



Relations between students' well-being and academic achievement: evidence from Swedish compulsory school

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Abstract

The study aimed to investigate students' psychological, cognitive, and social well-being in 6th Grade and the relations to academic achievement in compulsory school, as measured by grades in 9th Grade. Due to reports from Swedish authorities and research, students' self-reported well-being has decreased during the last decade. Data from the Swedish longitudinal project Evaluation Through Follow-up was analyzed with confirmatory factor analysis and structural equation modelling. By using data from two birth cohorts (1998: $N=7\ 684$ and 2004: $N=9\ 437$), differences in well-being across the two cohorts could be investigated. Cognitive ability, parental education, and gender were also accounted for. Statistically significant cohort and gender differences were found, where cohort 2004 was disadvantaged in all three well-being dimensions, and girls were disadvantaged in psychological and social well-being. Psychological well-being was negatively related to academic achievement, indicating that students who experienced more school-related stress performed higher than students who experienced less stress. Cognitive well-being was positively related to academic achievement. Possible causes of the decrease in well-being may be changes in the educational and assessment system, which meant that cohort 2004 went through compulsory school with a stronger focus on results and grades than earlier cohorts.

Keywords Psychological well-being · Cognitive well-being · Social well-being · Assessment system · Academic achievement · Measurement construction

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Introduction

In the field of well-being and education, there is a consensus that gaining academic knowledge on its own is not enough for children and young people to become active citizens as adults (Cefai et al., 2021). Education needs to go beyond limited goals such as academic achievement to actively promote children's and young people's well-being. Children should develop the necessary social and emotional competencies to navigate successfully through the challenges and transitions they will meet when growing up into adulthood. Well-being is a part of the concept of health and concerns individuals' physical, mental, and social well-being. The World Health Organization (WHO) notes that well-being is "... not merely the absence of disease or infirmity" and that 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" (WHO, 2005, p. 2).

The well-being of children and young people has become a major concern in many OECD countries, as shown in an OECD report (2019) based on data from the Programme of International Student Assessment (PISA) from 2018. About one in three students in 2018 expressed that they were not satisfied with life, which was a 5 percent increase from the 2015 results. Moreover, about 6 percent of all students expressed that they always felt sad, 37 percent expressed that intelligence cannot change, and in almost every OECD country, girls expressed greater fear of failure than boys (OECD, 2019). Among children in Europe, 35 percent of 13-year-olds and 40 percent of 15-year-olds reported negative emotions such as feeling low and nervous and experiencing psychosomatic symptoms more than once a week (Inchley et al., 2020). It has also been found that students' sense of belonging, i.e., to feel accepted, liked, and connected to others in school, on average had decreased when the PISA 2018 results were compared to the PISA 2015 results. This decrease in students' sense of belonging seems to be in line with a gradually negative trend that has been observed during the past 15 years (OECD, 2017, 2019). Additionally, it was found that students attending schools with low socioeconomic status (SES) reported a weaker sense of belonging than their more well-off peers. The WHO HBSC study (Inchley et al., 2020) and a recent Swedish study (Klapp & Jönsson, 2021) reported that adolescents with low SES received lower levels of support from teachers, school peers, and friends. There have also been reports of a decline in resilient schools in Sweden, i.e., low SES schools that have relatively high levels of average student achievement (Siebecke & Jarl, 2022). Due to the reports of children and young people's decreasing well-being, the aim of the study was to investigate school-related dimensions of well-being and how they relate to academic achievement.

Causes of children and young people's decrease in mental health and well-being may be due to several mechanisms in society, such as increasing levels of social inequality and poverty, unemployment, cyberbullying and technological addiction, online safety, and media manipulation (e.g., WHO, 2015; Inchley et al., 2020; UNICEF, 2021). In 2018, the Public Health Agency of Sweden reported that the mental illness of adolescents in Sweden has increased since the mid-1980s, with increased psychosomatic symptoms such as sleeping problems, depression, headaches, and stomachache (2014; 2018). According to the Public Health Agency of Sweden (2018), this increase in mental illness was partly associated with school-related factors, such as school stress. Researchers have argued that changes leading to a stronger focus on assessments can hurt children and youth's mental health, well-being, and social support (e.g., Banks &

Smyth, 2015; Cefai et al., 2021; Chamberlin et al., 2018; Högberg et al., 2019), as well as for anxiety and perceived self-worth (Bong & Clark, 1999; Marsh, 1986). Considering that children and youth spend a considerable amount of time in school during their compulsory education, it is reasonable to believe that their well-being may be affected by school-related factors (Högberg et al., 2019; Lewis & Frydenberg, 2002).

Previous research

The biopsychosocial framework and well-being dimensions

The WHO's definition of mental health overlaps greatly with the salutogenic perspective of health, which defines health as a "process by which individuals maintain their sense of coherence and ability to function in the face of changes in themselves and their relationships with their environment" (Antonovsky, 1987). These definitions highlight that mental health and well-being are determined by multiple and interacting social, psychological, and biological factors, as well as health and illness levels in general. A biopsychosocial perspective is applied in the current study, which includes the assessments of factors implicated in students' mental health and well-being, such as students' characteristics, characteristics of their social and school environments, academic achievement, and the impact of the environment such as different education and feedback systems. The factors have complex relations and interactions between them, and the biopsychosocial framework is a common foundation for understanding these complex relations (Cefai et al., 2021).

There have been some inconsistencies regarding definitions and measurements of well-being, where terms like general and subjective well-being sometimes are used without clear definitions. Pollard and Lee (2003) attempted to remedy the inconsistency around the dimensionality of well-being in their systematic literature review. According to their compilation of the literature, general child well-being comprises five main dimensions: the psychological, cognitive, social, economic, and physical dimensions. Since the term well-being is neither defined nor measured consistently across studies, it is important to define what aspects of well-being are being studied. Due to the limitations that come with using secondary data, the economic and physical dimensions are left out of the present study. Instead, the psychological, cognitive, and social well-being dimensions are scrutinized more thoroughly.

In accordance with Pollard and Lee (2003), the psychological well-being dimension should be defined as children's emotions and mental health or mental illness. School-related psychological well-being can therefore be understood as levels of anxiety, distress, nervousness, stress, and self-esteem about school. Cognitive well-being is related to individuals' intellectual capability and the opportunities or limitations it entails. It does not refer to actual intellectual capability, but to individuals' perception of their capability to function in an intellectual context. Social well-being refers to having supportive and well-functioning social relationships (Pollard & Lee, 2003). Individuals who feel that they can develop and maintain satisfying and healthy relationships with surrounding people tend to have high social well-being, while individuals who feel the opposite are more likely to experience social isolation and because of that are more exposed to depression and lack of well-being (Bandura et al., 1996).

Well-being and student characteristics

Gender

While findings in many studies indicate that there are gender differences in well-being, where girls tend to experience higher levels of stress in school (see, e.g., Banks & Smyth, 2015; Giota & Gustafsson, 2017; Haugland et al., 2001; Sonmark et al., 2016), others report opposite or no gender effects (Högberg et al., 2019; Miller et al., 2013; Pietarinen et al., 2014). For instance, Miller et al. (2013) used a relatively large sample of 7–11-year-old students and measured well-being with indicators such as self-esteem, psychological health, school environment, enjoyment of education, and peer relationships. They found no significant evidence for gender differences in well-being.

Socioeconomic status

As with gender differences, varying results have been found in studies controlling for SES. Generally, research findings indicate that SES is an important aspect of students' educational attainment and other academic outcomes because it says something about families' educational resources, which can influence educational support and guidance through the educational system (Bukodi & Goldthorpe, 2013; Bukodi et al., 2014). SES has also been shown to influence students' well-being, for example by Due et al. (2011), who found that children's health was affected by their social condition and that children and adolescents with lower SES faced higher risks of negative health outcomes. Similarly, in a large cross-national study, Viner et al. (2012) found that structural income inequality and access to education were strong determinant factors of adolescent health. However, results from other studies indicate that SES has little or no effect on students' life satisfaction (Högberg et al., 2019) or students' well-being (Miller et al., 2013).

Cognitive ability

Yet another factor that has documented effects on student school outcomes is cognitive ability. Research shows, for instance, that cognitive ability has direct and positive effects on academic achievement and academic self-concept (see, e.g., Marsh, 1990), and academic self-efficacy and motivation (Stoeger & Ziegler, 2010). Regarding well-being specifically, Giota and Gustafsson (2017) found that students with strong inductive abilities were less prone to school-related stress, while Masten et al. (1999) found that cognitive ability increased students' adaptive ability, which functioned as protection when they were facing academic adversities.

Well-being and the school context

Several studies have shown that school factors such as high demands, tests, and grading are associated with stress and anxiety among children and youth (see, e.g., von der Embse et al., 2013; Pollard & Lee, 2013; Högberg et al., 2019; Konu et al., 2002; Chamberlin et al., 2018). One example is the results from the longitudinal study (N = about 9000) by Giota and Gustafsson (2017), which showed that students who experienced school to be

academically demanding had higher levels of stress in both 6th and 9th Grade and that the perceived demands increased extensively from 6 to 9th Grade. Similar results were found by Schraml et al. (2011), but for upper secondary school students ($N=304$).

In a recent difference-in-difference study by Högberg et al. (2019), student well-being was investigated before and after a major educational reform in 2011 (the same reform that will be discussed in the present study). The same survey was distributed twice, before and after the reform, to Swedish 5th, 7th, and 9th Grade students (N =about 7000/survey). They found that when students were graded earlier and more frequently, school-related stress increased while academic self-esteem and life satisfaction decreased. Such an increase in stress may, however, be moderated by other factors and student characteristics. For example, in a mixed-methods study with in-depth interviews and multilevel modelling, Banks and Smyth (2015) followed a sample of 900 secondary school students in Ireland. They found that although high-stake exams had a negative effect on students' school-related stress, well-functioning social relations with peers and teachers mitigated the negative effect. Similarly, West and Sweeting (2003) showed that student SES, measured by parental occupation, significantly influenced students' worries about school performance. Overall, these results indicate that the school context is an important part of the well-being of students. However, in the present study, we have looked at two different cohorts close in time to each other that had different education and assessment systems, which enable comparisons of students' school-related well-being. To our knowledge, not many similar studies have been published, which may be due to the lack of data that allows such comparisons and the fact that it depends on reform implementations.

Well-being and academic achievement

In several studies, students' well-being has been linked to their academic achievement. However, there has been some inconsistency in the results. Some studies indicate that there is a positive relationship between well-being and academic achievement, whereas others indicate a negative relationship. Kaya and Erdem (2021) conducted a meta-analysis ($N=81$ studies) and found that general well-being affected academic achievement positively. Additionally, the relationship varied as a function of age. When age increased, the effect of well-being on academic achievement decreased. Similar results were identified in a literature review conducted by Amholt et al. (2020). They found that the studies investigating the relationship between well-being and academic achievement with students aged 10–14 reported that the relationship was positive. This stood in contrast to the results concerning older students, for which no association was found. An explanation for the moderation effect of age may be that younger students (i.e., compulsory school students) depend more on factors that influence their well-being, such as feeling that school activities are manageable and having well-functioning social relations in and outside of school, to perform well in school. Older students, on the other hand, may perhaps perform well independent of social relations with parents, teachers, and peers (Amholt et al., 2020).

Another approach was taken by Heller-Sahlgren (2018), who used PISA data from 34 countries to conduct an instrumental variable (IV) design to study the potential trade-off between student well-being and academic achievement. The hypothesis behind the reasoning of such a trade-off is based on research suggesting that when educational reforms are implemented to increase academic achievement, it tends to increase student stress and decrease school-related well-being. The results presented by Heller-Sahlgren (2018) indicated that the competition found in independent schools affected student performance

positively but student well-being negatively. Similar issues are discussed by Låftman et al. (2013), who interviewed 49 students in a high-performing Swedish school. The themes that emerged from the interviews concerned how students' aspirations, external expectations, and high-performing contexts increased school-related stress, directly or indirectly. Student accounts included, for example, reports of competitive cultures concerning grades, as well as having high performance tied to their identity. In their meta-analysis of subjective well-being and academic achievement ($N=47$ studies), Bücker et al. (2018) found a positive correlation ($r=0.16$) suggesting that positive well-being and higher academic achievement were related, but because of the weak relation, they could not draw strong conclusions from it. Rather, they noted that it was not a given that low-achieving students reported low well-being and high-achieving students reported high well-being. This is in line with the discussions of Chamberlin et al. (2018) and Tannock (2015), whose findings indicated that grades contribute to social comparisons and competition between peers, fostering educational environments that oppose peer solidarity and encourage more individualistic approaches.

Overall, there seems to be some evidence of a positive relationship between student well-being and academic achievement. However, it seems like competitive school environments succeed in increasing performance levels but fail to foster school-related well-being. This means that in some studies, students seem to depend on their school-related well-being to perform well in school, whereas in other studies, students seem to perform well at the expense of their well-being. Clarke (2020) notes that varying results may be due to inconsistencies in the measurement of well-being, for example, by failing to account for the multidimensional structure of well-being.

Purpose

Whereas some research has been carried out on the topic of school-related well-being and academic achievement, much uncertainty still exists on issues like the measurement of child well-being, relevant background variables, and possible outcomes. Several studies have used general measures of non-school-related well-being or used single-item proxies to measure the abstract and multidimensional structure of well-being. In the present study, the intention was to look at students' school-related psychological, cognitive, and social well-being to be able to disentangle the relations between the separate well-being dimensions, the background variables, and academic achievement. As there seems to be a negative trend in child and youth well-being in Sweden and internationally, more research on the topic is needed. Against this background, the main purpose of the study was to investigate school-related dimensions of well-being and their relation to academic achievement, taking into account student characteristics and school context. Specific questions were as follows:

- (1) What are the relations between psychological, cognitive, and social well-being and academic achievement in school, measured by grades in 9th Grade?
 - a. How can psychological, cognitive, and social well-being be constructed, and to what extent are the measurements invariant over time?
- (2) How do cognitive ability, educational background, gender, and school context influence the three dimensions of well-being and academic achievement?

Method

Context of the study

The current study use data from two birth cohorts, 1998 and 2004. The 1998 cohort experienced an educational system with different characteristics compared to the 2004 cohorts. In 2011, a new curriculum was implemented in Swedish compulsory schools that introduced changes to the educational and assessment systems. This affected the frequencies of testing and grading and the requirements of the number of passing grades for eligibility to upper secondary education increased.

Cohort 1998 received grades for the first time in 8th Grade (age 14–15, 2012) and received grades each term until the final grades in 9th Grade. The grading scale was four categories from “not yet passing” to “passing with special distinction.” In compulsory school, a fail grade did not exist. National tests were given to the students in 5th Grade in Swedish and mathematics and 9th Grade in Swedish, English, and mathematics. The national tests did not steer teachers' grading but were used for purposes such as implementing the curricula, evaluating the education system, and helping teachers calibrate their assessments. The requirements for being admitted to upper secondary education were passing grades in three subjects: Swedish, English, and mathematics.

Cohort 2004 received grades for the first time in 6th Grade (age 12–13, 2016), followed by grading every term throughout compulsory school (National Agency for Education, 2015). This means that cohort 2004 was graded two years earlier than cohort 1998 and that they received twice as many grades during compulsory school. In addition, the reform introduced a fail grade to the grading scale, which was a change from cohort 1998. National tests were given in 3rd Grade in Swedish and mathematics, in 6th Grade in Swedish, English, and mathematics and in 9th Grade in Swedish, English, mathematics, social science, and natural science. The requirements for entering upper secondary school became stricter, cohort 2004 needed passing grades in at least 12 subjects for college preparatory programs, and eight passing grades for vocational programs (National Agency for Education, 2019). In 2018, 15.6% of Swedish 9th Grade students were not qualified to enter upper secondary school (National Agency for Education, 2018).

Overall, the 2011 educational reforms contributed to a school system with a stronger focus on tests and results in comparison to the previous education system. Final grades were given a more important role in the Swedish educational system, in the sense that they strongly affected the possibility of continuing within the educational system.

Participants

Data were retrieved from the Swedish longitudinal database Evaluation Through Follow-up (UGU: Utvärdering genom Uppföljning), compiled by Statistics Sweden (Härnqvist, 2000). The sampling was a two-step stratified procedure, where municipalities were selected in the first step and school catchment areas in the second step. Each sample is 10% of the population and is nationally representative of the respective population. We used survey and cognitive test data from two birth cohorts, 1998 ($N=9180$) and 2004 ($N=9775$), when each cohort attended 6th Grade (ages 12–13) in 2011 and 2017, respectively. Cohort 1998 answered the survey in the spring of 2011, before the reform implementations, and cohort 2004 did so in the spring of 2017 when the 2011 educational

reforms had been active for about 4–5 years. The cohorts answered identical questions, which enabled cohort comparisons. Register data were used to measure academic achievement, parental education, and gender.

Measures

Academic achievement In 9th Grade, students were graded and received a merit value based on their best 16 subject grades (out of 17 subjects). The merit value is used as a selection instrument for applying to upper secondary education. The merit value ranges from 0 to 320 points, 320 being the highest.

Psychological, cognitive, and social well-being From the UGU questionnaire data, 9 items were selected to represent students' psychological, cognitive, and social well-being, based on the findings of previous research (Pollard & Lee, 2003). These items were subsequently used as indicators to create three school-related well-being factors (Table 1): one psychological well-being factor (PsyWb), one cognitive well-being factor (CognWb), and one social well-being factor (SocWb). Psychological well-being was operationalized by indicators connected to school-related stress and worries, such as "I worry about how I am going to pass exams." Cognitive well-being was operationalized by indicators connected to perceived cognitive functioning and behavior in school, such as "I normally manage to do the tasks that I am given." Social well-being was operationalized by indicators that said something about students' social relations within schools, such as "How content are you in your current class?" The variables were coded so that a higher value indicated greater well-being.

Student characteristics and school context Cognitive ability, educational background, gender, and cohort were included as covariates. Cognitive ability (COGN) is an interval scale variable operationalized by three variables that each represent a test of cognitive ability (Svensson, 1964). The tests were the following: vocabulary, spatial, and inductive reasoning. These three tests were conducted at the same time as the questionnaire in 6th

Table 1 Descriptive statistics of indicators

Items	<i>N</i>	% Missing	<i>M</i>	<i>SD</i>
Psychological well-being				
psy1 I worry about tests on homework	12,538	32.6	3.67	1.09
psy2 I worry about how I am going to pass the exams	12,552	32.6	3.10	1.17
psy3 I worry about things that happen in school	12,564	32.5	3.76	1.14
Cognitive well-being				
cog1 I find it difficult to concentrate during lessons	12,537	32.6	3.43	1.06
cog2 I normally manage to do the tasks that I am given	12,609	32.3	4.03	0.66
cog3 I find it difficult to keep up during lessons	12,585	32.4	3.88	0.99
Social well-being				
soc1 How do you like your current class?	12,374	33.5	4.38	0.84
soc2 How do you like the teachers?	12,365	33.6	4.24	0.87
soc3 How do you like it during breaks?	12,378	33.5	4.53	0.73

The questionnaire items were answered on a 5-point Likert scale. Total *N* = 18,612

Grade. The tests were summed and standardized into z-scores, ranging from -3.28 to 2.63 in the 1998 cohort, and from -3.79 to 2.65 in the 2004 cohort. Parental education was operationalized as the education level of the highest educated parent, with 5 categories ranging from pre-secondary education to college education covering four years or more. Gender was dummy coded with boys as the reference category. School context was operationalized as a dummy variable of the birth cohorts 1998 and 2004, with cohort 1998 as the reference category.

Method of analysis

To investigate the dimensionality of well-being and the effect of student and school characteristics on students' psychological, cognitive, and social well-being, confirmatory factor analysis (CFA) and structural equation modelling (SEM) were used. First, measurement models were estimated with CFA to create psychological, cognitive, and social well-being factors. The CFA models were then further analyzed with multiple-group CFA, to estimate measurement invariance across the two birth cohorts. In measurement invariance testing, three levels of invariance are considered, the configural, metric, and scalar invariance levels. Respectively, they refer to equal factor structures, equal factor loadings, and equal indicator intercepts across groups (Marsh et al., 2018).

The first SEM model was estimated with the three well-being factors regressed on the background variables (COGN, EDU, GENDER, and COHORT), presented in model 1, Table 5. The interaction terms COHORT \times GENDER and COHORT \times COGN were then examined in model 2. Model 3 in Table 6 was estimated with relations between the three well-being factors and academic achievement (MERIT) as the outcome. Lastly, model 4 with all three well-being factors, student characteristics (COGN, EDU, and GENDER) and school context (COHORT, education system pre- and post-reform) was estimated with relation to the outcome academic achievement (MERIT).

The intraclass correlations (ICCs) ranged from 0.014 to 0.093 in the 1998 cohort, with design effect sizes ranging from 1.132 to 1.882. In the 2004 cohort, ICCs ranged from 0.016 to 0.105, with design effect sizes ranging from 1.165 to 2.084. An ICC less than 0.05 is considered small enough not to seriously affect estimates of standard errors (Hox et al., 2010), and a design effect greater than 2 generally indicates that the clustering in the data should be considered (Muthén & Satorra, 1995a). Since some of the ICCs and design effects were below/above the recommended cutoff values, the school clustering in the data was accounted for with the "complex" option offered by the Mplus program, with which it is possible to take school clustering effects into account (Muthén & Muthén, 1998–2017; Muthén & Satorra, 1995b). This method compensates for disturbance in the chi-square test of model fit and standard errors due to clustering effects but does not affect the estimates. The standard errors become larger, and the *t*-values become smaller due to the loss of information caused by the clustering. The extent of the information loss is a function of the ICC and the cluster size (Muthén & Muthén, 1998–2017). Cohen's *d* was computed as a measure of effect size. Values of *d* above 0.10 are worth considering when the sample size is large and multiple variables are used, which is the case for the current sample (Ellis, 2010).

Root mean square error of approximation (RMSEA), confidence intervals for RMSEA, comparative fit index (CFI), and standardized root mean square residual (SRMR) were used as goodness-of-fit indices. RMSEA takes the number of observations and the number of free parameters into account and is highly recommended for assessing model fit (Jöreskog, 1993). RMSEA should be below 0.08 for a model to be acceptable, and around

0.05 to be good. The CFI index should be as close to 1.0 as possible, and values below 0.95 are hesitant to accept (Hu & Bentler, 1998, 1999).

Missing information was handled by using missing data modelling (Muthén et al., 1987), which assumes that the data are missing at random (MAR). This procedure gives unbiased estimates when the missing is random, given the information in the data. This is a considerably less restrictive assumption than the assumption that the data are missing completely at random. High interrelations between the observed variables provide good possibilities to meet the MAR assumption (Schafer & Graham, 2002). While the Mplus missing data modelling procedure effectively controls for bias due to internal missing data, it is less powerful for dealing with missing data across cohorts. To take the substantial differences in the amount of missing data between the 1998 and 2004 cohorts into account, calibration weights estimated by Statistics Sweden were applied (Särndal, 2007). The calibration weights take advantage of auxiliary information from population registers (e.g., parental education, grades, national tests) and estimate individual weights for the participants, controlling for bias due to non-participation.

IBM SPSS Statistics 27.0 was used for data management, descriptive analysis, and graph making, while Mplus 8 (Muthén & Muthén, 1998–2017) was used for modelling and data analyses.

Results

The results from the analysis will be presented in four steps: descriptive statistics, measurement modelling (CFA), measurement invariance testing, and lastly, structural equation modelling (SEM).

Descriptive statistics

In the 1998 cohort, 18.5% of the observations were missing in the cognitive ability test, while 46% of the observations were missing in the 2004 cohort. Regarding the questionnaires, 17.3–18.6% of the observations were missing in the 1998 cohort, while 46.6–48.1% of the observations were missing in the 2004 cohort (see Table 2). The number of internal missing data was greater in the 2004 cohort than in the 1998 cohort. In the 2004 cohort, the survey in 6th Grade coincided with the grading of students' knowledge in relation to criteria and the implementation of the Swedish national tests. The large amount

Table 2 Descriptive statistics of the manifest variables for cohorts 1998 and 2004

Variables	N		% Missing		M		SD	
	1998	2004	1998	2004	1998	2004	1998	2004
MERIT	7555	9023	1.7	4.4	221.41	230.75	56.28	66.61
COGN	7476	5097	2.7	46.0	64.90	67.13	16.75	17.71
EDU	7689	9398	0.0	0.4	3.29	3.51	1.22	1.19
GENDER	<i>Girls</i>	<i>Boys</i>	<i>Girls</i>	<i>Boys</i>				
	3709	3975	4651	4786	0.0	0.0		

MERIT academic achievement measured by grades; *COGN* cognitive ability; *EDU* parental education

of missing data in the 2004 cohort was due to the increased workload for teachers after the reform implementations, leading teachers not to prioritize the UGU survey. As mentioned, missing observations were handled with calibration weights that accounted for student and family characteristics, to minimize biased estimates. Parental education and gender, register data collected by Statistics Sweden, had no internal missing. Missing in the MERIT variable were low, 1.7% ($N=129$) for the 1998 cohort and 4.4% ($N=414$) for the 2004 cohort. Cohen's d was 0.15 for the difference in MERIT between the 1998 and 2004 cohorts.

Cohort 2004 had a somewhat higher mean in the cognitive ability variable (COGN) than cohort 1998, suggesting either that low-performing students in the 2004 cohort did not respond to the same extent as high-performing students, or that there was a slight increase in the population level of performance across cohorts. The effect size was $d=0.13$, suggesting that the difference in cognitive ability between the 1998 and 2004 cohorts was negligible.

The dimensionality of psychological, cognitive, and social well-being

Table 3 provides CFA factor loadings. Since two cohorts were used from two separate data collections, analyses were estimated for each cohort. As can be seen, the relations between the factors and their respective indicators were relatively strong, with factor loadings ranging from 0.62–0.74 (PsyWb), 0.40–0.70 (CognWb), and 0.53–0.85 (SocWb). Factor correlations were similar across cohorts, with the highest correlations observed between the psychological and cognitive well-being factors in cohorts 1998 and 2004 (0.65/0.66, respectively). Social well-being was correlated with about 0.40 with psychological and cognitive well-being. The measurement models had acceptable/good model fit. Overall, the results indicated acceptable construct validity of the measurement models.

Table 3 Standardized factor loadings for the two 3-factor measurement models for each cohort (standard error in parentheses)

Indicators	PsyWb		CognWb		SocWb	
	1998	2004	1998	2004	1998	2004
psy1	.72 (.01)	.73 (.01)				
psy2	.69 (.01)	.74 (.01)				
psy3	.62 (.01)	.63 (.01)				
cog1			.68 (.01)	.70 (.01)		
cog2			.44 (.02)	.40 (.02)		
cog3			.65 (.02)	.69 (.01)		
soc1					.85 (.01)	.84 (.02)
soc2					.53 (.01)	.58 (.02)
soc3					.68 (.01)	.69 (.02)

All estimates were significant on the .001 level

PsyWb=psychological well-being, CognWb=cognitive well-being, SocWb=social well-being

1998=birth cohort 1998, 2004=birth cohort 2004

Model fit: $\chi^2(60) = 816.68$ $p < .001$; RMSEA = .045 [C.I. .042-.047]; CFI = .942; SRMR = .044

Test of measurement invariance

Turning to the invariance testing of the measurement models, Table 4 presents information on the configural, metric, and scalar invariance models in which the equivalence of the factors is considered across the two cohorts. As shown, configural, metric, and scalar invariance all had good model fit. Significant chi-square differences between the models were found, suggesting that as assessed by chi-square, the measurements of well-being were non-invariant across the two cohorts. However, as discussed by Cheung and Rensvold (2002) and others (e.g., Vandenberg & Lance, 2000), chi-square is sensitive to large sample sizes, where even a small chi-square difference may result in a significant difference test. The CFI difference was therefore assessed in addition to the chi-square difference test, as it is not sensitive to sample size and is robust in the sense that it does not correlate with the goodness-of-fit indices of the unconstrained model. The CFI difference between the configural model and the more restricted metric model was 0.002, which was small enough to indicate invariance between the groups. The corresponding difference between the configural and the scalar models was 0.013, which was only slightly bigger than the recommended CFI difference of 0.01 (Cheung & Rensvold, 2002). Overall, these results suggest that the measurement models were equivalent across the cohorts.

The importance of student characteristics and school context for the well-being dimensions

Table 5 provides standardized estimates for the relationship between student characteristics, school context, and school-related well-being. Model 1 shows the influence of COGN, EDU, GENDER, and COHORT on the well-being factors, while model 2 was extended with the interaction terms COHORT×COGN and COHORT×GENDER. Starting with COGN, we identified significant and positive relations to PsyWb ($b=0.21$) and CognWb ($b=0.39$), suggesting that higher cognitive ability was associated with higher psychological and cognitive well-being. EDU was weakly related to CognWb ($b=0.09$), suggesting that having higher-educated parents slightly increased cognitive well-being. Girls had significantly lower PsyWb ($b=-0.24$) and SocWb ($b=-0.08$), compared to boys. No significant gender difference was found for CognWb. Lastly, the estimates for the relations between COHORT and the well-being factors were all significantly negative, suggesting that cohort 2004 had lower well-being compared to cohort 1998, particularly regarding CognWb ($b=-0.11$) and SocWb ($b=-0.13$).

Table 4 Tests of measurement invariance of the psychological, cognitive, and social well-being measurements across cohorts 1998 and 2004

	χ^2	df	RMSEA (90% CI)	CFI	SRMR
Configural	632***	48	.044 [.041–.047]	.955	.036
Metric	660***	54	.042 [.039–.045]	.953	.042
Scalar	817***	60	.045 [.042–.047]	.942	.044
Metric vs configural	35***	6			
Scalar vs configural	181***	12			
Scalar vs metric	148***	6			

*** $p \leq .001$

Table 5 SEM with standardized coefficients, dependent variables are psychological, cognitive, and social well-being (standard error in parentheses)

	Model 1			Model 2		
	PsyWb	CognWb	SocWb	PsyWb	CognWb	SocWb
COGN	.21*** (.01)	.39*** (.02)	.05*** (.01)	.19*** (.02)	.29*** (.02)	-.01 ^{NS} (.02)
EDU	.01 ^{NS} (.01)	.09*** (.02)	.01 ^{NS} (.01)	.01 ^{NS} (.01)	.08*** (.01)	.01 ^{NS} (.01)
¹ GENDER	-.24*** (.01)	-.01 ^{NS} (.02)	-.08*** (.01)	-.21*** (.02)	.03 ^{NS} (.02)	-.04*** (.02)
² COHORT	-.04*** (.02)	-.11*** (.02)	-.13*** (.02)	.00 ^{NS} (.02)	-.06*** (.02)	-.08*** (.02)
COHORT×COGN				.13*** (.02)	.13*** (.02)	.09*** (.02)
COHORT×GENDER				-.07*** (.02)	-.08*** (.02)	-.08*** (.02)

¹Reference group is boys

²Reference group is 1998

Model 1 fit: $\chi^2(47) = 1270.28, p < .001$; RMSEA = .038 [CI .036-.039]; CFI = .921; SRMR = .037

Model 2 fit: $\chi^2(60) = 1366.87, p < .001$; RMSEA = .042 [CI .040-.044]; CFI = .917; SRMR = .041

*** $p \leq .001$, ** $p \leq .01$

Moving on to model 2, the interaction term $\text{COHORT} \times \text{COGN}$ was significantly and positively related to all three well-being factors (see Fig. 1a–c for visual presentation). For psychological and cognitive well-being, the results suggested that when COGN was equal between the cohorts, students in cohort 1998 had higher psychological and cognitive well-being compared to students in cohort 2004. In both cases, the difference between the cohorts was visible mainly at the lower end of the COGN scale. The observed differences decreased with higher cognitive ability, meaning that students at the upper end of the COGN scale had more equal psychological and cognitive well-being across the cohorts. Regarding social well-being, the positive effect indicated that for pupils with higher cognitive ability, the effects on social well-being were similar across the cohorts. For pupils with lower cognitive ability, however, the difference between the cohorts was larger, meaning that the 2004 cohort reported significantly lower social well-being compared to the 1998 cohort. Next, the interaction term $\text{COHORT} \times \text{GENDER}$ was significantly and negatively related to all three well-being factors. This suggested that girls belonging to cohort 2004 had slightly lower psychological ($b = -0.07$), cognitive ($b = -0.08$), and social well-being ($b = -0.08$), compared to boys born in 2004 and to girls and boys in cohort 1998.

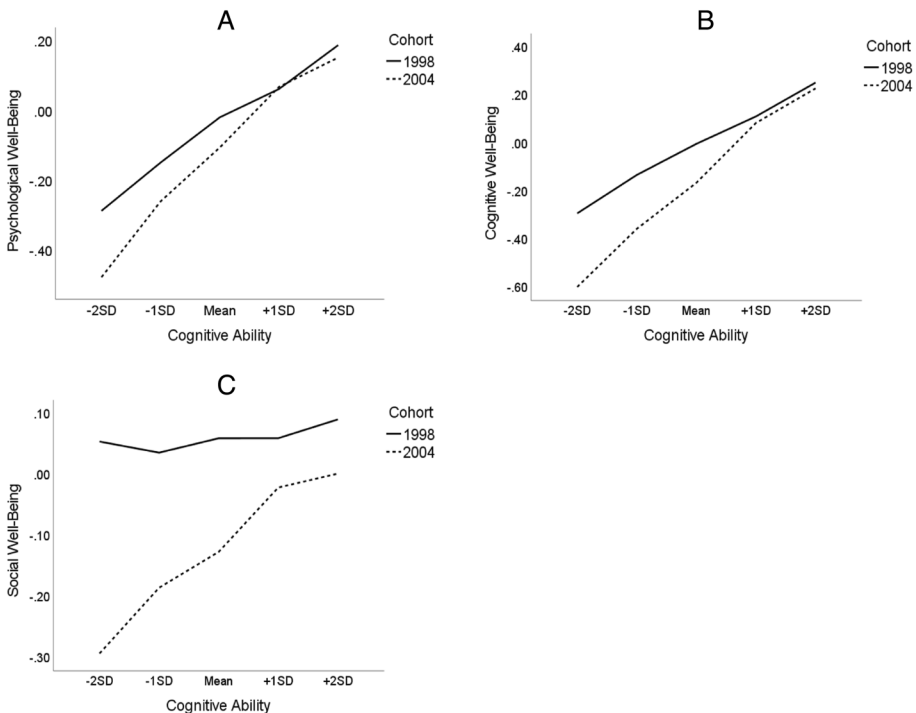


Fig. 1 a–c Interaction effect of cohort and cognitive ability ($\text{COHORT} \times \text{COGN}$) on psychological (PsyWb), cognitive (CognWb), and social (SocWb) well-being. For visual purposes, COGN was binned into mean and standard deviations

The relation between the well-being dimensions and academic achievement in 9th grade

First, a baseline model was estimated with relations between the three well-being dimensions and MERIT (academic achievement). The standardized coefficients and p values are presented in Table 6. Significant effects were found for all three dimensions, psychological well-being ($b = -0.39$), cognitive well-being ($b = 0.85$), and social well-being ($b = -0.12$), respectively. The strong positive relationship between CognWb and MERIT indicated that higher cognitive well-being was important for students to perform well in school, while the negative effect of PsyWb suggested that students with higher psychological well-being scored lower on MERIT. The same direction was found for SocWb, but weaker.

In model 4, the background variables COGN, EDU, GENDER, and COHORT were included. Starting with COGN, it was positively related to MERIT ($b = 0.29$). Interestingly, the relation was not as strong as the one between cognitive well-being and MERIT ($b = 0.56$). Additionally, the results show that students with more highly educated parents, girls (compared to boys), and birth cohort 2004 (compared to birth cohort 1998) achieved higher on MERIT. Interaction terms for the background variables were estimated as well, with no significant results.

To sum up, the results seem to have provided support for the notion of school-related psychological, cognitive, and social dimensions of well-being. It was also found that psychological, cognitive, and social well-being varied with cognitive ability, parental education, gender, and school system. Additionally, the results indicated that psychological and cognitive well-being were particularly important for students' academic achievement.

Discussion

The main purpose of the present study was to investigate school-related dimensions of well-being and academic achievement. An additional aim was to account for student characteristics and school context and to investigate the psychological, cognitive, and social dimensions of school-related well-being.

Table 6 SEM with standardized coefficients, dependent variable is MERIT (standard error in parentheses)

Variables	Model 3	Model 4
PsyWb	-.39*** (.04)	-.28*** (.03)
CognWb	.85*** (.05)	.56*** (.05)
SocWb	-.12*** (.02)	-.03 Ns (.02)
COGN		.29*** (.02)
EDU		.19*** (.01)
¹ GENDER		.11*** (.01)
² COHORT		.10*** (.01)

¹Reference group is boys

²Reference group is 1998

Model 3 fit: $X^2(29) = 925.97$, $p < .001$; RMSEA = .041 [CI .039–.044]; CFI = .936; SRMR = .042

Model 4 fit: $X^2(53) = 1358.27$, $p < .001$; RMSEA = .037 [CI .035–.038]; CFI = .931; SRMR = .039

The multidimensionality of well-being

The first key finding concerns the dimensionality of school-related well-being. The identified well-being dimensions supported the arguments presented by Pollard and Lee (2003), who argued that general well-being consists of several dimensions (the psychological, cognitive, social, economic, and physical dimensions). Our results also supported their notion that the different well-being dimensions behave differently, at least when it comes to the psychological, cognitive, and social dimensions. This means that general conclusions that are made about well-being need to be based on measures that capture the multidimensional structure.

Well-being in relation to student characteristics

In different ways, the three dimensions of well-being varied significantly with students' cognitive ability and gender. Cognitive ability, for instance, seems to be relatively important for psychological and cognitive well-being, but not for social well-being. Students with relatively higher cognitive abilities were more prone to feel that they could manage everyday academic activities and were less prone to worry about tests and homework. As regards to gender differences, girls have lower psychological and social well-being compared to boys, which supports previous findings of gender differences in well-being (Haugland et al., 2001; Högberg et al., 2019; Sonmark et al., 2016). In the present study, gender differences are primarily associated with feeling worried and stressed over school-related tasks, which is in line with several studies (e.g., Haugland et al., 2001; Högberg et al., 2019; Sonmark et al., 2016), and indicates that girls seem to be more negatively affected by pressure to perform well in school, compared to boys.

Well-being in relation to school context

The second key finding concerns the differences in psychological, cognitive, and social well-being across the two cohorts of students born in 1998 and 2004. The cohort comparison shows that students in the later cohort (2004) reported lower well-being in all three well-being dimensions, particularly in cognitive and social well-being, compared to students in the former cohort (1998). There are several possible explanations for these results. As there were six years between the two cohorts (2011 to 2017), the two student groups were a part of different social, political, and economic contexts, which could have contributed to the decrease in well-being between 2011 and 2017. During that time, there have been reports of increased social inequality and poverty, as well as cyberbullying and online safety (WHO, 2015; Inchley et al., 2020; UNICEF, 2021), all of which might have influenced the well-being of children and youth in Sweden. Another factor that distinguished the two cohorts was the school context, where cohort 2004 experienced the reforms that were implemented in 2011, whereas cohort 1998 did not. The 2011 reforms implemented earlier grading and more frequent tests and exams. As the well-being measures used in the study were directed towards school-related issues, the difference in well-being between the cohorts is likely influenced by the reform implementations, which would support the results found by Högberg et al. (2019). It may be so that the increased pressure to perform well at an earlier age made students more self-aware and stressed about how well they managed in school. Regarding social well-being, previous findings suggest that grades

foster a school climate of social comparison and peer competition (Chamberlin et al., 2018; Tannock, 2015), which could explain the decrease in social well-being from cohort 1998 to cohort 2004. It is possible that the 2011 educational reforms influenced the 2004 students' social relations in school negatively by introducing testing and grading at an early age, fostering students to compare results instead of creating an open learning environment.

The influence of cognitive ability and gender across cohorts

In addition, the differences in psychological, cognitive, and social well-being across the cohorts varied with cognitive ability and gender. Students in cohort 2004 with lower relative cognitive ability were more sensitive to school-related stress, were less likely to perceive that they manage academic activities successfully, and had less successful social relations within school, compared to 2004 students with higher relative cognitive ability and compared to students in cohort 1998 with equal cognitive ability. There is therefore reason to believe that cognitive ability was more important for students in cohort 2004 to maintain psychological, cognitive, and social well-being than it was for students in cohort 1998. One possible interpretation is presented by Schraml et al. (2011), who argue that high levels of stress tend to increase cognitive difficulties, which could explain why the difference in well-being between high- and low-performing students increases from 1998 to the 2004 cohort.

Furthermore, the results indicate that girls in the 2004 cohort had lower psychological, cognitive, and social well-being compared to boys in the same cohort and compared to all students in cohort 1998. This means that they experienced more school-related stress, were less likely to perceive that they managed academic activities successfully, and perceived that they had less successful social relations within school. In previous research, gender differences in school-related stress have been suggested to be caused by parents' and teachers' higher expectations of academic performance and behavior of girls, resulting in higher stress exposure for girls compared to boys (e.g., Högberg et al., 2019; Schraml et al., 2011). Considering the earlier introduction of grades (6th vs 8th Grade), and the more frequent exposure of being graded, it is reasonable to believe that the 2004 students, and girls in particular, were more exposed to expectations on their academic performance from an early age, than the former cohort.

Well-being and academic achievement

The third, and final, key finding concerns the relation between the well-being dimensions and academic achievement. The findings indicated that psychological and cognitive well-being are related to academic achievement but not to social well-being.

Psychological well-being was negatively related to academic achievement, suggesting that students with lower psychological well-being achieved higher than other students. Hence, higher-achieving students experienced more stress and worries about tests and homework than lower-achieving students. It may be that higher-achieving students experience greater internal and external expectations to achieve well in school (Låftman et al., 2013). Internal expectations could include aspirations to achieve well to get grades that allow the future success or to maintain an identity that is based on high performance. Besides this, comparison with classmates may also increase the pressure to perform well. External expectations, on the other hand, could include parents' and teachers' expectations. Låftman et al. (2013) found that even if students were content with the support given by their parents, they often compared

themselves with their academically successful siblings, which could be interpreted as a way of meeting their parents' and families' expectations.

Turning to the influence of cognitive well-being on academic achievement, we found that high cognitive well-being was associated with high academic achievement when student characteristics and school context were held equal. This means that students who feel that they can manage academic activities, such as concentrating during lessons and doing certain tasks given in class, tend to perform better compared to students who feel that they do not manage those activities as well. This supported the results found by Amholt et al. (2020) and Kaya and Erdem (2021). Interestingly, cognitive well-being was more important for students' academic achievement than their cognitive ability was. This indicates how important it is for students to feel that they manage their everyday academic activities. Considering that most students spend several hours of the day at school, it is likely that the feeling of mastering the activities during those hours is important for their school-related well-being, regardless of performance levels.

In all, the findings indicate that there are traditional gender differences in, primarily, psychological well-being and that cognitive ability is important for students to be able to cope with the everyday academic activities in school. Furthermore, from 1998 to the 2004 cohort, there was a slight decrease in all three well-being dimensions, which may have been caused by several factors, of which the new and stricter educational and assessment system may be one. Students in cohort 2004 had somewhat higher academic achievement compared to cohort 1998, but slightly lower psychological, cognitive, and social well-being.

Implications

Starting with the measurement issue, the results from the study may contribute to the field of child and student well-being by disentangling the effects and differences of some dimensions of student well-being that are relevant in a school context. An additional implication concerns the importance that teachers and schools go beyond the goal of academic achievement to also work with interventions that promote students' well-being. Interventions to promote well-being may be focused on helping students to cope with the everyday stresses that come with the pressure to perform well in school from a young age. In their report on student mental health and well-being, Cefai et al. (2021) highlighted that school interventions to promote students' well-being have a positive impact on mental health and social, emotional, and educational outcomes.

Limitations and directions for further research

With the data and methods used in the present study, no claims of causal inference can be made. This means that we can only speculate about the causes of the difference in well-being across the two cohorts. In the six years that passed between 2011 and 2017, when cohorts 1998 and 2004 attended 6th Grade, many changes may have occurred that could have influenced the well-being decrease we found in the study. One example could be social media, which has become a more frequent factor in our everyday lives, not least for young people. Other possible explanations are increased social inequality and poverty, as well as climate change. However, as the items we used to measure psychological, cognitive, and social well-being were distinctly connected to school-related issues, it seems likely that the measures indeed have captured school-related well-being. Considering this,

we identified the 2011 educational reform as one of the major contextual changes that occurred in compulsory school between the cohorts. Such a change is likely a part of the decrease we could see in psychological, cognitive, and social well-being. However, to discuss trends in school-related well-being over time, more cohorts should be included and compared. This could be an important issue for future investigations.

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Data availability The datasets analysed during the current study are not publicly available due to ethical and legal reasons but are available within Europe upon request at [<https://www.gu.se/en/evaluation-through-follow-up-etf>].

Declarations

Competing interests The authors declare no competing interests.

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Thea Klapp

Current themes of research:

Concern students' well-being in school, the relation between cognitive and non-cognitive skills (e.g., motivation) and academic achievement, as well as how students' academic self-perceptions are influenced by school-average achievement (the big-fish little-pond effect).

Most relevant publications in the field of Psychology of Education:

Thea Klapp is a currently doctoral student, working on a project concerning students' academic self-concept, self-efficacy, and academic achievement. No relevant publications in the field of Psychology of Education as of yet.

Alli Klapp

Current themes of research:

Grades and grade assignments, the negative grading effect, and students' academic self-perceptions. Jan-Eric Gustafsson's research concerns, for example, individual preconditions for education, such as cognitive abilities. He has also studied the effect of education and teacher competence on student skills.

Most relevant publications in the field of Psychology of Education:

Klapp, A. (2018). Does academic and social self-concept and motivation explain the effect of grading on students' achievement? *European Journal of Psychology of Education*, 33(2), 355–376. <https://doi-org.ezproxy.ub.gu.se/10.1007/s10212-017-0331-3>.

Klapp, A., Cliffordson, C., & Gustafsson, J.-E. (2016). The effect of being graded on later achievement: evidence from 13-year olds in Swedish compulsory school. *Educational Psychology*, 36(10), 1771–1789. <https://doiorg.ezproxy.ub.gu.se/10.1080/01443410.2014.933176>.

Klapp, A., & Jönsson, A. (2021). Scaffolding or Simplifying: Students' Perception of Support in Swedish Compulsory School. *European Journal of Psychology of Education*, 36(4), 1055–1074. <http://dx.doi.org.ezproxy.ub.gu.se/10.1007/s10212-020-00513-1>.

Two of Jan-Eric Gustafsson's most relevant publications in the field of Psychology of Education are:

Thorsen, C., Gustafsson, J., & Cliffordson, C. (2014). The influence of fluid and crystallized intelligence on the development of knowledge and skills. *British Journal of Educational Psychology*, 84(4), 556–570. <https://doiorg.ezproxy.ub.gu.se/10.1111/bjep.12041>.

Valentin Kvist, A., & Gustafsson, J.-E. (2008). The relation between fluid intelligence and the general factor as a function of cultural background: A test of Cattell's Investment theory. *Intelligence*, 36(5), 422–436. <https://doiorg.ezproxy.ub.gu.se/10.1016/j.intell.2007.08.004>.

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