

**Childhood antecedents of socioeconomic and  
health-related disadvantage in adulthood: The role of  
behavioural factors and school performance**

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## ABSTRACT

Social exclusion, in general, is seen as a long-term process that is multidimensional and cumulative. It includes educational, occupational, social, normative and the exercise of power; the present study focused on the first three of these dimensions. They were chosen, because they are closely related to the other dimensions of exclusion (normative and the exercise of power) and because they were most relevant from the public health view. Particular interest was to find those less serious factors of the exclusion process that can still be influenced. Thus, the aim of the present study was to examine in two large population-based samples childhood and adolescence characteristics that may be involved in the process of educational, occupational or social exclusion. It was hypothesized that 1) social status among classmates is related to temperament and that social status is associated with higher self-esteem. Further expectations were that 2) disruptive childhood behaviour is associated with both poor school performance at comprehensive school and 3) a lower socioeconomic position in adulthood and that 4) poor school performance associates with obesity in adulthood.

The findings supported the hypotheses. Adolescent's self-perception of their social status in classroom was highly associated with social and general self-esteem, whereas the association with family self-esteem was lower in magnitude. It was shown that different aspects of self-esteem have a different impact on a person's social status in general. Disruptive childhood behaviour was associated with poor school performance throughout the school years, but its impact first started in middle childhood. Within these associations a gender-related difference was also found: hyperactivity was negatively associated with girls' school performance, while aggression was detrimental for boys' school success. Disruptive childhood behaviour further associated with educational and occupational status in adulthood, but it had no effect on income. Childhood aggression predicted educational and occupational status in adulthood, whereas hyperactivity only had an effect on education. A gender-related association was also found between poor school performance and adulthood obesity: poor school performance was a risk factor for women's health.

To sum up, it was shown that early behaviour and school performance are associated with later socioeconomic and health-related outcomes. These finding suggest that the roots of detrimental development can already be found in childhood. From the perspective of public health and its improvement, identifying those children at risk is highly relevant.

## TIIVISTELMÄ

Yleisesti sosiaalinen syrjäytyminen käsitetään moniulotteisena kasautuvana ja kehittyvänä ilmiönä. Tässä tutkimuksessa selvitettiin yhtäältä temperamentin ja itsetunnon yhteyttä sosiaaliseen statukseen ja toisaalta lapsuuden häiriökäyttäytymisen ja koulumenestyksen yhteyttä aikuisuuden matalaan sosioekonomiseen asemaan ja aikuisiän lihavuuteen. Jokaisen näistä mahdollisista yhteyksistä katsottiin edustavan syrjäytymisen eri dimensioita, eli koulutuksellista, ammatillista ja sosiaalista syrjäytymistä. Näitä dimensioita tutkittiin, sillä niiden katsotaan olevan läheisesti yhteydessä muihin dimensioihin, eli vallankäyttöön ja normatiiviseen syrjäytymiseen. Lisäksi nämä ulottuvuudet ovat kansanterveydellisestä näkökulmasta katsottuna merkittävimpiä.

Tutkimusaineistoina käytettiin kahta kansallisesti edustavaa aineistoa: Suomalainen Tutkimus Temperamentin ja Koulumenestyksen välisestä yhteydestä -aineistoa (N=4,255) sekä Lasten ja Nuorten Sepelvaltimotautiriski -aineistoa (N=3,596). Tutkimuksessa oletettiin, että 1) sosiaalinen status luokassa on yhteydessä temperamenttiin ja korkeampaan itsetuntoon. Lisäksi oletettiin, että 2) lapsuuden aikainen häiriökäyttäytyminen ennustaa huonompaa koulumenestystä ja 3) matalampaa sosioekonomista asemaa aikuisuudessa ja että 4) heikko koulumenestys ennustaa aikuisiän lihavuutta.

Tulokset tukivat oletuksia. Käsitös sosiaalisesta asemasta luokassa oli vahvasti yhteydessä sosiaaliseen ja yleiseen itsetuntoon kun taas vanhempiin liittyvällä itsetunnolla ei ollut merkitystä. Tulosten mukaan näyttäisi siltä, että itsetunnon eri aspekteilla on erilainen yhteys sosiaaliseen statukseen. Lapsuuden häiriökäyttäytyminen ennusti heikkoa koulumenestystä yli peruskoulun ja sen vaikutus alkoi keskilapsuudesta lähtien. Yhteyksien välillä löytyi sukupuolieroja: tytöillä hyperaktiivisuus ja pojilla puolestaan aggressiivinen käyttäytyminen ennusti huonoa koulumenestystä. Lapsuuden häiriökäyttäytyminen oli lisäksi yhteydessä aikuisiän koulutustasoon sekä ammattistatukseen. Aggressiivisen käyttäytymisen negatiivinen vaikutus ulottui koulutustasoon ja ammattistatukseen kun taas hyperaktiivisuudella oli yhteys vain ammattistatukseen. Sosiaalinen sopeutuminen näytti kuitenkin olevan merkityksellisin ammattistatukseen vaikuttava tekijä sillä yhteys säilyi merkitsevänä riippumatta vanhempien ammattistatuksesta ja muista häiriökäyttäytymisen ominaisuuksista. Lisäksi heikko koulumenestys ennusti aikuisiän lihavuutta, mutta ainoastaan naisilla.

Tulokset osoittivat, että lapsuuden häiriökäyttäytyminen ja koulumenestys ovat yhteydessä aikuisuuden matalampaan sosioekonomiseen asemaan ja aikuisiän lihavuuteen. Tulevaisuuden haasteena ja kansanterveydellisestä näkökulmasta katsottuna tärkeää on tunnistaa riittävän varhain ne lapset, joilla on ongelmia käytöksessä tai koulumenetyksessä.

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## LIST OF ORIGINAL PUBLICATIONS

This review is based on the following original publications. The original articles are referred to in the text with their Roman numerals I–IV.

- I Hintsanen, M., Alatupa, S., Pullmann, H., Hirstiö-Snellman, P., & Keltikangas-Järvinen, L. (2010). Associations of self-esteem and temperament traits to self- and teacher-reported social status among classmates. *Scandinavian Journal of Psychology*, *51*: 488–494.
- II Alatupa, S., Keltikangas-Järvinen, L., Hintsanen, M., Elovainio, M., & Keltikangas-Järvinen, L. (2013). Disruptive behaviour in childhood and socioeconomic position in adulthood: A prospective study over 27 years. *International Journal of Public Health*, *58*:247–256.
- III Alatupa, S., Pulkki-Råback, L., Hintsanen, M., Ravaja, N., Raitakari, O.T., Telama, R., Viikari, J.S.A., & Keltikangas-Järvinen, L. (2010). School performance as a predictor of adulthood obesity: a 21-year follow-up study. *European Journal of Epidemiology*, *25*: 267–274.
- IV Alatupa, S., Pulkki-Råback, L., Hintsanen, M., Mullaola, S., Lipsanen, J., & Keltikangas-Järvinen, L. (2011). Childhood disruptive behaviour and school performance across comprehensive school: A prospective cohort study. *Psychology*, *2*: 542–551.

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## ABBREVIATIONS

$\alpha$	Cronbach's alpha
$\beta$	Standardised beta coefficient
BMI	Body Mass Index (kg/m <sup>2</sup> )
CI	Confidence Interval
CSDH	Commission on Social Determinants of Health
CVD	Cardiovascular disease
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders (4 <sup>th</sup> edition, revised)
DOTS-R	Dimensions of Temperament Survey-Revised
EU-SILC	European Union Statistics for Income and Living Conditions
FTSA	Finnish Study of Temperament and Achievement
GLM	General linear modelling
GPA	Grade point average
M	Mean
n	Number of subjects
OR	Odds Ratio
ns	Non-significant
p	Probability
PAI	Physical Activity Index
r	Coefficient of Determination
r <sup>2</sup>	Coefficient of Determination
SD	Standard Deviation
SEKN	Social Exclusion Knowledge Network
SEP	Socioeconomic position
SES	Socioeconomic status
sr <sup>2</sup>	Semi-partial correlation coefficient
TABC-R	Temperament Assessment Battery for Children-Revised
WC	Waist circumference
WHO	World Health Organisation
YF	Young Finns Study

# 1 INTRODUCTION

Social exclusion has become an everyday topic of public debate in many European welfare countries, including Finland. In Europe social exclusion is used to describe several phenomena related to underprivileged educational, work and health conditions. Social exclusion and its possible consequences, such as alcohol and drug consumption and criminality, present a problem tangle that influences the entire society. Exclusion increases inequality between citizens and is a risk factor for internal safety. In the long-term, the expenses caused by exclusion represent a high priced burden for the whole of society, not to mention personal suffering. Recent calculations have shown that each excluded person costs society around 28,000 € a year, indicating an overall expenses (including social security, healthcare, and loss of tax revenue) of 1.4 million Euros during a period of forty years (e.g., 25-65 years) (Tikkanen, 2006).

One reason for social exclusion may be dropping out from educational and occupational career. Finnish statistics have shown that around 15% of each age cohort has no secondary education (Ministry of Education and Culture, 2012). In numbers, this means that approximately 110,000 20 to 29-year-old adults (70,000 of whom are men) have merely finished their comprehensive education (Ministry of Education and Culture, 2012). It has been estimated that from the same age group ca. 55,000 are not currently in working life. Moreover, the number of those under-educated youths outside both education and working life amounts to 40,000 individuals, of whom ca. 25,000 are outside all the statistics. This group constitutes the hard core of excluded persons who are neither in education nor at work or registered as job applicants. Consequently, the number of young adults at risk of being excluded from education and working life is alarmingly high.

In order to tackle the causes and consequences of social exclusion, numerous ongoing national projects have been launched over more than a decade. More recently, the Finnish Ministry of Employment and the Economy (Työ- ja elinkeinoministeriö, 2012) presented a government policy initiative with the emphasis on the reduction of social exclusion. The goals of the government policy initiative are 1) to offer each person freshly graduated from comprehensive school a

study place at a high school, vocational school, or workshop or an apprenticeship, rehabilitation or some other form of training and 2) to offer each under 25-year-old and each under 30-year-old freshly graduated student work, a trainee or study place or a place in a workshop or rehabilitation at the latest three months after becoming unemployed (Työ- ja elinkeinoministeriö, 2012). An allowance of 60 million euros per year has been allocated in order to carry out these goals and to examine the impact of the planned actions. These actions indicate that this problem is taken seriously at the national level. However, it is also of importance to focus on the possible factors that may lead to a negative educational and occupational career development. When more is known about the risk factors that contribute to the exclusion process at a population-based level, it will be possible to act at an early stage.

In the context of social exclusion, the role of educational career is indisputable, as it has a potential to pave the way for later occupational outcomes. Regarding later educational and occupational opportunities, in turn, the role of early school success is significant. Recent research has suggested several student-, teacher-, and school-related factors that are associated with educational outcomes. Underachievement, which refers to school performance that is under an individual's actual capacity, is one factor that may have long-term influence on later educational career. Several student, teacher and school related factors are known, in turn, to have an influence on underachievement.

From the student characteristics, intelligence, school bonding, and motivation have been associated with school performance. Studies have demonstrated that teachers' perception of student temperament may influence the school grades they give. It has continuously been shown that high distractibility (referring to the inability to concentrate and maintain perceptual focus despite extraneous stimuli), high activity (referring to the motoric activity) and low task persistence (referring to the inability to keep working on a task) are associated with poor academic outcomes measured by both standardized achievement tests and teacher-rated school grades (Alatupa, 2007; Hintsanen et al., 2012; Martin & Holbrook, 1985; Martin, 1989; Martin, Olejnik, & Gaddis, 1994; Rudasill, Gallagher, & White, 2010). In a Finnish population-based sample, associations have also been found between poor school performance (measured as grade point averages (GPAs), or grades in mathematics

and native language) and high impulsivity, high negative emotionality and a low positive mood (Alatupa, 2007; Hintsanen et al., 2012; Martin, 1989). It has further been shown that children with self-control problems (referring to impulsivity, low self-regulation and inattention-hyperactivity) are more likely to have poorer health, more financial problems and a higher risk of being convicted of criminal offences as adults (Moffitt et al., 2011).

In regard to teacher related factors, when teachers create an empathetic and motivating climate, it has a positive effect on students' task orientation (Bru, Stephens, & Torsheim, 2002), which, in turn, is known to have a positive impact on academic success (Wigfield & Cambria, 2010). In addition, students who experience positive interaction with their teachers are more motivated in their schoolwork (Stornes, Bru, & Idsoe, 2008) and are achieving better (Liem & Martin, 2011). On the contrary, students who show disruptive behaviour and cannot focus on their schoolwork may elicit negative reactions from their teachers (Brendgen, Wanner, & Vitaro, 2006).

Concerning school related factors, large class and school sizes have been shown to influence school performance negatively, especially among young children from lower socioeconomic groups and ethnic minorities (Blatchford, Goldstein, Martin, & Browne, 2002; Robinson & Wittebols, 1986; Robinson, 1990; Slavin, 1989). Little research has been conducted among older children, but in a Finnish population-based sample of adolescents (M=15 years), it was shown that boys are more likely to perform worse in large classes and large schools (Alatupa, Hintsanen, & Hirstiö-Snellman, 2011). It was not possible, however, to draw firm conclusion, as there were not enough large classes and schools in the aforementioned study. Further research is needed, as the national tendency is to form increasingly large classes and schools, especially for older children.

To sum up, several student, teacher, and school related factors may influence a student's school career throughout the school years. Research also indicates that a poor school career, once begun, is not easy to change (Entwisle, Alexander, & Steffel & Olson, 2005). Furthermore, poor educational and occupational opportunities often go hand in hand with poor health. Research has continuously shown that exposure to a low socioeconomic position (low educational level, occupational status and income) at any occasion during the lifetime is associated

with a higher risk of poorer health (Cohen, Janicki-Deverts, Chen, & Matthews, 2010) and premature mortality (referring to overall mortality and mortality caused by specific diseases) (B. Galobardes, Lynch, & Smith, 2004; B. Galobardes, Lynch, & Smith, 2008). Thus, early school experience and success may pave the way for the later educational and occupational career and even influence health later in life.

The focus of the present study was to examine those less serious early markers of social exclusion that are easier to influence. The study was conducted on two population based non-clinical samples where the subjects were followed from childhood into adulthood. Childhood and adolescent behaviour were examined as possible factors involved in the process of educational and occupational career development. A further interest was to examine the association between early school success and health-related disadvantage in terms of obesity in adulthood. Each of the possible associations between early life factors and educational, occupational or health-related consequences in adulthood is considered as part of a multidimensional, long-term process of social exclusion.

## **1.1 Definition of social exclusion**

Social exclusion has become a central political topic, and its consequences are a public health concern in many European countries. Despite the widespread use and the publicity the topic attracts, there is neither a generally accepted definition nor a consensus on how to use the term. It seems that its meaning depends on the context in which it is used. From the perspective of policy, social exclusion is mainly used to describe a state in which people or groups are excluded from society and live in extreme poverty and disadvantage.

In the scientific literature the term social exclusion has not yet become established, probably due to many difficulties related to the measurement of the phenomenon. The Social Exclusion Knowledge Network (SEKN), which is one of the nine Global Networks of the Commission on Social Determinants of Health (CSDH) and established by the World Health Organisation (WHO) (Popay et al., 2008), has summarized the problems related to the measurement of social exclusion. One measurement problem is linked to the fact that there are no general indicators that would have a similar meaning in different regions and countries around the

world. Second reason is that most of the available indicators measure the state of exclusion instead of taking into account that exclusion is a phenomenon that develops as a process. The third reason is related to the difficulty of distinguishing which are the causes and which are the consequences of exclusion. Finally, another problem relates to the measurement of the associations between social exclusion and health outcomes.

There are, however, some theoretical perspectives, which define social exclusion as a multidimensional and cumulative long-term process. The SEKN defines social exclusion as *“Dynamic, multidimensional processes driven by unequal power relationships interacting across four main dimensions: economic, political, social and cultural and at different levels including individual, household, group, community, country and global levels. It results in a continuum of inclusion/exclusion characterized by unequal access to resources, capabilities and rights which leads to health inequalities”* (Popay et al., 2008).

Two other notable definitions of social exclusion have been developed by social and educational scientists. What these definitions have in common is that social exclusion is understood as a long-term process between an individual and society. According to Jyrkämä (Jyrkämä, 1986), exclusion can be divided into five dimensions: 1) educational, 2) industrial, 3) social, 4) related to the exercise of power, and 5) normative. Each of these dimensions is further explained by dimension specific domains, contents, mechanisms, causes and background, and consequences.

Takala (Takala, 1992) explains exclusion as a process with different phases. The first phase is characterized by difficulties at school, home and other social environments, followed by school dropout or underachievement, i.e., school achievement that is below an individual's actual capacities, in the second phase. This leads to worsened labour-market opportunities in third phase and total exclusion (including shunning work, criminal behaviour, problems with alcohol use, dependence on social welfare and social isolation) in fourth phase. The last phase (the fifth phase) is characterized by hospitalization or segregation from society. According to Takala (Takala, 1992), educational and occupational exclusion are strongly associated with other forms of exclusion, that is, social exclusion, the exercise of power and normative exclusion.



In the context of social exclusion, Takala also refers to “school allergy”, which refers to young people (aged 16-20) who have abandoned comprehensive or vocational school and have no work place because of their lack of education (Takala, 1992). A person suffering from school allergy is characterised by having no educational interests and a difficulty in specifying their own interests or skills in regard to themselves or others. In consequence, exclusion from society already begins during their school years (Takala, 1992). A person excluded from society will face problems in all of the abovementioned dimensions of exclusion (Jyrkämä, 1986) causing an immeasurable amount of individual suffering and expense for the entire society.

In regard to age, the debate on social exclusion mainly concerns the adult population. It has been suggested that among younger individuals it is more appropriate to refer to the risk of becoming excluded (Järvinen & Jahnukainen, 2001). As mentioned above, several person and environment related factors may contribute to this detrimental development. In order to influence this development, it is necessary to examine possible risk factors that may be associated with it. Identifying and tackling early life factors that contribute to social exclusion may have public health significance.

The focus of the present study is to examine childhood and adolescence characteristics that may be involved in the exclusion process in terms of educational, occupational or health-related development. The possible associations between childhood and adulthood factors are considered to represent the different dimensions (i.e. educational, occupational or social) of the exclusion process. These dimensions are also closely related to the other dimensions of social exclusion, that is, with the exercise of power and normative exclusion (Takala, 1992).

## **1.2 Individual characteristics underlying educational and occupational pathways**

### **1.2.1 Temperament and self-esteem in association with academic and social outcomes**

Personality related factors may have an impact on educational and social outcomes later in life. One of these elements is temperament, which refers to biologically rooted individual differences that are present early in life and are relatively consistent over time. Although there are a variety of theories on temperament, almost all approaches agree that temperament consists of two major aspects: the intensity of emotional reactions and the capacity of self-regulation (Rothbart & Jones, 1998). Temperament tells us *how* a child behaves in reaction to social, novel or frustrating situations (Bates, 1987; Kohnstamm, 1986). However, temperament does not explain *why* a person does what he does or what the motives or abilities are. Neither does temperament explain *what* a person actually does.

According to Caspi (Caspi, 1998), temperamental qualities affect a child's development in at least six ways. Temperament has an effect on how a child 1) learns, 2) perceives the environment, 3) selects the situations she/he wants to engage with, 4) manipulates the environment, 5) affects the reactions from the environment, and 6) compares her/himself to others. It appears that temperament is involved in any communication that occurs between people.

While a school-aged child is still learning to cope with the environment and its demands, there are numerous situations in which temperamental tendencies and the demands of the environment may collide. Within the school environment, certain behaviour is no longer appropriate and certain behaviour is expected: a student is ought to sit still and listen to what the teacher says. A student, who cannot concentrate and behaves impulsively within a class misses the lesson and gets worse grades than a student who is so able. This behaviour also affects the way the teacher perceives the child. At this point, the role of goodness of fit becomes relevant. This phenomenon describes the compatibility or incompatibility of the environmental demands with a person's temperament (also abilities and other personality characteristics) resulting in goodness of fit versus poorness of fit, respectively (Chess & Alexander, 1996).

Even though temperament is only marginally related to intelligence, abilities and cognitions, it is known to have far-reaching effects on children's academic success (Guerin, Gottfried, Oliver, & Thomas, 2003; Keogh, 2003). Temperament may affect school performance in at least two ways. First, temperament may affect school success through its effect on task orientation, which is a constellation of several temperament features that has been associated with learning (Bramlett, Scott, & Rowell, 2000; Bruni et al. 2006; McGee, Prior, Williams, Smart, & Sanson, 2002; Mulla et al. 2010). Pupils with low task orientation are high in activity, easily distracted from the task at hand, and give up their task easily (low in persistence), and they are likely to underachieve at school, that is, to perform below their capacities (Keogh, 1983; Martin, 1989). Second, temperament plays a significant role in teachers' conceptions and attitudes toward the student, thereby affecting the student-teacher relationship (DiLalla, 2004) and even the way they teach the student (Keogh, 1998). The most important temperamental characteristics in this sense are negative emotionality/reactivity and social flexibility, also called sociability. Students high in negative emotionality are likely to be intense, emotional and irritable. Typically, teachers dislike such students, rate them as immature and difficult to deal with, and spend less time with them (eg., Alvidrez & Weinstein, 1999; DiLalla, 2004; Keogh, Pullis, & Cadwell, 1982; Kornblau, 1982). In contrast, social flexibility consists of a positive mood and high adaptability, and such individuals are rated by teachers as likeable and teachable (Keogh et al., 1982).

In addition to the teacher's perceptions and the student's academic success, temperament also affects peer relations and the student's social standing within the class. A sociometric approach is used to examine students' social preference (social likeability) and social impact (the extent to which they are liked or disliked by their peers) among classmates (e.g. Coie, Dodge, & Coppotelli, 1982). Social impact refers to a student's like and dislike (from which a sum is calculated) of another peer, whereas social preference refers to the result of the liking score minus disliking score nominations (Peery, 1979). As a result, five different categories can be composed: popular, controversial, rejected, neglected and average. Popular children generally get lots of positive feedback and only a little negative feedback, whereas for rejected children it is the other way around. Average children are rather neutral, they have average amount of both positive and negative feedback. Neglected

children receive neither positive nor negative feedback whereas controversial children get most of both extremes (least and most liked).

In regard to temperament and social status, recent research has found that rejected children show higher levels of activity and distractibility, and they are lower in persistence than popular children (Walker, Berthelsen, & Irving, 2001). Similarly, highly aggressive, less sociable and more withdrawn children have been found to be more neglected than their popular classmates (Newcomb, Bukowski, & Pattee, 1993). Highly aggressive children are likely to be rejected by their peers, but at the same time they are accepted by their peers. This association has even been found among kindergarten (Estell, 2007) and preschool aged children (Johnson, Ironsmith, Snow, & Poteat, 2000).

Temperament also relates to a student's self-esteem (Klein, 1992) and social competence (Corapci, 2008). Self-esteem describes one's social competence, which is a larger construct including both social status and social functioning. Along with the Theory of Sociometry of Self-esteem (Leary & Baumeister, 2000), self-esteem is mainly formed in social interactions. Regarding the theory, the main function of self-esteem is to monitor one's social position and motivate behaviours that promote acceptance. Thus, self-esteem is an indicator of one's value within a social group (Leary & Baumeister, 2000).

Social competence can be seen as the organizing construct of those general characteristics, i.e., transactional, context-dependent and goal-specific (Rose-Krasnor, 1997). In general, these approaches are operationalized as social skills, sociometric status, relationships and functional outcomes (for a review see Rose-Krasnor, 1997). In the present study, the focus was on examining the associations between self- and teacher-rated social status and self-esteem and temperament.

### **1.2.2 Disruptive childhood behaviour predicting academic and social outcomes**

Disruptive childhood behaviour may be another risk factor for disadvantaged educational and occupational career development. Disruptive behaviour is a composite of negativistic externalizing behaviours that co-occur in childhood. The characteristic for disruptive behaviour is impulsivity, inattention, over-activity, and

antisocial acts. Disruptive behaviour is likely to persist over time, and it tends to manifest even before the child starts schooling (Hinshaw, 1992b). Furthermore, the cognitive elements of disruptive behaviour, i.e., hyperactivity, inattention, and impulsivity are close to the temperamental characteristics of activity (referring to the vigor and tempo of motor activity), distractibility (referring to the ease by which a person is distracted by low-level environmental stimuli), and impulsivity (referring to the tendency to act before thinking), respectively.

Disruptive childhood behaviour has been shown to be associated with poor educational career and social outcomes in several longitudinal studies. Childhood disruptive behaviour has been related to lower reading ability (Berger, Yule, & Rutter, 1975; Heiervang, Stevenson, Lund, & Hugdahl, 2001), poor school performance (Hinshaw, 1992a; Hinshaw, 1992b; Tremblay & Masselink, 1992), and underachievement, i.e., achievement that is below one's actual capacities (Alexander, Entwisle, & Horsey, 1997; Asendorpf, Denissen, & van Aken, 2008; F. Vitaro, Larocque, Janosz, & Tremblay, 2001). Disruptive behaviour is also associated with higher school dropout rates (Alexander et al., 1997; Asendorpf et al., 2008; Bradshaw, Schaeffer, Petras, & Jalongo, 2010; F. Vitaro et al., 2001; F. Vitaro, Brendgen, Larose, & Trembaly, 2005), and lower college attendance rates (Hinshaw, 1992b).

Disruptive childhood behaviour is also related to poor health and social outcomes later in life. Disruptive children are more likely to start smoking (Otten, Wanner, Vitaro, & Engels, 2009) and consume alcohol as teenagers (King, Iacono, & McGue, 2004) as well as in adulthood (Englund, Egeland, Oliva, & Collins, 2008). In adulthood, they also have a tendency to develop psychiatric disorders such as anxiety and antisocial personality disorders (Sourander et al., 2007), and they are at a higher risk of committing criminal offences (Sourander et al., 2006).

Additional evidence on the risk-proneness of disruptive behaviour emerges from studies that have used externalizing (aggression, impulsivity), undercontrolled (impulsiveness, irritability, restlessness, emotional lability, low task persistence), explosiveness (temper tantrums), and lack of emotional control (aggression, compliance, lability, anxiety, passivity, stability, constructiveness, activity) for similar purposes. Externalizing behaviour is known to predict substance abuse (King et al., 2004), and antisocial (Sourander et al., 2007), and delinquent behaviour later

in life (Sourander et al., 2006). Externalizing behaviour in childhood also associates with a higher risk of injury in adulthood (Jokela, Power, & Kivimäki, 2009), and it is even related with a higher risk of premature death before the age of 50 (Jokela, Ferrie, & Kivimäki, 2009). Children with explosive behavioural styles also tend to have poor life course patterns, i.e., their lives are likely to be characterized by downward occupational mobility, irregular working lives and poor choices in social-life as adults (Caspi, Elder, & Bem, 1987). Low childhood self-control is directly associated with school maladjustment in adolescence and long-term unemployment in adulthood, and it is also indirectly related via problem drinking and poor occupational alternatives (Kokko & Pulkkinen, 2000; Kokko, Pulkkinen, & Puustinen, 2000). In addition, lack of control in childhood is associated with externalizing behaviour problems in adolescence (Caspi & Henry, 1995), with adjustment problems and social difficulties (Newman, Caspi, Moffitt, & Silva, 1997), as well as with psychiatric problems, such as disordered gambling (Slutske, Moffitt, Poulton, & Caspi, 2012) in adulthood.

Gender differences are observed in epidemiological studies in regard to the prevalence of externalizing disorders, i.e., conduct disorder (CD), oppositional defiant disorder (ODD), and attention-deficit/hyperactivity disorder (ADHD). The prevalence of behavioural disorders is reported to be 2 to 4 fold higher among boys (Frick & Dicknes, 2006). Girls and boys show rather equivalent rates before school age, but by school age males are overrepresented (Boylan, Vaillancourt, Boyle, & Szatmari, 2007; Loeber, Burke, Lahey, Winters, & Zera, 2000). In adolescence, both girls and boys show dramatic increase of ODD and CD (Loeber et al., 2000; Silverthorn & Frick, 1999). The peak of externalizing behaviour is reached by early adulthood, whereafter a steady decline is observed in both gender groups (Hicks et al., 2007).

Despite numerous studies into disruptiveness and school performance, few studies have examined the effect of disruptive behaviour on school performance at an early age, i.e., before school entry (Vitaro et al., 2005). Similarly, even though the association between hyperactivity, with or without formal diagnoses of ADHD, and poor school performance is well established (Loe & Feldman, 2007), studies examining the association between preschool hyperactivity and later school performance are lacking (Spira & Fischel, 2005). In addition, it has been pointed out

that there is a need for studies examining these associations in community based samples including children with hyperactivity symptoms but without a formal diagnosis of ADHD (Loe & Feldman, 2007).

To sum up, personality related factors, such as temperament and disruptive behaviour, may determine why an individual drifts into certain educational and social pathways. Disruptive behaviour not only causes educational difficulties and educational exclusion but also social dropout in terms of alcohol abuse and long-term unemployment. Thus, examining disruptive childhood behaviour as a potential risk factor for educational and occupational related outcomes in adulthood becomes relevant.

The present study focused on the associations between disruptive behaviour and school performance throughout the compulsory school years. A further point of interest was to examine the associations between disruptive behaviour and adulthood socioeconomic position (subsequently abbreviated as SEP). To date, little is known about how the different dimensions of disruptive behaviour (aggression, hyperactivity, and social adjustment) are associated with different socioeconomic outcomes in terms of educational level, occupational status and income.

### **1.2.3 School performance and academic outcomes**

Not only does school performance plays an important role in a child's present life, but it also affects later educational and occupational career choices. Previous research demonstrates that poor school performance is likely to persist over time and that it is difficult to change a vicious circle once it has begun (Entwisle et al., 2005). Poor school performance may thus present a risk factor, as by the end of compulsory education poor school performance may hinder from student's transition to upper-secondary education.

Indeed, poor school performance has been shown to predict several educational and social outcomes later in life. It has been associated with low educational levels and low work performance (Kuncel, Credé, & Thomas, 2005), unemployment (Kokko, Bergman, & Pulkkinen, 2003), detrimental health behaviour (Lynch, Kaplan, & Salonen, 1997), such as smoking (Bryant, Schulenberg, Bachman,

O'Malley, & Johnston, 2000), and excessive alcohol (Huurre et al., 2010; Pitkänen, Kokko, Lyyra, & Pulkkinen, 2008) and drug consumption (Fothergill et al., 2008).

Previous research has shown that school performance tends to be transferred from generation to generation. In Finland, mother's educational level explains 38% of child's school performance while father's level of education explains 32% of a child's school performance. Previous research has continuously shown that children from low socioeconomic backgrounds and ethnic minorities on average tend to perform worse in school (Heyneman, 2005). However, in a recent review Heyneman suggested that while social status consistently influences school performance, children from poor families do not necessarily perform poorly at school (Heyneman, 2005). Heyneman further concluded that the reasons why certain children perform poorly at school are more complicated. Among others, school performance is influenced by several school related factors and by age and gender (Heyneman, 2005). Indeed, it is a well known fact, that in general girls perform better than boys in several countries, including Finland (e.g. (D. Epstein, Elwood, Hey, & Maw, 1998; L. H. Epstein, Wu, Paluch, Cerny, & Dorn, 2000; Opetushallitus, 2004; Van Houtte, 2004).

There are several other factors that are also associated with school performance, too. From school related indicators, large classes and schools negatively influence school performance especially among the youngest children (Goldstein, Yang, Omar, Turner, & Thompson, 2000; Robinson & Wittebols, 1986; Slavin, 1989), and among those from low social status families and ethnic minorities (Blatchford & Mortimore, 1994; Blatchford & Mortimore, 1994; Blatchford et al., 2002; Robinson & Wittebols, 1986; Robinson, 1990; Slavin, 1989). There is a lack of studies among older students, but within a national study it was shown that boys tend to perform worse in large classes and large schools than girls (Alatupa et al., 2011).

The evidence further shows that school performance is strongly affected by teachers' perceptions of a student's temperament. It has been repeatedly shown that high distractibility (referring to the inability to concentrate and maintain perceptual focus despite extraneous stimuli), high activity (referring to motor activity) and low task persistence (referring to the inability to keep working at a task) are associated with poor academic outcomes measured by both standardized achievement tests and teacher-rated school grades (Alatupa, 2007; Hintsanen et al., 2012; Martin &



Holbrook, 1985; Martin, 1989; Martin et al., 1994; Mullola et al., 2010; Mullola et al., 2011; Mullola et al., 2012; Rudasill et al., 2010)

The quality of student-teacher interaction has also shown to be significant in students' educational career development. It has been found that children (aged 6-years) who are bullied, referring to verbal abuse, by their teachers are less likely to have a school graduation certificate at the age of 23, after controlling for childhood antisocial behaviour, anxiety, school performance and social preference in the peer group among girls and behaviour problems among both genders (Brendgen, Bukowski, Wanner, Vitaro, & Tremblay, 2007). In contrast, positive interactions between teachers and students may have positive effect on students' school performance, general self-esteem and well-being (Liem & Martin, 2011),

School performance is an early predictor of a person's later socioeconomic position. Socioeconomic position (SEP) refers to an individual's social standing within the social hierarchy, and it provides information about an individual's access to social and economic resources (Galobardes, Lynch, & Smith, 2007; J. Lynch & Kaplan, 2000). Research has shown that SEP is strongly associated with quality of life, health and longevity. These associations have been shown to be true with various SEP indicators, i.e. factors including information about education, occupation and income (Lynch & Kaplan, 2000). In a recent review the authors concluded that early childhood low socioeconomic status is moderately associated with later cardiovascular risk (CVD) factors (lower levels of physical activity, higher levels of smoking and alcohol consumption, elevated Body Mass Index (BMI) or Weight Height Ratio (WHR)), CVD morbidity and mortality (Pollitt, Rose, & Kaufman, 2005). In this review, consistent support was also found for the accumulative impact of negative SES experiences or conditions on CVD risk over the life course (Pollitt et al., 2005). Later research has consistently supported inverse associations between low socioeconomic status in childhood and health in later life (e.g., Albus, 2010; Hiscock, Bauld, Amos, Fidler, & Munafò, 2012; Raat et al., 2012; Stringhini et al., 2012).

In light of this evidence, poor school performance seems to play an important role in life-course development. Poor school performance may be the first marker of school dropout, but it is also an indicator of detrimental health behaviour in later life.

#### **1.2.4 School performance and health outcomes**

Our health and longevity is known to be affected by the way we stand relative to others in the social hierarchy. Research has continuously shown that people with low levels of education and fewer social and financial resources are more likely to display behaviour that is detrimental to their health (Lynch & Kaplan, 2000). Poor health behaviour, which tends to be transferred from generation to generation (J. W. Lynch et al., 1997), refers to low physical activity, poor diet and higher levels of cigarette and alcohol consumption. Each of these behavioural styles is associated with a higher risk of cardiovascular disease (CVD), which further associated with higher rates of mortality (Pollitt, 2005). According to the World Health Organisation (WHO), in 2008 alone, 17.3 million people worldwide died of CVD and more than 80% of those deaths occurred in low- and middle-income countries (WHO, 2011).

Obesity and overweight, which represent a serious global health threat among different generations (WHO, 2007), are strongly related with heightened CVD risk. Obesity is known to be an etiological factor in serious chronic diseases such as type 2 diabetes (Must et al., 1999), heart disease and hypertension (Field et al., 2001), certain types of cancers (McMillan, Sattar, & McArdle, 2006), psychological malfunctioning (Mokdad et al., 2003; Pulkki-Råback, Elovainio, Kivimäki, Raitakari, & Keltikangas-Järvinen, 2005), accelerated aging, and increased risk of premature death (Roth, Qiang, Marbán, Redelt, & Lowell, 2004). Since early last century, the number of obese adults has increased rapidly in both developed and developing countries (Caballero, 2007). In European countries, the prevalence of obesity among adults varies between 7 and 45% (Berghöfer et al., 2008).

Even though several early-life risk factors have been identified as etiological causes for later obesity (Parsons, Powers, Logan, & Summerbell, 1999), not much is known about the role of the timing or duration of different early-life factors in later obesity (Power & Parsons, 2000). One of the most robust indicators of adulthood obesity is exposure to socioeconomic disadvantage in childhood (Parsons et al., 1999). A disadvantaged socioeconomic environment is also reflected in students' poor school performance (Heyneman, 2005), which, in turn, is related to obesity (Taras & Potts-Datema, 2005). A child's performance at school may thus provide an important link between early-life factors and adulthood obesity. In regard to social exclusion, examining those early life factors related to adulthood health, such as

obesity, is highly important from the public health perspective. In the present study, the focus was on examining how school performance throughout comprehensive school is associated with weight gain and obesity in adulthood.

## **2 AIMS OF THE STUDY**

The aim of the present study was to examine the early life factors that may influence the process of social exclusion. The possible associations between early life factors and educational, occupational or social exclusion were examined during different periods over the life course. The study was conducted in two population-based samples.

The conceptual framework of the study is presented in Figure 1 (page 30). The conceptual framework of the study suggests that each of the predictive factors, that is, childhood behaviour (in terms of disruptive behaviour), personality in adolescence (in terms of temperament and self-esteem) and school performance (for over nine years covering the whole of comprehensive education) are associated with either the educational, occupational or social dimension of the exclusion process. The data enabled the examination of these possible associations in the developmental phases of childhood, adolescence and adulthood in two population-based samples. Table 1 (on page 31) presents the research questions within the studies I-IV, and a more detailed description of each study is presented in the text below.

### **Study I**

In a cross-sectional study, self-rated and teacher-rated social status among classmates in relation to different aspects of self-esteem and temperament was examined. Moreover, the associations between self-esteem and social status were studied while controlling for temperament and vice versa. It was expected that social status among classmates is related to temperament traits. Furthermore, higher social status was expected to be associated with higher self-esteem.

### **Study II**

The aim of the second study was to examine whether the different components of disruptive behaviour in adulthood are associated with different socioeconomic position (SEP) outcomes, i.e., educational level, occupational status and income, in adulthood. It was assumed that high levels of aggression and hyperactivity and lower

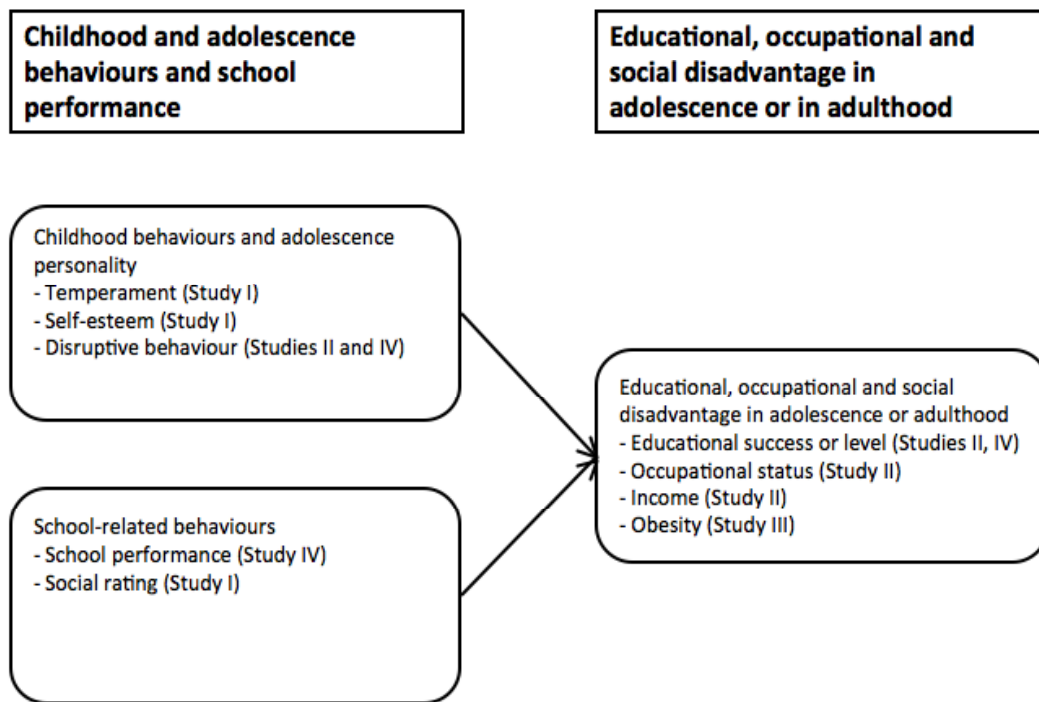
levels of social adjustment are related to lower SEP outcomes in adulthood. We also examined whether disruptive behaviour in childhood is associated with upward or downward social mobility by comparing the participants' adulthood socioeconomic position with that of their parents.

### **Study III**

The aim of the third study was to prospectively examine the association between school performance, in terms of grade point averages (GPAs), in early and middle childhood and weight gain and adulthood obesity. The hypothesis was that lower GPAs related to a higher risk of becoming obese in adulthood. Additionally, we expected that this association would be stronger among women. Furthermore, the changes in GPAs were expected to be stronger among these participants who were obese in adulthood.

### **Study IV**

The aim of this study was to examine the association between disruptive behaviour in childhood, in terms of aggression, hyperactivity and social adjustment, and GPAs on three different occasions. The hypothesis was that disruptive behaviour is related to lower GPAs throughout the whole of comprehensive school. It was further expected that hyperactivity would be more strongly associated with school performance in early school years, whereas aggression would be more relevant at a later age. Girls and boys were studied separately, as gender differences have been found both in school performance and in the prevalence of disruptive behaviour.



**Figure 1.** The conceptual frame of the study.

Table 1. Study Cohort, Research Questions, and the Study Variables During the Different Phases

Study cohort	Research Question	Examination year						
		1980	1983	1986	1989	2001	2005	2007
I FTSA	Are there associations between student's temperament and self-esteem with student's self-rated and teacher-rated social status among classmates?						Self-rated: Temperament Self-esteem Social status	
							Teacher-rated: Social status	
II YF	Is there an association between childhood disruptive behaviour and adulthood SEP?	Parental report of disruptive behaviour						Education Occupational status Income
		GPA	Parent with highest education, occupational status and income					
III YF	Does school performance in early and middle childhood predict adulthood obesity?	GPA	GPA	GPA	GPA	GPA	BMI	
		Maternal years of education	Maternal years of education	Childhood BMI	Childhood BMI	Childhood BMI	WC	PAI
IV YF	Does childhood disruptive behaviour associate with school performance over the comprehensive school?	BMI of both parents						
		Disruptive behaviour	Disruptive behaviour	GPA	GPA	GPA	GPA	

FTSA = Finnish Study of Temperament and Achievement; YF = Young Finns Study; GPA = Grade point average; BMI = Body Mass Index; WC = Waist Circumference; PAI = Physical Activity Index

## 3 METHODS

### 3.1 Outline of the study and the samples

This study consists of four studies conducted using two databases:

- 1) The Finnish Study of Temperament and School Achievement (FTSA) (Study I)
- 2) The Young Finns study (YF) (Studies II, III, and IV).

The final number of participants varies between Studies I-IV, as the participants included in the studies were required to have complete data for all study variables. There were 3941, 782, 732 and 973 participants in Study I, Study II, Study III, and Study IV, respectively (Table 2).

**Table 2.** Number of Participants in the Individual Studies

Study	Study Population	Number of Participants	Age (Years)						
			1980	1983	1986	1989	2001	2005	2007
I	FTSA	3941						15	
II	YF	782	3-9						30-36
III	YF	732	6-9				27-30		
IV	YF	973	3-9			12-15			

FTSA = Finnish Study of Temperament and Achievement; YF = Young Finns Study

#### 3.1.1 Design and selection of the study population in the Finnish Study of Temperament and School Achievement

Participants from Study I were derived from the Finnish Study of Temperament and School Achievement (FTSA), which is a nationally representative sample of upper-comprehensive school students. A geographically representative sample of upper-comprehensive schools was compiled in the years 2005-2006. For this, Finland was divided into five provinces with a total of 636 schools, and from each province, 10% of the Finnish-speaking schools were randomly selected. If the educational board of a school refused to participate, the next randomly selected school in that province was selected. As a result, 64 schools, giving a total of 5,292 students attending 9<sup>th</sup>



grade, were sampled. All students voluntarily completed a test battery during regular class sessions. Valid data were obtained from 4,255 students, and there were no systematic reasons for dropout. Swedish-speaking schools and special schools were excluded from the study. The mean age of the participants was 15.1 years ( $SD = 0.38$ ). The sample had an equal number of girls (50.0%) and boys (50.0%).

In addition to the students, their teachers were asked to participate as additional raters. From a total of 274 teachers (74.8% females, 25.2% males, mean age 45.0 years), 259 were included in the final data of the current study. The teachers were not paid for their contribution.

Participants from whom information on all study variables could be collected formed the final sample of Study I, with a total of 3,941 participants. Required information consisted of self-reported temperament, self-esteem and social status, and teacher-rated temperament and social status.

### **3.1.2 Design and selection of the study population in the Young Finns study**

Participants in studies II, III, and IV were selected from the Young Finns study (YF), which is a nationally representative, randomly selected sample of 3,596 healthy children and adolescents from six age cohorts (3, 6, 9, 12, 15, and 18 years at the baseline) that have been followed for 27 years (since 1980). Based upon the location of university cities with a medical school, Finland was divided into five areas (Helsinki, Kuopio, Oulu, Tampere and Turku). In each area, 360 urban boys and girls and 360 rural boys and girls were randomly selected on the basis of information obtained from the personal Social Insurance Institution's population register, which covers the whole of Finland's population. Complete details of the study are given by Raitakari (Raitakari et al., 2003). The study plan was approved by the local committees of all the participating universities, and the study protocol of each study phase corresponded to the proposal by the World Health Organization (WHO). The study was conducted in accordance with the Helsinki declaration. Written informed consent was obtained from each participant.

## **3.2 Measures**

### **3.2.1 Temperament (Study I)**

Self-report information was collected from students using two different temperament measures. Five scales from the Temperament Assessment Battery for Children (TABC-Revised; Martin & Bridger, 1999) were used: Inhibition (eight items; tendency to be cautious or hesitant in social or novel situations), Persistence (five items; level of continued engagement with tasks over time), Negative Emotionality (eight items; tendency to be easily irritated, angry, or upset), Activity (six items; tendency to engage in motor activity) and Impulsivity (ten items; an aggregate of the degree to which the child can control behaviour, emotion and attention). Some of the items of TABC-Revised were slightly modified to be more age appropriate for the current participants. The internal reliabilities were  $\alpha = 0.83, 0.60, 0.65, 0.51$  and  $0.62$  for the scales, respectively. The reliabilities were rather low, but these scales have been tested for construct validity (Hintsanen, 2012; Mullola, 2011) and predictive validity in relation to similar constructs.

Additionally, two scales from the Revised Dimensions of Temperament Survey (Windle & Lerner, 1986; Windle, 1992) were applied: Mood (seven items; tendency to frequently experience positive emotions and the amount of pleasant and friendly behaviour in various situations) and Distractibility (five items; tendency to be distracted and to easily shift perceptual focus). The internal consistencies of the scales were  $\alpha = 0.91$  and  $0.72$ , respectively. All items were answered on a five-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Temperament and self-esteem scores were only calculated for those participants who had answered at least to 50% of the items of a scale. Others were excluded from the analyses.

### **3.2.2 Self-esteem (Study I)**

The students filled in the shortened Finnish version of the Coopersmith Self-Esteem Inventory (Coopersmith, 1967; Keltikangas-Järvinen, 1992) to measure three aspects of self-perception. More specifically, the scale included eight items for the assessment of general self-esteem (e.g., “I often feel ashamed of myself”, reverse

scored), five items for social self-esteem (e.g., “I’m popular with kids of my own age”) and, finally, seven items for family self-esteem (e.g., “My parents and I have a lot of fun together”). Agreement with each item was rated on a five-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The Cronbach alphas of the scales were  $\alpha = 0.77$ ,  $0.77$  and  $0.83$ , respectively.

### **3.2.3 Social status among classmates (Study I)**

Self-rated social status in the classroom was measured using two items: “I’m among the leaders of the class” and “I don’t hold any important position in the class; I rather prefer to be an observer” (reverse scored). To obtain an independent rating on the students’ self-reported social status in the school setting, participating teachers answered the same two items completed by the students, reworded in the third person. For both versions, items were significantly correlated ( $r = 0.53$  and  $0.80$ , respectively,  $p < 0.001$ ) and answered on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

### **3.2.4 Disruptive behaviour (Studies II and IV)**

The dimensions of disruptive behaviour were assessed in 1980 by the mothers of the participants with a questionnaire derived from the Health Examination Survey (Wells, 1980). This questionnaire was originally designed to screen children for potential behavioural problems, and it can be completed by non-professionals (by persons without a background in psychology). The three dimensions of disruptive behaviour were aggression, hyperactivity and social adjustment. These scales have been tested for construct validity (Katainen & Raikkonen, 1999; Räikkönen, Katainen, Keskivaara, & Kelikangas-Järvinen, 2000) and predictive validity (Pesonen, Räikkönen, Keskivaara, & Keltikangas-Järvinen, 2003; Pulkki-Råback et al., 2005) in relation to similar constructs.

### **3.2.5 School performance (Studies III and IV)**

School performance was assessed by grade point averages (GPAs), which is a standard measure of school performance in Finland. The grade point averages

(GPAs) in this study were based on school reports in the 3<sup>rd</sup>, 6<sup>th</sup> and 9<sup>th</sup> grades, with the respective ages of the participants being 9, 12, and 15 years. GPAs are the means of marks in all school subjects, and they are assessed on a scale from 4 to 10 (4=fail, 5-6=poor, 7-8=good and 9-10=excellent). GPAs are compiled systematically twice year, and all pupils are evaluated on the same subjects (e.g. math, biology, history) using similar criteria in each school. The GPAs were reported by the participants' mothers at the age of 9 (the 3<sup>rd</sup> grade GPA), and self-reported by the participants at the ages of 12 (6<sup>th</sup> grade) and 15 (9<sup>th</sup> grade).

### **3.2.6 Socioeconomic position and intergenerational social mobility (Study II)**

Educational level in adulthood, occupational status, and income were self-reported by the participants at the 27-year follow-up. Because the interest was to find out whether disruptive behaviour in childhood predicts poor socioeconomic outcomes or downward drift, the variables were dichotomized as follows: low versus high educational level (comprehensive education only versus upper-secondary or higher education), low versus high occupational status (manual occupation versus non-manual), and low versus high income (the lowest tertile versus the two highest tertiles) (Statistics, 2010).

Parental educational level, occupational status, and income were self-reported by both parents in 1980. Each of the SEP variables used in the present study were defined using information from the parent with the highest educational level, higher occupational status and higher income. The parents SEP categories were formed similarly to those of the participants and were used as covariates in the respective analyses.

Intergenerational social mobility was based on comparing participants adulthood SEP with that of their original SEP (i.e., parental SEP). For educational, occupational and income related mobility, four categories were formed: *stable high* (high parental and high adulthood SEP), *downwardly mobile* (high parental and low adulthood SEP), *upwardly mobile* (low parental and high adulthood SEP), and *stable low* (low parental and low adulthood SEP).

### **3.2.7 Body mass index and waist circumference (Study III)**

Adulthood body mass index (BMI) and waist circumference (WC) were obtained at a follow-up in 2001, when the participants were 27 and 30 years of age. BMI was calculated as weight in kilograms divided by height in square meters ( $\text{kg}/\text{m}^2$ ). Weight was measured with a Seca weight scale and height with a Seca anthropometer. WC was measured at the level of the twelfth rib (level with the navel in thin subjects) to an accuracy of one millimetre. The measurement of waist circumference was conducted twice, and the mean of the two measurements was used. The adulthood measurements of height, weight, and waist circumference were taken by a nurse during a laboratory examination.

### **3.2.8 Covariates**

In Study II, the parent with the higher SEP (educational level, occupational status, and income) and in Studies III and IV the number of years of maternal education were used as control variables. Additionally, in Study II, birth weight, childhood BMI, physical activity in adulthood, and the mothers and father's BMI were additionally controlled for. At the study baseline (1980), the mothers of the participants were contacted through postal questionnaires. They were requested to report their child's birth weight (in grams) and their own completed years of education. Childhood BMI-related measurements of height and weight were taken at the ages of 9 and 12 by a nurse during a lab examination. Weight was measured with a Seca weight scale and height with a Seca anthropometer. Physical activity was self-reported in 2001, and it was the mean value of five variables including information on the intensity, duration and the frequency of physical activity (Telama et al., 2005). In regard to adulthood physical activity, more detailed information can be found in the original article (Study III).

### **3.3 Statistical analyses**

#### **3.3.1 Study I: Does student's temperament and self-esteem associate with student's self-rated and teacher-rated social status among classmates?**

All analyses were performed separately for girls and boys as there were gender differences in almost all study variables and as temperament has been shown to have a different effect depending on the gender of the individual (Keltikangas-Järvinen, Pulkki-Råback, Puttonen, Viikari, & Raitakari, 2006; Pitzer, Esser, Schmidt, & Laucht, 2009). Bivariate correlations were calculated in order to see, whether student's temperament traits and self-esteem associate with self-rated or teacher-rated social status. The associations, simultaneously including all temperament and self-esteem variables, were then calculated with partial correlations with self-rated or teacher-rated social status as the outcome variable.

We calculated the explained variance for school and class level variables (in analyses for self-rated social status) and for school and teacher level variables (in analyses for teacher-rated social status) with multiple modelling. In the analyses for self-rated social status, higher-level variables (school and class) each explained very little variance (ranging from 0 to 1.1%). In the analyses for teacher-rated social status, of the higher-level variables school explained 0.4% in girls and 0% in boys. The variable "teacher" explained 3.7% in girls and 5.2% in boys. It is worth noting that these variances for teacher are still very low. Furthermore, we calculated the design effect for these higher-level variables. The design effects varied between 1 and 1.4%, which also supports the conclusion that multi-level modelling is unnecessary. Therefore, bivariate and partial correlations are reported.

Not surprisingly, higher-level variability is low in the current data. The school system in Finland is very homogenous, and teachers are highly educated. Additionally, the student population is very homogenous between schools as the vast majority of schools are public schools and the school is generally chosen by vicinity.

### **3.3.2 Study II: Is there an association between disruptive behaviour in childhood and adulthood SEP?**

First we tested for gender differences in the associations between childhood disruptiveness traits and adult educational level, occupational status and income. The general linear models showed non-significant gender interactions (all  $p$ -values  $> 0.228$ ), except for one significant gender interaction between aggression and adulthood income ( $p = 0.007$ ). We tested whether the univariate association between childhood aggression and adulthood income would differ between the gender groups. As the associations pointed in a similar direction and were of a similar magnitude for women and men, all of the subsequent analyses were conducted with the gender groups combined.

In order to see whether participants from low and high SEP families differ in regard to disruptive behaviour,  $t$ -tests for independent-samples were conducted. We used logistic regression analyses to examine the associations between standardized values of disruptive behaviour and adulthood low socioeconomic position. In adulthood the analyses were conducted separately for the different components of disruptive behaviour (aggression, hyperactivity and social adjustment) and separately for each of the adulthood SEP variables (low educational level, low occupational status and low income) as binary outcome variables. We constructed three models for each component of disruptive behaviour: Model 1 was adjusted for age and gender, Model 2 was additionally adjusted for parental SEP, and Model 3 was additionally adjusted for the other components of disruptive behaviour (for instance, adjusting for hyperactivity and social adjustment in the analyses where aggression is the dependent variable). If a significant association between disruptive behaviour and occupational status or income was observed, adulthood education was included as a covariate to examine potential mediation-effects (model already including age, gender and SEP of origin). The results from the latter analyses are reported in the text.

Finally, we used the univariate general linear model procedure to examine the mean levels of disruptive behaviour in childhood in different social mobility groups (stable high, downwardly mobile, upwardly mobile, stable low). For the post hoc comparisons of the differences in disruptive behaviour between the social mobility groups, Bonferroni tests were computed.

### **3.3.3 Study III: Is school performance in early and middle childhood associated with weight gain and adulthood obesity?**

We tested for gender differences in the associations between GPAs and BMI and WC. Because the general linear models showed significant gender interactions (the *p*-values of gender  $\times$  grade point average as a predictor of BMI or WC ranged between 0.010 and 0.024 at ages 12 and 15; the interactions ranged between 0.490 and 0.535 at the age 9, however), all of the subsequent analyses were conducted and reported separately by gender.

Linear regressions were computed in order to examine the association between GPAs at the ages 9, 12, and 15 and BMI and WC in adulthood, with BMI and WC as continuous dependent variables. Two separate regression models were conducted, i.e., a non-adjusted and fully adjusted model including the variables of birth weight, BMI at the ages of 9 and 12, physical activity in adulthood, the BMI of mothers and fathers and years of maternal education.

In order to examine whether the GPA formed a risk factor for obesity, logistic regression analysis was used. BMI  $\geq$  30 kg/m<sup>2</sup> was used as the cut-off point for obesity (National Institute for Health and Clinical Excellence, 2006). Participants with a BMI of less than 30 served as a reference group. Odds ratios (OR) and their 95% confidence intervals (CI) were calculated for an unadjusted and fully adjusted model (adjusted for age, birth weight, childhood BMI, physical activity in adulthood, maternal and paternal BMI, and maternal education).

Finally, we used the GLM repeated measures procedure to test whether the GPA over the three measurements (or changes in GPA) is associated with adulthood BMI and WC. A non-adjusted and fully adjusted model (adjusted for age, birth weight, childhood BMI, physical activity in adulthood, maternal and paternal BMI, and maternal education) were constructed.



### **3.3.4 Study IV: Is disruptive behaviour in childhood associated with school performance throughout the comprehensive school?**

Because the school careers of girls and boys have been systematically shown to be different, all analyses were performed for girls and boys separately. To examine the association between disruptive behaviour in childhood (aggression, hyperactivity, and social adjustment) and GPAs in the 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grades, we computed linear regressions with the GPAs as the continuous dependent variables. These analyses were conducted separately in each age cohort to examine age-related differences in the association between disruptive behaviour and school performance.

Additionally, we used the repeated measures ANOVA procedure to test whether the GPAs over the three measurements, i.e., the 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grades (or changes in GPA), were associated with disruptive behaviour in childhood. For this, the GPA measurements were employed as a continuous dependent variable, and each of the disruptive behaviour traits were employed separately as independent binary-outcome variables. For this, each of the traits of disruptive behaviour was divided into low and high through a median split. The GPA means were then plotted over the three measurements by childhood aggression, hyperactivity, and social adjustment.

We computed two models in all aforementioned analyses: a non-adjusted model and a model adjusted for the years of maternal education. We used the Bonferroni correction in order to control for the Type I error rate (Abdi, 2007). The critical  $\alpha$  level of 0.050 was divided by 3, which was the number of analyses performed in examining the three measurements of disruptive behaviour. We then used the adjusted  $\alpha$  level of 0.016 ( $.050 / 3 = 0.016$ ) as the critical significance value.

## 4 RESULTS

### 4.1 Study I: Students' temperament and self-esteem in association with self-rated and teacher-rated social status among classmates

Boys rated their social status in the classroom higher than girls. In teacher assessments girls were rated higher in social status. Significant differences were found in each temperament dimension. In regard to self-esteem, boys rated their general and family self-esteem higher than girls. For the detailed descriptives, see Table 1 in original article number I.

Bivariate and partial correlations examining the associations of temperament traits and self-esteem scales with self-rated and teacher-rated social status are shown in Table 3. The results show that there was remarkable variation in the associations between social status and different aspects of self-esteem. The strongest predictor of social status was social self-esteem in the bivariate associations ( $r \geq 0.254$ ,  $p < 0.01$ ), except for teacher-rated social status in girls, which was most strongly predicted by temperamental inhibition ( $r = -0.268$ ,  $p < 0.01$ ). When other temperament and self-esteem factors were included in the analyses, the strongest predictor of self-rated social status in girls and boys was still social self-esteem ( $r \geq 0.355$ ,  $p < 0.01$ ), but for teacher-rated social status the strongest predictor was general self-esteem in both genders ( $r \geq 0.128$ ,  $p < 0.01$ ) in partial correlations.

From the self-esteem variables, family self-esteem had the weakest associations with social status. In bivariate correlations, only family self-esteem was associated with self-rated social status, and only in boys. In partial correlation analyses, the direction of the association was reversed so that high family self-esteem predicted lower social status. Family self-esteem was associated with social status in all bivariate correlations ( $r \geq -0.069$ ,  $p = < 0.01$ ).

In regard to the bivariate correlations between temperament and social status, it was found that with the exception of negative emotionality and distractibility, all temperament traits are associated with social status in both girls and boys, as shown

in Table 3. Self-ratings and teacher-ratings of social status give very similar results, and the magnitudes of the associations examined with these two ratings are also very similar.

As shown in Table 3, the partial correlations show that there is still no association between distractibility and social status, but, surprisingly, higher negative emotionality is now consistently associated with higher social status in boys and girls in analyses using self-ratings and teacher-ratings of social status ( $r \geq 0.054$ ,  $p \leq 0.05$ , for all analyses).

Lower inhibition ( $r = -0.157$ ,  $p < 0.01$ ;  $r = -0.121$ ,  $p < 0.01$  for self-rated and teacher-rated social status, respectively) was the strongest temperamental predictor of social status among girls, whereas among boys the strongest associations were found for higher impulsivity ( $r = 0.171$ ,  $p < 0.01$ , for self-rated social status) or activity ( $r = 0.091$ ,  $p < 0.01$ , for teacher-rated social status). However, these associations were rather small in magnitude.

**Table 3.** Bivariate and Partial Correlations for Temperament Traits and Self-esteem with Self-rated and Teacher-rated Social Status

	Self-rated social status				Teacher-rated social status				
	Girls (N=1970)		Boys (N=1971)		Girls (N=1970)		Boys (N=1971)		
	<i>r</i>	<i>p</i>	<i>r</i> <sup>2</sup>	<i>r</i>	<i>p</i>	<i>r</i> <sup>2</sup>	<i>r</i>	<i>p</i>	
<i>Bivariate Correlations</i>									
Temperament									
Inhibition	-0.42	**	0.17	-0.34	**	0.12	-0.27	**	0.07
Persistence	0.07	**	0.00	0.07	**	0.00	0.08	**	0.01
Negative emotionality	0.02		0.00	0.01		0.00	-0.01		0.00
Activity	0.23	**	0.05	0.19	**	0.04	0.13	**	0.02
Impulsivity	0.15	**	0.02	0.12	**	0.01	0.04	**	0.00
Mood	0.24	**	0.06	0.25	**	0.06	0.19	**	0.04
Distractability	0.03		0.00	-0.04		0.00	-0.02		0.00
Self-esteem									
General	0.33	**	0.11	0.29	**	0.08	0.23	**	0.05
Family	0.03		0.00	0.05	*	0.00	0.01		0.00
Social	0.53	**	0.28	0.52	**	0.27	0.22	**	0.05
<i>Partial Correlations</i>									
Temperament									
Inhibition	-0.16	**	0.02	-0.12	**	0.02	-0.12	**	0.01
Persistence	0.01		0.00	-0.01		0.00	0.01		0.00
Negative emotionality	0.09	**	0.01	0.05	*	0.00	0.06	*	0.00
Activity	0.05	*	0.00	0.05	*	0.00	0.04	*	0.00
Impulsivity	0.13	**	0.02	0.17	**	0.03	0.03	**	0.00
Mood	-0.03		0.00	0.01		0.00	0.08	**	0.01
Distractability	0.01		0.00	-0.04		0.00	-0.02		0.00
Self-esteem									
General	0.12	**	0.01	0.12	**	0.01	0.14	**	0.02
Family	-0.07	**	0.00	-0.09	**	0.01	-0.09	**	0.01
Social	0.36	**	0.13	0.38	**	0.14	0.02	**	0.00

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

\*Correlation is significant at the 0.05 level (2-tailed)

<sup>a</sup>All temperament traits and self-esteem variables are controlled for each other

## 4.2 Study II: Disruptive behaviour in childhood and adulthood SEP

The relationships between the characteristics of disruptive behaviour in childhood and adulthood socioeconomic outcomes are shown in Table 4. The odds of belonging to the group with a low educational level in adulthood were 1.29 times higher per each unit increase in childhood aggression (Model 1). The association was robust against adjustment for childhood SEP (Model 2) and the other elements of disruptive behaviour (Model 3). Hyperactivity and social adjustment did not show robust associations with adulthood educational level.

The odds of belonging to the group with low occupational status (a manual occupation) were approximately 1.2 times higher per each unit increase in aggression and hyperactivity (Model 1). Higher social adjustment, in contrast, was associated with a smaller risk of belonging to the group with a low occupational status (95% OR = 0.76). In the fully adjusted models, however, the only remaining significant association was between lower social adjustment and lower socioeconomic position.

As there were significant results in the analysis above, a further model was computed for occupational status. A point of interest was to examine whether this association remained when participants' years of education in adulthood were added in the analysis (other variables: age, gender, parental occupational status). An association was found for social adjustment (OR = 0.774, CI = 0.64—0.94,  $p = 0.010$ ). There were no significant associations between any form of childhood disruptiveness and the level of adulthood income ( $p \geq 0.249$ , for all associations).

**Table 4.** Childhood Disruptive Behaviour (Mean Age 6.1 Years) predicting Low Educational Level, Low Occupational Status, and Low Income in Adulthood (Mean Age 33.1 Years). The Young Finns Study (N=782).

	Low educational level		Low occupational status		Low income	
	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>
<b>Aggression<sup>a</sup></b>						
Model 1 <sup>b</sup>	1.29 (1.11 - 1.49)	0.001	1.25 (1.08 - 1.45)	0.003	1.09 (0.94 - 1.27)	0.249
Model 2 <sup>c</sup>	1.24 (1.07 - 1.44)	0.005	1.21 (1.04 - 1.41)	0.015	1.05 (0.91 - 1.23)	0.502
Model 3 <sup>d</sup>	1.21 (1.04 - 1.45)	0.013	1.16 (0.99 - 1.35)	0.062	1.05 (0.90 - 1.22)	0.576
<b>Hyperactivity<sup>a</sup></b>						
Model 1 <sup>b</sup>	1.12 (0.96 - 1.30)	0.138	1.18 (1.02 - 1.38)	0.026	1.06 (0.91 - 1.24)	0.429
Model 2 <sup>c</sup>	1.14 (0.97 - 1.33)	0.108	1.21 (1.03 - 1.41)	0.017	1.05 (0.90 - 1.23)	0.544
Model 3 <sup>e</sup>	1.10 (0.94 - 1.29)	0.245	1.15 (0.98 - 1.36)	0.081	1.04 (0.89 - 1.22)	0.633
<b>Social adjustment<sup>a</sup></b>						
Model 1 <sup>b</sup>	0.86 (0.73 - 0.99)	0.030	0.76 (0.66 - 0.91)	<0.001	0.94 (0.80 - 1.09)	0.390
Model 2 <sup>c</sup>	0.89 (0.76 - 1.04)	0.135	0.80 (0.69 - 0.94)	0.006	0.96 (0.82 - 1.13)	0.630
Model 3 <sup>f</sup>	0.94 (0.80 - 1.10)	0.428	0.85 (0.72 - 0.99)	0.048	0.98 (0.83 - 1.15)	0.780

<sup>a</sup>OR depicts the change in risk per one standard deviation in disruptive behaviour

<sup>b</sup>Model 1 - Adjusted for age and gender

<sup>c</sup>Model 2 - Adjusted for age, gender, and parental SEP (educational level, occupational status or income)

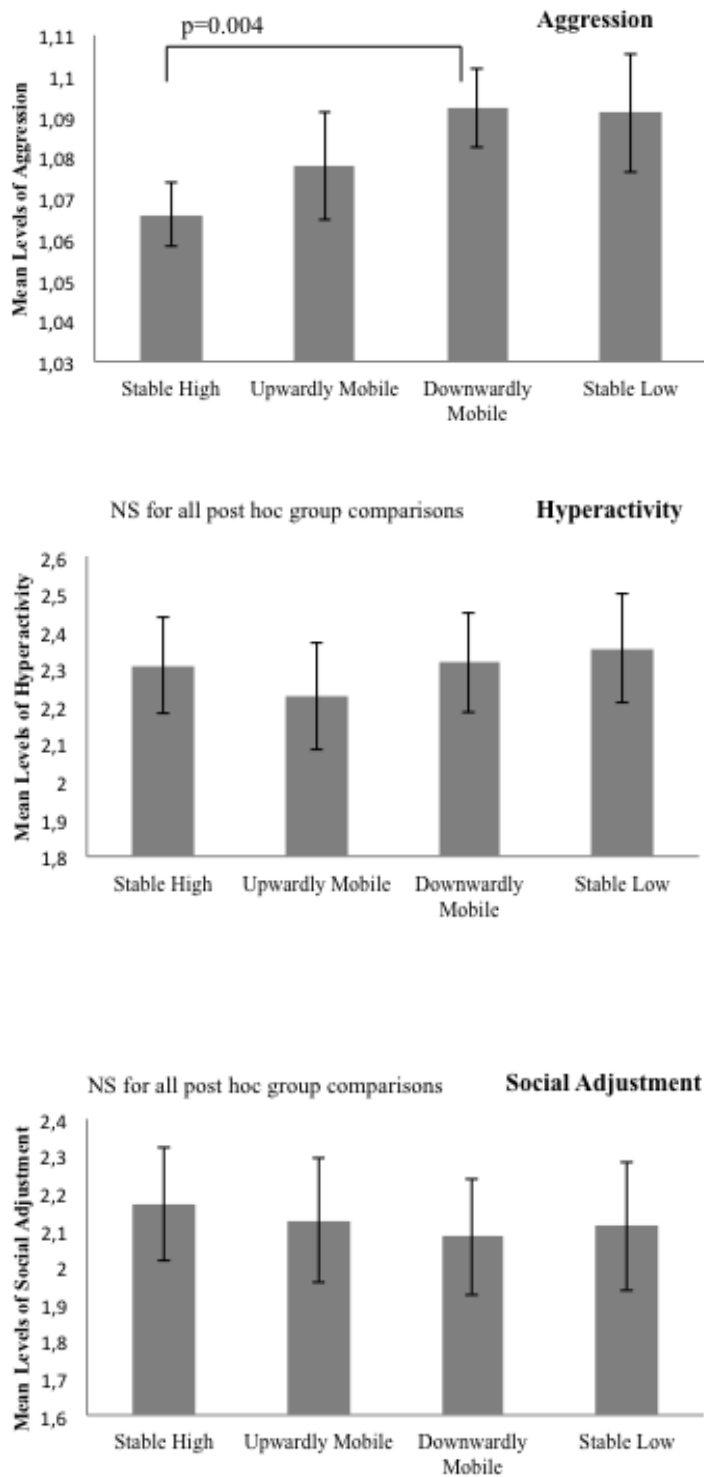
<sup>d</sup>Model 3 - Adjusted for age, gender, parental SEP and the traits of hyperactivity and social adjustment

<sup>e</sup>Adjusted for age, gender, parental SEP and the traits of aggression and social adjustment

<sup>f</sup>Adjusted for age, gender, parental SEP and the traits of aggression and hyperactivity

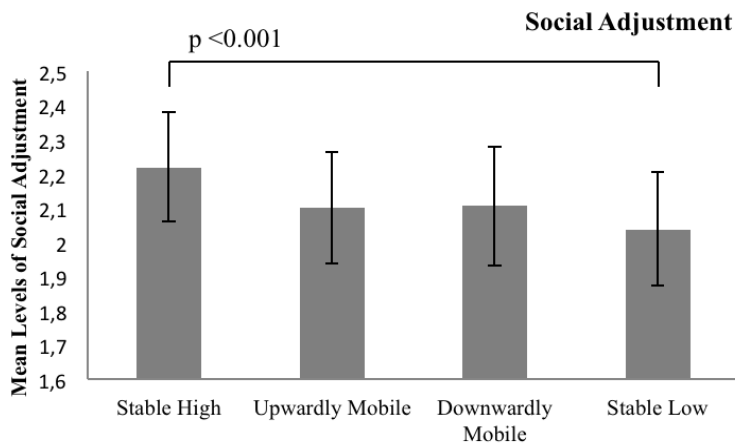
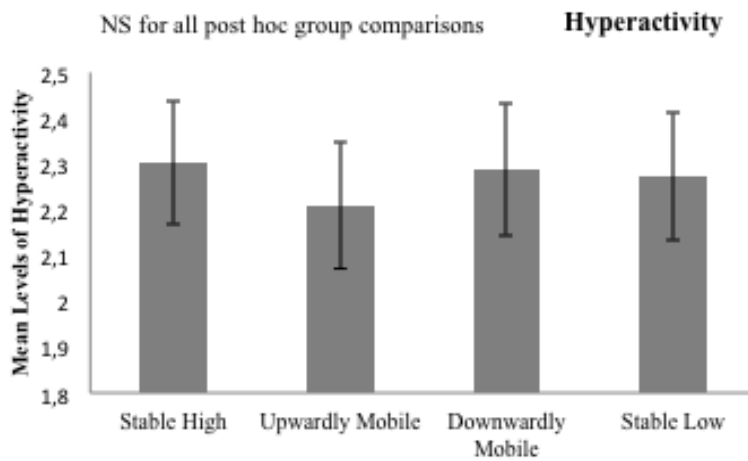
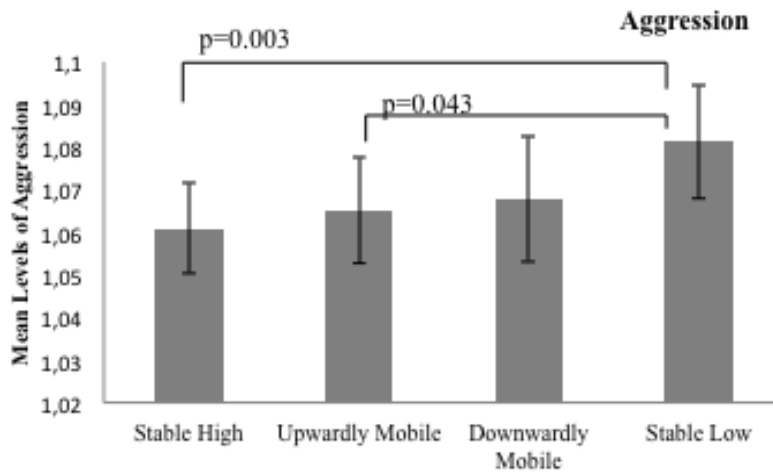
The mean scores of childhood disruptiveness in different intergenerational educational and occupational social mobility groups are shown in Figures 2 and 3, respectively. The figures present the fully adjusted models (controlled for age, gender, parental SEP, and disruptive behaviour; Figure 3 is additionally adjusted for years of education in adulthood). Figure 2 demonstrates that participants with a stable low and downwardly mobile educational level had the highest scores in aggression. The mean levels were significantly different between stable high and the downwardly mobile group (means 1.07 vs. 1.09,  $p = 0.004$ ). No other significant differences were found.

Figure 3 shows that participants with a stable low occupational status had higher levels of aggression than those from a stable high ( $p = 0.003$ ) mobile group. Participants with stable low occupational status had higher aggression than upwardly mobile participants ( $p = 0.043$ ). In social adjustment, participants from the stable high mobility group had higher levels than those with stable high status ( $p < 0.001$ ). No significant differences were found for hyperactivity.



**Figure 2.** Means and standard errors of disruptive behaviour in childhood (aggression, hyperactivity and social adjustment) according to the groups of *intergenerational educational mobility*. Adjusted for age, gender, and the other components of disruptive behaviour. The Young Finns Study, 1980-2007. Original article II.





**Figure 3.** Means and standard errors of disruptive behaviour in childhood (aggression, hyperactivity and social adjustment) according to groups of *intergenerational occupational mobility*. Adjusted for age, gender, and the other components of disruptive behaviour, and years of education in adulthood. The Young Finns Study, 1980-2007. Original article II

### 4.3 Study III: School performance and adulthood obesity

Women had significantly higher GPAs than men throughout the measurements. The GPAs increased somewhat with ascending school grade for both women and men. Mean levels of BMI and WC in adulthood were significantly higher for men than women. Men had an average adulthood BMI of borderline overweight, while in women BMI fell within the normal range (based on the criteria of National Institutes of Health and Clinical Excellence, 2006, which defines normal weight as BMI < 25). With the exception of slightly higher birth weight among men, no significant gender differences were found for other covariates. Detailed information of the descriptives are shown in article number III.

Table 5 shows the results of the regression analyses of GPAs predicting adulthood BMI and WC. Among women, a lower GPA at each measurement phase was associated with higher adulthood BMI ( $\beta = -0.137$ ,  $p = 0.018$ ,  $sr^2 = 0.019$  for age 9,  $\beta = -0.204$ ,  $p < 0.001$ ,  $sr^2 = 0.042$  for age 12, and  $\beta = -0.231$ ,  $p < 0.001$ ,  $sr^2 = 0.053$  for age 15). In the fully adjusted models, the associations remained significant at each measurement of GPA. No significant associations between GPA and adulthood BMI were found among men.

The results were essentially similar when WC was used as the outcome variable. Lower GPAs at 9 years of age were associated with higher adult WC in women ( $\beta = -0.126$ ,  $p = 0.035$ ,  $sr^2 = 0.016$ ). The association between GPAs at 9 years of age with adulthood WC decreased to borderline significance in the fully adjusted model. GPAs measured at ages 12 and 15 had significant effects on adulthood WC in the unadjusted regression models (betas ranged between -0.130 and -0.242,  $ps$  between < 0.001 and 0.026,  $sr^2$  between 0.017 and 0.059). The associations between GPAs at the ages of 12, and 15 on adulthood WC remained significant after adjustment for the confounding variables among women. There was no relation between GPAs and WC at any age among men.

**Table 5.** Standardized Beta Coefficients of Grade Point Averages (GPAs) at the Ages of 9, 12, and 15 in predicting Adulthood Body Mass Index (BMI) and Waist Circumference in Adulthood for Women and Men separately

	BMI						WC						
	Women			Men			Women			Men			
	Beta	p	sr <sup>2</sup> #	Beta	p	sr <sup>2</sup> #	Beta	p	sr <sup>2</sup> #	Beta	p	sr <sup>2</sup> #	
GPA at the age of 9													
Unadjusted	-0.137	0.018	0.019	-0.043	0.502	0.002	-0.130	0.026	0.017	-0.045	0.478	0.002	0.002
Fully adjusted <sup>a</sup>	-0.103	0.026	0.010	-0.016	0.759	0.000	-0.086	0.075	0.007	0.001	0.983	0.000	0.000
GPA at the age of 12													
Unadjusted	-0.204	<0.001	0.042	-0.077	0.232	0.006	-0.225	<0.001	0.051	-0.077	0.230	0.006	0.006
Fully adjusted <sup>a</sup>	-0.134	0.007	0.016	-0.041	0.453	0.001	-0.148	0.004	0.019	-0.023	0.703	0.000	0.000
GPA at the age of 15													
Unadjusted	-0.231	<0.001	0.053	-0.105	0.116	0.011	-0.242	<0.001	0.059	-0.089	0.184	0.008	0.008
Fully adjusted <sup>a</sup>	-0.147	0.004	0.019	-0.028	0.632	0.001	-0.154	0.003	0.020	0.003	0.962	0.000	0.000

Note. Analyses of the GPAs at the ages of 9, 12, and 15 in predicting adulthood BMI and WC are conducted separately

# = sr<sup>2</sup> is for the squared semi-partial correlation coefficient

<sup>a</sup> - Adjusted for age, birth weight, childhood BMI, physical activity, mother's and father's BMI, and maternal education

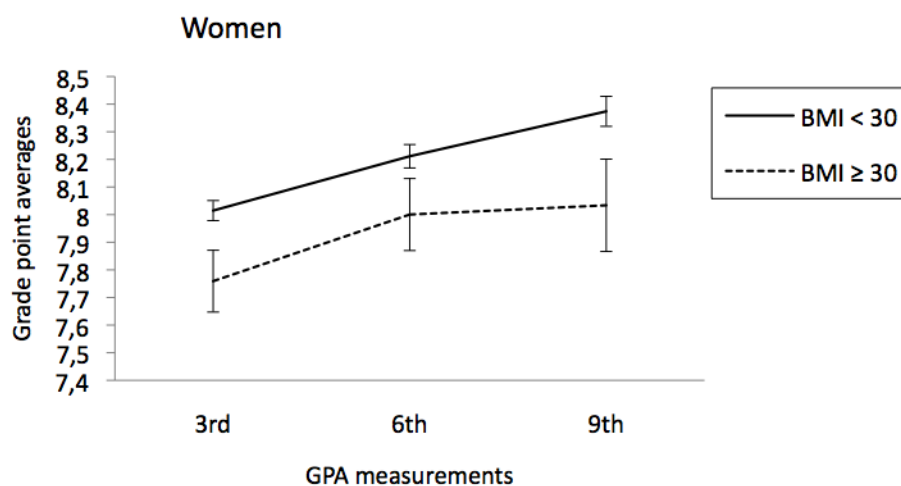
In addition, regression analyses were conducted to test whether the associations between GPAs (at the ages of 9, 12, and 15) and adulthood BMI and WC differ among included and excluded women and men. The results showed that the associations between GPAs and BMI were also significant in the 6<sup>th</sup> ( $\beta = -0.110, p = 0.042, sr^2 = 0.012$ ) and 9<sup>th</sup> grade ( $\beta = -0.129, p = 0.022, sr^2 = 0.017$ ) also among men. However, this was only the case for BMI, not for WC. In this connection, it was not possible to conduct a fully adjusted model, since all participants without missing data were already included in the present study.

The results of the logistic regression analyses only showed significant associations between GPAs and obesity (obese BMI  $\geq 30$ , non-obese BMI  $< 30$ ) among women. Low GPAs at the ages of 12 (OR = 0.55, 95% CI = 0.33 – 0.93), and 15 (OR = 0.59, 95% CI = 0.38 - 0.92) were significant predictors of adulthood obesity. The results indicate that for every unit increase in GPA, BMI was 0.20 and 0.23 BMI units lower at age 12 and 15, respectively. In the fully adjusted models, however, the associations were no longer significant at age 12 (OR = 0.70, 95% CI = 0.36 – 1.34) and age 15 (OR = 0.78, 95% CI = 0.47 – 1.30). Among women, no significant association was found between BMI and the GPAs assessed at age 9 (OR = 0.53, 95% CI = 0.27 - 1.03) or at any age among men ( $p$  values varying from 0.83 to 0.99).

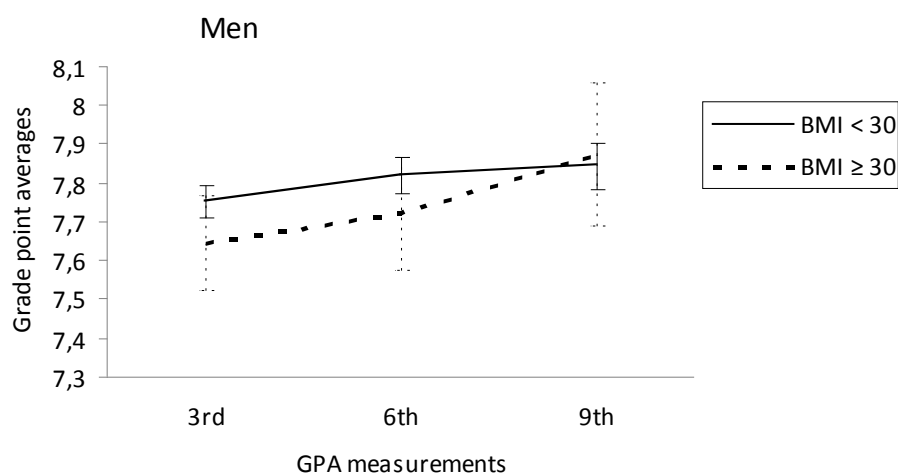
The results of the GLM repeated measures procedure support the results of the regression analyses. Using GPA measurements as a dependent variable, we found that the linear trend over the three GPA measurements was significantly associated with adulthood BMI among women ( $F(1,253) = 5.839, p = 0.016, \eta^2 = 0.001$ ). Low GPAs over the measurements were associated with high BMIs, whereas high GPAs were associated with low adulthood BMIs. This linear association, however, did not remain significant when adjusted for the confounding variables ( $F(1,247) = 1.261, p = 0.263, \eta^2 = 0.000$ ). Likewise, among women, the association between the linear trend of the GPA measurements and WC was significant in the unadjusted model ( $F(1,253) = 8.950, p = 0.003, \eta^2 = 0.001$ ) but not in the fully adjusted model ( $F(1,247) = 2.941, p = 0.088, \eta^2 = 0.000$ ). The directionality of the association was similar to that of BMI and GPAs: low GPAs over the measurements were associated with high WC, whereas high GPAs were associated with low adulthood WC. The

finding that the associations between GPAs and BMI and between GPAs and WC did not remain significant in the fully adjusted models may be due to the high tracking of adulthood BMI and WC, childhood BMI, birth weight and adulthood physical activity. No significant associations between GPAs and adulthood BMI and WC were found among men.

For demonstration of the directionality of the associations between GPAs over the three measurements and adulthood obesity, we have used the binary obesity outcome variable with obese ( $BMI \geq 30$ ) and non-obese ( $BMI < 30$ ) women and men shown in Figures 4 and 5, respectively. The figures show that non-obese ( $BMI < 30$ ) women and men had higher GPAs throughout the measurements when controlling for confounding variables. The GPA differences between the groups of non-obese and obese were significant for women in the 3<sup>rd</sup> grade ( $p$ -value 0.031), but non-significant in the 6<sup>th</sup> and 9<sup>th</sup> grade ( $p = 0.126$  in 6<sup>th</sup>, and  $p = 0.055$  in 9<sup>th</sup> grade). Among men, there were no significant GPA differences between the obesity groups at any age ( $p$ -values varying between 0.412 and 0.879).



**Figure 4.** Fully adjusted GPAs over the three measurements (3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grade) among non-obese (BMI < 30) and obese (BMI ≥ 30) women. Original article III.



**Figure 5.** Fully adjusted GPAs over the three measurements (3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grade) among non-obese (BMI < 30) and obese (BMI ≥ 30) men. Original article III.

#### 4.4 Study IV: Disruptive behaviour in childhood and school performance

Boys scored lower on social adjustment in each of the cohorts ( $p$  values varying from .003 to .017). At each school level, girls had significantly higher GPAs than boys ( $p$  values in each school grade  $< .001$ ). No other significant differences in the study variables were found.

The results of the regression analyses of disruptive behaviour predicting GPAs are shown separately for girls (Table 6), and for boys (Table 7). While no significant associations with GPAs were found when disruptive behaviour was measured at the age of three, consistent associations were found among older children. Among girls, high hyperactivity as assessed at the age of six, predicted poorer GPAs throughout the comprehensive school, i.e., in the 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grade. Additionally, high aggression as assessed in the age of nine years was associated with poor GPAs in 6<sup>th</sup> grade whereas, social adjustment, assessed at the age of nine, predicted poor GPAs in the 9<sup>th</sup> grade.

Table 7 shows that among boys, high aggression at the age of nine predicted poorer GPAs in the 3<sup>rd</sup> and 6<sup>th</sup> grade. In addition, we found that social adjustment at the age of nine predicted poor performance in the 3<sup>rd</sup> and 9<sup>th</sup> grades. For girls and boys, the associations were robust against adjustment for maternal education.

For illustrative purposes, the mean GPA scores were separately plotted over the three measurements with disruptive behaviour as a binary outcome variable for girls (Figure 6) and boys (Figure 7). Figure 6 shows that girls with high hyperactivity had lower GPAs throughout the three measurements. The pairwise comparisons demonstrate that the GPA differences among girls with high and low hyperactivity were significant in the 6<sup>th</sup> and 9<sup>th</sup> grade ( $p$  values in the 6<sup>th</sup> and 9<sup>th</sup> grade were 0.001 and 0.011, respectively).

In regard to social adjustment, the pairwise comparisons showed that the GPA differences were significant among girls in the 3<sup>rd</sup> and 9<sup>th</sup> grade ( $p$  values 0.010 and 0.003, respectively), and among boys in the 6<sup>th</sup> grade ( $p = 0.014$ ).

Figure 7 demonstrates that boys with high aggression had lower GPAs over the whole comprehensive school, i.e. at 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grade (adjusted for age and maternal education). The pairwise comparisons showed that the difference between

boys with high and low aggression was significant in 6<sup>th</sup> grade ( $p = 0.014$ ) and almost significant in 9<sup>th</sup> grade ( $p = 0.018$ ).



**Table 6.** Standardized Beta Coefficients of Disruptive Behaviour in 3 different Age Groups in Predicting Grade Point Averages (GPAs) in the 3rd, 6th, and 9th Grades for **girls**. The Results are shown Separately for 3-, 6-, and 9-year Old Cohorts

	GPA in 3 <sup>rd</sup> grade€			GPA in 6 <sup>th</sup> grade€			GPA in 9 <sup>th</sup> grade€		
	n	$\hat{\alpha}$	Adjusted R <sup>2</sup> of the model change	n	$\hat{\alpha}$	Adjusted R <sup>2</sup> of the model change	n	$\hat{\alpha}$	Adjusted R <sup>2</sup> of the model change
<b>3-Year-Old Cohort</b>									
Aggression	114	-.121	.006	114	.004	-.009	114	.004	.000
+ SEP <sup>a</sup>	114	-.075	.097	114	.073	.207	114	.073	.005
Hyperactivity	114	.079	-.003	114	-.040	-.007	114	-.040	.002
+ SEP <sup>a</sup>	114	.091	.103	114	-.023	.202	114	-.023	.001
Social adjustment	114	-.151	.014	114	-.074	-.003	114	-.074	.006
+ SEP <sup>a</sup>	114	-.136	.110	114	-.053	.204	114	-.053	.003
<b>6-Year-Old Cohort</b>									
Aggression	193	-.111	.007	193	-.156	.019	193	-.127	.011
+ SEP <sup>a</sup>	193	-.105	.022	193	-.144	.092	193	-.117	.065
Hyperactivity	193	-.185*	.029	193	-.189*	.031	193	-.185*	.029
+ SEP <sup>a</sup>	193	-.175*	.042	193	-.170*	.100	193	-.168*	.079
Social adjustment	193	-.203*	.036	193	-.134	.013	193	.134	.018
+ SEP <sup>a</sup>	193	-.185*	.045	193	-.095	.080	193	-.100	.061
<b>9-Year-Old Cohort</b>									
Aggression	209	-.085	.002	209	-.179*	.027	209	-.122	.010
+ SEP <sup>a</sup>	209	-.069	.026	209	-.158	.077	209	-.098	.071
Hyperactivity	209	-.024	-.004	209	-.132	.013	209	-.109	.007
+ SEP <sup>a</sup>	209	-.022	.022	209	-.130	.069	209	-.107	.073
Social adjustment	209	-.085	.002	209	-.104	.006	209	-.197**	.034
+ SEP <sup>a</sup>	209	-.096	.031	209	-.119	.066	209	-.213**	.107

Note The time of the measurement of disruptive behaviour within the cohorts is the same as the cohort age.

\* p < .017, \*\* p < .001

<sup>a</sup> = Childhood socioeconomic position in terms of maternal years of education

€ = The ages of participants in the 3rd, 6th, and 9th grades are 9, 12, and 15, respectively

**Table 7.** Standardized Beta Coefficients of Disruptive Behaviour in 3 different Age Groups in Predicting Grade point averages (GPAs) in the 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> Grades for boys. The Results are shown Separately for 3-, 6-, and 9-year Old Cohorts

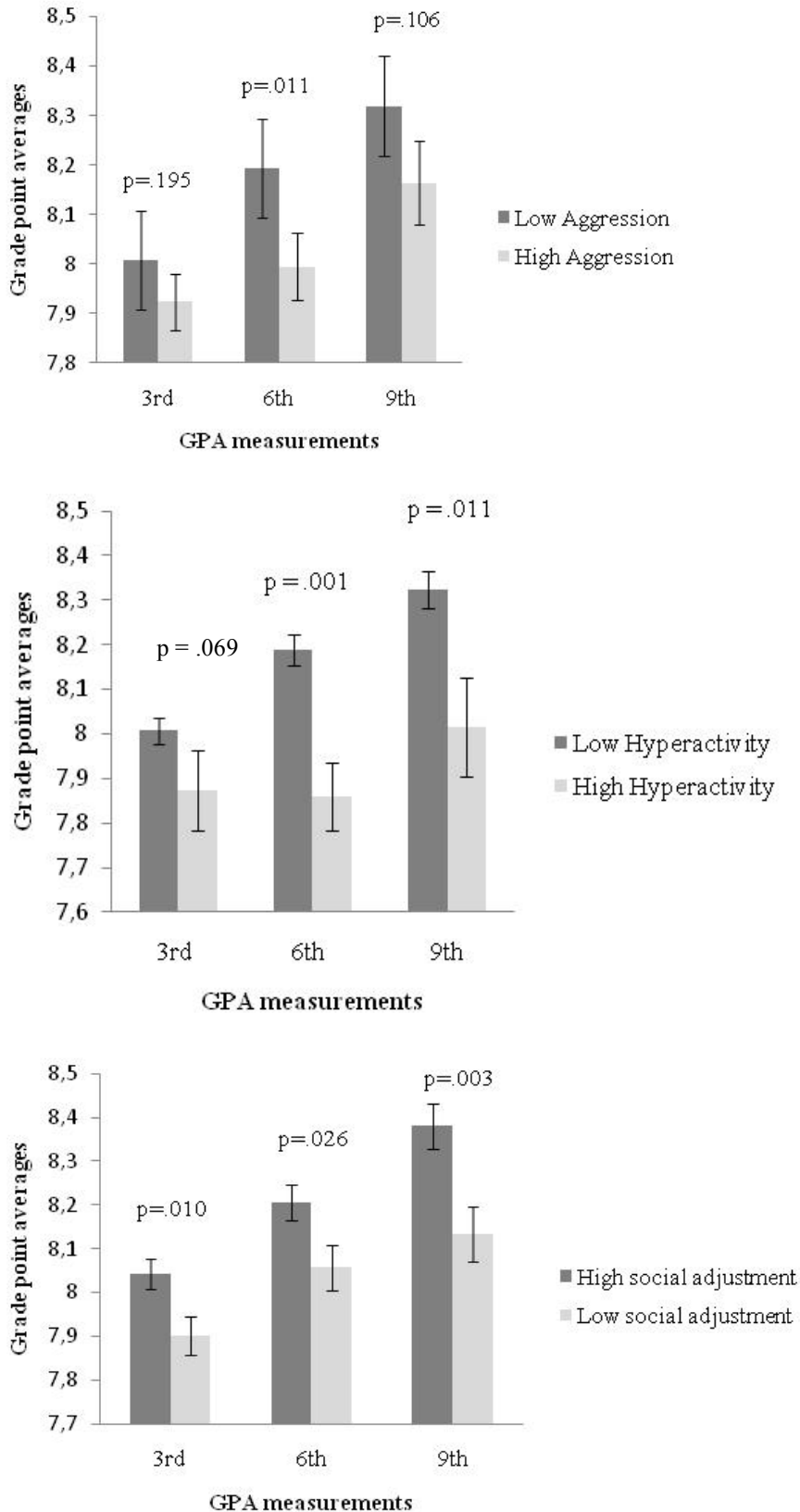
	GPA in 3 <sup>rd</sup> grade€			GPA in 6 <sup>th</sup> grade€			GPA in 9 <sup>th</sup> grade€					
	n	$\hat{\alpha}$ of the model	R <sup>2</sup> change	n	$\hat{\alpha}$ of the model	R <sup>2</sup> change	n	$\hat{\alpha}$ of the model	R <sup>2</sup> change			
<b>3-Year-Old Cohort</b>												
Aggression	111	.045	-.007	.002	111	-.029	-.008	.000	111	-.029	-.008	.000
+ SEP <sup>a</sup>	111	-.013	.100	.000	111	-.056	.066	.003	111	-.056	.066	.003
Hyperactivity	111	.122	.006	.006	111	.126	.007	.016	111	.126	.007	.016
+ SEP <sup>a</sup>	111	.056	.103	.003	111	.072	.068	.005	111	.072	.068	.005
Social adjustment	111	-.046	-.007	.002	111	-.116	.005	.014	111	-.116	.005	.014
+ SEP <sup>a</sup>	111	-.004	.100	.000	111	-.083	.070	.007	111	-.083	.070	.007
<b>6-Year-Old Cohort</b>												
Aggression	154	.037	-.005	.001	154	-.115	.007	.013	154	-.168	.022	.028
+ SEP <sup>a</sup>	154	.099	.074	.009	154	-.038	.131	.001	154	-.092	.145	.008
Hyperactivity	154	.015	-.006	.000	154	-.105	.005	.011	154	-.184	.028	.034
+ SEP <sup>a</sup>	154	.041	.066	.002	154	-.071	.135	.005	154	-.149	.159	.022
Social adjustment	154	.000	-.007	.000	154	-.116	.007	.014	154	.115	.007	.013
+ SEP <sup>a</sup>	154	-.062	.068	.004	154	.037	.131	.001	154	-.033	.138	.001
<b>9-Year-Old Cohort</b>												
Aggression	192	-.292**	.080	.085	192	-.200*	.035	.040	192	-.180*	.027	.032
+ SEP <sup>a</sup>	192	-.255**	.158	.064	192	-.164	.111	.026	192	-.140	.119	.019
Hyperactivity	192	-.076	.001	.006	192	-.100	.005	.010	192	-.118	.009	.014
+ SEP <sup>a</sup>	192	-.035	.094	.001	192	-.061	.088	.004	192	-.076	.106	.006
Social Adjustment	192	-.214*	.041	.046	192	-.155	.019	.024	192	-.180*	.027	.032
+ SEP <sup>a</sup>	192	-.199*	.133	.040	192	-.141	.105	.020	192	-.165*	.127	.027

Note: The time of the measurement of disruptive behaviour within the cohorts is the same as the cohort age.

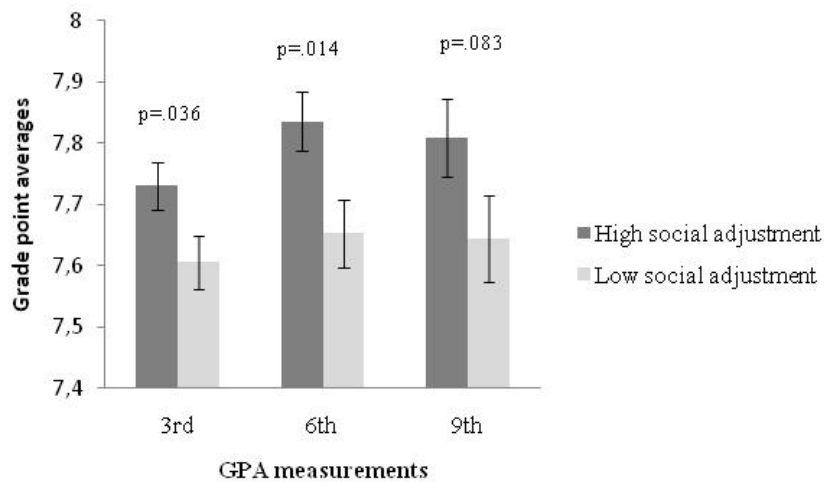
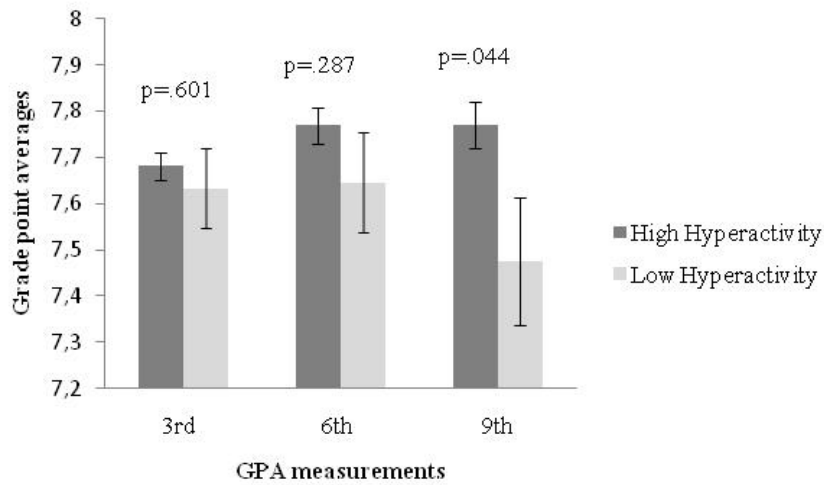
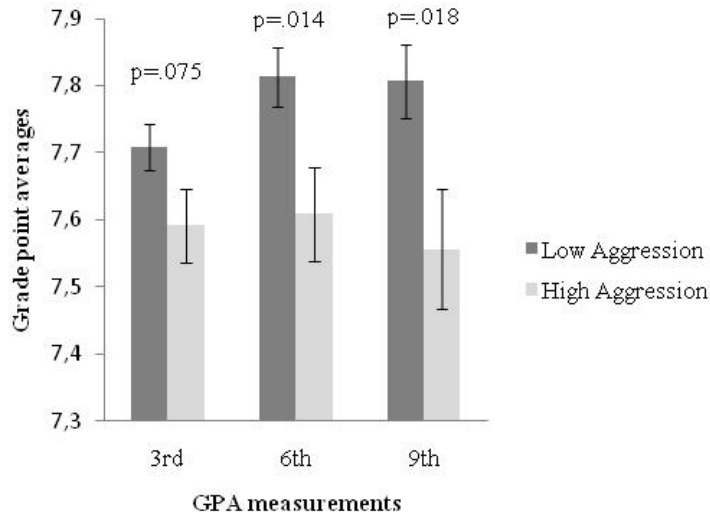
\* p < .017, \*\*p < .001

<sup>a</sup> = Childhood socioeconomic position in terms of maternal years of education

€ = The ages of participants in the 3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grades are 9, 12, and 15, respectively



**Figure 6.** The fully adjusted grade point averages (GPAs) over the three measurements (3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grade) among *girls* with low and high aggression, hyperactivity, and social adjustment, respectively. Original article IV.



**Figure 7.** The fully adjusted grade point averages (GPAs) over the three measurements (3<sup>rd</sup>, 6<sup>th</sup>, and 9<sup>th</sup> grade) among *boys* with low and high aggression, hyperactivity and social adjustment, respectively. Original article IV.

## **5 DISCUSSION**

Social exclusion can be seen as a multidimensional, process-natured phenomenon (Jyrkämä, 1986; Popay et al., 2008; Takala, 1992). The present study design allowed the examination of several indicators (disruptive behaviour, temperament, school performance) at different developmental phases (that is, childhood, adolescence, and adulthood). It also allowed to follow their possible impact on the process of educational, occupational or social exclusion. The main findings of the individual empirical studies are summarized in the following chapter.

### **5.1 Summary of main findings**

Adolescents' self-perception of their social status was shown to be associated with social and general self-esteem, whereas the association with family self-esteem was lower in magnitude. It seems that different aspects of self-esteem have a different influence on one's social status in general. This is in line with Rosenberg's (Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995) conclusion that general and specific self-esteem are relevant in different ways, due to the fact that the former is more related to psycho-social well-being and the latter is more relevant to the study of behavioural aspects. Actually, social self-esteem was the most prominent aspect of self-esteem in association with self-rated social status among classmates. Both self-esteem and social status are factors that have an impact on students' well-being and school performance. Thus, the role of self-esteem and social status becomes relevant in regard to a student's educational and occupational career development. However, because of the correlational nature of the present study, it is not possible to make any conclusions regarding the directionality of these associations. The present findings suggest, however, that one's social functioning and peer relations are associated with one's self-esteem and temperament.

The influence of disruptive behaviour on school performance and adulthood SEP was examined in two different studies. An age-specific difference was found in regard to the association between disruptive behaviour and later school performance. The present results showed that disruptive behaviour in middle and late childhood predicted later school performance, whereas no association was found when children's behaviour was measured at toddler age. It is known that at the age of three disruptive behaviour is, at least to certain degree, age-appropriate and not a relevant predictor of later academic success, as was shown in the current study. In accordance with previous research (Caspi & Henry, 1995) it was found that disruptive behaviour becomes relevant to school performance when it is measured more proximally to the start of school. In regard to children's age and the measurement of disruptive behaviour, the present findings further support previous research (Hinshaw, 1992b) by showing that hyperactivity is more strongly associated with school performance in elementary grades, whereas aggression is the primary indicator of school performance by adolescence.

Disruptive behaviour in childhood was linked with poor school performance from middle childhood until early adolescence, and it was further associated with both educational and occupational careers in adulthood. This finding suggests that the negative tracking of aggressive behaviour begins early. Aggressive tendencies in childhood have previously been associated with school maladjustment at the age of 14 (Kokko & Pulkkinen, 2000) and with educational attainment, referring to poor reading achievement and the lack of school graduation certificate at the age of 15 (Caspi, Moffitt, Entner Wright, & Silva, 1998). These findings suggest, that school maladjustment and poor educational attainment and may provide a mechanism linking disruptive behaviour with later educational outcomes. The present results are in agreement with previous research that has found associations between high childhood aggression and poor educational outcomes in adulthood (e.g., Asendorpf et al., 2008; Breslau et al., 2009; Caspi et al., 1987; Dubow, Huesmann, Boxer, Pulkkinen, & Kokko, 2006; Stansfeld, Clark, Rodgers, Caldwell, & Power, 2008).

In line with earlier findings (e.g., Asendorpf et al., 2008; Johnson, McGue, & Iacono, 2005), higher levels of hyperactivity in childhood were associated with poor school performance throughout compulsory education. In contrast to expectations, however, hyperactivity was not related to educational levels in adulthood, but a link

was found between hyperactivity and occupational status. Neither was there an association between social adjustment and the level of education in adulthood, but social adjustment most strongly predicted occupational status, as the link remained even after controlling for confounding variables and other dimensions of disruptive behaviour. This result suggests that the role of social adjustment first seems to become relevant in working life.

That hyperactivity and social adjustment were not linked with the level of education, but showed associations with occupational status, may result from their slow cumulative effect. The negative impact of aggression, in turn, already becomes relevant during the school years, and its' influence continues throughout the occupational career.

The present study suggests that social adjustment is not essential in order to perform well during the school years, but it seems to become a more relevant character in working life. Social adjustment is known to correlate with evoking disliking from teachers and with poor social status among peers (Dougherty, 2006; Newcomb et al., 1993). In girls and boys, only moderate evidence for the association between social adjustment and school performance could be found. Previous research has suggested that the role of social adjustment in a child's social status and social popularity is far from clear. Actually, a direct association only exists in kindergarten (Johnson et al., 2000). The present findings suggest that the association between social adjustment and school performance is not clear, either.

Another finding that disruptive behaviour did not relate to adulthood income may result from the stronger influence of disruptive behaviour on academic achievement at an earlier age. It has been shown that hyperactivity is more relevant to educational attainment in elementary grades, whereas aggression becomes more relevant by adolescence (Hinshaw, 1992b). Additionally, our result may be at least partly explained by the fact that income is more sensitive when it comes to short-term life changes, such as ill-health in adulthood (Lynch & Kaplan, 2000), but it is not affected through childhood or adolescence behavioural styles.

Along with previous research, it was found that poor school performance throughout the comprehensive school was a risk factor for adulthood obesity, but only among women. This gender-specific association was consistent with some previous studies (Datar & Sturm, 2006; Laitinen, Power, Ek, Sovio, & Jarvelin,

2002; Morrill, Leach, Shreeve, & Radebaugh, 1991) but not all (Cottrell, Northrup, & Wittberg, 2007; Falkner et al., 2001; Judge & Jahns, 2007; Mikkilä, Lahti-Koski, Pietinen, Virtanen, & Rimpelä, 2003; Mo-suwan, Lebel, Puetpaiboon, & Junjana, 1999; Schwimmer, Burwinkle, & Varni, 2003). One possible link between this gender-specific association is that women, in general, are more conscientious about their school work (Steinmayr, Spinath, & Neubauer, 2008). It could therefore be possible that females may experience poor school performance more stressful than males (West & Sweeting, 2003). Another reason may be that females are expected to perform better at school than males (Entwisle & Hayduk, 1981; Entwisle & Baker, 1983). Thus, poor school performance may cause higher stress among females than among males. Stress, in turn, is known to be related with overeating (Torres & Nowson, 2007).

It is worth of noting that the association between school performance and adulthood obesity remained even after adulthood physical activity was controlled for. In other words, physical exercise in adulthood cannot act as a buffer. It would be of interest to find out whether the result would remain the same, if childhood physical activity were controlled for.

Another major finding is linked to the gender-specific association between disruptive behaviour and school performance. Even though there were no gender differences in the mean levels of aggression, it seemed to play an important role in boys' school success, whereas such an effect was not found for girls. This was not in concordance with earlier research, which has shown that, in general, boys are more likely to show higher levels of aggressive behaviour (Archer, 2004; Rhee & Waldman, 2002). It was concluded that this may be due to the different gender-specific expectations in regard to the acceptance of aggressive behaviour. For instance, the aggressive behaviour of girls in early childhood is more likely to be ignored by teachers and peers, whereas it might be reinforced among boys (Else-Quest, Hyde, Goldsmith, & Hulle, 2006; Fagot & Hagan, 1985). Consequently, even though girls and boys show similar levels of aggression, it may be more condoned among boys. Previous studies have shown that the association between disruptive behaviour and academic performance is either stronger among boys (Williams & McGee, 1994), among girls (Maughan, Pickles, Hagell, Rutter, & Yule, 1996) or similar among both gender groups (Willcutt, Pennington, & DeFries, 2000). Here it



was found that an association between aggression and school performance was only found among boys, suggesting the gender specific role of aggression in academic achievement.

When examining disruptive behaviour in childhood and adulthood income, no association was found for any of the studied disruptive behaviour traits. This may be due to the fact that hyperactivity is more relevant to educational attainment during the elementary grades, whereas aggression becomes more relevant by adolescence (Hinshaw, 1992b). Furthermore, income is more sensitive when it comes to short-term life changes (Lynch & Kaplan, 2000), but it is less affected through childhood or adolescent behavioural styles.

When examining intergenerational social mobility, there were no associations with income-related social mobility, but high hyperactivity predicted a low educational downward drift, whereas high aggression and low social adjustment were related to occupational downward drift. This is in line with a previous finding showing that externalizing behaviour in childhood at the age of seven highly predicted manual SEP at the age of 42 (Stansfeld, Clark, Rodgers, Caldwell, & Power, 2011). In summary, different aspects of disruptive behaviour were shown to predict different types of SEP outcomes in adulthood, and it was seen that disruptive behaviour most clearly associates with occupational status.

Even though educational, occupational and income levels are highly correlated in adulthood, disruptive behaviour, however, was differently associated with them, probably due to their phased development in a person's life. Educational attainment is usually achieved first, representing the transition from childhood and adolescence into adulthood and exposure to working life. Occupation and income are the consequences of the achieved educational level, and final occupational and income levels are often attained several years after reaching final education. Thus, aggression might be the first marker predicting later socioeconomic position that might have its foundation in low educational attainment. These results provide evidence for the health selection hypothesis, i.e., that disruptive behaviour in childhood increases the risk of being in a low SEP in adulthood.

According to Hinshaw (Hinshaw, 1992b), there are four mechanisms through which the impact of disruptive behaviour on school achievement may occur: 1) disruptive behaviours lead to achievement difficulties, 2) achievement difficulties

lead to disruptive behaviours, 3) each leads to the other, and 4) the associations result from underlying causes. The results of the present study suggest that disruptive behaviour affects school performance directly throughout comprehensive education.

In sum, the most important results of the present study are as follows: The study showed that personality and social status are associated with each other at the end of compulsory education (9<sup>th</sup> grade in Finland), highlighting the important role of social feedback on the development of self-esteem. It was further shown that disruptive behaviour in childhood has a negative influence on educational and occupational career development. Aggression and hyperactivity start to influence a person's educational career during the school years (middle childhood), whereas social adjustment becomes relevant first during the working life. There were gender-related differences in regard to the associations between disruptive behaviour and school performance: hyperactivity plays a role among girls' school performance, while aggression is detrimental to boys' success. In addition, poor school performance during comprehensive school years presents a health risk factor in terms of weight gain and obesity. However, this finding was only true among women. These results provide some knowledge of educational, occupational and social exclusion in two population-based non-clinical samples. From a public health viewpoint these results highlight the importance of 1) the early identification of behavioural problems during childhood and 2) the importance of early intervention.

## **5.2 Methodological considerations**

The major strengths of the study are as follows: 1) it was possible to use a population-based ongoing cohort study; 2) in each individual study, it was possible to control for relevant confounding variables; 3) several sources of information (the parents, the participants, medical examiners, teachers) could be taken into account; 4) multidisciplinary approach allowed to make hypotheses from psychology, educational sciences and epidemiology; and, finally, 5) as the teachers receive the same education and all schools follow the same curriculum, the Finnish school system can be seen as rather homogenous.

In Study I, the cross-sectional study design did not allow to make any conclusions in regard to the causality of the associations. During adolescence, rapid developmental changes may occur, which may limit the extent to which the results can be generalized beyond the age group of the sample. In addition, we had only one measurement of social position, which does not allow for examining the changing nature of social hierarchies.

One general limitation concerning studies II-IV is related to the high and somewhat systematic attrition rate. The participants lost to the follow-up were more likely to be men, who had higher levels of childhood aggression and hyperactivity and lower levels of social adjustment, and their adulthood socioeconomic position tended to be lower both in childhood and in adulthood. They also had higher childhood BMIs, and were less physically active. Thus, the present sample was unfortunately selected so that the most disadvantaged persons had been lost by the follow-up, which may have restricted the range of our sample.

In Studies II and IV, another limitation is associated with the operationalization of the disruptive behaviour. In 1980, appropriate instruments for measuring disruptive behaviour were limited. The measurement adopted in our study was originally developed to screen children with potential behavioural problems. It is probable that the whole domain of disruptive behaviour was not covered. Moreover, internalizing symptoms (keeping negative feelings within instead of acting them out) were not assessed. However, due to known importance for their associations with detrimental educational and social outcomes (e.g., Boylan et al., 2007; King et al.; 2004) they would require further attention.

In addition, we have to take into account the possibility that the assessment of children's behaviour may be biased by maternal stress or an affective disorder. It has been suggested, for example, that maternal depression may have an effect on mother's perceptions of their child's maladjustment and temperamental difficulty (Pesonen, Räikkönen, Strandberg, Keltikangas-Järvinen, & Järvenpää, 2004; Whiffen, 1990). In regard to this, children assessed as highly aggressive, highly hyperactive or low in social adjustment may have been perceived by their mothers more negatively than children actually were (Studies II and IV).

In regard to Studies III and IV, another possible concern associates with the validity of the GPA measurement, as self-reported GPAs may be biased through

recall problems. A recent meta-analysis suggests, however, that self-reported GPAs reflect actual performance reasonably well (Kuncel et al., 2005). Additionally, it has been shown that in Finland school grades given by teachers are a more reliable predictor of later academic success than standardized tests (e.g., baccalaureate) (Rantanen et al., 2004).

### **5.3 Implications of the study and future directions**

The evidence from the present study suggests that later socioeconomic position is partially rooted in childhood behaviour and its influence remains throughout the life course, irrespective of the SEP of origin. Problem behaviours in childhood may thus be used as early markers of potential future educational and occupational problems. The identification of several early risk factors that are known to predict the disruptive behaviour clusters of hyperactivity, aggression and rule-breaking behaviour therefore becomes salient. It has been recognized that maternal antisocial behaviour, young age of the mother at birth of her first child, smoking during pregnancy, maternal depression shortly after the child's birth, and a hostile parenting style are risk factors for hyperactivity and aggression or rule breaking behaviour (Petitclerc & Tremblay, 2009). Moreover, low income, low maternal education, family dysfunction and the presence of a young sibling have been identified as additional risk factors for overt aggressive behaviour (Petitclerc & Tremblay, 2009). It has been suggested that in order to reduce the detrimental impact of disruptive behaviour, the interventions should already be employed in prenatal, perinatal and postnatal care. Recent research has shown that disruptive behaviour problems can be identified at the age of 2-3 (Dougherty et al., 2011; Petitclerc et al., 2009). Thus, it can be seen as knowledge that inspires hope, as disruptive behaviour can be influenced early.

Research has shown that teaching children skills to control their disruptive behaviour may reduce its negative impact. A recent meta-analysis has shown that, in general, school-based programs have positive effects in order to reduce fighting, bullying, name-calling, intimidating, acting out and undisciplined behaviour (Wilson & Lipsey, 2007). These programs mainly use cognitive and behavioural approaches,

concentrating on changing thinking patterns, developing social skills or self-control and anger-management. In reducing disruptive behaviour, continuous positive effects have also been achieved through family-focused cognitive-behavioural programs (Barlow & Stewart-Brown, 2000; Nixon, 2002).

Furthermore, because temperament and disruptive behaviour measurements of the present study rely on behavioural evaluation, it is difficult to distinguish what the assessment actually measures. It is possible that such factors as motivation, mood, vitality, to mention a few, may confuse the evaluation of one's individual characteristics. Additionally, there is a fine line between extreme temperament and problem behaviour. A future challenge will be to clarify the difference between risk-level temperament and disruptive behaviour. Recent research has shown that extreme temperament and disruptive behaviour tend to have similar detrimental outcomes. It has been shown that high emotionality relates to both externalizing and internalizing behaviour, and that high activity associates with internalizing and externalizing problems (De Pauw, Mervielde, & Van Leeuwen, 2009; De Pauw & Mervielde, 2011). Similarly, disruptive behaviour is known to be associated with later DBD and ADHD. In the present study disruptive behaviour was considered within a continuum of temperamental characteristics representing the high or low end (high aggression and hyperactivity and low social adjustment).

That social adjustment associated with occupational status is not surprising given the significance that the society currently gives to sociability. Sociability is a necessary leadership quality (Judge & Livingston, 2008), but less is known about whether sociability in general is needed in many other positions. It will be a future challenge to determine what are the benefits and disadvantages of high sociability in regard to particular occupations and positions. It is at least of importance to distinguish between sociability and social skills. With social skills are meant abilities that a person learns through different learning processes and socialization (model learning, social comparison, positive validation and creating possibilities, that enables learning and socialization), whereas sociability refers to innate temperamental tendency to prefer being with others instead of being alone (Buss, 1991). Thus, sociability is not a characteristic that can be learned through socialization.

Girls in general perform better at school and the number of highly educated women in Finland is continuously grows, and the statistics simultaneously shows that those at risk of dropping out from education are more likely to be men (Työ- ja elinkeinoministeriö, 2012). A future challenge will be to identify those risk factors that are associated with worsened school outcomes, especially among the boys.

Research has continually shown that women's health is more likely to be affected by poor school achievement than that of men (Bryant et al., 2000; Huurre et al., 2010; Pitkänen et al., 2008). This was further confirmed by the present study. More research is needed in order to better understand the observed gender-related differences between poor school performance and adulthood health in general and obesity in particular. This would be of interest also from the point of view that more men are at risk being excluded because of poor education.

Furthermore, while research mainly pays attention to problematic behaviours and poor educational and social outcomes, it would also be of interest to find out which traits are necessary for a positive developmental pathway. It has been shown, for example, that among males high childhood self-control (referring to emotional and behavioural control) together with activity (referring to constructive behaviour) is a resource for positive social functioning (referring to psychological well-being, self-esteem and life satisfaction) in adulthood, while among women, high childhood self-control predicts psychological functioning via social functioning such as career development (Pulkkinen, 2009).

The present study also suggests that self-esteem is strongly associated with social status. Both of these factors further influence students' school success. Hence, enhancing students' self-esteem can be one factor that may buffer against detrimental career development. Self-esteem is known to be a relevant factor for personal well-being (Ciarrochi, Heaven, & Davies, 2007). It plays an important role in regard to the development of one's self-perception.

Social exclusion is a complicated phenomenon with a multidimensional background and severe consequences. In order to study the phenomenon of social exclusion as such, register information is needed. However, from the point of view of public health, it is also relevant to study those early risk factors that can still be influenced. The present study provided some evidence in regard to educational and occupational (in terms of school achievement and the level of education in

adulthood, occupational status and income), and on social (in terms of social status and health) development in two population-based samples. These findings may have public health significance, as those early life factors (temperament, self-esteem and behavioural tendencies) associated with negative educational and health development are markers that may already be influenced in antenatal and post-natal clinics.

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