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Breaking the vicious circle

Studies on the interplay between mental health and school achievement among students in the first years of primary school in Sweden

FIFFI BOMAN

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Breaking the vicious circle

Studies on the interplay between mental health and
school achievement among students in the first years of
primary school in Sweden

Fiffi Boman



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DOCTORAL DISSERTATION

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Faculty Opponent: Professor Pernille Due, University of Southern Denmark.

Supervisor: Professor Per-Olof Östergren, Lund University, Sweden.
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Title and subtitle: Breaking the vicious circle, Studies on the interplay between mental health and school achievement among students in their first years of primary school in Sweden.		
Abstract The general objective of this thesis was to increase the knowledge of how mental health and school performance are associated and how interventions may be designed and implemented to enhance the two. The data used in the four quantitative studies on which this thesis is based were derived from two age cohorts of students attending 14 elementary schools in two cities in the southern part of Sweden. The data were collected in the month of January in 2010, 2011, and 2012, thus allowing the individual students' development to be tracked over a total of 2 years. The data were obtained using the Strengths and Difficulties Questionnaire (SDQ), a health questionnaire, standardized tests, and measurement of physiological variables. Seven of the fourteen schools were part of an intervention called UTSIKTER, that aimed to improve academic test results, while the remaining seven schools served as comparison schools. The students were in grades 1 and 2 at the first data collection and in grades 3 and 4 at the last data collection. Three of the quantitative studies involved cross-sectional designs and one a longitudinal design. The data were analyzed using exploratory factor analysis, logistic, linear, and multilevel regression analyses, Cronbach's alpha, sensitivity/specificity analysis, and effect modification. The data of the qualitative study, namely, study V, were obtained by holding focus group discussions with the teachers working at the intervention schools; these data were analyzed using a grounded theory approach. Mental health was independently associated with reading comprehension, writing composition, and mathematics test results. Associations were also found between socio-economic factors and school performance; students who came from families with a low educational level were particularly sensitive to the effects of poor mental health on their school performance. Mental health in the first and second grades predicted reading comprehension outcomes two years later. The school class and school levels together explained 16–23% of the students' variance in school achievement. The intervention schools showed a significantly greater improvement in reading comprehension in grades 3 and 4 relative to in grades 1 and 2 than the comparison schools; this was possibly mediated by the students' improved mental health status. The intervention and comparison schools did not differ significantly in terms of mathematics results. Teacher SDQ assessments, but not parent assessments, showed an adequate construct validity that did not seem to be affected by student socio-economic background. Parent SDQ assessments were, however, influenced by socio-economic factors. Both teacher and parent SDQ assessments had acceptable internal consistency. The qualitative study on the teachers' experience of the intervention process revealed important factors that promoted teacher engagement described by the core category "Getting one's bearings on a maiden voyage". The associations between mental health, school performance, and socio-economic status suggest that societal inequity is already present and exerting deleterious effects in the early school years. The school intervention UTSIKTER showed a potential in terms of improving school performance, possibly by ameliorating mental health. The teacher's involvement in the implementation process seemed to influence intervention outcomes and should thus be carefully considered when designing school intervention programs. The associations between mental health and school performance were especially pronounced for children from families with low socio-economic status, which suggests that school interventions that aim to improve mental health as well as school performance may improve health equity as well as equity in general.		
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Breaking the vicious circle

Studies on the interplay between mental health and
school achievement among students in the first years of
primary school in Sweden

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To my dad

“Find the key to the child! The teacher must help the child to break free from constraint, find its means of expression and become creative. In doing so, the child’s attitude towards learning and work will change.”

Ester Boman, founder and principal of Tyringe helpension, 1909 – 1936.

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Abstract

The general objective of this thesis was to increase the knowledge of how mental health and school performance are associated and how interventions may be designed and implemented to enhance the two.

The data used in the four quantitative studies on which this thesis is based were derived from two age cohorts of students attending 14 elementary schools in two cities in the southern part of Sweden. The data were collected in the month of January in 2010, 2011, and 2012, thus allowing the individual students' development to be tracked over a total of 2 years. The data were obtained using the Strengths and Difficulties Questionnaire (SDQ), a health questionnaire, standardized tests, and measurement of physiological variables. Seven of the fourteen schools were part of an intervention called UTSIKTER, that aimed to improve academic test results, while the remaining seven schools served as comparison schools. The students were in grades 1 and 2 at the first data collection and in grades 3 and 4 at the last data collection. Three of the quantitative studies involved cross-sectional designs and one a longitudinal design. The data were analyzed using exploratory factor analysis, logistic, linear, and multilevel regression analyses, Cronbach's alpha, sensitivity/specificity analysis, and effect modification. The data of the qualitative study, namely, study V, were obtained by holding focus group discussions with the teachers working at the intervention schools; these data were analyzed using a grounded theory approach.

Mental health was independently associated with reading comprehension, writing composition, and mathematics test results. Associations were also found between socio-economic factors and school performance; students who came from families with a low educational level were particularly sensitive to the effects of poor mental health on their school performance. Mental health in the first and second grades predicted reading comprehension outcomes two years later. The school class and school levels together explained 16–23% of the students' variance in school achievement. The intervention schools showed a significantly greater improvement in reading comprehension in grades 3 and 4 relative to in grades 1 and 2 than the comparison schools; this was possibly mediated by the students' improved mental health status. The intervention and comparison schools did not differ significantly in terms of mathematics results. Teacher SDQ assessments, but not parent assessments, showed an adequate construct validity that did not seem to be affected by student socio-economic background. Parent SDQ assessments were, however, influenced by socio-economic factors. Both teacher and parent SDQ assessments had acceptable internal consistency. The qualitative study on the teachers' experience of the intervention process revealed important factors that

promoted teacher engagement described by the core category “Getting one’s bearings on a maiden voyage”.

The associations between mental health, school performance, and socio-economic status suggest that societal inequity is already present and exerting deleterious effects in the early school years. The school intervention UTSIKTER showed a potential in terms of improving school performance, possibly by ameliorating mental health. The teacher’s involvement in the implementation process seemed to influence intervention outcomes and should thus be carefully considered when designing school intervention programs. The associations between mental health and school performance were especially pronounced for children from families with low socio-economic status, which suggests that school interventions that aim to improve mental health as well as school performance may improve health equity as well as equity in general.

List of Publications

- I. Boman F, Stafström M, Lundin N, Moghadassi M, Törnhage C-J, Östergren P-O. Comparing parent and teacher assessments of mental health in elementary school children. *Scandinavian journal of public health*. 2016; 44: 168–176
- II. Stafström M, Boman F, Törnhage C-J, Währborg P, Lundin N, Östergren P-O. Associations of mental wellbeing and health on academic achievement in primary school children? A cross-sectional study of 1st and 2nd grades students in southern Sweden. (*Manuscript submitted to Journal of School Health*.)
- III. Boman, F., Stafström, M., Lundin, N., Moghadassi, M., Törnhage, C-J., Währborg, P., and Östergren, P-O. A Multi-level Analysis of Mental Health and School Achievement Amongst Elementary School Children in Southern Sweden. (*Manuscript submitted to School Effectiveness and Improvement*).
- IV. Boman, F., Stafström, M., Lundin, N., Moghadassi, M., Törnhage, C-J., Währborg, P., and Östergren, P-O. Improving school achievement and mental health? A Swedish intervention study. (*Manuscript submitted to Health Promotion International*).
- V. Boman, F., Östergren, P-O., and Odberg Pettersson K. “Getting one’s bearings on a maiden voyage” – how school interventions can become the teachers’ own springboard and concern: A grounded theory study. (*In manuscript*).

Introduction

Mental health

There are diverse definitions of mental health, many resembling each other (Bremberg and Dalman, 2015). The WHO definition, which is probably the most well-known reads as follows: “Mental health is a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”. In terms of mental health in children, the WHO definition becomes more detailed: “having a positive sense of identity, the ability to manage thoughts, emotions, as well as to build social relationships, and the aptitude to learn and to acquire an education, ultimately enabling their full active participation in society” (WHO, 2013). Thus, the WHO definition of mental health in children and adolescents specifies important aspects of mental health, namely, the desire to learn and acquire an education, and the importance of social relationships.

The overall prevalence of mental health problems in children and youth is estimated to be 10–20% in the Western world (National Research Council & Institute of Medicine, 2009; Bremberg and Dalman, 2015; Evans et al., 2016). Since the 1980s, we have seen an increase in mental health problems in children and adolescents in Sweden, regardless of whether it is measured by self-rated or objective tools. In the last few years, the increase has been particularly marked in 15-year-olds and 13-year-old girls (Hagquist, 2015). Mental health problems and diseases are a growing concern worldwide. In Europe, 11% of the total burden of disease is due to mental ill health; in Sweden, that figure is 14%. For Swedish children and adolescents who are between 5 and 14 years of age, this proportion rises to 30%; this figure climbs even further in the 15–29-year-olds to 42% (WHO, 2014).

However, the increased burden of poor mental health in the younger age groups must be seen in light of the concurrent decrease in other conditions that induce disability and mortality in these age groups. Serious physical diseases are less common in children and young people than in adults. Nevertheless, it is clear that the incidence and prevalence of mental health problems increase gradually as

children and adolescents grow into young adults (Petersen et al., 2010; Hagquist, 2011, 2015).

Most studies support the existence of a socio-economic gradient in child and adolescent mental health (Hjern, 2006; Ravens-Sieberer et al., 2009; Reiss, 2013; Hagquist, 2006, 2015; Elgers, 2015). A gradient is also found in the physiological response to stress, which could indicate risk for subsequent poor mental health. Gustafsson et al. (2006) found associations between psychosocial factors, including socio-economic factors, and cortisol levels in preadolescent children. Minority groups and children and adolescents who are maltreated or exposed to other adversities early in life have an increased risk of experiencing mental health problems (Costello, Egger, and Angold, 2005; WHO, 2013). Such early childhood experiences can have lasting consequences later in life. Indeed, up to 50% of adult mental health problems start before the age of 14 years (Costello, Egger, and Angold, 2005; The Science of Early Childhood Development, 2007; National Prevention Council, 2012; WHO, 2013). Given the importance of the early phases of life in the individual's development, it is essential to ensure good mental health in childhood and adolescence. During this period, children and adolescents form their identity and develop the skills needed for creating good social relationships, acquiring an education, and handling the natural events of life (West, 1997).

Education and health

West (1997) and Bruns et al. (2016) stated that young people must have good mental health to be able to acquire a higher education and career. Education is in turn one of the most important factors that shape both future life possibilities and health outcomes throughout life; thus education affects future mortality and morbidity (Feiler et al., 2008, Kristjánsson et al., 2008, Falkner et al., 2001, Gustafsson et al., 2006). Associations between mental health and educational attainment are also seen in younger schoolchildren (Gustafsson et al., 2010; Guzman et al., 2011; Malecki and Elliott, 2002; Murphy et al., 2015). Mental health problems affect behavior, concentration, and cognitive capacities negatively, thereby impairing school performance (Liston et al., 2009; Gustafsson et al., 2010; Center on the developing child at Harvard University, 2011; De Brito et al., 2013). Moreover, adolescents who report having poor health are more likely to drop out of high school than those who report having good health (De Ridder et al., 2012).

Mental health is also linked to the associations between school performance and other psychosocial problems. High school dropouts and adolescents with low or insufficient grades when graduating from school are more likely to require societal

support later in life (Melzer *et al.*, 2003; Rothon *et al.*, 2009; Vinnerljung *et al.*, 2010; Gustafsson *et al.*, 2010; De Ridder *et al.*, 2012). The situation is particularly alarming for children and adolescents growing up in societal care or who live in families that receive economic support: they are more likely to graduate from primary school with significantly lower grades than other children and adolescents and have a greatly increased risk of future psychosocial and related mental health problems such as criminality, need for societal support, drug addiction, teenage pregnancies, and suicide attempts (Vinnerljung *et al.*, 2010). The grades acquired in the last year of primary school are very important for all adolescents, regardless of socio-economic background, because they correlate with future education outcomes. However, this is particularly true for children in vulnerable life situations; indeed, acceptable grades in primary school are the most important factor protecting the future positive life opportunities of such children (Vinnerljung *et al.*, 2010).

Given that education is one of the most important factors shaping the future health and life opportunities of an individual, interventions that support the performance of children and adolescents in school and thereby secure the future opportunities of underprivileged children and adolescents are needed (Vinnerljung *et al.*, 2010).

The Swedish school system has a compensatory mission, meaning that the schools promote the development and learning of all children. To give every student a fair chance of enjoying learning, being successful according to his or her potential, and acquiring a higher education and employment, it is necessary that the school system provides an education that is equal for all. It should be equal in the sense that all schools provide the same educational quality and possibilities. In particular, all schools must be able to competently adapt the teaching approach according to the needs of individual students (The Swedish school inspectorate, 2010; Sahlberg, 2012; National Agency for Education, 2015). Ensuring that schools give all children equal opportunities to acquire an education can compensate for socio-economic differences or at least lessen their influence on the future life opportunities of the child (The Swedish school inspectorate, 2010).

Early identification and intervention

As mentioned above, up to 50% of adult mental health problems originate before the age of 14. Promoting and preventing such problems early in life are therefore essential for building a sound foundation for future health, well-being, and skill formation (Heckman, 2006; The Science of Early Childhood Development, 2007; Marmott, 2009; National Prevention Council, 2012; Evans, *et al.*, 2016; WHO, 2013). This applies to educational problems as well. Educational skills are built on

previously acquired skills and are dependent on the natural psychological development of human beings (Heckman 2006). The Finnish school system, development of human beings (Heckman, 2006). The Finnish school system, which has been ranked as one of the most successful school systems in the world, in terms of achieving learning outcomes, is based on several important approaches. One is the early identification and treatment of learning difficulties and other problems that relate to function in school (Sahlberg, 2012).

It is easy to imagine that the child feeling at ease and managing to reach educational challenges will have additive effects. It is also easy to see that a group of students in this situation can, together with supportive teachers, influence each other's mental health status and educational achievements. John Dewey proclaimed in his 1916 book "Democracy and Education" that students and teachers impact each other if they share a common interest: "...each one has to refer his or her actions to that of others and to reflect upon the actions of others to give direction and meaning to his' or hers". In other words, a group of people who work together will influence each other's behaviors, sense of well-being, and creativity. If the group shares the same values and goals, they will reinforce each other's behaviors and mindsets, creating a positive spiral that further supports those values and goals.

Education in its context

Cognitive, linguistic, social, and emotional competencies are interdependent (Heckman, 2006). Education is a social process that is dependent on context and the individual's willingness to learn and participate. Providing or acquiring an education is thus not a simple predictable process of adding factors a, b, and c; rather, it is the result of relationships, perception, experience, internal processing, and willingness to understand (Dewey, 1916; Gärdenfors, 2010). Only with this perspective can the tight and interactive relationship between mental health, the school environment, and educational attainment become understandable. It then becomes obvious that interventions that aim to enhance school performance must be targeted at a multitude of factors at diverse levels before success can be achieved.

Interventions

Early school interventions with universal, ecological, and whole-school approaches are not only the most successful interventions; they are also necessary for building resilience and self-esteem and for preventing and treating mental, emotional, and behavioral disorders (Greenberg *et al.*, 2001; Strein and Koehler, 2003; Weare and Nind, 2010; Membride, 2016; Bruns *et al.*, 2016). Universal approaches circumvent the difficulties associated with identifying students at risk and the possible risk of inducing stigma when intervening on the individual level (Greenberg *et al.*, 2001). They also reach students who are at moderate or low risk but who might develop mental health problems or school failure later on. The latter group is the largest; therefore, in line with the prevention paradox, it will contribute in the future the most students with problem behavior, educational failure, and/or mental health problems (Rose, 1980). Similar to universal interventions, whole-school interventions are also likely to be truly beneficial to everyone, not only to those who are at risk of mental ill health (Johnson *et al.*, 2008).

Interventions with ecological approaches encompass interactions between different levels and contexts that affect the students' well-being and educational attainment (Bronfenbrenner, 1994). Bronfenbrenner described human development, including the mental health status and school performance of individuals, as the result of interactions within and between five different systems. Since these systems are all interconnected, they should all be addressed with equal weight if one wants to significantly influence the development of children and adolescents.

The five systems include the micro-, meso-, exo-, macro-, and chrono-systems. The micro-system is the direct interaction between the child and his or her immediate environment. The interaction between a child's different micro-systems is called the meso-system. The exo-system encompasses the interaction between the individual's micro-systems and one or several other systems that only has an indirect effect on the child. The macro-system is the overarching culture of traditions, values, knowledge base, life opportunities, *etc.* in which the micro-, meso-, and exo-systems exist. Lastly, the chrono-system includes the dimension of time and the effect of change on human development (Bronfenbrenner, 1994).

This interconnectedness and constant interaction means that it is almost impossible to target only one phenomenon and not affect others. In other words, interventions with ecological approaches can achieve simultaneous positive effects on more than one outcome (Naylor *et al.*, 2006; Snyder *et al.*, 2009). From this perspective, it is also relevant to combine both universal and selective components in the same intervention since they support the effect of each other (Greenberg *et al.*, 2010).

The importance of flexibility in the implementation process has been extensively discussed and is seen by some as being incompatible with replicable and evidence-based interventions (Mihalic, 2002; Gearing *et al.*, 2011). By contrast, others argue that allowing for flexibility promotes success and is necessary for sustainability, as long as the core components are ensured (Bierman *et al.*, 2002; Fixsen *et al.*, 2005; Bopp *et al.*, 2013). Flexibility improves the participation and local ownership that empower teachers and other professionals who are the key actors in the implementation processes (Reinschmidt *et al.*, 2010; Schäfer Elinder *et al.*, 2012). Therefore, a participatory approach towards a school intervention, where teachers and other professionals are truly listened to and engaged, has great advantages. Creating good relationships with the key implementers and acknowledging and making use of their experience and competence increases intervention acceptability and makes it easier to do the right things in the right place and at the right time.

Mental health measurements

The tools used for measuring mental health in larger research projects must be validated, easy to use, and applicable to larger groups. The Strengths and Difficulties Questionnaire (SDQ) used in this research project meets these standards and is therefore extensively used all over the world in clinical practice and research, and for screening purposes.

The SDQ is based on perceived behavior. Almost half of the 25 statements posed in the questionnaire relate to behaviors that affect the ability to concentrate and use one's full cognitive capacity. Thus, the SDQ screens for difficulties in being productive and attaining educational goals, which, as stated in the WHO definition, are important for the mental health of children and adolescents. Of the five scales in the SDQ, one, namely, the Pro-social sub-scale, is not used to generate the Total Difficulties score that is employed for screening. However, this SDQ sub-scale is also important because it focuses on the strengths of the individual in terms of their social relationships, which, as indicated by the definition of the WHO, are also important for the sound mental health and well-being of children and adolescents.

When evaluating research findings, we need to be able to interpret them correctly. We thus need to be aware of and understand how the instruments we use work in different settings and how informant characteristics may affect the results.

The SDQ had been validated in many cultural contexts and languages, including in Arabic (Alyahri and Goodman, 2006). This was an advantage for this research

project because many of the individuals in the study populations came from Arabic backgrounds. However, to our knowledge, the Swedish version has only been validated for parents of 6–17-year-olds; it has not been validated for teachers of this age group (Smedje *et al.*, 1999; Malmberg *et al.*, 2003; Björnsdotter *et al.*, 2013). There are also very few studies on the differences between informants from ethnically or socio-economically diverse backgrounds in terms of SDQ scores (Bøe *et al.*, 2012; Zwirs *et al.*, 2011).

Many studies show associations between mental health and educational attainment and depict how this works at the individual and neuro-scientific level (Liston *et al.*, 2009; Gustafsson *et al.*, 2010; Center on the developing child, 2011; De Brito *et al.*, 2013; El-Hage *et al.*, 2006; McEwen, 2007). Others show associations between mental health, educational attainment, and the contextual levels (*e.g.*, school and class) (Sellström and Bremberg, 2006). We know that interventions at the school and class level reach more students and are probably more sustainable than interventions that are only targeted to the individual. However, there is a gap in the literature in terms of how environmental and individual systems interact and reinforce each other, especially in younger schoolchildren. Further exploration of how the interconnectedness of contextual and individual factors affects educational attainment and mental health in younger schoolchildren could therefore give schools clearer guidance in terms of how to create organizations that empower the students and give them the skills to manage school and themselves (Hoagwood, 2007).

The nature of ecological interventions implies that they are multifaceted and consider the uniqueness and complexity of each school and its context. This means that these interventions must be flexible and able to adapt readily to the local needs and resources. This poses a slight problem: solitary studies may not produce findings that are applicable to other contexts (Greenberg, 2005). However, broad research encompassing a multitude of studies with different designs and posing different questions may be able to identify the core components that can tolerate flexibility and that make these types of interventions successful and sustainable. At present, many studies of successful universal, ecological school interventions have been performed. However, hardly any of these studies address school performance (Webster-Stratton *et al.*, 2008; Foster *et al.*, 2007; Snyder *et al.*, 2009; Mc Creary *et al.*, 2012; Burke *et al.*, 2014; Schäfer Elinder *et al.*, 2012; Naylor *et al.*, 2006; Martin *et al.*, 2014).

Interventions that aim to enhance the school performance or mental health of students often depend on teacher involvement and participation. Understanding how teachers experience and engage in the implementation process is essential for avoiding obstacles and creating successful and sustainable interventions. However, we could not find any extensive literature on teacher experiences regarding

intervention processes or how the teachers can become truly involved. Indeed, Greenberg *et al.* (2005) stated that there is little research that assesses how teacher characteristics, such as previous social emotional learning training or psychological mindedness, affect program delivery or program outcomes. We believe such studies are needed to promote the future successful implementation of school interventions.

The overarching issue of this thesis is to contribute to the knowledge about the important interplay between mental health and school performance in younger schoolchildren and to communicate the potential usefulness of rethinking the schools' organization and their work so that the needs of their students can be truly met, thereby creating healthy environments in which the students can grow and flourish.

Aims and objectives

General objectives

The overall objective of this thesis is to contribute to the existing knowledge base regarding how the mental health and school performance of younger schoolchildren associate and how interventions may be designed and implemented to enhance the two.

We hope that the knowledge provided by this thesis will help policy makers and school leaders to better understand the relationship between mental health and educational issues starting from the very first school years and continuing throughout school. We hope that this improved understanding will aid them to develop an educational system that optimizes the future development and opportunities of the students. This also means flagging the issue of students' educational attainment and mental health status as a question of equity and societal prosperity.

Specific Aims

- I. To critically investigate the instrument (SDQ) by analyzing the factor structure of parent and teacher SDQ assessments and comparing them in terms of construct validity and precision, and to analyze whether the assessments are affected by the child's sex or parental socio-demographic factors such as country of birth and level of education (paper I).
- II. To analyze to what extent mental health factors associate with academic performance in younger schoolchildren (papers II and III) in terms of contextual factors (paper II), and to identify the influence of the individual level and the contextual levels of school and class on the academic performance of these younger schoolchildren (paper III).

- III. To evaluate how an ecological school intervention (termed “UTSIKTER”) that is based on participatory principles impacts the school performance of students, with particular focus on the role of mental health (paper IV).
- IV. To explore how teachers exposed to the ecological school intervention “UTSIKTER” experienced and engaged in the implementation process (paper V).

Background

The study context and the intervention

To give all children and youth the opportunity to achieve a good educational start and a solid base for good health, there is a need for collaboration and shared responsibilities in society. Therefore, Helsingborg, its neighboring city Landskrona, and the county council Region Skåne (which is responsible for healthcare activities in the most southern part of Sweden) formed a collaborative organization named PART (a Swedish acronym that means working preventively together) in which all “soft” boards and committees in the cities were represented. The focus of PART was to enhance the education and future health opportunities of at-risk children by implementing early interventions.

The composition of PART made it possible to attain a comprehensive picture of the factors that influence the education and health of the children and youth in the participating cities. This, together with the diverse competencies represented in PART, provided a solid base for the decisions that were taken. Responsibilities and financial aspects could be spread across the different boards and committees. All boards and committees agreed that the responsibility for the school achievements of the students was not merely a school board responsibility, it was also the responsibility of all the boards and committees of the cities, as well as of Region Skåne.

In doing so, PART extended the responsibility of the educational attainment of each child from the individual teacher to the city boards and committees and provided a structure to support the development of the schools all the way from the classrooms up to the political level.

In 2005, PART initiated a project called Skolfam (School and Family). The reason for this project was the finding that children in societal care have a 3-fold higher risk of not completing high school education than their peers (Vinnerljung *et al.*, 2005). Given that education is one of the most important factors that dictate future life opportunities, and that this association is even more pronounced for underprivileged youth, this finding indicates a major inequality (Berlin, Vinnerljung, and Hjern, 2011; Jackson, 1994). The aim of Skolfam was thus to

break this negative linkage by providing a strong educational support for children in long-term foster care.

Twenty-five children were included in the first Skolfam project. A school psychologist and a special education teacher assessed every child individually in terms of school performance, mental health, and cognitive capacity. The strengths and difficulties of each child were identified and communicated to the children and their foster care parents, teachers, and social workers. Together, they planned systematic interventions to support the child educationally and in other aspects that were found to be important to the child's development. The main aim of the interventions was to enhance school performance. The progress of the children was regularly and systematically monitored and evaluated, and a continuous dialogue was maintained between all involved parties to ensure that the child received the right support and developed according to his or her capacity.

The Skolfam project was successful: after 2 years, the children had significantly improved their results in reading and spelling. Their IQ test results had improved as well (Tideman *et al.*, 2011). Due to these positive results, Skolfam was incorporated into the cities' ordinary activities and a Skolfam manual was created. Today, Skolfam has been adopted by 26 cities in Sweden and further positive results have been reported (Tordön *et al.*, 2014).

The experiences with Skolfam encouraged PART to apply a similar model to other groups of children who are at increased risk of school failure and limited opportunities in life, namely, children in families with long-term dependency on social welfare and children who recently had immigrated to Sweden (WHO, 2013). During the Skolfam project, it was found that it was easier and more fruitful to work with schools whose principals were interested and engaged in the Skolfam work. It was also observed that there was a demand for interventions at the organizational level rather than at the individual level only. For this reason, the cities wished to focus on the schools whose principals volunteered to join the project. Thus, schools in socio-economically vulnerable neighborhoods were asked to participate in a new project called UTSIKTER. Five schools in Helsingborg and two in Landskrona took on the challenge. UTSIKTER is an acronym in Swedish that stands for Education, Collaboration, Intervention/Integration, Knowledge, Application, Economy, and Results and means "prospects" or "views" in Swedish. The basic principle of UTSIKTER was that all schools are capable of and responsible for giving every student the opportunity to perform his or her best by having high expectations of and placing reasonable demands on the student and by providing suitable teaching and school environments. The development of the students guided the school's development. If the students failed to reach the goals, the primary approach was to identify the

deficiency in the organization that led to the failure to meet the needs of the individual students.

The procedure employed in UTSIKTER was the same as in Skolfam. Thus, individual children in the chosen risk groups were identified by the social services. After having received initial information about the project, the parents decided whether they wanted their child to participate. The children were then assessed in the same systematic manner as in Skolfam except that their physical health status was also reviewed. This component was added because the Skolfam team had discovered that many of the children in Skolfam had health problems and had not received adequate health checkups.

After the work with the children in UTSIKTER commenced, the staff tested new ideas and acquired new insights that were applicable to many of their other students. From time to time, organizational alterations had to be made to meet the target students' needs. Since these alterations were also beneficial to the other students, it seemed appropriate to apply the UTSIKTER model to the whole school as an ecological intervention targeting all students and different levels of the school's organization and processes.

Around the same time, the National Institute of Public Health in Sweden proclaimed the need to focus more intensely on the health of children and adolescents. In 2009, a 50-million kronor project to address this was launched. Grants were announced and Swedish cities were challenged to collaborate with researchers to establish and study new methods of enhancing the mental and physical health of children and adolescents. The aims behind initiating this collaboration between the cities and researchers were to emphasize the importance of evaluating activities and interventions, raise awareness about using methods that have been shown scientifically to be effective, and hopefully find new effective methods for enhancing the health of children and adolescents.

Together with the Division of Social Medicine and Global Health at Lund University, the cities of Helsingborg and Landskrona, i.e. PART, applied successfully for a grant. The 50-million kronor project eventually included six cities and their collaborating academic institutions that had received grants. During multiple seminars the different projects were presented and discussed. These seminars with researchers, practitioners, public officials, and politicians stimulated important and fruitful discussions about the obstacles hampering project implementation and collaboration between the practitioners and researchers; they also stimulated novel thinking about how to overcome these obstacles. The seminars were a great source of learning for everyone involved.

In line with Skolfam and UTSIKTER, PART chose to target student health by influencing school performance, thereby also, through the bi-directional

relationship depicted in figure 1, improving the mental health of the students. By focusing on the UTSIKTER schools, which were situated in neighborhoods with low socio-economic status, the cities hoped to positively influence the current and future health of the students who would benefit the most. The long-term aim was to decrease inequality in the society.

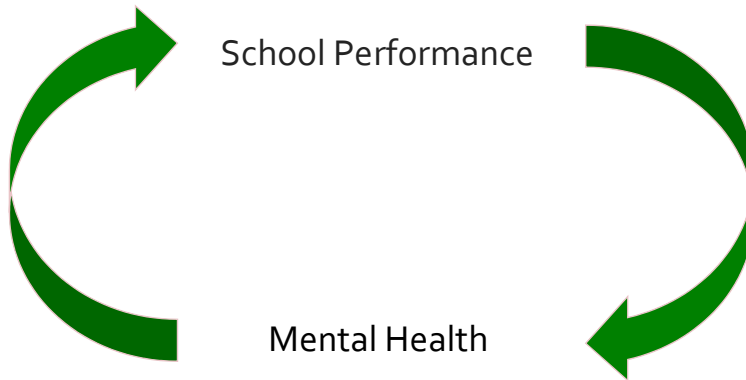


Figure 1
The circular relationship between School Performance and Mental Health

The intervention was designed as a research-supported intervention that would be implemented during the two years of the 50-million kronor project. This meant that the intervention was planned and implemented and the continuous evaluations and data collection were performed in constant collaboration with the researchers. The data were collected and presented to the schools regularly, and the researchers were accessible for support in analyzing the data and for planning further local interventions.

However, working with hundreds of children by necessity requires a slightly different approach to that taken when working with a few individual children. Some alterations had to be made to the project to accommodate its size. Thus, one-to-one assessments were omitted so that all remaining assessments could be performed in class or by the teacher or parent. The assessments were, as in Skolfam, performed on a regular and systematic basis. To obtain a comprehensive picture of the students' development at a group level, the results were aggregated in color charts (see figure 2 for an example).

in the analysis and having access to the advice and knowledge of the UTSIKTER project group also made it possible for teachers and other personnel to participate in designing the local interventions and influence the implementation process. It also greatly helped the principals to focus on their utmost important mission, namely, their educational leadership.

A learning organization as a framework for a school based on equity

If we know where we want to go, we have to know where we are and decide how to get from here to there. This is simple, but this was not how the participating schools in Helsingborg and Landskrona, or Swedish schools in general, had organized their work. The UTSIKTER intervention meant introducing systematic monitoring and analysis with a holistic view of why the outcome variables, namely, the students' school performance, developed as they did. Adopting a holistic view of the students' performance was needed to be able to perform sound evaluations and find ways to facilitate development. It helped the school personnel to see patterns and processes instead of solitary incidences. This is the idea behind systems thinking, which is a framework describing the relationships and interconnectedness between phenomena, incidents, and actions. Systems thinking is considered the foundation of how learning organizations view themselves in relation to the world surrounding them (Senge, 1990). In our context, it implies that the school is an organism that is dependent on the surrounding ecosystem and all of the individuals and processes taking place within the school. The consequence is that the teachers and the principal share a collective responsibility for the students and that diverse factors both within and outside the school arena have to be taken into account when understanding and altering processes within the school. The systematic, regular monitoring, and holistic analysis, in the UTSIKTER schools created an ongoing improvement cycle that provided the principal and teachers with continuous feedback; this, together with their sense of shared responsibility, yielded the potential of creating a learning organization.

Using formal assessments such as standardized tests to guide the school's work has a great impact on the students' achievements (Hattie, 2009). So does forward-oriented feedback and positive expectations of the students' abilities (Hattie, 2009). Formal assessments, if performed on a regular basis, become a sound feedback for not only the students in terms of their performance but also their parents and perhaps most importantly their teachers and the principal.

Incorporating formal assessments in the ordinary educational assignment also makes it easier to detect learning disabilities, cognitive impairments, *etc.* at an

early stage. Early detection gives the school a better chance to support the students before the problems escalate and is one of the most efficient ways to elevate both the educational level and health of individuals and society (Forness, 2000; National institute of Public Health, 2004; Heckman, 2006; von Greiff *et al.*, 2012).

Of the OECD countries, Finland has the weakest relationship between reading performance and socio-economic background. Thus, Finland has succeeded best in creating schools with equal learning opportunities for all students regardless of their background. The basic principles of the Finnish school system are that all students can learn if given proper opportunities and support and that the school has a compensatory assignment and must thus provide needs-based high-quality educational opportunities for everyone. An important part of this is to identify learning difficulties and other individual deficits early and provide the right support and treatment directly (Sahlberg, 2012). This suggests that the early detection of learning difficulties is an essential part of giving all students the same life opportunities both educationally and health-wise.

Table I.

Overview of the thesis papers: Aims, study design, population sample, data sources and analytical approach

Paper	Aims	Study design	Population sample	Data sources	Statistical analysis
I	To compare the precision and validity of parent and teacher SDQ assessments in elementary school children, and to analyze whether assessments were affected by the child's sex and by socio-demographic factors.	Cross-sectional	512 first and second grade students in 14 schools.	Self-administered questionnaires, parent and teacher SDQ assessments.	Exploratory factor analysis, Simple and multiple binary logistic regression analysis Cronbach's alphas Sensitivity / specificity analysis
II	To analyze to what extent health factors, predominantly those pertaining to mental wellbeing, are associated with academic performance during the very first years in school	Cross-sectional	606 first and second grade students in 14 schools.	Self-administered questionnaires, parent and teacher SDQ assessments, standardized tests in mathematics and in reading comprehension, and biometric tests.	Simple and multiple binary logistic regression Analyses of effect modification
III	To understand how mental health in younger school children is associated with school achievement in the context of class and school.	Cross-sectional	665 third grade students from two cohorts in 14 schools.	Self-administered questionnaires, parent and teacher SDQ assessments, standardized tests in mathematics and in reading comprehension, and salivary cortisol.	Simple and multiple linear regression and multivariable multilevel linear regression analysis
IV	To evaluate the impact of an ecological school intervention on students' school performance, considering the role of mental health.	Longitudinal over two years	443 primary school students of which 262 attended 7 intervention schools and 181 attended 7 comparison schools.	Self-administered Questionnaires, teacher SDQ assessments, standardized tests in mathematics and in reading comprehension.	Simple and multiple linear regression analysis
V	To explore how teachers experienced the process of, and engaged in an ecological school intervention with participatory principles.	Qualitative	16 individual teachers exposed to the intervention UTSIKTER	Focus group discussions.	Grounded theory analysis

Study populations and methods

Study populations and study designs

The intervention took place in seven schools in the cities of Helsingborg and Landskrona, which are located in the southern part of Sweden. The two cities are considered large and medium-sized cities: their populations consist of 130 000 and 43 000 people, respectively. In addition to the seven intervention schools, seven comparison schools in the same cities were included in the research project. The comparison schools were situated in similar neighborhoods as the intervention schools, namely, neighborhoods with a low socio-economic status that were predominantly inhabited by immigrant and low-income families.

All students attending grades 1 and 2 in the 14 schools in January 2010 were invited to participate in the research project. Students who joined the schools later on were also given the opportunity to participate. Students whose parents had neither given their consent nor rejected their child's participation were invited to participate again in 2011 and 2012. Students who left the schools during the project time were thereafter excluded from the study. The included students' development was observed during 2 consecutive years, with data being collected three times during the same month of the year (January).

The mobility of the students meant that the number of students in the research project differed from year to year. The total number of students who were invited to be a part of the research project increased every year. In 2010, 792 students were invited to participate, in 2011 it was 798, and in 2012, 954. The proportion of students whose parents consented to their participation varied from 76.5% to 86.5% (table II).

As demonstrated by table II, we did not acquire all data for all included students every year. Depending on the aim and variables that were studied, the data that were missing varied in the different quantitative studies in this thesis.

Table II.
Study population over the years

	Intervention and Comparison schools			Intervention Schools		Comparison Schools	
	Total	Included in study	All data	Total	Included in study	Total	Included in study
2010	792	606 (76.5%)	453 (74.8%)	467	352 (75.4%)	325	251 (77.2%)
2011	798	690 (86.5%)	399 (57.8%)	455	397 (87.3%)	394	326 (82.7%)
2012	954	783 (82.1%)	466 (59.8%)	560	467 (83.4%)	394	326 (82.7%)

Study I

This was a cross-sectional study that included 512 students who attended grades 1 and 2 in the seven intervention and seven comparison schools in January 2010 (table III). We included only those students for whom we had data from both parent- and teacher-assessed SDQ.

Study II

Study II also used a cross-sectional design and included 606 first and second year students from the 14 schools; these 606 students comprised 76.5% of all students in the two first grades in January 2010 (table III). For 453 of the 606 students (75%), the different types of data were obtained. They consisted of biometric measurements, information gathered using the health and socio-economic questionnaire, the parent and teacher SDQ assessments, and standardized tests in mathematics, reading, and writing skills.

Table III.

Overall response-rates for different types of data collection and response-rates within the cross-sectional dataset (papers I and II include the 2010 cohort)

Type of data collection	2010 (% of study pop.)	2011 (% of study pop.)	2012 (% of study pop.)
Number of students in the 14 schools	792	798	954
Students with informed parental consent (Study population)	606 (76.5)	690 (86.5)	783 (82.1)
Biometric test	563 (92.9)	665 (96.4)	633 (80.8)
Health questionnaire	551 (90.9)	606 (87.8)	621 (79.3)
SDQ parents	563 (92.9)	536 (77.7)	551 (70.4)
SDQ teachers	540 (89.1)	595 (86.2)	563 (71.9)
Math test	587 (96.9)	639 (92.6)	619 (79.1)
Reading comprehension test	534 (88.1)	632 (91.6)	625 (79.8)
Participated in all types of data collection	394 (64.0)	399 (57.8)	466 (59.5)

Study III

In study III, we again applied a cross-sectional design. This time, we included all students who were part of the research project and who attended third grade in January 2011 and January 2012. Thus, we combined two cohorts of third-grade students to obtain a larger study population. The two cohorts consisted of 665 9–10-year-olds from 36 different classes across the 14 schools (table IV).

Table IV.

Overall response-rates in 3rd grade students 2011 and 2012 for different types of data collection and response-rates within the cross-sectional dataset (paper III)

Type of data collection	2011 (% of study pop.)	2012 (% of study pop.)	Total (% of study pop.)
Number of students in the 14 schools	412	377	789
Students with informed parental consent (Study population)	356 (86.4)	309 (82.0)	665 (84.3)
Biometric test	320 (89.9)	288 (93.2)	608 (91.4)
Health questionnaire	295 (82.9)	275 (89.0)	570 (85.7)
SDQ parents	283 (79.5)	264 (85.4)	557 (83.8)
SDQ teachers	286 (80.3)	275 (89.0)	571 (85.9)
Math test	332 (93.3)	301 (97.4)	633 (95.2)
Reading comprehension test	328 (92.1)	297 (96.1)	625 (94.0)
Participated in all types of data collection	178 (50.0)	211 (68.3)	389 (58.5)

Study IV

Study IV was a longitudinal study whose aim was to evaluate the success of the intervention over the 2 study years. Thus, the changes between 2010 and 2012 in the school achievements and mental health of the students who attended the intervention and comparison schools were compared. We followed 443 students individually from 2010 to 2012. Of these, 262 students attended an intervention school and 181 attended a comparison school (table V).

Table V.

Overall response-rates and response-rates different types of data collection and within the panel dataset (paper IV)

Number of students in the 14 schools in 2010	2010 participants within the panel with parental consent	2011 participants within the panel (% of baseline panel)	2012 participants within the panel (% of baseline panel)
792	606	552 (91.1)	477 (78.7)
Type of data collection in the panel study	2010 participants (% response rate)	2011 participants (% response rate)	2012 participants (% response rate)
Biometric test	563 (92.9)	538 (97.5)	461 (96.6)
Health questionnaire	551 (90.9)	482 (87.3)	458 (96.0)
SDQ parents	563 (92.9)	440 (79.7)	415 (87.0)
SDQ teachers	540 (89.1)	485 (87.9)	411 (86.2)
Math test	587 (96.9)	518 (93.8)	452 (94.8)
Reading comprehension test	534 (88.1)	508 (92.0)	453 (95.0)
Participated in all types of data collection	394 (65.0)	316 (57.2)	338 (70.9)

Study V

Study V was a qualitative study. Every step of the study was performed in line with grounded theory, from open data collection and analysis performed simultaneously to an increasingly more selective analysis. All teachers in the seven intervention schools who were responsible for the classes that were included in the research project were invited to participate in consecutive focus group discussions. Of all teachers, 16 individual teachers participated in the discussions. Some teachers attended only one session, others two to four sessions. All focus groups consisted of four to six teachers each.

Study measures and main variables

School performance

School performance was measured using standardized tests in reading skills and mathematics. The tests were performed in class with the guidance of the ordinary teacher.

The Magne Mathematics Test was used to assess mathematics skills. This test measures elementary mathematics and is standardized for specific age groups (Engström and Magne, 2003).

To assess flow of reading and reading comprehension, a test designed by Lundberg, 2001 was used. This test is commonly used in Swedish elementary schools to identify students with reading comprehension problems (Lundberg, 2001).

In study II, a test in writing skills was included in addition to the tests mentioned above. The students had to write a short description of a picture. The text was evaluated in three levels according to certain standards for the relevant grade.

The raw test scores on the reading and mathematics tests were categorized into predefined continuous and standardized Stanine scales.

Mental health

The students' mental health was measured using a screening instrument, namely, the Strength and Difficulties Questionnaire (SDQ). It is widely used both in clinical practice and research. It was designed and introduced in 1997 by Robert Goodman (Achenbach *et al.*, 2008; Goodman *et al.*, 2000; Obel *et al.*, 2004; Goodman, 2001). There are versions for parent and teacher assessments of students aged 3–17 years and a version for self-assessment by youths aged 11–17 years. It has been translated to more than 80 languages, including Swedish and Arabic (Malmberg *et al.*, 2003; Smedje *et al.*, 1999; Alyahri and Goodman, 2006).

The SDQ comprises 25 questions that are divided into five sub-scales. Four of the sub-scales reflect difficulties, namely, the Hyperactivity/concentration, Conduct, Peer-relations, and Emotional sub-scales. The fifth sub-scale reflects strengths, namely, the Pro-social behavior sub-scale. The questions in all sub-scales are posed as statements with three alternative answers: “not true”, “somewhat true”, and “certainly true”. These answers each receive 0, 1, and 2 points, respectively, for each question.

To assess risk of mental health problems with the SDQ, the scores of the four sub-scales that reflect difficulties or problem behaviors are added to form the Total Difficulties Scale. The scores on the Total Difficulties Scale range from 0–40, with higher scores indicating an increased risk of mental health problems.

In studies I, II, and IV, we used the cutoff scores that were suggested by Goodman and have been employed in clinical practice. Thus, Total Difficulties scores of ≥ 17 in the parental ratings and ≥ 16 in the teacher ratings were used to indicate a high risk of mental health problems (Mark and Janssen, 2008). In study III, we used the scores as a continuous scale. This approach was shown to be feasible in a 2009 study (Goodman and Goodman, 2009).

The teachers in our studies completed the SDQ for each of their students in school. The parents filled out the SDQ at home. The largest immigrant group in the schools was of Arabic origin. The parents of Arabic origin received a validated Arabic version of the SDQ (Alyahri and Goodman, 2006). Parents who needed interpretation in another language were invited to fill out the questionnaires with the assistance of an interpreter.

Symptoms of mental health problems tend to be situational (Achenbach *et al.*, 1987; Ederer, 2004), and full agreement between different informants who assess the same child is not expected (Ederer, 2004; Stone *et al.*, 2010). For this reason, many authors recommend using several sources of informants to identify children and youth with mental health problems (Goodman *et al.*, 2000; Achenbach *et al.*, 2008; Obel *et al.*, 2004). In studies I and III, we used both parent and teacher SDQ assessments, but, in studies II and IV, we only used teacher assessments. We chose to do so to simplify the analysis and because teacher assessments have better psychometric properties than parental assessments (Stone *et al.*, 2010; Becker *et al.*, 2004; Goodman, 2001; Niclasen *et al.*, 2012). Moreover, teacher SDQ assessments fitted the five-factor structure well in this particular population whereas parent SDQ assessments did not.

Demographic and socio-economic variables

Information about demographic and socio-economic factors was obtained by asking the parents and children to together complete the health and socio-economic questionnaire.

Parents' level of education (studies I–IV)

There were five options for reporting the mother and fathers' level of education in the questionnaire: university exam; completed secondary school and some university education; completed secondary school (maximum 11–13 years of education), completed primary school (maximum 9 years of education); did not

complete primary school (less than 9 years of education). This classification was based on the Swedish school system, where 9 years of education is considered as having completed primary school and 12 years is considered as having completed high school.

In study I, the mother's and fathers' educational level was dichotomized. The cutoff for high educational level was set at having 12 years of education or more, which corresponded to having completed secondary school (high school).

In study II, the mother and fathers' educational level was also dichotomized but, in this study, the cutoff for higher educational level was set at having more than 9 years of education, which implies having completed primary school.

In study III, the whole scale was used and having less than 9 years of education was used as the reference category.

Only the mothers' educational level was used in study IV. The categorization was identical to that used in the other studies and was applied as a continuous scale.

Parents' country of birth (studies I–IV)

In study I, the parents' country of birth was dichotomized. The children were deemed to have either Swedish-born parents (both parents were born in Sweden) or non-Swedish-born parents (either or both parents were born outside of Sweden).

In study II, the parents' country of birth was also dichotomized but this time the children were considered to have Swedish-born parents if one or no parent was born outside of Sweden. If both of the parents were born outside of Sweden, they were classified as non-Swedish-born parents.

In studies III and IV, the classification was trichotomized. Having two Swedish-born parents was used as the reference category; in addition, the children could be classified as having one or no Swedish-born parents.

Vocational activity (study II)

Parents answered the question "What is your current labour market status?" in the health and socio-economic questionnaire. There were eight alternative answers: working full time, working part-time, being on parental leave, undertaking governmental labor market activities, unemployed, studying, in retirement/early retirement, and not active.

The parents' vocational activity was then dichotomized with a cutoff between working part-time (being vocationally active) and being on parental leave (not being vocationally active). A new dichotomized variable was created on the basis of both the mother and fathers' vocational activity. The new variable was categorized as having at least one or having no vocationally active parent.

Living conditions (study II)

The additional questionnaire also included the question “With whom do you reside?” The answer “both parents” was coded into one category (parents not divorced), and all of the other answer alternatives (residing predominantly with mother/residing predominantly with father/residing equally with mother and father but they are living apart/residing with someone else) were coded into a second category (parents divorced).

Health variables

Biomarkers of stress: salivary cortisol (study II, III), and rate pressure product (study III).

Stressful situations lead to the activation of the hypothalamic-pituitary-adrenal (HPA) axis and thereby to the secretion of cortisol in addition to other hormones. Cortisol is easily measurable in blood, urine, and saliva. Salivary cortisol is suggested to reflect the level of stress and has thus been extensively used as a biomarker of stress in research (Inder *et al.*, 2012).

Samples of salivary cortisol were collected in the first hour of the school day (between 8 and 9 am) by asking the students to let a cotton swab soak in their mouth for about a minute. The times the child woke up and had breakfast that morning were documented. All salivary cortisol samples were frozen and analyzed simultaneously after the last data collection in 2012. The individual levels of salivary cortisol were then logged and used in studies II and IV as a continuous variable, as described by Törnå, 2002.

Rate pressure product is used as a measure of physiological stress on the cardiac muscle and is also affected by psychological stress (Goyal, 2014). It is calculated by multiplying the heart rate with the systolic blood pressure (Riopel, 1979). Two research nurses measured the students’ blood pressure and heart rate in the morning. Rate pressure product was used in study II.

Psychosomatic symptoms (study II)

Information about psychosomatic symptoms was obtained using the health and socio-economic questionnaire.

The psychosomatic scale consisted of nine different questions that were based on scales used in other age groups. The questions were posed as “how often do you...” followed by the psychosomatic conditions, have difficulties concentrating, have difficulties falling asleep, have difficulties sleeping, have headaches, have stomach aches, have poor appetite, feel sad, feel scared or worried, and feel irritated and ill-tempered.

The answers were assessed on a 4-point Likert scale with four answer alternatives, namely, “never or very rarely”, “rarely”, “often”, and “always or almost always”. The answers were added into a scale with scores ranging from 9 to 36, where a high score indicated more psychosomatic problems than a low score. The mean scores were calculated and found to be 14.6 (SD, 3.6); the median was 14. The scale was then dichotomized between the third and fourth quartile; thus the cutoff for high amounts of psychosomatic symptoms was set at between 17 and 18 points.

School environmental variables

The school environmental factors were obtained using the health and socio-economic questionnaire.

Being dissatisfied in school (study II)

School satisfaction was assessed by three questions that were asked in the additional questionnaire: “How satisfied are you with your class?”, “How satisfied are you with the school breaks?”, and “How satisfied are you with your teacher?” A 4-point Likert scale ranging from very satisfied to very dissatisfied was applied to these questions. Each answer represented a score. When the answers of all three questions were added up together, we ended up with a scale that ranged from 3 to 12 points, with the median at 4 points and a scale reliability (Cronbach’s alpha) of 0.62, which is not strong but acceptable. The scale was dichotomized so that those whose score was less than the mean (4.4) plus one standard deviation (SD, 1.5) were placed in the category “satisfied with school”. The cutoff was thus set at between 6 and 7 points.

Having been bullied and/or teased in the past 6 months (study II)

The question whether the participants had been bullied or teased in the past 6 months was only possible to answer with yes or no.

Leisure-time environmental variables

The leisure-time environmental factors were assessed using the additional questionnaire.

Excessive screen-time (study II)

In line with previous studies on the relationship between excessive screen-time and adverse health outcomes, excessive screen-time was defined as spending more

than 20 hours/week in front of a screen, including TVs, computers, and mobile devices (Mark and Janssen, 2008; Carson et al., 2011).

Extracurricular activity participation (study II)

Extracurricular activities were defined as diverse organized activities such as sports, boy/girl scouts, church groups, dancing, and playing instruments. The variable was dichotomized into two categories, namely, those who participated on a weekly basis in such activities and those who did not.

Data collection

Quantitative data

The data collection took place in January in the years 2010, 2011, and 2012. The same types of data were collected each year. Only the educational tests varied according to the grade. Since these tests were standardized, the results were comparable across the grades.

The parents had to give their written informed consent for their child to be included in the study. They were informed that the data we collected would be kept anonymous and that they could withdraw their child from the research project whenever they wished. For us to be able to follow the data of an individual, each participating child was labeled with a unique number. The key that matched each number to a certain child was only accessible to one of the researchers.

The parents were also informed that they would be contacted if any information in the collected data raised concern of any sort. Members from the project team contacted the parents in such cases and offered them support or, if needed, referrals.

Educational tests

The tests were all standardized according to the relevant age group and performed in class by the ordinary teacher.

The Magne Mathematics Test was used to assess skills in mathematics (Engström, and Magne, 2003).

“Vilken bild är rätt” (“What picture is right?”) was used to assess the flow of reading and reading comprehension (Lundberg, 2001). It is a common test used in Swedish schools to assess reading skills. To assess the students’ writing skills, the DLS test in writing (DLS base for grades 1 and 2) was used in study II (www.hogrefe.se).

Health and socio-economic questionnaire

A questionnaire that included questions about living habits, well-being, physical activity, and socio-economic factors was distributed to all participating children to take home and be filled out with the assistance of the parents. The questionnaire was constructed specifically for the research project by the research group in cooperation with school health professionals. Some questions were directed to the children and others to the parents. Instructions on how to fill in the questionnaires were attached.

Parents who were Arabic-speaking but not fluent in Swedish were supplied with an Arabic version of the questionnaire. If not fluent in either Swedish or Arabic, they were offered to fill out the questionnaire with the help of an interpreter. The questionnaires were returned to the school in a sealed envelope.

The Strengths and Difficulties Questionnaire

The SDQ was distributed to the parents along with the health and socio-economic questionnaire. It was to be filled out by the parents alone at home and returned together with the health and socio-economic questionnaire in a sealed envelope.

Arabic-speaking parents received, in line with the above-mentioned health and socio-economic questionnaire, an Arabic version of the SDQ. Parents who needed interpretation in another language were given the opportunity to fill in the form with the assistance of an interpreter.

The teachers filled out their version of the SDQ in school for every child in their class. The teacher SDQs were collected by a member of the research group.

Physiological variables

Two research nurses who were also experienced school nurses visited each of the 14 schools once during each of the data collection periods. They measured the children's blood pressure, heart rate, height, and weight. In addition, they collected samples of saliva from the students for salivary cortisol analyses in neutral cotton-based "Salivette" tubes (Sarstedt, Rommeldorf, Numbrecht, Germany). The samples were collected in school between 8 and 9 am. The exact time each sample was obtained as well as the times the child had woken up and had breakfast that day were documented. The samples of saliva were refrigerated and sent within 3 days to the laboratory, where they were centrifuged and frozen at -80°C until analysis. After the last data collection in 2012, all samples of saliva were analyzed using a commercial Cortisol I125 coated tube RIA, Orion Diagnostica, Finland (Törnåge, 2002, 2009; Törnåge and Alfvén, 2006).

Qualitative data

In study V, qualitative data were collected by means of focus group discussions with teachers working at the intervention schools, namely, the teachers who were exposed to the intervention. The teachers were invited on consecutive occasions, which resulted in four focus group discussions, all of which were tape-recorded.

Data analysis

Quantitative data analysis

Exploratory factor analysis (study I)

To examine the factor structure and the construct validity of the parent and teacher SDQ, an exploratory factor analysis was performed using maximum likelihood approach and oblimin rotation. Exploratory factor analysis was chosen in favor of confirmatory factor analysis to determine the underlying construct of the SDQ without being limited by any previously suggested factor structure.

The aim of study I was to compare teacher and parent assessments of the SDQ. Therefore, we included the parent and teacher SDQ assessments in the same analysis.

A factor loading of 0.4 was considered the minimum for an item to be included in a factor, in line with Stone *et al.* (2010) and Goodman (2001).

Cronbach's alpha (study I)

The internal consistency of the SDQ was calculated separately for the parent and teacher assessments in study I using Cronbach's alpha. We considered a Cronbach's alpha of 0.7–0.8 to indicate acceptable internal consistency.

Sensitivity/specificity analysis (study I)

Using the teachers' ratings as the gold standard, we calculated the sensitivity, specificity, and positive predictive value with which parent ratings predicted teacher ratings at an individual level.

Simple and multiple binary (called bivariate and multivariate in study II) logistic regression analyses (studies I and II)

In study I, we explored the correlation between SDQ ratings and parent ethnicity, educational level, and the child's sex using simple and multiple binary logistic regression analyses.

In study II, both simple and multiple binary logistic regression analyses were used to explore the associations between standardized test scores in mathematics, reading comprehension, and writing skills, and the independent variables, namely, health, socio-economic status, school satisfaction, and school environmental factors. 95% confidence intervals indicated the statistical significance of odds ratios in both studies.

Effect modification analyses (study II)

Effect modification analyses were performed in study II. A significant effect moderation between two variables indicated that there was a synergistic effect of the two variables, namely, an effect that was stronger than when the individual effects of the variables were merely added.

Pearson Chi-square (study II)

Pearson Chi-square was used to identify statistically significant differences between groups in the descriptive data analysis.

Simple and multiple linear regression analyses (studies III and IV)

In study III, simple and multiple linear regression was used to determine each individual-level covariate's association with the outcome variables, namely, test scores in reading comprehension and mathematics, both when analyzed alone and when adjusted for the other covariates.

In study IV, the changes in reading comprehension and mathematics test scores between 2010 and 2012 were used as outcome variables and analyzed with simple and multiple linear regression. The difference between the intervention and comparison schools was calculated. Potential confounders were adjusted for.

Since we assumed that there is a reciprocal association between mental health and educational attainment, change in the students' mental health was not seen as a confounder but rather as a mediator. The variable change in the students' mental health was thus added to the analysis as a test of mediation, not as a confounder.

Multivariable multilevel linear regression analysis (study III)

To determine the additional influence of each of the levels of class and school on reading comprehension and mathematics test scores, a multivariable multilevel linear regression analysis that included all individual-level covariates as well as the school and class level for each outcome variable was performed. The multilevel analyses used hierarchical regression analyses where the individual-level variables were adjusted for the individual-level variance and, concurrently, the higher-level variances, *i.e.*, the school and class levels. Intra-class correlations (ICC) were estimated for higher-level variances with 95% confidence intervals.

All analyses of the quantitative data applied a 95% level of significance. In study I, the SPSS version 20 (IBM Corp., Armonk, NY) was used for all analyses except for the factor analysis, which was performed using STaTa 12 (StataCorp LP, College Station, TX). The latter program was also used for all analyses in studies II, III, and IV.

Qualitative data analysis

Grounded theory was used to analyze the qualitative data in study V. The focus group discussions were tape-recorded, transcribed, and analyzed with constant comparative analysis according to Corbin and Strauss (2008). First, the data was broken down line-by-line and coded with open coding. Similar codes were grouped in categories. The categories were then examined according to their possible relationships and interconnectedness using axial coding. In the analysis, a core category was identified and a conceptual model was formed.

Ethical considerations

The students' participation in the data collection for studies I–IV was only possible if one of their parents had given written informed consent for their child's participation. The parents were informed of the purpose and methods of the study and that they could withdraw their child from being part of the data collection and the research project at any time and that all information would be treated confidentially. They were also informed that, if the collected data revealed results that implied a potential health risk for the student, they would be contacted by the research group and offered an appointment with the school nurse for further support.

The teachers in study V were informed that the focus group discussions would be tape-recorded and transcribed but that the teachers' identity would not be revealed. The teachers were also informed that they could withdraw from the study whenever they wished to.

All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

The research project was approved by the Regional Ethical Review Board in Lund (registration number: 2009/755).

Main findings

Study I

How do the parent and teacher assessments with the Strengths and Difficulties Questionnaire compare in terms of validity and precision, and do the students' sex and socio-economic factors affect the assessments in a multicultural population of younger schoolchildren?

Of the children, 10.9% and 8.8% were assessed as being at high risk of having mental health problems by their parents and teachers, respectively. The overlap between the parent and teacher ratings for individual children was low (only 32.1%).

Children whose parents were not born in Sweden were more likely to be assessed by their parents to have a high risk of mental health problems (14.4%) than children whose parents were born in Sweden (5.8%) (table VI).

Children whose mothers had a low educational level were significantly more likely to be assessed by their parents as being at high risk (17.5%) than children whose mothers had a high educational level (8.9%). The father's educational level did not seem to affect parental ratings. The teachers' assessments of the same children did not seem to be affected by the parents' country of birth or educational level (table VI).

Table VII shows the exploratory factor analysis of the teacher and parent SDQ assessments. The suggested five-factor solution of the SDQ could be confirmed for teacher assessments but not for parent assessments, although the internal consistency was acceptable both for the parent and teacher assessments (Cronbach's alpha: 0.73 and 0.71, respectively).

Table VI.
Simple and Multiple Binary Logistic Regression Results

Socio-demographic characteristics	Parent SDQ			Teacher SDQ		
	Parent SDQ		Adjusted model	Teacher SDQ		Adjusted model
	Crude model	95% CI		Crude model	95% CI	
Boy	OR	95% CI	OR	95% CI	OR	95% CI
	2.86	[1.46, 5.58]	3.14	[1.58, 6.24]	3.87	[2.64, 9.14]
Non-Swedish-born parents	3.18	[1.54, 6.57]	3.05	[1.45, 6.40]	0.89	[0.43, 1.81]
Mothers with low education	2.25	[1.21, 4.18]	2.08	[1.05, 4.12]	0.61	[0.24, 1.51]
Fathers with low education	1.31	[0.69, 2.49]	0.98	[0.48, 1.97]	1.50	[0.71, 3.15]

Dependent variable: high risk of mental health problems according to parent and teacher SDQ ratings.

SDQ = Strengths and Difficulties Questionnaire; OR = Odds ratios; CI = Confidence intervals.

Figures in bold are significant.

High risk: ≥ 17 in parental SDQ or ≥ 16 in teacher SDQ.

Study II

How do health factors, i.e., mental well-being, associate with academic performance in the younger school years?

Poor mental health associated independently with low academic test scores in standardized tests in mathematics, reading comprehension, and writing composition.

Except for having divorced parents, socio-economic status associated strongly with poor performance on the standardized tests, particularly for reading comprehension. Moreover, the students who came from a lower socio-economic status and who were suffering from poor mental health had a considerably higher risk of poor academic performance.

The multivariate logistic regression analyses showed statistically significant associations between mathematics results and all independent variables except for “being dissatisfied in school”. Reading comprehension was only found to associate with socio-economic status (table IIX)

Only one of the environmental and leisure-time factors, namely, “being dissatisfied with school”, was shown to associate with poor academic performance, in this case poor writing skills.

Effect modification analyses showed a strong interaction effect between teacher-assessed mental health and parents’ education level. Higher parental educational level seemed to prevent school failure in students who were assessed by their teachers as having poor mental health (table IX).

Table IIX. Sex and age adjusted multivariate logistic regression of associations between poor performance on a standardized test in mathematics and health, SES, school satisfaction, and environment indicators

MATHEMATICS	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Teacher assessed SDQ - High risk of poor mental health	2.2	1.12	4.22	2.1	1.09	4.18	2.2	1.11	4.28	2.2	1.07	4.43						
At least one parent has < 9 years of education				1.7	1.18	2.59	1.7	1.14	2.52	1.7	1.13	2.58						
Both parents are born abroad							1.5	1.02	2.18	1.6	1.06	2.37						
Dissatisfied in school										1.6	0.84	2.96						
READING COMPREHENSION	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Teacher assessed SDQ - High risk of poor mental health	2.0	0.95	4.06	1.9	0.93	4.03	2.0	0.94	4.13	2.1	0.95	4.49	2.2	1.00	5.17	2.3	1.00	5.17
High salivary cortisol				2.1	1.09	4.04	1.9	0.95	3.62	1.7	0.86	3.46	1.8	0.85	3.61	1.7	0.84	3.61
At least one parent has < 9 years of education							2.8	1.76	4.32	2.9	1.79	4.66	3.0	1.83	4.58	2.8	1.69	4.58
No vocationally active parents										2.4	1.35	4.23	2.7	1.50	4.29	2.3	1.28	4.29
Parents are divorced													0.4	0.20	0.70	0.4	0.21	0.70
Both parents are born abroad																1.8	1.10	3.04
Dissatisfied in school																		
WRITING COMPOSITION SKILLS	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Teacher assessed SDQ - High risk of poor mental health	3.8	1.61	8.77	4.2	1.66	10.68	4.7	1.83	12.08	4.7	1.82	12.05	3.8	1.43	10.10			
Psychosomatic conditions				1.3	0.75	2.22	1.2	0.66	2.02	1.2	0.67	2.04	1.3	0.70	2.26			
At least one parent has < 9 years of education							2.4	1.36	4.16	2.3	1.32	4.10	2.5	1.37	4.40			
No vocationally active parents										1.2	0.57	2.40	1.4	0.65	2.92			
Dissatisfied in school													1.9	0.72	5.15			

Table IX.

Effect modification expressed as Synergy Indices (SI) of the associations between poor performance on the three different standardized tests results and teacher assessed mental health status and parents' level of education

		OR	[95% CI]	SI
Mathematics	Good teacher assessed mental health status & At least one parent with more than 9 years of education	1	(ref.)	
	Poor teacher assessed mental health status & At least one parent with more than 9 years of education	1.9	4.51	
	Good teacher assessed mental health status & No parent with more than 9 years of education	1.7	2.57	
	Poor teacher assessed mental health status & No parent with more than 9 years of education	4.3	12.54	2.08
Reading comprehension	Good teacher assessed mental health status & At least one parent with more than 9 years of education	1	(ref.)	
	Poor teacher assessed mental health status & At least one parent with more than 9 years of education	1.5	3.90	
	Good teacher assessed mental health status & No parent with more than 9 years of education	2.7	4.25	
	Poor teacher assessed mental health status & No parent with more than 9 years of education	8.0	24.79	3.29
Writing composition skills	Good teacher assessed mental health status & At least one parent with more than 9 years of education	1	(ref.)	
	Poor teacher assessed mental health status & At least one parent with more than 9 years of education	2.8	8.16	
	Good teacher assessed mental health status & No parent with more than 9 years of education	2.1	3.60	
	Poor teacher assessed mental health status & No parent with more than 9 years of education	16.3	67.06	5.18

Study III

How does mental health in younger schoolchildren associate with school achievement, and how is this association affected by individual-level characteristics and contextual-level factors (school and class)?

Simple linear regression analysis showed a linear association between mental health and school performance in mathematics as well as in reading comprehension (table X). The association was independent of class and school context and individual-level factors (table XI a and b).

The multilevel linear regression analyses showed that the contextual levels of class and school explained 16–23% of the variance in the test results in both mathematics and reading comprehension (table XI a and b).

Girls achieved better results in reading comprehension than boys, and boys obtained better results on tests in mathematics (table XI a and b). Students with two Swedish-born parents had better results in reading comprehension than those with one or two non-Swedish-born parents (table XI a). Students whose mothers had more than 12 years of education performed better in mathematics than those whose mothers had a lower level of education (table XI b). These associations were also independent of other variables (tables XI a and b).

Salivary cortisol levels correlated negatively with reading comprehension in the simple linear regression analysis, but this effect disappeared in both the multiple linear regression and the multivariable multilevel linear regression. This could indicate mediation. In other words, it may be that stress, as indicated by salivary cortisol levels, affects mental health status, which in turn affects reading comprehension skills. Alternatively, poor reading comprehension skills may give rise to stress, which in turn affects the student's mental health status.

Table X.

Simple linear regression analysis of the relationship between SDQ scores, other individual characteristics, and test results in mathematics and in reading comprehension.

	Mathematics		Reading Comprehension	
	B coefficient (SE)	CI 95%	B coefficient (SE)	CI 95%
Mental health (SDQ assessed by parents)	-0.07 (0.02)	(-0.11—0.04)	-0.11 (0.02)	(-0.14—0.07)
Mental health (SDQ assessed by teachers)	-0.11 (0.02)	(-0.15—0.08)	-0.10 (0.02)	(-0.13—0.06)
Parents' country of birth	-0.17 (0.11)	(-0.38—0.05)	-0.57 (0.09)	(-0.76—0.39)
Maternal educational level	0.27 (0.09)	(0.10— 0.44)	0.36 (0.08)	(0.21—0.51)
Sex	-0.25 (0.19)	(-0.62—0.13)	0.42 (0.17)	(0.08—0.75)
Cortisol level (logged)	-0.09 (0.19)	(-0.46—0.28)	-0.55 (0.16)	(-0.87—0.23)

SDQ - The Strengths and Difficulties Questionnaire. SE - Standard Error. CI - Confidence interval

Figures in bold are significant.

Table XI a.
Variance of reading comprehension test results by parent and teacher SDQ assessments, class- and school-level.
Multiple linear regression and multivariable multilevel linear regression.

	Parental SDQ				Teacher SDQ					
	Empty model*		Model 1**		Model 2***		Model 1**		Model 2***	
			Student level		Student-, class- and school-level		Student level		Student-, class- and school-level	
	B(SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI
Constant	5.01 (0.23)	4.55–5.47	1.37 (2.28)	-3.12–5.84	1.41 (3.28)	-5.04–7.84	2.21 (2.32)	-2.35–6.77	2.11 (3.56)	-4.88–9.09
Mental health assessed by parents			-0.09 (0.18)	-0.12–0.05	-0.09 (0.02)	-0.12–0.05				
Mental health assessed by teachers							-0.09 (0.02)	-0.13–0.05	-0.09 (0.02)	-0.13–0.06
Salivary cortisol logged			-0.15 (0.18)	-0.51–0.21	-0.17 (0.18)	-0.52–0.18	-0.01 (0.19)	-0.38–0.37	0.03 (0.19)	-0.33–0.40
Parents country of birth										
Two Swedish-born (ref)										
One Swedish-born			-0.74 (0.29)	-1.31–0.16	-0.73 (0.29)	-1.30–0.17	-0.86 (0.30)	-1.46–0.26	-0.80 (0.30)	-1.38–0.23
No Swedish-born			-0.91 (0.22)	-1.35–0.47	-0.78 (0.23)	-1.23–0.34	-1.18 (0.23)	-1.62–0.74	-0.94 (0.23)	-1.40–0.49
Mothers educational level										
Not completed primary school										
Completed primary school			0.01 (0.41)	-0.81–0.83	0.03 (0.40)	-0.75–0.81	0.20 (0.43)	-0.63–1.04	0.16 (0.40)	-0.63–0.95
Completed secondary school			0.60 (0.39)	-0.16–1.39	0.69 (0.38)	-0.05–1.43	0.75 (0.40)	-0.04–1.55	0.64 (0.38)	-0.11–1.39
Completed secondary school and some university education			0.45 (0.43)	-0.40–1.29	0.39 (0.42)	-0.42–1.21	0.80 (0.44)	-0.06–1.67	0.59 (0.42)	-0.23–1.41
University exam			0.76 (0.42)	-0.05–1.59	0.82 (0.40)	0.03–1.60	1.03 (0.43)	0.18–1.87	0.88 (0.41)	0.08–1.88

Student's sex (ref boy)					0.45 (0.19)	0.08–0.83	0.47 (0.18)	0.12–0.83	0.26 (0.20)	–0.14–0.65	0.31 (0.20)	–0.06–0.69	
Survey year					0.41 (0.19)	0.04–0.79	0.41 (0.28)	–0.15–0.96	0.29 (0.19)	–0.08–0.67	0.29 (0.31)	–0.31–0.89	
					Estimate (SE)	95 % CI	Estimate (SE)	95 % CI	ICC		Estimate (SE)	95 % CI	ICC
School level ^{ref_cons}					0.72 (0.21)	0.41–1.27	0.11	0.05–1.60	0.02		0.39 (0.29)	0.09–1.67	0.04
School Class level ^{ref_constant}					0.61 (0.15)	0.39–0.97	0.19	0.41–1.06	0.14		0.70 (0.17)	0.44–1.12	0.17
School Class level ^{ref_resident}					1.93 (0.06)	1.82–2.04		1.65–1.90			1.79 (0.07)	1.67–1.92	

SDQ - Strengths and Difficulties Questionnaire. SE – Standard error. CI – Confidence interval. ICC – Intra class correlation.

* Empty model: a multilevel linear regression analysis with only the outcome variable (reading comprehension results), and class- and school-level included.

** Model 1: a single level linear regression analysis including the outcome variable (reading comprehension results), and individual variables at the student level. Parental and teacher SDQ assessments were analysed separately.

*** Model 2: a multilevel linear regression analysis including the outcome variable (reading comprehension results), and individual variables at the student level as well as class- and school-level. Parental and teacher SDQ assessments analysed separately.

Table XI b.

Variance of mathematics test results by parent and teacher SDQ assessments, class- and school-level. Multiple linear regression and multivariable multilevel linear regression.

	Parental SDQ					Teacher SDQ				
	Empty model*					Model 1**				
	B(SE)	95% CI	B(SE)	95% CI	Model 1**	Student-level	B(SE)	95% CI	Model 2***	Student-, class- and school-level
Constant	4.50 (0.21)	4.09–4.90				Student-level				
Mental health assessed by parents			B(SE)	95% CI	B(SE)	95% CI	B(SE)	95% CI	B(SE)	95% CI
			5.84 (2.74)	0.45–11.23	4.34 (4.13)	–3.77–12.44	5.73 (2.74)	0.34–11.11	4.56 (4.36)	–3.98–13.11
Mental health assessed by teachers			–0.07 (0.02)	–0.11–0.03	–0.08 (0.02)	–0.12–0.04				
Salivary cortisol logged							–0.10 (0.02)	–0.14–0.06	–1.00 (0.02)	–0.14–0.06
Parents country of birth			0.13 (0.22)	–0.31–0.57	0.03 (0.22)	–0.39–0.46	0.12 (0.23)	–0.32–0.56	0.09 (0.22)	–0.33–0.52
Two Swedish-born (ref)										
One Swedish-born			–0.70 (0.35)	–1.39–0.00	–0.71 (0.34)	–1.37–0.04	–1.02 (0.36)	–1.73–0.31	–0.85 (0.34)	–1.53–0.18
No Swedish-born			–0.27 (0.27)	–0.80–0.27	–0.27 (0.27)	–0.80–0.26	–0.56 (0.27)	–1.09–0.04	–0.47 (0.27)	–0.99–0.57
Mothers educational level										
Not completed primary school										
Completed primary school			0.43 (0.50)	–0.55–1.41	0.43 (0.46)	–0.48–1.34	0.52 (0.49)	–0.45–1.49	0.46 (0.46)	–0.44–1.37
Completed secondary school			0.62 (0.47)	–0.31–1.54	0.76 (0.44)	–0.10–1.62	0.87 (0.47)	–0.5–1.80	0.99 (0.44)	0.13–1.85
Completed secondary school and some university education			0.13 (0.51)	–0.88–1.15	0.17 (0.49)	–0.79–1.11	0.50 (0.51)	–0.51–1.51	0.45 (0.48)	–0.50–1.39
University exam			0.89 (0.50)	–0.08–1.87	1.01 (0.47)	0.09–1.93	1.11 (0.50)	0.12–2.09	1.11 (0.47)	0.20–2.03
Student's sex (ref boy)			–0.28 (0.23)	–0.74–0.17	–0.31 (0.22)	–0.73–0.11	–0.60 (0.23)	–1.07–0.13	–0.63 (0.22)	–1.06–0.20

Survey year	Estimate (SE)	95 % CI	ICC	-0.09 (0.23)	-0.54–0.37	0.06 (0.36)	95 % CI	ICC	-0.08 (0.23)	-0.53–0.37	0.02 (0.37)	95 % CI	ICC
School level ^{ref} _cons	0.48 (0.24)	0.18–1.30	0.04			0.45 (0.29)	0.13–1.58	0.04			0.45 (0.30)	0.12–1.66	0.04
School Class level ^{ref} _constant	0.80 (0.17)	0.53–1.20	0.15			0.87 (0.19)	0.57–1.34	0.18			0.89 (0.19)	0.59–1.35	0.19
School Class level ^{ref} _residual	2.24 (0.07)	2.11–2.37				2.09 (0.78)	1.94–2.24				2.07 (0.07)	1.93–2.22	

SDQ - Strengths and Difficulties Questionnaire. SE – Standard error. CI – Confidence interval. ICC – Intra class correlation.

*Empty model: a multilevel linear regression analysis with only the outcome variable (reading comprehension results), and class- and school-level included.

***Model 1: a single level linear regression analysis including the outcome variable (reading comprehension results), and individual variables at the student level. Parental and teacher SDQ assessments were analysed separately.

***Model 2: a multilevel linear regression analysis including the outcome variable (reading comprehension results), and individual variables at the student level as well as class- and school-level. Parental and teacher SDQ assessments analysed separately.

Study IV

How does an ecological school intervention based on participatory principles affect the school performance of students, considering the role of mental health?

Students in intervention schools exhibited significantly more improvement in terms of reading comprehension, but not mathematics, between the years of 2010 and 2012 than the students in comparison schools. The greater improvement in the intervention schools remained significant after adjusting for potential confounders, namely, grade, student sex, parents' country of birth, and mothers' level of education (table XII and XIII, models 1–4).

When change in SDQ scores (risk of mental health problems) between 2010 and 2012 was added to the analysis, the association diminished (table XII, model 5). Assuming there is a reciprocal association between mental health and school achievement, the change in SDQ scores was not included in the model as an adjustment for confounding. The fact that including change in SDQ scores diminished the effect of attending an intervention school suggests that mental health may have helped to mediate the effect of the intervention on reading comprehension.

Even though there were no significant differences between the intervention and comparison schools in terms of change in mathematics test results over time, the multilevel linear regression models suggest that student sex, grade, and parents' country of birth affected the scores in mathematics over time.

We could also see that mental health at baseline positively predicted reading comprehension skills 2 years later in both the intervention and comparator schools.

Table XII.

Independent variables and their association with changes in reading comprehension test scores over time, 2010-2012, in a population of Swedish elementary school children.

		Coef.	P>t	[95%	CI]	Adj. R²
<i>Model 1</i>	Intervention school	0.656	0.007	0.177	1.133	<i>0.016</i>
<i>Model 2</i>	Intervention school	0.512	0.010	0.122	0.901	<i>0.348</i>
	Gender	-0.351	0.069	-0.728	0.027	
	Birth cohort (grade)	-2.770	0.000	-3.152	-2.388	
<i>Model 3</i>	Intervention school	0.465	0.024	0.061	0.868	<i>0.348</i>
	Gender	-0.367	0.058	-0.747	0.012	
	Birth cohort (grade)	-2.789	0.000	-3.174	-2.405	
	Parents' origin of birth	-0.094	0.377	-0.303	0.115	
<i>Model 4</i>	Intervention school	0.455	0.037	0.028	0.882	<i>0.338</i>
	Gender	-0.351	0.090	-0.757	0.055	
	Birth cohort (grade)	-2.776	0.000	-3.183	-2.369	
	Parents' origin of birth	-0.098	0.393	-0.323	0.127	
	Mother's level of education	0.028	0.763	-0.156	0.212	
<i>Model 5</i>	Intervention school	0.316	0.175	0.141	0.773	<i>0.364</i>
	Gender	-0.602	0.007	-1.040	-0.164	
	Birth cohort (grade)	-2.804	0.000	-3.252	-2.356	
	Parents' origin of birth	-0.180	0.147	-0.423	0.064	
	Mother's level of education	-0.045	0.658	-0.247	0.156	
	DELTA teacher assessed risk of poor mental health	-0.044	0.065	-0.090	0.003	

Table XIII.

Independent variables and their association with changes in mathematics test scores over time, 2010-2012, in a population of Swedish elementary school children.

		Coef.	P>t	[95%	CI]	Adj. R²
<i>Model 1</i>	Intervention school	-0.075	0.731	-0.499	0.350	0.003
<i>Model 2</i>	Intervention school	-0.039	0.856	-0.460	0.382	0.018
	Gender	-0.277	0.189	-0.692	0.137	
	Birth cohort (grade)	-0.641	0.002	-1.056	-0.227	
<i>Model 3</i>	Intervention school	-0.103	0.642	-0.536	0.331	0.019
	Gender	-0.300	0.157	-0.716	0.116	
	Birth cohort (grade)	-0.657	0.002	-1.072	-0.242	
	Parents' origin of birth	-0.141	0.227	-0.370	0.088	
<i>Model 4</i>	Intervention school	-0.010	0.964	-0.456	0.435	0.032
	Gender	-0.379	0.085	-0.809	0.052	
	Birth cohort (grade)	-0.755	0.001	-1.184	-0.326	
	Parents' origin of birth	-0.192	0.113	-0.431	0.046	
	Mother's level of education	0.153	0.123	-0.042	0.348	
<i>Model 5</i>	Intervention school	0.172	0.491	0.319	0.663	0.060
	Gender	-0.596	0.014	-1.072	-0.119	
	Birth cohort (grade)	-1.000	0.000	-1.489	-0.511	
	Parents' origin of birth	-0.268	0.047	-0.531	-0.004	
	Mother's level of education	0.092	0.404	-0.125	0.309	
	DELTA teacher assessed risk of poor mental health	-0.007	0.789	-0.057	0.043	

Study V

How did the teachers experience the process and engage in the school intervention called “UTSIKTER”?

“Getting one’s bearings on a maiden voyage” emerged as the core category in the grounded theory analysis of the focus group discussions with teachers who were exposed to the school intervention UTSIKTER. “Getting one’s bearings on a maiden voyage” was a metaphor depicting the teachers’ feelings of having set out on an unknown voyage on a ship of uncertain seaworthiness. It encompassed the uncertainty of what the intervention would embrace, where it was heading, and what the outcomes might be. In the process, the teachers expressed various degrees of trust and confidence depending on their individual experience of the intervention. This directed the process towards either of the two outcomes “Catching a favorable course” and “Being lost on an unfamiliar ocean”.

“...I didn’t know what I headed for, it was a voyage that I set out on, on my own, without knowing how to do it and what not to do. I have felt a bit unsure; there were no ready concepts for any of the steps, it has really been a voyage to the unknown. But at the same time, I have learnt an incredible amount.” (FGD4)

Inclusion, involvement, collaboration, personal attitudes, support, and information were all factors that were found to influence teacher engagement and their perspective on the intervention process. In addition, teacher engagement itself was found to have a major influence on the development of the implementation process.

Figure 3 shows how the category “Becoming involved” was formed from four sub-categories. “Becoming involved” was like a filter forming the teachers’ experiences of the process and affecting their actions and thus the development of the process.

The conceptual model of the teachers’ experiences of the process “Getting one’s bearings on a maiden voyage” is shown in figure 4. It visualizes the fluctuating, dynamic process (a) leading towards the two outcomes (b and c) under the influence of the categories (e, f, g, and h) and the intervening conditions (i and j).

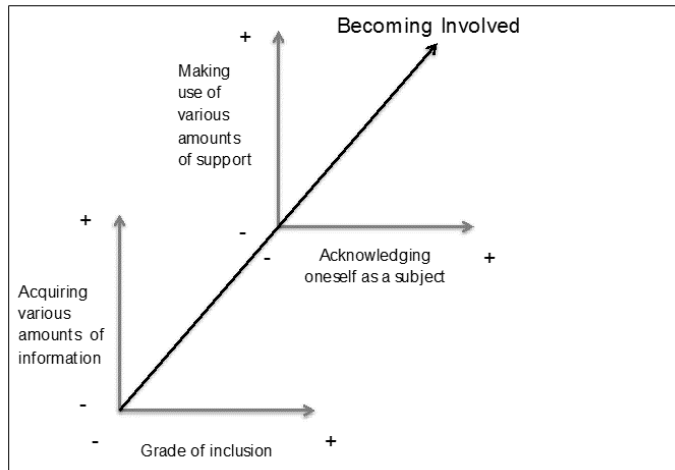


Figure 3
Becoming involved

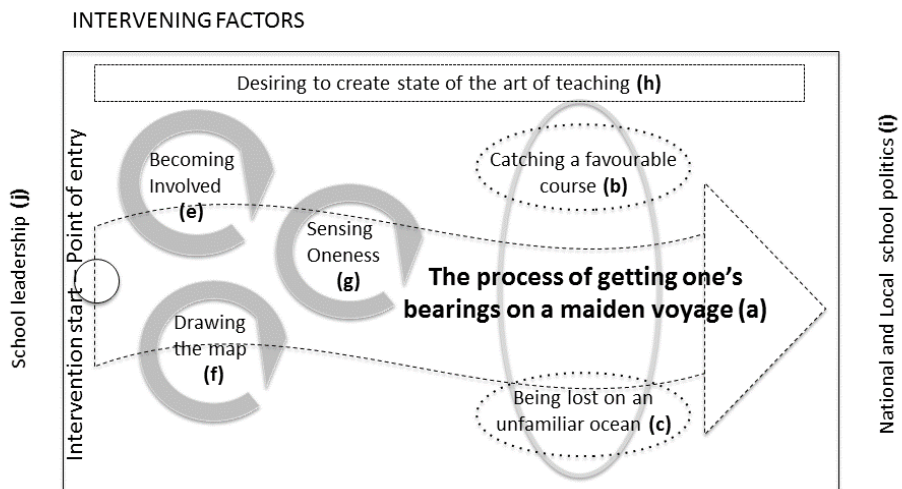


Figure 4
The conceptual model of "Getting one's bearings on a maiden voyage"

Discussion

Summary of findings

The teacher SDQ assessments were judged to have an adequate construct validity since they fitted the suggested five-factor solution very well and did not seem to be influenced by parental socio-economic status. By contrast, the parent SDQ assessments did not fit the suggested five-factor solution, which was interpreted as a lack of construct validity. However, the parent SDQ assessments had an acceptable internal consistency, which suggests that parent SDQs did capture some common features of mental health. However, they were found to be influenced by parental socio-economic status. The decision to use the SDQ to measure one of the main outcomes in this thesis, namely, mental health, seems justified, especially with regard to the teacher assessments.

It was shown that there is an association between mental health and school performance in the early school years. This association was found to be independent of other individual-level factors as well as school class and school context. Mental health was also found to positively predict how well the students developed their skills in reading comprehension 2 years later.

Parental socio-economic status and the class and school levels also had statistically significant effects on the students' school performance. Moreover, students with both poor mental health and a low socio-economic background, specifically low parental educational level, showed particularly high risks of poor academic performance. A higher level of parental education seemed to protect students who were assessed by teachers to be at risk of mental health problems from school failure.

Salivary cortisol levels correlated negatively with reading comprehension, but, since the effect disappeared in the multiple linear regression analysis, it may be that salivary cortisol mediated reading comprehension. In summary, these findings support the aim of the intervention activities.

Students in the intervention schools exhibited a greater improvement in reading comprehension skills compared to the comparison school students over the 2 project years. The improvement was independent of grade, student sex, parental

country of birth, and mothers' level of education. When including "change in SDQ scores" between 2010 and 2012 in the model, the difference between intervention and comparison schools in terms of improvement in reading comprehension seemed to diminish. This suggests that improved mental health may have mediated the effect of the intervention on reading comprehension. Moreover, mental health at baseline positively predicted reading comprehension skills 2 years later in both the intervention and comparison schools. In conclusion, the intervention seemed adequate for improving some aspects of school achievement; moreover, improvement of mental health may have mediated this effect.

The qualitative study found that inclusion, involvement, collaboration, personal attitudes, support, and information were factors that influenced teacher engagement and their perspective of the intervention process. In addition, teacher engagement itself affected the development of the implementation process. We interpret this as support for the participatory approach of the intervention.

Thus, we see that, already in the earliest school years, school performance does not solely associate with the individual student's background, character, or talent but also with many other factors on different levels. Class and school levels, as well as the student's mental health, associated independently with school performance. These are all factors that can be influenced at the group level within schools.

One factor at the individual level that is difficult to influence by school interventions is the student's parental socio-economic status, which associated with school performance. Parental socio-economic status also associated independently with student mental health. This interconnectedness between school performance, mental health, and socio-economic status indicates that inequality is already present in the earliest school years.

These findings corroborate earlier research that shows an association between school performance and mental health and that mental health in the lower grades is predictive of school performance a few years later (Gustafsson *et al.*, 2010; Guzman *et al.*, 2011; Malecki and Elliott, 2002; Murphy *et al.*, 2015). The relationships between school performance and mental health are most likely reciprocal and can be explained by psychological as well as neuroendocrine interactions (Gustafsson *et al.*, 2006; McEwen, 2007; Obradovich, 2010; Center on the developing child at Harvard University, 2011; Quas *et al.*, 2014).

Considering that educational level is one of the most influential factors shaping lifetime health, our findings suggest that future life opportunities and health are already in jeopardy in the earliest school years due to the development of negative loops between mental health, socio-economic factors, and school performance (Molla *et al.*, 2004; Cutler and Lleras-Muney, 2006; Olshansky *et al.*, 2006).

The construct validity of the teacher SDQ suggests that it is a suitable instrument for assessing student mental health in elementary schools within multicultural student populations. The lack of construct validity for the parent SDQ assessments means that it is not recommended to apply the five sub-scales separately for parent assessments. However, the internal consistency of both the teacher and parent SDQ assessments was acceptable and comparable, which probably means that the Total Difficulties score in the parent assessments indicates risk of mental health problems in schoolchildren of different origins. It could thus be an important complement to teacher SDQ assessments as it is recommended to use more than one source of informants when assessing the mental health of children and adolescents (Achenbach, 1987; Ederer, 2004; Stone, 2010).

The systematic and structured monitoring, aggregation, and analysis of the students' development that formed the core of the UTSIKTER intervention were perceived by the teachers as a great help for advancing their work and increasing their professional development. The teachers' participation in the intervention differed between individuals, which must have affected the degree of professional development. Considering the quite large effect of the class level on school performance, this could suggest that the teachers' professional development may have contributed to the improvement in reading comprehension in the intervention schools.

The design of the UTSIKTER intervention meant combining the core component, which was the same across the schools, with local interventions chosen for each specific school. The local interventions were chosen as a result of the core component, namely, the systematic monitoring and analysis of the students' development. This design required local flexibility and needed teacher participation to deepen the analysis and enhance the implementation of the local interventions. This strategy also gave the teachers an opportunity to contribute with their own experience and opinions in the analysis and in choosing local interventions. This is supported by the factors that were found in study V to increase teacher involvement in the intervention and their professional development. Flexibility, teacher participation, and the possibility to influence their practice have the potential to empower teachers and increase their feeling of local ownership, which can in turn increase implementation success and sustainability (Reinschmidt *et al.*, 2010; Schäfer Elinder *et al.*, 2012; Bopp *et al.*, 2013).

Of the two contextual levels (class and school), class level accounted for the greater share of the test results' variance in both reading comprehension and mathematics. Earlier studies are consistent with our findings, although some of these studies only considered the school level, or did not differentiate school level from class level (MacBeath, 2001; Sellström and Bremberg, 2005). We were not

able to elucidate the specific mechanisms at these levels that affect school performance, but other studies suggest that school climate as well as factors in the class such as teacher attitudes and teacher-student relationships have a great impact on student achievements and school results (Brookover *et al.*, 1978; Grosin, 1991; MacBeath, 2001; Sammons, 2007; The Swedish school inspectorate, 2010). This could suggest that the variation in school performance seen here may depend to an important degree on teacher performance.

The effect of the contextual levels on school performance argues for the potential effectiveness of interventions targeted at the school and class levels. Moreover, since Henchey (2001) showed that the effect of school factors on student achievement is especially important for students from low-income neighborhoods, it may be that targeting the contextual levels is particularly important for reducing social inequality.

The intervention

It is possible that the improvement in reading comprehension in the intervention schools that was seen over the 2 study years was due, at least in part, to a betterment in student mental health. Supporting this is that the improvement in reading comprehension diminished when change in mental health was included in the model (study IV). We believe that change in mental health mediated the effect of the intervention on reading comprehension rather than acting as a confounder because there is a strong theoretical association between school performance and mental health that is supported by the results in this thesis and by previous research (Liston *et al.*, 2009; Gustafsson *et al.*, 2010; Center on the developing child at Harvard University, 2011; De Brito *et al.*, 2013). This mediating effect of mental health is likely to act in a constant reciprocal interchange with school achievement in a manner best described as a spiral. If this interpretation of the results is valid, then it would suggest that UTSIKTER may have even more profound effects on the students' mental health when it is applied for longer durations. In other words, it could mean that UTSIKTER could produce a positive spiral of improved mental health and school performance over the long term.

Changing a school's organization and way of working is a long-term process. The research project followed the schools for 2 years, which can be considered to be a rather short time frame from a school perspective. As our qualitative study (study V) demonstrated, the teachers needed time to adjust and only gradually adopted new approaches to grasp and engage in the intervention. The time needed differed between teachers; indeed, some did not grasp and fully engage in the intervention

during the time span of this study. Thus, a study period of only 2 years may have been too short to fully determine the effects of an intervention like UTSIKTER.

There are reasons for believing that the UTSIKTER intervention would be more successful when applied for a longer period. In particular, many of the components in UTSIKTER are consistent with what earlier research has identified as effective school processes. Greenberg (2003), Sammons (2007), and Hattie (2009), among others, have summarized what is known about effective and successful schools, teaching practices, and effective school interventions. Others focused specifically on aspects that are essential for schools in disadvantaged and challenging areas (Henchey, 2001; Muijs *et al.*, 2004). Nevertheless, their findings are quite consistent. The main mission of successful interventions and effective schools is to concentrate on teaching and learning. In addition, it is important to have a student focus, creating not only good teacher-student relationships but also good relationships between the students, all school staff, and parents. High expectations of the students' abilities, and giving both teachers and the students the support needed to meet these high expectations, are also crucial for producing effective schools and interventions. Data on student development should be used to guide teaching, professional development, and school development, thereby building a learning organization. It must be clear that the school is responsible for the students' achievements and that the school must therefore be innovative and flexible to find ways of supporting all students. The UTSIKTER intervention meets most of these criteria as well as several criteria that have been identified to promote intervention sustainability (Florian, 2000). These observations support the notion that UTSIKTER may be successful over the long term.

Greenberg *et al.* (2003) expressed the need for further knowledge on how information from assessments and tests could be used to improve school development. The color charts used in UTSIKTER were introduced as a part of the intervention for aggregating, visualizing, and following the students' performance. By merging a variety of important factors, including student well-being and mental health, the color charts allowed the schools to readily detect patterns and trends at the organizational, group, and individual levels, thus facilitating comparisons, analyses, and evaluations. The color charts played an essential role in UTSIKTER and were considered one of its greatest strengths. In fact, they were deemed such an asset that the Swedish Association of Local Authorities and Regions supported the development of a software to facilitate the usage of the color charts so that the working model could be used in other communities and schools (Sveriges kommuner och Landsting, 2015).

UTSIKTER incorporated a universal and ecological approach to be able to reach and profit from the interactions between the different levels and contexts that influence students' school performance and well-being. These interactions have

been detailed by Bronfenbrenner (1994) and are regarded by many as being necessary for promoting mental health in schools (Greenberg *et al.*, 2001; Strein and Koehler, 2003; Weare and Nind, 2011; Membride, 2016; Bruns *et al.*, 2016). Universal interventions are effective partly because they address all children and thus there is no need to point out those at risk (Greenberg, 2001). Moreover, by addressing all children, these interventions are likely to achieve better long-term effects because some of the children who are in the low-risk group early on will go on to suffer from mental health problems later; since this group includes the majority of students, any intervention that targets the initially low-risk group will have large positive effects later on. This is known as the prevention paradox (Rose, 1980). Ecological interventions address and consider how the whole school and the wider context affect the students' mental health, such as peers, family, community services, *etc.* Thus, they emphasize the need for modifying the many diverse aspects that can affect mental health (Strein and Koehler, 2003). This is effective because no single approach can prevent all triggers of mental ill health and because targeting the whole student population and its context will broaden support for the intervention while helping the students to be treated in the same manner and to encounter the same messages (Greenberg, 2001; Weare and Nind, 2010).

The ecological approach of UTSIKTER involved collaboration with parents, cultural institutions, and sport clubs. Thus, society was invited to interact with the students, which in turn increased the students' awareness of and participation in society. According to the reform pedagogy, activities and interactions such as these are especially important for children who live in deprived areas because their involvement in society and the insights this provides prepares them for life and promotes their readiness to act (Hägglund, 2001). Engagement in community, sports, and/or cultural activities is well-known to be protective against the risk of poor mental health (National Research Council and Institute of Medicine. (2009).

Engaging teachers in the implementation processes was crucial since the teachers were the main implementers of the intervention and worked closely with the students. There is little research on the factors that cause teachers to truly engage and become involved in the intervention process. This thesis showed that six factors, namely, inclusion, involvement, collaboration, personal attitudes, support, and information, affected the teachers' sense of involvement and engagement in the process. These factors were identified on the basis of the teachers' own experiences. Given that teachers have a huge influence on student achievement and intervention effectiveness, ensuring that these factors are present is likely to greatly increase the success of intervention implementation (Muijs *et al.*, 2004; Sammons, 2007; Hattie, 2009).

The fundamental concept of the reform pedagogy, which developed during the years 1870–1939, was that new insights in developmental psychology and teacher observations should guide the teaching. By taking advantage of each student's strengths and potential, the reform pedagogues believed that motivation for achievement could even be elicited in other areas. Education was considered to promote social equity: by adapting the teaching to individual students' talents and needs, the reform pedagogues could provide education for all, thereby reforming society and increasing equality (Hägglund, 2001). Having high expectations of the students' capability is also found to be important for promoting good school performance (Hattie, 2009), probably because it empowers the students: if someone else believes in the students' capabilities, the students' trust in their own capability appears to improve. Moreover, achievement by itself is empowering, as it shows that you are capable and can be in control. This feeling can be transferred to other areas of life, thereby increasing one's ability to influence diverse events in life. Empowerment and a sense of capability are therefore important aspects of mental health and resilience (Antonovsky, 1974; White *et al.*, 2016). Thus, it is important to help schools to empower the students, thereby improving their mental health and in turn increasing their resilience; this is likely to be especially important for students from disadvantaged backgrounds.

The idea that an evidence-based and flexible school system that empowers the students and increases their resilience might lead to important positive long-term effects on not only the health and life opportunities of individuals but also on societal economy, equity, and growth is not new. However, it might be time to dust off those ideas and give them the legitimacy and influence they deserve.

Methodological considerations: mental health

To investigate the validity and precision of the teacher and parent SDQ assessments, explorative factor analysis was chosen prior to confirmatory factor analysis. Given that the factor structure of the SDQ has been analyzed and found by most studies to fit a five-factor solution, most other researchers would probably have chosen confirmatory factor analysis (Stone *et al.*, 2010). However, we considered explorative factor analysis to be a better choice for impartial analysis of the teacher and parent SDQs.

We knew that the interrater correlation between the teacher and parent assessments (as measured by calculating Pearson's r) was moderate (0.4). To compare the teacher and parent assessments further, we chose to analyze the teacher and parent assessments simultaneously, depicting any differences in correlation in the different sub-scales.

We cannot be sure that the assessments of the students' mental health status by parents and teachers actually corresponded to actual mental health problems. Since the parental SDQs, but not the teacher SDQs, showed that students with non-Swedish-born parents were considered to be more at risk of mental health problems than students with Swedish-born parents, one could assume that this difference was due either to cultural or educational differences between the informants that influenced their norms, thus causing them to perceive and value the student's behaviors differently. Alternatively, it may reflect the fact that the parents and teachers interact with the students in different contexts and that they have different relationships with them (Achenbach, 1987, 2008; Johnston, 2010). This has been discussed in previous studies, but, to our knowledge, it has not been previously investigated whether and how the informants' cultural and educational differences affect the outcomes of assessment instruments such as the SDQ (Javo, 2009).

However, we have reason to believe that our results regarding the students' mental health status reflect a real situation. First, the SDQ has been validated by many earlier studies (Woerner *et al.*, 2004, Obel *et al.*, 2004, Stone *et al.*, 2010, Niclasen *et al.*, 2012). Second, research has shown that refugee children and adolescents often experience high levels of depressive symptoms, PTSD, and emotional and behavioral problems due to pre-migration, flight, and post-migration factors (Bronstein and Montgomery, 2011). In particular, post-migration stresses such as economic distress, lack of support, poor living conditions, and language difficulties have all been found to accentuate these symptoms (Bronstein and Montgomery, 2011). The negative effects of migration on mental health can also be expected long after migration. Al-Baldawi (2011) described the diverse states of emotional distress that fluctuate and differ between parents and children in emigree families during the first years after arrival. The fact that emigree families often have a traditional group-centered mindset while the Swedish have an individual-centered mindset poses additional challenges, as the different mindsets shape notions of autonomy, loyalty, dependency, rights, and responsibilities. These challenges can be especially difficult for emigree children and adolescents, as they are about to form their identity and yet must move daily between school and home from one mindset to the other while adapting to the new country and a new social context (Al-Baldawi, 2011). However, most of the children studied in this thesis were born in Sweden. Earlier studies show divergent results regarding the differences between non-immigrant children and second-generation immigrant children in terms of mental health status (deKeyser *et al.*, 2011, 2014; Masaud, 2015). Since we adjusted for parents' educational level, we believe that the differences between the children of non-Swedish-born parents and the children of Swedish-born parents in terms of mental health problems reflect the effects of immigration on the family (deKeyser *et al.*, 2014).

Considering the paucity of studies on the psychometric properties of both the parent and teacher SDQs in Swedish settings, this thesis makes an important contribution to the existing literature. We cannot claim to have validated the Swedish SDQ since we used both the Swedish and Arabic SDQ versions. However, we have added some valuable information of the differences between the parent and teacher SDQs in terms of construct validity. Our findings on the parent SDQ are corroborated only by solitary studies (Mellor and Stokes, 2007). Most earlier studies contradict our findings but many show that the parent SDQ has a weaker construct validity than the teacher SDQ (Stone *et al.*, 2010). In addition, the differences between the teacher and parent SDQs in terms of construct validity could be explained by the greater heterogeneity relative to the teacher group of the parent group in terms of both cultural background and educational level. Such a heterogeneous group could be expected to answer less consistently than a professional group with similar levels of education and cultural background.

Regarding the associations found between school performance and SDQ-assessed mental health and the adequate construct validity of the teacher SDQ, this thesis shows that the SDQ can help to analyze the students' development in school performance. We also believe that, despite the fact that the construct validity of the parent SDQ was poor in this thesis, it is an important complement because it nevertheless had good internal consistency and it is recommended to use several informants when assessing the mental health of children and adolescents (Achenbach, 1987; Ederer, 2004). These findings are of great importance regarding choosing, using, and interpreting the SDQ in school settings.

Teacher SDQ assessments were not affected by either the parents' country of birth or their educational level. This suggests that teacher perceptions were not influenced by student background, which in turn suggests that the school environment is characterized by equity and may be salutogenic for the children of immigrants. Javo *et al.* (2009) and Jäkel *et al.* (2015) found similar results, namely, that teacher assessments were not affected by factors that related to the students' origin.

The SDQ interprets the students' observed behavior in diverse settings. Usually, only the Total Difficulties scale is used for screening purposes, as in this thesis. The purpose of this scale is to detect the accumulation of behaviors that signal mental health problems, which is useful when screening for mental health problems. However, the SDQ also includes a pro-social scale that detects positive aspects of an individual's mental health. This is consistent with the broader definition of mental health that is supplied by the WHO, which includes the essential factor of social relationships. This is an advantage of the SDQ. This in addition to being very brief and easy to apply makes the SDQ both feasible and

suitable for use in school settings, both for screening purposes and for individual assessments.

Methodological considerations: general

All studies in this thesis were based on data collected from the UTSIKTER intervention only. Both quantitative and qualitative methods were used, including cross-sectional and longitudinal methods. The causality of some of the associations between the independent and dependent variables was not possible to define. However, study IV had a longitudinal design, thus allowing us to assess whether the independent variables could predict the outcome of the dependent variable.

The populations in the studies were composed of children with diverse backgrounds that mirrored the populations living in many parts of Swedish cities today.

The screening instrument used to assess mental health status in this thesis was shown to be valid by previous studies; moreover, we critically investigated our own results regarding the validity and precision of this instrument as well as the influence of socio-economic factors. This added more depth to the results (see the previous section) for not only study I but also for the other three studies using the same instrument. This, in addition to the multifaceted approach and the cross-sectional and longitudinal aspects, provided diverse perspectives of the intervention and revealed various issues relating to the mental health and school performance of younger schoolchildren. This constitutes a strong feature of this thesis.

The size of the populations varied between studies. Since data of one or more variables for some of the participants was lacking, the amount of missing data increased as the number of included variables rose. However, for all studies, the sample sizes we ended up with were considered large enough to detect effects/differences in the range of 50–100% in the dependent variable.

The research was conducted in close association with the participating schools and the cities' project group. This facilitated and enhanced the acceptability of the extensive data collection. The results from the three data collections were presented successively to the intervention schools. The results were presented separately for each school as well as aggregated and compared to the comparison schools. The comparison schools only received raw data for each specific school without any aggregation or analysis.

To ensure inclusion of as many students with an increased risk of school failure as possible, schools in socio-economically deprived areas of the cities were invited to be part of the project. This could be regarded as a form of “weighted” recruitment, which improved statistical power without introducing selection bias.

We do not have any information on the students who declined to be part of the research project. Since language difficulties could affect willingness to participate in the studies, children of foreign origin may have been particularly likely not to participate in the research project. This could have resulted in some selection bias. Since the thesis showed that non-Swedish children had a higher risk of having poor mental health on the parent SDQ than Swedish children, this selection bias may have led to an underestimation of the prevalence of mental health problems among the invited students.

However, we do not expect this to bias our result to any great degree since we cannot find a strong argument for the assumption that the proportion of exposed cases versus un-exposed cases among non-participants were significantly different from this proportion among the participants.

The schools were already approached and had agreed to be involved in the intervention project when the research project started. To be able to evaluate the results, seven comparison schools were incorporated thereafter in the research project. They were selected due to their localization in socio-economically distressed neighborhoods in the same cities as the intervention schools. The assumption was that the student composition of the comparison schools would be comparable to that in the intervention schools. However, to be able to perform the extensive data collection at three consecutive periods, the comparison schools also had to join the research project voluntarily. This meant that we could only hope for, but not assure, similarity between the student compositions of the comparison and intervention schools. This introduced a situation of potential confounding due to our inability to apply a randomization process regarding assignment to intervention versus comparison school. However, this problem was reduced by adjusting for socio-economic factors and several other important factors.

The health questionnaire included a question about the number of years that the student had lived in Sweden. However, due to difficulties in interpreting the responses, it was not possible to include this variable in the analyses. Other than the possible effect on the outcome measures of the number of years the student had lived in Sweden, we believe that we included the most relevant confounders by adding them step-wise in multivariate analyses. However, it remains possible that we neglected to adjust for confounders that could have influenced the outcome.

We have to consider the risk of non-differential misclassification using self-reported data, although we have no reason to believe that such misclassification would be extensive since most of our findings are well in line with earlier research.

The aim of grounded theory is to discover new processes or to generate theories from data. The theories should be generalizable and transferable to other situations and settings. Grounded theory is thus considered suitable for studying interventions since the findings or theories are supposedly more transferable than findings retrieved with other more descriptive qualitative methods. This was a reason for choosing this approach when analyzing the qualitative study in this thesis. The theories and new discoveries are supposed to help us understand and cope with new situations or processes, which is relevant when exploring the teachers' experiences of an intervention with the aim of creating more successful implementations of such interventions in the future (Dahlgren *et al.*, 2007).

Conclusions and implications

This thesis shows that there are already associations between mental health, school performance, and socio-economic factors in the earliest school years. This indicates that, even at this stage, there is an unfortunate inequity that may burden children and adolescents throughout their entire life. However, the ability of the class and school levels to influence the very youngest schoolchildren's performance suggests that there are opportunities to improve the learning environment at the start of the students' educational trajectory, thereby improving student performance. As earlier research shows that the effects of class and school on school performance are especially important for students from disadvantaged backgrounds, our observations indicate that there is an opportunity to influence school achievement and decrease social inequity. The possibility to intervene and reverse this negative spiral places a strong demand on politicians, policy makers, and school leaders to do their utmost to fulfil the schools' compensatory assignment. There is quite a substantial amount of research on effective schools and school interventions that improve both student mental health and school performance. Since the associations between these two variables are most likely reciprocal, we can expect synergistic effects if both are simultaneously addressed. Hopefully, the word "intervention" in the context of school will disappear and be supplanted by "development", provided that schools acknowledge the need for organizational adaptation and lasting solutions for supporting and improving student achievement and mental health, especially for underprivileged students.

The teacher's role in intervention implementation and school development is crucial. Research on effective schools shows how important teacher attitude, teacher-student relationships, and other factors that relate to the art of teaching are to student achievement. The effects of the school and especially the class level on student performance are most likely partly due to the effects of the individual teacher; this reinforces the vital role of the teacher in implementation and intervention. This thesis showed that it is advantageous to be respectful of every individual teacher's comprehension of his or her role in the process of school interventions or development. Truly including and involving all teachers in the process as well as providing clear information and supportive collaborative work environments seems to be a prerequisite for engaging teachers and creating sustainable school interventions.

When promoting the ability of schools to better meet the students' needs and thereby improve their performance and mental health, we need valid and reliable assessment instruments and tests that can be used to evaluate and understand what the students' needs are. The SDQ, which was investigated in this thesis, is a brief and widely used questionnaire for assessing mental health problems in children and adolescents. The teacher SDQ was found to have good construct validity and can thus be recommended for use in schools for analyzing student development, for screening purposes, for assessing individual students, or for evaluating the effect of school interventions. However, earlier research suggests that more than one informant should be used when assessing the mental health of children and adolescents. We believe that the parent SDQ is an important complement and should be used together with the teacher SDQ, despite its lack of construct validity. The parent SDQ probably captures other aspects of the children's mental health that cannot be categorized in line with the suggested SDQ structure with its five different sub-scales. This could be due to the relative heterogeneity of the parents in addition to the absence of professional perspective and comparison, as well as the emotional bonds that exist between parents and their children.

The UTSIKTER intervention was implemented in schools that were situated in socio-economically disadvantaged areas. It showed potential for improving the students' school performance. An advantage of UTSIKTER was the inbuilt constant evaluation: this kept the intervention on track and made other specific efforts of quality assurance unnecessary. Its design also meets many of the criteria identified by earlier research to be essential for successful interventions. Therefore, we can, given its complex design and relatively short evaluation time, expect that it will yield larger effects over longer durations. The UTSIKTER intervention could thus be useful for communities and schools that are not only willing to introduce completely new interventions in the existing school organization but also willing to embrace the powerful but challenging component of continuous organizational development, thus letting the intervention help the school to become and be a learning organization.

The associations between mental health and school performance in the youngest schoolchildren are strong and flag an important inequality. School interventions that take on the challenge of organizational change will create the possibility of breaking this vicious circle, thereby improving the life opportunities of individual children and reducing inequality in society.

Summary in Swedish

Psykisk ohälsa och sjukdom är ett växande problem världen över både för vuxna och yngre. Hos svenska barn och unga har den psykiska ohälsan ökat de senaste åren, framför allt bland yngre tonåringar och särskilt bland flickor.

För barns och tonåringars utveckling är det extra viktigt med en god psykisk hälsa. De utvecklas, växer och formar sin identitet. De behöver utbilda sig, bilda goda relationer och lära sig att klara av de utmaningar som tillhör livet. Tidiga upplevelser, både bra och dåliga, kan därför ha effekt långt senare i livet. Upp till hälften av all psykisk ohälsa hos vuxna har haft sin debut före 14 års ålder.

Utbildning och hälsa hänger tätt samman. Utbildning är en av de viktigaste faktorerna för en god hälsa genom hela livet. Psykisk hälsa påverkar i sin tur förmågor som vi behöver för att kunna tillgodogöra oss kunskap. För utsatta barn och ungdomar är en bra skolgång den viktigaste skyddsfaktorn för bra psykisk hälsa och framtida livsmöjligheter. Mot bakgrund av dessa samband mellan psykisk hälsa och utbildning kan man lätt förstå att tidiga interventioner som stöttar barn och ungdomar så att de kan prestera väl i skolan är viktiga för att säkra barns och ungdomars framtidsutsikter. Särskilt viktigt är detta för barn som kommer från en bakgrund med begränsade resurser att stötta dem.

Syftet med denna avhandling är därför att öka kunskapen om hur psykisk hälsa och skolprestationer hänger samman och hur man bäst kan utforma och implementera interventioner i skolan för att positivt påverka både elevernas psykiska hälsa och deras skolprestationer.

Informationen som studierna bygger på samlades in från 14 olika låg- och mellanstadieskolor i Helsingborg och Landskrona, vid tre tillfällen med vardera ett år emellan. I hälften av skolorna genomfördes en intervention kallad UTSIKTER. De andra sju skolorna var med i forskningsprojektet som jämförelseskolor. Eleverna gick i årskurs ett och två vid den första datainsamlingen och i årskurs tre och fyra vid den sista datainsamlingen. Det insamlade materialet innehöll information om elevernas kunskaper i svenska och matematik, om hälsa och levnadsvanor, blodtryck, puls, längd, vikt, salivprov för att mäta stress, samt information om föräldrarnas bakgrund, utbildning och sysselsättning. Barnens psykiska hälsotillstånd skattades av såväl lärare som föräldrar med frågeformuläret ”Styrkor och svagheter” som är ett internationellt etablerat mätinstrument som

översatts till ca 80 olika språk. Lärarna på interventionsskolorna bjöds in till fokusgruppsdiskussioner för att diskutera hur de uppfattade och tog del av interventionen.

Resultaten från studierna visade tydliga samband mellan elevernas psykiska hälsa och kunskaper i matematik och svenska, oberoende av andra faktorer. Det fanns också samband mellan kunskapsnivå, psykisk hälsa och socio-ekonomisk bakgrund. Elever med dålig psykisk hälsa och låg socio-ekonomisk bakgrund hade ännu större risk att prestera dåligt i skolresultat. Vilken skola och framför allt vilken klass eleverna gick i påverkade också deras kunskaper i matematik och svenska.

Interventionen verkade ha en positiv effekt på elevernas kunskaper i läsförståelse. Den effekten kan ha berott på en förbättring av elevernas psykiska hälsa genom interventionen. Lärarnas engagemang visade sig att ha betydelse för hur interventionen utvecklade sig. För att lärare skulle bli engagerade så krävdes att de inkluderades och involverades i de aktiviteter som var del av interventionen, att de fick bra information och stöd samt gavs möjligheter till samarbete.

Att samband tydligt kan demonstreras mellan psykisk hälsa, skolresultat och socio-ekonomisk bakgrund redan i skolans första år visar att ojämlikheten i samhället påverkar redan yngre skolbarn. Barn med låg socio-ekonomisk bakgrund och dålig psykisk hälsa hade ännu sämre skolresultat än elever med bra socio-ekonomiska förutsättningar och dålig psykisk hälsa. Detta kan det betyda att interventioner i skolan som förbättrar både elevernas psykiska hälsa och deras skolresultat kan ha stor betydelse genom att utjämna ojämlikheter i hälsa och därför även generellt i samhället genom de stora positiva effekterna av utbildning på individernas livschanser.

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