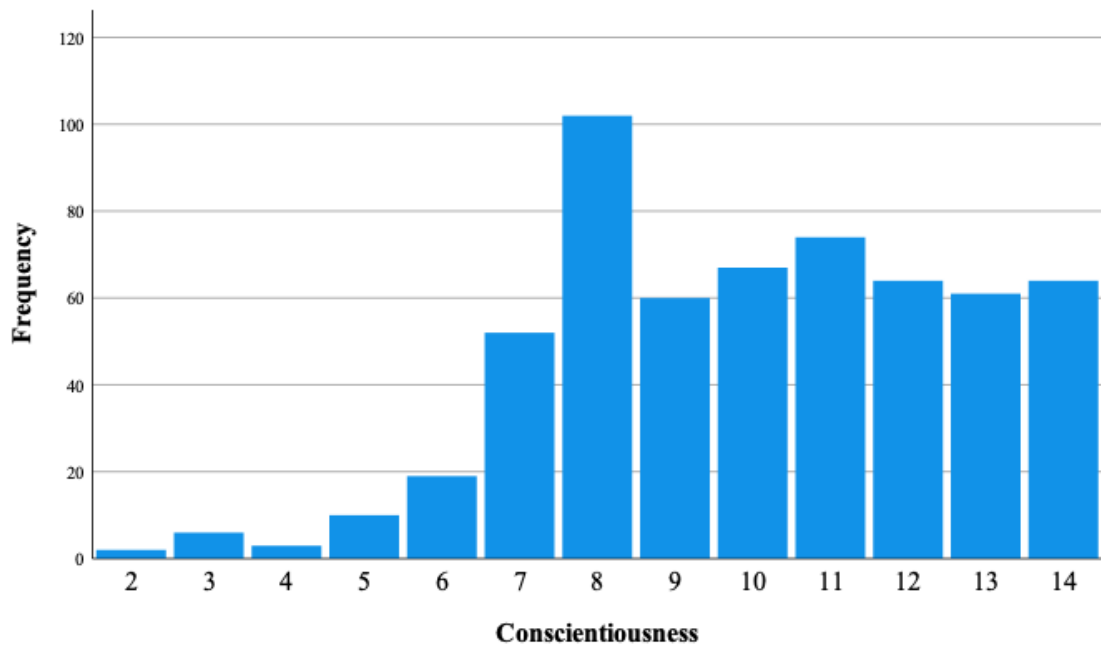
Figure 12. *Bar plot of the conscientiousness measurement.*

The measure of self-rated health was also inversed so that a higher score indicated a more positive self-rated health (N= 590, M=10.09, Mdn=4.00, SD=0.77, Variance=0.60, Skewness=-0.47, Kurtosis=-.07).
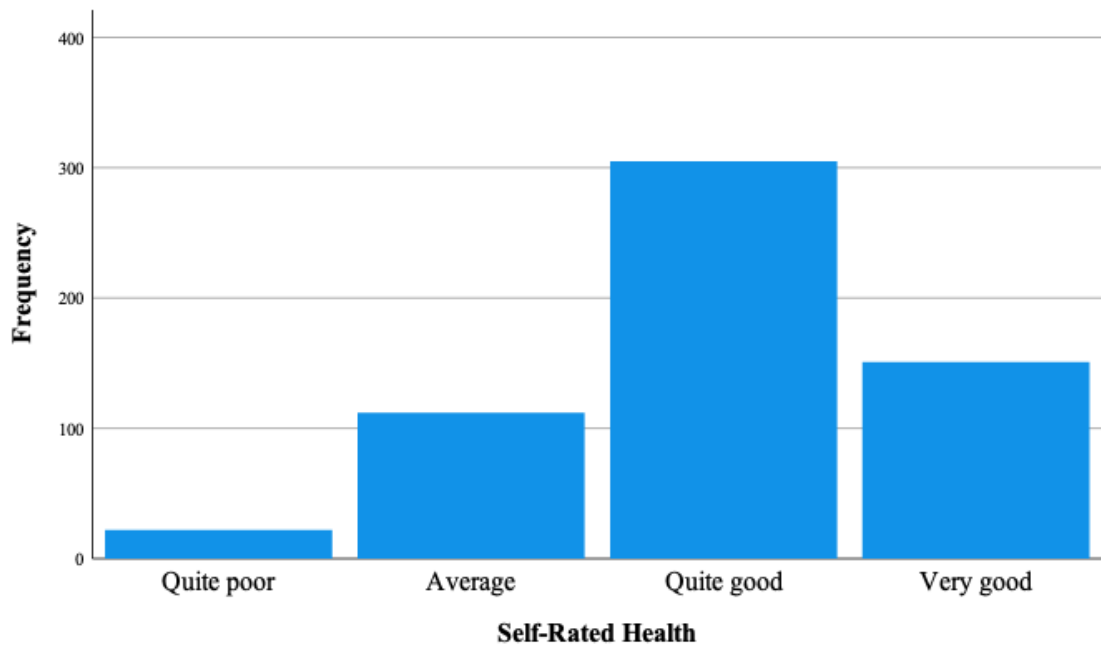
Figure 13. *Bar plot of the inverted measurement of self-rated health.*

The variables are not normally distributed, as is shown by their kurtosis or skewness. Both the conscientiousness measure, the self-rated health measure and the age measure are slightly skewed, conscientiousness and self-rated health negatively, and age positively. A perfectly normal distribution is unusual in social sciences (Pallant, 2016, p. 57). However, the risk of distribution related problems is reduced when using larger samples (N>200) (Field, 2005, p. 72). Hence, I will proceed with these variables without conducting any distribution transformations. Boxplots were assessed to find outliers. The variables did not have outliers, except for the self-rated health variable, with four outliers that extended more than 1,5 box lengths from the edge of the box. The outliers will be assessed after the regressions with Cook's distance to either be deleted from the data or kept.

5. RESULTS

In the correlation analysis between the variables in this thesis, only the correlation between conscientiousness and health was found to be significant. Correlations are presented in Table 1. Simple linear regression 1, regarding the first research question: "Does parental educational attainment predict adolescent conscientiousness?". Parental educational attainment did not predict conscientiousness $R^2 = .002$, $F(1, 580) = 1.121$, $p = .290$.

Hypothesis 1: Parental socioeconomic position predicts conscientiousness, was thus rejected. The results of the regression analysis 1 are presented in Table 2.

To explore research question 2: "Does conscientiousness predict adolescent health?" simple linear regression 2 was conducted. Conscientiousness did predict self-rated health $R^2 = .018$, $F(1, 580) = 10.59$, $p = .001$. Hypothesis 2, that conscientiousness predicts adolescent health, was confirmed. The results of the regression analysis 2 are presented in Table 3. To investigate research question 3: "Does parental educational attainment predict health?" simple linear regression 3 was conducted. Parental educational attainment did not predict self-rated health $R^2 = .003$, $F(1, 589) = .84$, $p = .359$. Hypothesis 3, that parental socioeconomic position predicts health was thus rejected. The results of the regression analysis are presented in Table 4.

Scatter plots were examined to assess the assumptions for residuals (for residual distribution scatter plots and histograms, see Appendix 1 and 2). The assumptions concerning homoscedasticity assumptions were confirmed concerning all three variables. The scatter plots were explored visually to assess the linearity of all three variables. As the variables self-rated health and parental educational attainment are ordinal scale variables with only 5 and 3 grade scales, respectively, and all the different combinations on the x and y axis are covered in the scatter plot, the non-linearity is difficult to rule out. However, due to the nature of the variables, some ambiguity remains regarding the assumption of linearity. The normality assumption was met as all standardised residual values fell between 3.3 and -3.3 (Tabachnick & Fidell, 2013). As Cook's distances were all below 1 for all three regression models, the outliers were not deleted from the sample. The Durbin-Watson statistic (Regression 1: parental educational attainment and conscientiousness d=1.99; regression 2: parental educational attainment and self-rated health d=1.50; regression 3: self-rated health and conscientiousness d=1.48) indicated that there is no auto-correlation in the first regression and that the small positive correlation in residuals in regression 2 and 3 is acceptable (Field, 2005, p. 311).

Due to only the second hypothesis being confirmed, a mediation analysis was not likely to be significant. A mediation analysis with bootstrapping was still conducted, and the model was found not to be significant, except for the indirect effect of conscientiousness

on health, as was proved in regression 2. The mediation analysis will thus not be reported in this thesis.

Table 1. *Descriptive Statistics and Correlations for Study Variables*

Variable	N	M	SD	1	2
1. Self-Rated health	590	2.77	0.99		
2. Conscientiousness	584	10.0	2.59	.134**	
3. Parental educational attainment	590	2.44	0.63	-.038	-.044

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2. *Regression Analysis 1: Parental educational attainment and Conscientiousness*

Model	Estimate	SE	95% CI		p
			LL	UL	
(Constant)	10.476	.432	9.627	11.324	<.001
Parental educational attainment	-.181	.171	-.518	.155	.290

a. Dependent Variable: Conscientiousness.

Table 3. *Regression Analysis 2: Conscientiousness and Self-rated health*

Model	Estimate	SE	95% CI		p
			LL	UL	
(Constant)	3.590	.127	3.341	3.839	<.001
Conscientiousness	.040	.012	.016	.064	.001

a. Dependent Variable: Self-rated health.

Table 4. *Regression Analysis 3: Parental educational attainment and Self-rated health*

Model	Estimate	SE	95% CI		p
			LL	UL	
(Constant)	4.105	.128	3.854	4.357	<.001
Parental educational attainment	-.047	.051	-.146	.053	.359

a. Dependent Variable: Self-rated health.

6. DISCUSSION

This thesis had four overarching aims (for visualization of aims see Figure 3). The first aim was to examine if parental educational attainment predicts conscientiousness. The second aim was to explore if conscientiousness predicts health. The third aim was to examine if parental educational attainment predicts health. If all these three aims were confirmed, the fourth aim was to investigate whether the effect of parental socioeconomic position on adolescent health is mediated by adolescent conscientiousness.

Regarding the first aim of this thesis, the data used in this thesis indicates that parental educational attainment does not predict conscientiousness in adolescents and young adults in this sample, which is contradictory to a large number of earlier studies. The earlier results regarding parental educational attainment and offspring conscientiousness have been inconsistent, with a large number of results confirming this hypothesis (Damian et al., 2015; Kaiser & Diewald, 2014; Lechner et al., 2021), but also some studies eliminating the association (Danish cohort: Flensborg-Madsen & Mortensen, 2014). The suggested mechanisms of this association have been material investments in learning, which could benefit the development of conscientiousness (Conger et al., 2021) and the positive influences of the offspring experiencing less psychosocial stress in families with higher educational attainment of the father, allowing for positive influences on the development of personality traits, benefitting conscientiousness (Jonassaint et al., 2011).

Concerning the second aim of this thesis, conscientiousness was shown to predict health in this sample of vocational upper secondary school students. The results regarding this research question are aligned with earlier research on the subject (Friedman et al., 1993; Reiss et al., 2014; Stephan et al., 2020). The mechanisms connecting the two have been suggested to contain health behaviors (Friedman et al., 1993; Hampson et al., 2007), risk-aversiveness (Bogg & Roberts, 2004), and neutralization of stressors (Donnellan et al., 2009) but are still to some part unclear and more research on the subject is needed.

Regarding the third aim of this thesis, the data indicates that parental educational attainment does not predict self-rated health in adolescents and young adults in this sample. This was not aligned with the hypothesis in this thesis. The earlier results on the

subject have not been consistent. A gradient association between parental socioeconomic position and offspring health has been found in many studies of US cohorts (Adler et al., 1994; Goodman, 1999; Wickrama et al., 1998), but eliminated in studies of the Finnish cohort (Huurre et al., 2003; Laaksonen et al., 2005; Rahkonen et al., 1997). The results in this thesis were thus aligned with the earlier data from the Finnish cohort.

Next, I discuss further the results of this thesis, starting with the contributions of this thesis to current research, followed by the limitations and strengths of this study, and finally, implications for future research.

6.1 Contributions to current research

This thesis contributes to current research by being the first (to my knowledge) to study the effects of parental educational attainment on health, with conscientiousness as the mediating variable. As there is an undeniable connection between socioeconomic position and health, and we know that social stratifications and unequal distribution of resources cause health disparities (Adler et al., 1994), it would be important to study the mechanisms connecting socioeconomic position to health even more thoroughly. This thesis studies the proposed pathways of socioeconomic position and health further in the Finnish cohort, exploring the personality trait of conscientiousness as a mediator between these variables.

The associations of the variables of parental socioeconomic position (including parental educational attainment) and health, and personality (including the trait of conscientiousness) and health, have only been studied in the Finnish cohort separately before this thesis, to my knowledge. In contrast, even though personality and socioeconomic position has been studied on individual level in the Finnish cohort, there is a lack of studies on the association between parental socioeconomic position (including parental educational attainment) and adolescent offspring personality. Research on this subject would be important because the results from studies made in the US might not translate into the societal context of Finland and the Nordics, as was shown by this thesis.

Even though the first and third research questions were not confirmed in this sample, support was found for the personality trait of conscientiousness as a predictor of adolescents' and young adults' health in the context of Finnish vocational upper secondary education students. This study also emphasizes the importance of matching the research questions to the thoroughness of measurement used when gathering data, as some of the associations between variables may remain hidden in a relatively homogenous sample. As an example of this, parental educational attainment might influence adolescent health, even though it was not detected in this sample. This matter is discussed more thoroughly later in this chapter.

6.2   Limitations and strengths

The overarching issue with the data in this thesis is that it is gathered for another purpose than what it is used for in this thesis. The data is gathered as baseline data for an intervention trial, and it was thus designed to meet the demands of the intervention trial, instead of the research questions of this thesis. Nevertheless, the data was chosen for this thesis due to it being the only accessible data suited for my research questions. I was not able to find any other accessible data of the Finnish adolescent and young adult cohort including the measurements of parental socioeconomic position, the personality trait of conscientiousness, and general health, gathered in the last ten years. Limitations regarding the data are discussed next.

6.2.1   Issues with measurements

The data of the sample used in this thesis only included two measurements of socioeconomic position: the highest educational attainment of mother and father, respectively. Socioeconomic conditions are a contextual quality in the life of the individual and are therefore present continuously throughout the life span. Socioeconomic conditions also include accumulating effects, such as the negative influences of poor socioeconomic conditions on health in later years of life. It would thus be important to also measure socioeconomic position thoroughly, throughout life, and through several measurements (Laaksonen et al., 2005; Quon & McGrath, 2014). With the data included in this thesis only including the educational attainment of the

participants' parents (in addition to the measurement of individual educational attainment as a student at vocational upper secondary education), it must be noted that the measurement of socioeconomic position was not as extensive as it should have been in the context of my research questions. Including additional measurements of socioeconomic position for a more comprehensive picture of the current and earlier socioeconomic conditions, could have improved the quality of the analysis in this thesis.

An additional measurement of socioeconomic position could have been household income or material possessions. Unfortunately, the accessibility of household income could prove to be difficult due to adolescents not being able to reliably assess this measure and due to household income not being easily accessible information even for research purposes. Material possessions such as how many rooms, bathrooms, or cars the family has, could have been an easier additional data point on the socioeconomic position.

A more precise measurement of parental educational attainment might have improved the scale of the parental educational attainment measure. If data on parental educational attainment would have been gathered so that lower and higher university degrees and university of applied science degrees would have been coded separately, it could have allowed for recoding of parental educational attainment to a ratio scale describing years of education. Unfortunately, there is variation in the duration of both upper and lower university and university of applied sciences degrees in Finland. With the variations in degree duration length and the data not separating between lower and higher university and university of applied sciences degrees, the parental educational attainment had to be coded into just three classes, namely, basic education, secondary and tertiary education. However, measuring the parental educational attainment on a level of years spent in education could also have proven to be a too difficult question for the adolescent and young adult participants. A more secure, but less convenient way of getting access to parental educational attainment could have been an objective measure of education, such as registers or other equivalent sources.

In the Finnish cohort, as an adolescent turns 18 becoming an adult and or finishes secondary education, their contextual environment gradually or abruptly changes from being dependent on their parents and living in their parents' home, to having their own financials and moving into their own home. This is often characterized by a gradual

transition from the social and financial context built by their parents to one that has been built by the individual themselves. The time for this transition is dependent on many different things, which means that at the time when Parental SEP was measured at the base level, some of the participants might have already left their parental home and moved into their individual socioeconomic contexts. Of the 590 participants, a total of 99 (16.8% of 590 participants) participants were 19 or older and could thus have been more reliant on their own individual socioeconomic position than the parental educational attainment used as a measurement of socioeconomic position in this study. If the measurement of parental educational attainment would have had low validity in this sample, it could have influenced the results. After the statistical tests of this study, I also conducted a mediation analysis only including participants between 15 and 18 years old. The results of the post hoc mediation analysis were not statistically significant.

The conscientiousness measure used in this thesis was based on the TIPI, a ten-item personality inventory scale, which is a very short personality test taking only one minute (Gosling et al., 2003). In the TIPI, conscientiousness and the four other FFM personality traits are measured with two items each. The TIPI is a very short measurement and created for use in research where personality is not the main interest of the study (such as the LMI trial), to not increase fatigue in the respondents (Gosling et al., 2003). A more comprehensive measurement of personality could have provided more exact data on the conscientiousness of participants, thus improving the quality of the analysis in this thesis.

6.2.2 Issues with the sample

In the initial data gathering phase of the LMI trial, a pilot study was conducted by Hankonen and colleagues (2016) using the first two batches of the intervention trial to study the effect sizes, required sample size and to explore the population of the study. The conclusions from the pilot study were considered in the final design of the intervention. The effect size was calculated for the purpose of the LMI intervention trial, and not to explore the associations of conscientiousness, parental educational attainment, and self-rated health in the data. However, in many studies, a sample size of for example 250 might be enough to stabilize correlations (Schönbrodt & Perugini, 2013), with

intervention trials likely to need larger samples, as concluded in the pilot study by Hankonen and colleagues (2016).

Regarding the statistical power and effect size of the sample, it should be noted, that one inclusion criteria in the sample was to only include vocational upper secondary education students, thus excluding students of general upper secondary education. This makes it impossible to control for the effects of the individual education level of the adolescents and young adults in this study. Due to that both parental educational attainment and individual level attainment could influence the health of the participant (Goodman, 1999; Huurre et al., 2003; Laaksonen et al., 2005), this makes it very difficult to rule out the effects of individual educational attainment on health in this study.

In addition to this, another inclusion criterion was that the students of the chosen classes had earlier reported lower physical activity levels and higher levels of sedentary behaviors (e.g. sitting for long times) when compared to average values provided by the Finnish National School Survey. Health and physical activity are connected and have been suggested to have a dose-response causality (Zhang et al., 2020). Including only students from study tracks with lower physical activity in the sample, might also cause lower self-rated health and or a smaller variance of self-rated health, as it is connected to physical activity. This, in turn, could influence the effects sizes and statistical power in the sample, if the heterogeneity in self-rated health is decreased (Field, 2005, p. 79), influencing the results.

According to results from the Finnish cohort, health problems are associated with selection effects in education. Health problems can influence the educational choices of adolescents, with every type of health problem decreasing the likelihood of secondary education and further tertiary education (Mikkonen et al., 2020). In addition to this, it is possible that the inclusion criteria of the LMI trial, including study tracks with students who are less physically active, might bias the sample. Education tracks for occupations that require a lot of sitting and inactivity are likely to attract students that are not physically very active. The selection effect might then decrease the mean value and variance of physical activity in the sample, which might also decrease the self-rated health of the sample.

Another issue with the data could be the development of conscientiousness in the participants of the sample. Some studies indicate that there is a growth in conscientiousness during the transitioning from adolescence to adulthood (Leikas & Salmela-Aro, 2015), with the growth of conscientiousness suggested to be larger in those who choose a vocationally oriented path (Lüdtke et al., 2011). There might also be individual differences in the start of the growth of conscientiousness (Salmela-Aro et al., 2014). With some of the participants having already started the transition into adulthood and developed a higher conscientiousness, while others participants have not, this could influence the variance of the conscientiousness measurement, and thus the results of this thesis.

6.3   Implications for future research

There are many areas of research concerning these three variables that have not yet reached a consensus among specialists. As earlier studies have pointed out, the associations connecting conscientiousness, health and parental socioeconomic position are multifaceted, with many of them being bidirectional or have been indicated to form longer chains of variables acting as mediators and moderators (Hakulinen, Elovainio, Pulkki-Råback, et al., 2015; Mikkonen et al., 2020; Shanahan et al., 2014; Sutin et al., 2017). One reason for the results of this thesis being contrary to earlier studies might be unknown mediating and moderating effects.

One of the reasons for contradictory results regarding both the associations of parental socioeconomic position to offspring health and to offspring conscientiousness might be the moderating effects of the social, economic, political, and cultural context in which the data was gathered(Goodman, 1999; Huurre et al., 2003; Laaksonen et al., 2005; Rahkonen et al., 1997; Wickrama et al., 1998). The associations of the variables might be different in the US as they are in Finland and require further research.

For example, regarding parental socioeconomic position and health, the level of social security, access to health care, cost and access to education differs between the US and Finland, with basic, secondary and most of tertiary education being practically free of charge in Finland, whereas tertiary education is relatively expensive in the US. Another

difference that might influence the associations between parental socioeconomic position and health in Finland and the US is the unequal distribution of assets in these societies, with inequality being larger in the US than in Finland (Kondo et al., 2009). Research suggests that there might be a stronger association between income inequality and health in countries with larger Gini coefficients, a measurement of income inequality, and that there might be a small threshold effect regarding the association between income inequality and health (Kondo et al., 2009). Reaching a consensus on how income inequality influences health needs more research.

It is possible that, compared to the earlier studies, the contrasting results in this thesis regarding parental socioeconomic position and conscientiousness are connected to the context of the sample. The scope of earlier studies from this perspective is very limited as there is only one study from the Nordic countries (Flensborg-Madsen & Mortensen, 2014) with the majority of research conducted in other countries, such as the US and Germany (Damian et al., 2015; Kaiser & Diewald, 2014; Lechner et al., 2021). More research on the impact of societal context on the associations between parental socioeconomic position and offspring personality is needed.

Subjective Social Status, the measurement of adolescent socioeconomic position on individual level, is stronger linked to health in Finland and the northern Europe than in the US. In the US, a stronger association can be found between the parental socioeconomic position and adolescent health, than when compared to Finland. A stronger association in the US can be found to the parental socioeconomic position, than in Finland, where the Subjective Social Status has a stronger association with adolescent health (Quon & McGrath, 2014). The difference in the associations between the Subjective Social Status and adolescent health could be linked to the differences in current societal circumstances in Finland and the US. In Finland, the basic needs regarding health care and education are covered for every adolescent and young adult, which might cause them to not be influenced by parental socioeconomic position in the same way as in the US. These results are in line with my thesis, where an association between parental socioeconomic position and adolescent health was not found. The subject does need further research.

Other moderating variables of the associations might be for example age- or cohort-based. For example, as discussed in the prior research chapter, there might be indications of moderating cohort effects in research regarding parental educational attainment and offspring conscientiousness (Sutin et al., 2017). The results of the study suggest a longer parental education to be associated with higher levels of conscientiousness in offspring in the older cohorts, whereas longer parental education seems to be associated with lower levels of conscientiousness in recent cohorts (Sutin et al., 2017).

As the results of this thesis and most of the earlier results are of cross-sectional data, it is sometimes difficult to ensure the causality of the results. Longitudinal research could complement the cross-sectional data in confirming causalities and exploring changes in variables over time. In addition to this, the connections between the variables in this thesis are of complex nature and can thus be over-simplified by using statistical models, due to unknown mediators or moderators left outside the model. The increase the understanding of these complex relations in the future, both explorative research and studies that test earlier research are needed.

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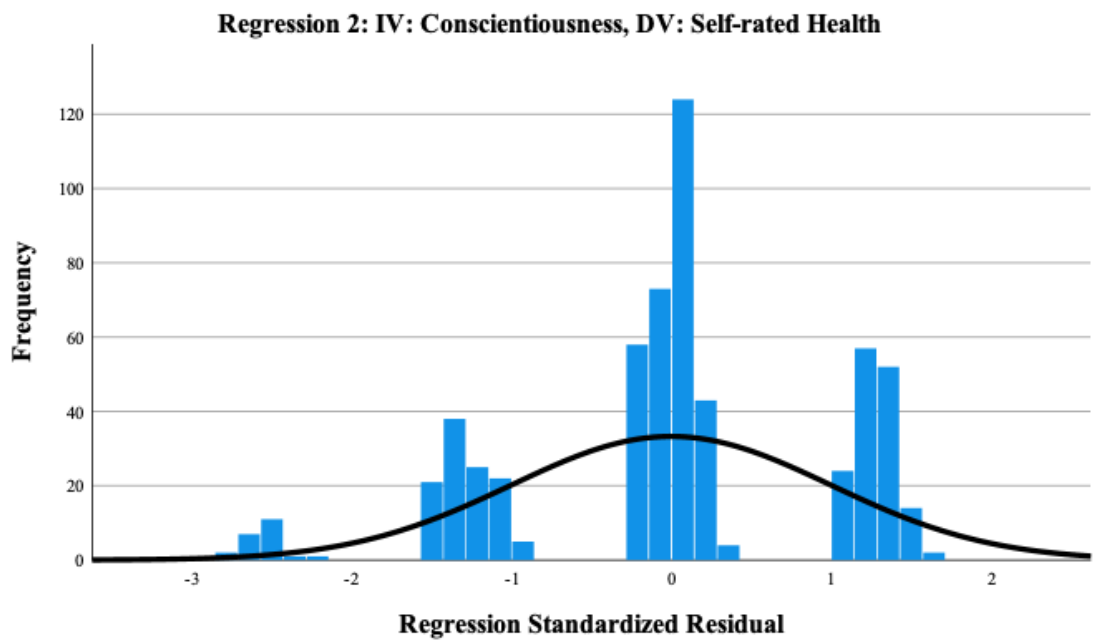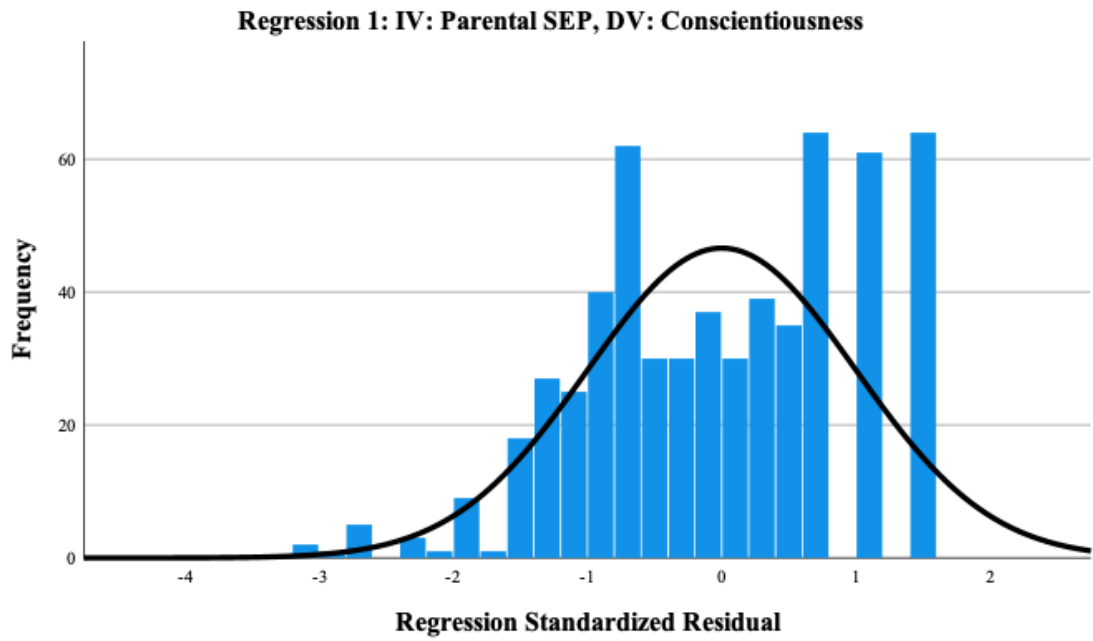
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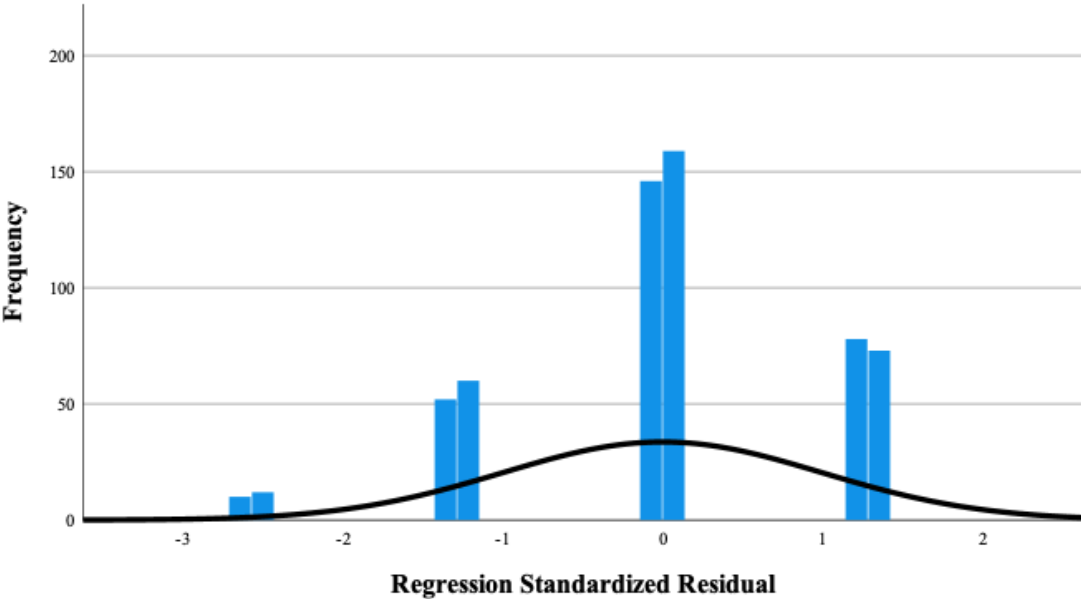
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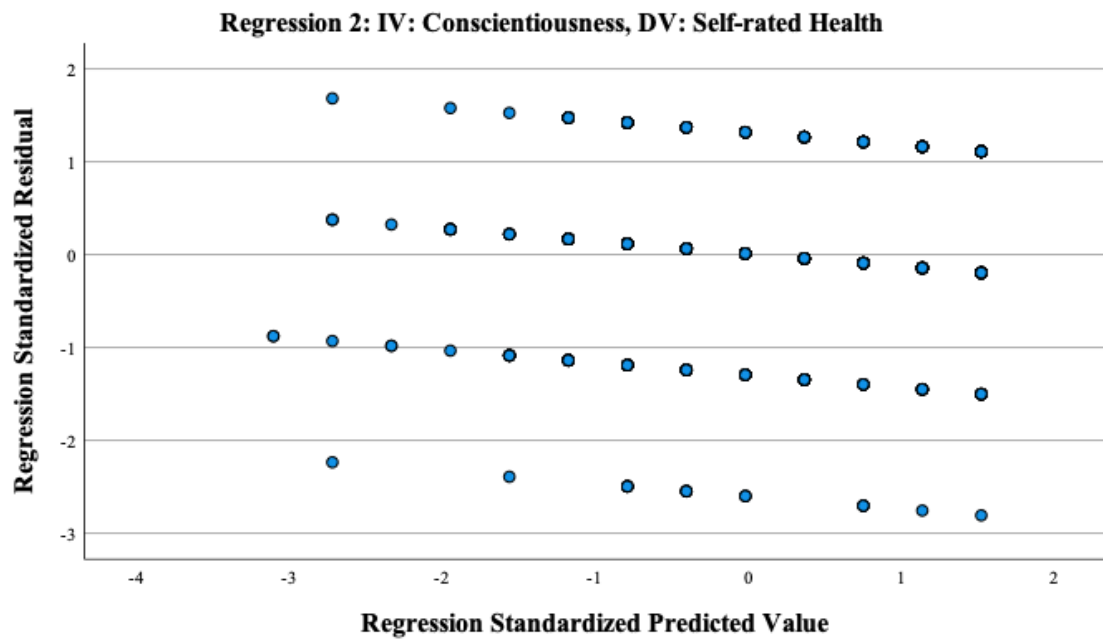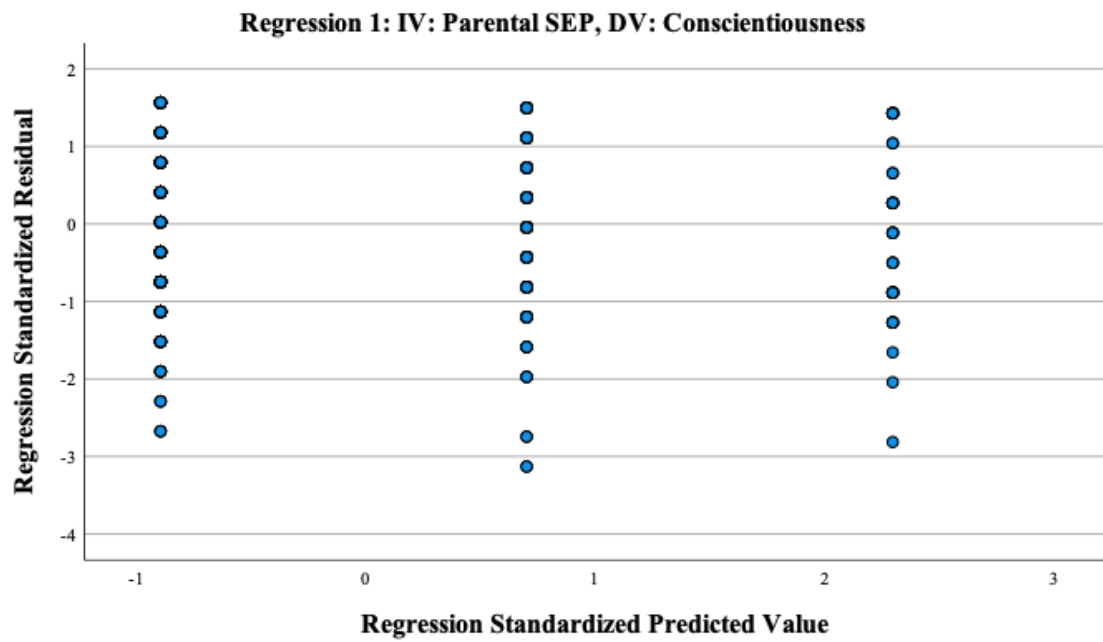
Regression 1: IV: Parental SEP, DV: Conscientiousness

Regression 2: IV: Conscientiousness, DV: Self-rated Health

Regression 3: IV: Parental SEP, DV: Self-rated Health

Regression 1: IV: Parental SEP, DV: Conscientiousness

Regression 2: IV: Conscientiousness, DV: Self-rated Health

Regression 3: IV: Parental SEP, DV: Self-rated Health