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Grades as motivators or stressors: the role of gender, cognitive ability, and parental education

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Grades are expected to motivate students to perform well in school. However, the connection between grades and student motivation and achievement is not clear. Understanding the relations between grades and student motivation and achievement requires knowledge about students' experiences of being graded, which is underreported in research. This study uses large-scale data to investigate Swedish upper secondary school students' perceptions about how grades influence their motivation. Confirmatory factor analysis has been used to create two factors based on the students' perceptions of being affected by grades: (1) that grades evoke negative emotions and (2) that grades act as an external motivator. Structural equation modeling has been used to relate the factors to background variables (gender, cognitive ability, and parental education), as well as Grade Point Average. Results indicate that grades evoke negative emotions more often among female students, students with lower cognitive ability, and students with lower parental education. Students with higher parental education, as well as female students with higher cognitive ability and highly educated parents, are more likely to perceive that grades act as an external motivator. The results also indicate that the perception of grades evoking negative emotions is negatively related to achievement, whereas the perception that grades act as an external motivator is positively related to achievement.

KEYWORDS
achievement emotion, grading, motivation, student perspective, upper-secondary education

1 Introduction

This study investigates how grades influence students' motivation for schoolwork. Grades are numbers, figures, or other symbols representing a student's level of performance on an individual task or a composition of summative measures (Brookhart et al., 2016). Furthermore, grades are intended to motivate students by signaling that academic success can lead to enhanced future opportunities. It is therefore not uncommon for policymakers to implement reforms to grading systems as a means to influence student learning. One example is the Swedish education system, which underwent major reforms in the late 2010s, including the introduction of earlier grading and an augmented grading scale, following a "PISA shock." However, understanding the relationship between how grading is implemented and students' behavior in school has proven to be difficult. There is currently no clear consensus on whether grades have a positive or negative impact on motivation and learning. Some studies conclude that grades may encourage students to perform better, whereas other studies highlight the negative side effect of grades, such as evoking emotions

that negatively influence students' well-being and self-perception, which may indirectly decrease students' motivation and achievement.

An important contribution to the complexity of how grades affect students is that, despite the intentions of educators and policymakers, it is ultimately students' own perceptions of grades that play a crucial role. Understanding students' perceptions of grades is therefore essential for making any predictions about how grades may impact students' approach to schoolwork. Understanding students' perceptions of grades may also provide better opportunities to mitigate potentially harmful effects of grades and enhance the potential for learning.

One of the main findings from previous research is that students' perceptions of grades vary widely and that grades can have both motivating and demotivating effects simultaneously. While some students feel that grades increase their motivation by creating "a positive pressure" and providing valuable information about their academic progress, others experience grades as a source of unhealthy pressure that negatively impacts their self-perceptions and diverts their attention away from potentially creative and joyful learning situations (e.g., Costa et al., 2024; Hirsh, 2020; Krogh, 2023; Liljeröd et al., 2025; Lipnevich and Smith, 2009; Vogt, 2017). However, the extent to which these perceptions exist, and among which groups of students, is not yet well understood.

By using a unique set of items from the longitudinal database Evaluation Through Follow-up, this study is able to explore students' perceptions of grades on a larger scale and to provide statistical data on how students' characteristics (gender, cognitive ability, parental education), as well as their achievement in school, are related to their perceptions of how grades affect motivation. The context is Swedish upper secondary education, where the grades are of a high-stakes character for the students.

1.1 The impact of grades on motivation and learning

Several studies in the field of education economics have concluded that grades, especially of high-stakes character, have a positive influence on students' achievement in school. For example, Fidjeland (2023) investigated the effects of a natural experiment, by comparing results from lower secondary school students in various municipalities, where the grades were given differing levels of importance for admission to upper secondary schools. He found positive relations between high-stakes grades and student achievements, which he suggests can be explained by students making a greater effort when grades are high-stakes. Several other studies from various countries have reached similar conclusions: students put in more effort and perform better when exposed to grading (e.g., Gray and Bunte, 2022; Hvidman and Sievertsen, 2021), particularly when the grades are high stakes (Bach and Fischer, 2020). Hence, grades are thought to act as an external motivator enhancing students' effort, leading to improved achievement.

A potential downside of using grades as an incentive for learning is the risk that students will focus entirely on behaviors that maximize their chances of achieving good grades, while other, non-measurable learning is "crowded out" (Frey, 1994) and students' intrinsic motivation is sidelined (Chamberlin et al., 2018; Pulfrey et al., 2013). In other words, grades may encourage students to adopt performance goals—where the purpose of school-related activities is to demonstrate their knowledge or avoid showing a lack of it—whereas mastery goals, focused on acquiring new skills and knowledge, are deprioritized. A one-sided focus on performance, and on avoiding making mistakes, may be maladaptive, since making mistakes and being exposed to challenges are considered essential parts of development and learning (Yeager and Dweck, 2012). Using grades as an incentive for learning may also turn students' attention away from task-related and formative feedback, which has been shown to be more productive in terms of learning and academic success (Butler, 1988; Goetz et al., 2018). In the fields of education and psychology, some research has therefore concluded that grades have a mainly negative impact on students' motivation and learning, especially for low achievers (Harlen and Deakin Crick, 2002; Klapp, 2015; Klapp et al., 2014).

1.2 The impact of grades on students' well-being

As mentioned, grades are intended to motivate students by signaling that academic success can lead to enhanced future opportunities. However, this "signaling system" may also foster anxiety and stress related to the potential consequences of academic failure. Formally, all students have the same opportunities in school, which places a heavy responsibility on the individual to make the most of their chances. In interview studies, some students express a feeling that their future lives depend on the grades they receive in school, making failure seem particularly consequential (Banks and Smyth, 2015; Reay and Wiliam, 1999).

The mental health and perceived well-being of young people have been declining for several years in Sweden and many other countries (Klapp et al., 2023), and in research this trend is linked to students feeling increased pressure to perform, including in school (Giota and Gustafsson, 2021). In several qualitative studies, students describe how grades and assessments make them feel monitored and forced to constantly perform well, which in turn creates stress, reduces well-being, and alters self-related perceptions (e.g., Hirsh, 2020; Krogh, 2023). Findings from some studies also indicate that a Swedish reform, where grades were introduced 2 years earlier (year 6 instead of year 8), led to increased experiences of stress and decreased academic self-concept among students, particularly girls (Cashman et al., 2023; Högberg et al., 2019). Klapp's (2015, 2018) studies show that grades negatively impact the future outcomes of low-performing students, which is partly mediated through the influence of grades on students' self-concept. The disproportionate negative impact of grades on low-performing students suggests that grades risk having a differentiating rather than compensatory effect on students' learning.

1.3 Grades and emotions

Given that grades are ultimately symbolic representations—letters or numbers recorded on paper or digital platforms—understanding their impact on students requires

analyzing how students perceive being graded. Control value theory (Pekrun, 2006) depicts how emotions arise in individuals before, during, and after engaging in activities where their performance is measured and evaluated, and how these emotions affect students' opportunities to achieve in school. According to this theoretical approach, emotions particularly arise when individuals perceive evaluations to be of high value, such as in high-stakes grades (Pekrun and Perry, 2014). Achievement emotions can be grouped by the dimensions of valence (positive/negative) and activation (activating/deactivating) (Pekrun and Linnenbrink-Garcia, 2012). Positive and activating achievement emotions (e.g., enjoyment and pride) tend to enhance performance by fostering intrinsic motivation and effective self-regulatory strategies, which are key success factors in school. On the other hand, negative and deactivating emotions (e.g., boredom and hopelessness) are related to decreased performance (Pekrun et al., 2023). Such emotions may distract students when studying (Pekrun, 2006). Furthermore, to screen themselves from negative emotions or to regain self-worth, students may shift their attention to non-education-related activities (Hobfoll, 2001).

1.4 The role of student characteristics

Student characteristics, such as cognitive ability, gender, and socioeconomic status, are well-established predictors of academic achievement and other school-related outcomes, including sense of belonging and academic self-concept. Of these characteristics, cognitive ability is generally considered the strongest predictor of academic achievement (Boman, 2023; Deary et al., 2007; Demetriou et al., 2020; Glaesser and Cooper, 2012; O'Connell, 2018). Furthermore, cognitive ability is related to higher resilience when coping with demands (Giota and Gustafsson, 2021). Female students generally perform slightly better than males in school, and the greatest differences are often reported in language subjects, whereas the smallest are found in mathematics and natural sciences (Voyer and Voyer, 2014). However, girls also seem to experience higher performance-related pressure in school, which can manifest itself in higher school-related stress, lower well-being, and lower academic self-concept (Högberg et al., 2019; Johansen and Røsand, 2024; Klapp et al., 2023; Östberg et al., 2015). Researchers have suggested that the higher performance-related pressure among girls can be explained by the fact that girls, to a greater extent than boys, associate themselves with their school performance (Schraml et al., 2011). This may result in greater efforts in school, but also higher demands. Parental education and other estimates related to socioeconomic status are usually positively correlated with student achievement (Myrberg and Rosén, 2009) which, beyond differences in behavior and habits, is suggested to be related to a sense of belonging in school (Marksteiner and Kuger, 2016) and parental expectations (Pinquart and Ebeling, 2020). However, high expectations from parents may also be a source of school-related pressure and worry (Löfgren and Löfgren, 2017).

Academic outcomes seem to be influenced not only by individual student characteristics, but also by how these characteristics interact with one another. When Tamayo Martinez et al. (2022) examined relations between parents' education and their children's achievement, they found that family routines as well as students' cognitive abilities were mediating factors. Furthermore, several studies have shown that performance gaps related to parental resources vary by gender, often being more pronounced among boys than girls (Glaesser and Cooper, 2012). One possible explanation for this is that school expectations and demands tend to align more closely with the experiences and skills of students with higher socioeconomic status, as well as with girls (Auwarter and Aruguete, 2008). In addition, parents having greater socioeconomic resources are hypothesized to be better equipped to support their children's education, which may mitigate gender-related disparities (Autor et al., 2019; Fischbein, 1990). For example, Eriksson and Lindvall (2023) show that the impact of socioeconomic status on gender differences in achievement is greater in societies with lower levels of gender equality.

2 Purpose

The aim of this study is to enhance the understanding of how students are affected by grades by investigating students' perceptions of being graded. Two aspects of students' perceptions of being graded are of interest: (1) the perception that grades evoke negative emotions, and (2) the perception that grades act as an external motivator. These two aspects are related to the individual characteristics of gender, cognitive ability, and parental education, as well as students' academic achievement. The research questions are:

- How are gender, cognitive ability, and parental education level associated with students' perceived perceptions of being affected by grades, in terms of negative emotions and external motivation?
- How are students' perceptions of being affected by grades related to students' achievement in school?

3 Grading in Swedish upper-secondary school

The study is conducted with Swedish students in the last year of upper secondary school. Grades from upper secondary education are high stakes for students, since grades are the most important instrument for admission to higher education. Upper secondary school is divided into separate courses (each individual student typically takes 25–30 courses) and students receive a formal grade for each course. Grades are awarded on a six-step scale, where F is the lowest (meaning that the student has failed the course) and A is the highest. In Sweden, all grades are assigned by the teachers, based on evaluations of students' performance in relation to national grading criteria. In subjects with national standardized tests, teachers are expected to take the test results into account when grading, but it is not specified how or to what extent. According to Lundahl et al. (2017), who have compared the grading systems in different countries, the Swedish tradition of relying solely on teacher assigned grades is uncommon internationally.

More commonly, teacher assigned grades are used for information purposes, whereas standardized tests are used administratively, for selection purposes.

4 Method

4.1 Participants

This study uses data from the Evaluation Through Follow-up longitudinal database (Sw: "Utvärdering genom uppföljning", UGU) (Härnqvist, 2000). In this database, started in 1961, a nationally representative sample of students from several birth cohorts has responded to school-related survey questions. Survey data is collected at school year 6 (age 12–13, administered in school by the teacher), school year 9 (age 15–16, sent by mail to students' home addresses), and at the third (and last) year of upper secondary education (age 18–19, sent by mail to students' home addresses). This study uses data from the final survey (upper secondary school, year 3) from the birth cohort 2004, which was collected in April 2023. The survey data is combined with results from a cognitive test that the students took in school year 6, as well as register data from Statistics Sweden, such as results on national tests, teacher assigned grades, and parental education. The register data was collected when the students were in the sixth grade (2017). About 10 percent of the total population of the birth cohorts was sampled in a two-step procedure. In the first step, a stratified selection of municipalities was drawn, and in the second step, school classes were drawn from the municipalities. Since Sweden has a relatively high proportion of students attending independent schools, the selection is also stratified on school type. In total, 9,437 students were included in the dataset.

4.2 Measures/variables

4.2.1 Two dimensions of students' perceptions of being affected by grades: Negative Emotions and External Motivator

The two main constructs in the study are *Negative Emotions* and *External Motivator*. Each construct was measured with three items where students answered questions about being affected by grades. The factor Negative Emotions is based on the perceptions that grades (1) stressed them, (2) made them feel bad, and/or (3) made them lose their desire to learn. The factor External Motivator was related to the perceptions that grades (1) encouraged them to perform better, (2) made them work harder to learn, and (3) made them "sharpen up" and focus more. Answers were given on a four-step Likert scale (Agree completely, Agree a lot, Agree partly, and Do not agree).

4.2.2 Academic achievements (GPA)

Students' Grade Point Averages (GPAs) are used as a measure of students' academic achievement. The GPA measure is calculated by adding the teacher assigned grades for all courses and then dividing that sum with the number of upper secondary credits the student has earned. Grade points are awarded as follows: F (Fail) = 0 points, E (Pass) = 10 points, D = 12.5 points, C = 15 points, B = 17.5 points, and A = 20 points. For each course, the grade point is multiplied with the number of upper secondary credits the course is worth. Typically, a course is worth 100 upper secondary credits, although some courses are worth 50, and a few 150 or 200, credits. Students must complete courses worth at least 2,500 credits to graduate from upper secondary education. This means that the student's GPA is typically based on approximately 25–30 teacher assigned grades. In the current sample, the GPAs ranged from 0 (i.e., the student failed all courses) to 20.0 (i.e., the student received the highest grade, A, in all courses), with a mean of 14.25 (corresponding to an average grade slightly below C).

4.2.3 Gender

The students' genders were dummy coded: boy = 0, girl = 1. The dataset included 4,786 boys (50,7 %) and 4,651 girls (49,3 %).

4.2.4 Parental education

The variable parental education was measured using information about the highest educational level attained by either of the student's biological parents, or the parents living with the student. The variable has five categories: 1 = pre-secondary education, 2 = 2-year secondary education or 3 years vocational education, 3 = at least 3 years of higher education preparatory education, 4 = 2 or 3 years of higher education, and 5 = at least 4 years of higher education.

4.2.5 Cognitive ability

The variable cognitive ability is based on results from four cognitive tests that the students took in grade 6. Two of the tests assessed the students' verbal abilities by asking them to choose the correct antonym or synonym for a given word. One test measured spatial ability, where students were asked to select which of four alternatives represented a piece of metal/paper when folded. Another test measured inductive ability by asking the students to complete a number-series. The synonym test contained 25 items and the other tests each contained 40 items. Three of the four tests have been used since the inception of the Evaluation Through Follow-up project in 1961, and results have shown them to be reliable measures of students' cognitive abilities, with small gender differences observed (Svensson, 1971). However, these tests cannot be considered a comprehensive representation of the students' total cognitive ability, as such complex constructs are difficult to capture (Kyllonen and Kell, 2018; von Stumm and Ackerman, 2013). The standardized correlations between the four tests ranged from 0.33 to 0.55. To avoid multicollinearity and facilitate model estimation, the students' results from the four tests were summed and standardized into a Z-score, ranging from −3.62 to 2.64.

4.3 Methods of analysis

Descriptive statistics of all manifest variables were used to investigate the characteristics and the robustness of the data. For descriptive purposes, Pearson correlations were also computed between the six manifest variables that measure the students' perceptions of being affected by grades. In the next step, confirmatory factor analyses (CFA) were estimated for the two main constructs, Negative Emotions and External Motivator. The two factors were estimated separately using their three respective indicators, and in a two-factor model with covariances between the factors.

Thereafter, Structural Equation Modeling (SEM) was used to investigate whether the two factors were predicted by the student characteristics of interest for the study (i.e., gender, cognitive ability, and parental education). The factors were related to the three background variables one by one in separate models, as well as in a relative model including the three background variables simultaneously, with covariance between the factors. To examine how the different background variables interact with each other, four interaction variables were created and added to the SEM model. The three background variables were combined as follows: Gender × Cognitive Ability, Gender × Parental Education, Cognitive Ability × Parental Education, and Gender × Cognitive Ability × Parental Education. These variables, along with the three background variables, were related to the two factors (Negative Emotions and External Motivator), with covariance between the factors. To investigate the relationship between the factors and student achievement, the final step was to regress students' GPAs on the two factors, as well as the background variables and interaction variables. First, GPA was regressed on the two factors. Thereafter, the model was expanded to allow the background variables to be related to both the factors and the students' achievements (see Figure 1). Finally, the interaction variables were also added to the model and regressed to the factors and to the students' achievements.

Although the indicators were ordinal with four response categories, the data were treated as approximately continuous. Accordingly, Pearson correlations and maximum likelihood robust (MLR) estimation were used. As a sensitivity check, polychoric correlations were estimated, producing substantively similar results, supporting the robustness of the analyses.

The sample contains a relatively high proportion of missing data for the six variables underlying the two constructs Negative Emotions and External Motivator. To mitigate potential bias due to differential non-response and unequal representation of subgroups, all analyses were conducted using a calibrated survey weight variable. Weights were calculated by Statistics Sweden[1] using a calibration procedure based on auxiliary register variables: gender, mother's country of birth, parental education, and achievement in grade 9 (age 15), all of which are available in the Evaluation Through Follow-up dataset. The weight variable adjusts the sample to better reflect the target population with respect to these characteristics. Furthermore, the "full information maximum likelihood" (FIML) method (which is default in the Mplus software) was used to handle missing data on the variables included in the models, allowing all available data to contribute to the estimation. This method assumes that data are missing at random (MAR), meaning that the probability of missingness is related to observed information in the dataset but not to the missing values themselves. This MAR assumption is less restrictive than the assumption of "missing completely at random" (MCAR) (Little, 2023).

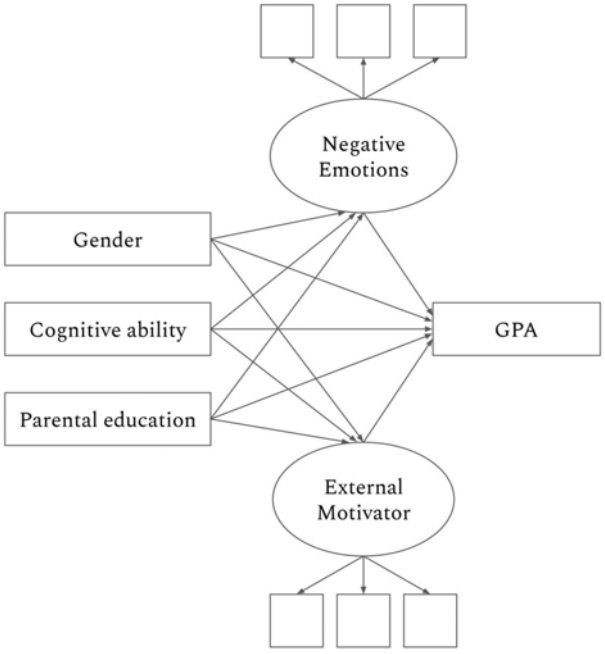

FIGURE 1
The structure of Model D.

The representative sample in the UGU study was selected at the school class level, meaning that all students who were in the same class at the time of sampling in grade 3 (age 10) were included. This stratification technique may cause cluster effects, biasing the analyses. In Sweden, many class compositions are split up during the years in compulsory school, and all students change schools when transitioning to upper secondary education. Hence there are natural circumstances splitting up the initial groups. To investigate the extent to which students were clustered during their third year of upper secondary school, when survey data were collected, and to what degree this resulted in cluster effects, basic two-level analyses were conducted using all variables, with the school as the cluster unit. The intra-class correlations (ICC) were relatively high, ranging from 0.275 to 0.408. The highest ICC values were observed for the variables academic achievement (GPA) and cognitive test results, indicating that a skill-level stratification existed among participants. To mitigate the potential influence of cluster effects on individual-level results, the "maximum likelihood complex" analysis in Mplus was used. This approach adjusts for standard errors and the chi-square (χ^2) test statistic without

1 For a description of the calibration procedure (in Swedish, see https://www4.gu.se/compeat/FUR/UGU/Rapporter/2023_Kalibreringsrapport%20%c3%a5k%2012%20koh%2004.pdf).

affecting the parameter estimates (Muthén and Muthén, 1998; Muthén and Satorra, 1995). As a robustness check, a series of two-level models with random intercepts for schools was also estimated. The results of these models were substantially similar to those reported in this paper, indicating that the findings are not driven by school-level clustering. Since the study does not aim to examine school effects, two-level analyses are not reported in detail.

To evaluate model fit, χ^2 statistics were used. In all the models, the χ^2 tests were significant ($p < 0.05$), indicating poor fit. However, the χ^2 statistic is sensitive to large sample sizes (Kline, 2023). Therefore, approximate and comparative fit indices that adjust for sample size were also considered: the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI), and the Standardized Root Mean Square Residual (SRMR). Even though no universal cutoffs exist, Little (2023) suggests that RMSEA below 0.08, as well as CFI and TLI above 0.90 often indicate acceptable fit. Hu and Bentler (1999) have suggested that SRMR values below 0.08 indicate acceptable fit. RMSEA values were below the suggested value of 0.08 in all models except Model A, where it was slightly above the threshold (0.087). In all models, CFI levels exceeded the suggested cutoff of 0.90 and SRMR values were below the suggested cutoff of 0.08. However, TLI values remained below the suggested threshold of 0.90, indicating poor model fit. As TLI is more sensitive to model complexity than other model fit indices (Kline, 2023), the lower values may partly reflect model complexity rather than substantial misspecification. Taken together, the overall pattern of fit indices suggests acceptable model fit.

Measurement invariance across gender and parental education was examined using multigroup CFA. For gender, metric invariance was supported ($\Delta CFI = 0.001$), whereas scalar invariance was not ($\Delta CFI = 0.026$). For parental education, both metric ($\Delta CFI = 0.003$) and scalar invariance ($\Delta CFI = 0.002$) were supported. Thus, associations can be compared across genders, whereas comparisons of latent means between genders should be interpreted with caution.

The Statistical Program for the Social Sciences (SPSS) version 29 was used to prepare data and calculate correlations. Mplus version 8 (Muthén and Muthén, 1998) was used to execute the CFA and SEM analyses.

5 Results

5.1 Descriptives

In Table 1, the number of observations, the proportion of missing data, the means, and the standard deviations, are presented for the manifest variables: GPA, cognitive ability, parental education, and gender, as well as for questionnaire items comprising the two factors. Notably, there is a high proportion of missing data, particularly in the questionnaire items, which may be due to lack of engagement to participate or that the survey was sent to the students' home addresses. As mentioned, weight variables, as well as the full information maximum likelihood method, were used to handle the missing data.

TABLE 1 Means, missing data, and standard deviations for the manifest variables GPA, cognitive ability, gender, as well as the variables related to the two factors.

Variable	*N* (valid)	% missing	M	SD
GPA	7,739	20.8	14.25	3.95
Cognitive ability	5,097	47.7	0	1
Parental education	9,379	4.1	3.47	1.20
Gender	Boys: 4,786 Girls: 4,651			
How do the grades affect you? They... (4 steps)				
...stress me	1,839	80.5	2.78	1.012
...make me feel bad	1,833	80.6	2.07	0.938
...make me lose my desire to learn	1,838	80.5	2.06	1.019
...encourage me to perform better	1,836	80.6	2.51	0.976
...make me work harder to learn	1,839	80.5	2.27	0.943
...make me sharpen up	1,839	80.5	2.24	0.922

TABLE 2 Standardized factor loadings for model A, the 2-factor measurement model (standard deviations in parentheses).

How do the grades affect you? They...	Negative Emotions	External Motivator
...stress me	0.650 (0.024)	
...make me feel bad	0.860 (0.029)	
...make me lose desire to learn	0.698 (0.036)	
...encourage me to perform better		0.729 (0.026)
...make me work harder to learn		0.858 (0.024)
...make me sharpen up		0.779 (0.024)

All factor loadings were significant at the 0.001 level.
χ^2 (df) = 103.960 (8); RMSEA (90% C.I) = 0.087 (0.072–0.102); CFI = 0.927; TLI = 0.862; SRMR = 0.075.

5.2 The two-factor model (Model A)

Table 2 shows the factor loadings in the two-factor model in which the factors were measured with three indicators each (Model A). The factor loadings were substantial (ranging from 0.65 to 0.86). The two factors were not highly correlated (0.18), suggesting that the indicators work well for measuring the two constructs. However, although the CFI (0.927) and the SRMR (0.078) indicated acceptable fit, the RMSEA of 0.087 was slightly higher than the suggested cutoff value of 0.08, indicating that the fit of this model may be poor. One explanation could be that the model uses a small number of indicators, as RMSEA has been shown to overestimate model misfit in simple models with few degrees of freedom. As in all models in this paper, the TLI (0.862) indicated poor model fit. Support for the two factors by qualitative research examining students' perceptions of grades (Liljeröd et al., 2025), as well as the

TABLE 3 Correlations between the indicators building the two factors Negative Emotions (neg. 1–neg.3) and External Motivator (ext. 1–ext. 3).

How do the grades affect you? They...	Neg. 1	Neg. 2	Neg. 3	Ext. 1	Ext. 2	Ext. 3
...stress me (neg. 1)	1	0.586*	0.419*	0.109*	0.152*	0.083*
...make me feel bad (neg. 2)		1	0.568*	−0.087*	−0.004ns	−0.090*
...make me lose desire to learn (neg. 3)			1	−0.259*	−0.213	−0.232*
...encourage me to perform better (ext. 1)				1	0.607*	0.552*
...make me work harder to learn (ext. 2)					1	0.679*
...make me sharpen up (ext. 3)						1

*$p < 0.01$.

TABLE 4 Standardized regression coefficients for Models B1–B4: associations between student characteristics and the factors Negative Emotions and External Motivator (standard deviations in parentheses).

Predictor variable	Model B1		Model B2		Model B3		Model B4	
	Negative Emotions	External Motivator	Negative Emotions	External Motivator	Negative Emotions	External Motivator	Negative Emotions	External Motivator
Gender (girl = 1)	0.375 (0.042)***	0.015 (0.044)^{ns}					0.361*** (0.043)	0.031 (0.043)^{ns}
Cognitive ability			−0.165*** (0.046)	0.132 (0.046)**			−0.119 (0.047)*	0.092 (0.050)^{ns}
Par. education					−0.177 (0.050)***	0.169 (0.044)***	−0.102 (0.050)*	0.143 (0.047)**
χ^2 (df)	145.723 (12)		123.001 (12)		109.454 (12)		163.809 (20)	
RMSEA 90% (C.I)	0.040 (0.034–0.046)		0.045 (0.038–0.053)		0.034 (0.028–0.040)		0.032 (0.028–0.037)	
CFI	0.909		0.921		0.929		0.907	
TLI	0.840		0.862		0.875		0.847	
SRMR	0.075		0.072		0.070		0.065	

***$p < 0.001$.
**$p < 0.01$.
*$p < 0.05$.
ns, nonsignificant.

correlation matrix (Table 3), justifies continued use in the structural equation models.

5.3 The structural equation models with student characteristics (Model B1–B4)

After estimating the two factors, Negative Emotions and External Motivator, models were specified in which these factors were related to student characteristics (gender, cognitive ability, and parental education). First, each background variable was analyzed separately (Models B1–B3 in Table 4), and subsequently, the three variables were analyzed simultaneously in a combined model (Model B4 in Table 4).

As shown in Table 4, there were significant relationships between gender and the factor Negative Emotions, both in the model with gender as the sole variable ($\beta = 0.375$) and in the model combining the background variables ($\beta = 0.361$). This indicates that girls are more likely than boys to perceive grades as a source of negative emotions. In contrast, no significant relations were found between gender and the factor External Motivator, meaning that no evidence is provided for gender differences in the degree to which students report that grades make them more engaged in studying.

Significant negative relations were found between cognitive ability and the factor Negative Emotions ($\beta = -0.165$ in the separate model and −0.119 in the combined model), indicating that students with lower results on the cognitive ability tests are somewhat more likely to perceive negative emotions related to grades. The relation between cognitive ability and External Motivator was significant in the model in which no other background characteristics were included (Model B2 in Table 4), but not in the combined model (Model B4 in Table 4), indicating that the relationship found in Model B2 may be related to other characteristics.

There were also significant relations between parental education and both factors. The relations with Negative Emotions were negative ($\beta = -0.177$ in the separate model and −0.102 in the combined model), whereas the relations with External Motivator

were positive (β =0.169 in the separate model and 0.143 in the combined model). These results suggest that students with more highly educated parents are slightly more likely to report that grades make them more engaged in studying and less likely to experience grades evoking negative emotions.

RMSEA (ranging from 0.065 to 0.075), CFI (ranging from 0.907 to 0.929) and SRMR (ranging from 0.065 to 0.075) indicated acceptable model fit, whereas TLI values indicated poor fit (ranging from 0.840 to 0.875).

5.4 The SEM-models with interaction variables (Model C)

After examining the background variables, interaction variables were created at two and three levels (Gender × Cognitive Ability, Gender × Parental Education, Cognitive Ability × Parental Education, and Gender × Cognitive Ability × Parental Education) and added to the previous model (Model C). As shown in Table 5, none of the interaction variables had a significant relation to the factor Negative Emotions. This indicates that the previously observed gender difference in the association with the factor Negative Emotions is stable; it does not appear to be influenced by the other variables.

Although gender was not significantly associated with External Motivation in earlier models (B1 and B4), Model C reveals complex interaction effects involving gender, cognitive ability, and parental education. Table 5 shows that two-way interaction between gender and cognitive ability is negatively associated with External Motivator, whereas the association between cognitive ability and External Motivator is non-significant at the reference level of parental education (0). Taken together, the model suggests that the association between cognitive ability and External Motivator differs by gender: the estimated slope is slightly positive (close to 0) for boys, but negative for girls. Moreover, the three-way interaction with gender cognitive ability and parental education is positively associated with External Motivator, indicating that the gender specific association between cognitive ability and External Motivator varies by parental education. As shown in Figure 2, this association appears negative when parental education is low and positive when parental education is high. In other words, higher parental education attenuates, and may reverse, the negative association between cognitive ability and External Motivator among girls.

The RMSEA (0.024) and SRMR (0.051) indicated good model fit, and the CFI (0.910) indicated acceptable model fit. The TLI levels (0.858) indicated poor fit.

TABLE 5 Standardized regression coefficients for Model C: associations between background characteristics and interaction variables and the factors Negative Emotions and External Motivator (standard deviations in parentheses).

Predictor variable	Negative Emotions	External Motivator
Gender (girl = 1)	0.375 (0.183)*	0.097 (0.165)^{ns}
Cognitive ability	0.201 (0.256)^{ns}	0.058 (0.242)^{ns}
Parental education	−0.093 (0.086)^{ns}	0.152(0.076)*
Gender × cognitive ability	−0.154 (0.236)^{ns}	−0.446 (0.225)*
Gender × parental education	0.005 (0.186)^{ns}	−0.087 (0.162)^{ns}
Cognitive ability × parental education	−0.243 (0.225)^{ns}	0.044 (0.209)^{ns}
Gender × cognitive ability × parental education	0.074 (0.215)^{ns}	0.437 (0.201)*
χ^2 (df)	180.610 (36)	
RMSEA (90% C.I.)	0.024 (0.021–0.037)	
CFI	0.910	
TLI	0.858	
SRMR	0.051	

*$p < 0.05$.
ns, nonsignificant.

5.5 The SEM-models with student academic achievement (Model D1–D2)

Finally, models were created to examine the relations between the two factors Negative Emotions and External Motivator and students' academic achievement, measured by their GPA. In the first step, a baseline model was created where academic achievement was related to the two factors (Model D1 in Table 6). The results indicated a negative significant relation between Negative Emotions and achievements ($\beta = -0.270$) and a positive significant relation between External Motivator and achievements ($\beta = 0.426$).

Next, the three background characteristics (gender, cognitive ability, and parental education) were added and related to academic achievement and the two factors (Model D2 in Table 6). In this model, the negative relation between Negative Emotions and academic achievement persisted, with only negligible changes, and the relation between External Motivator and achievement became somewhat weaker (from $\beta = 0.426$ to $\beta = 0.382$). The relation between the factors and academic achievement were more pronounced than those between the background characteristics and achievement. The relations between the student characteristics and the factors were similar to those found in the previous models (B1–B4), with a clear relation between gender and Negative Emotions and weak relations between cognitive ability and parental education on the one hand, and the two factors on the other hand. This suggests that previously reported relations between background characteristics and the factors are stable, even when accounting for achievement. RMSEA (ranging from 0.031 to 0.040) indicated good model fit, CFI (ranging from 0.923 to 0.925) and SRMR (ranging from 0.077 to 0.079) indicated acceptable model fit, whereas TLI (ranging from 0.873 to 0.875) indicated poor fit.

The last step was to add the two and three level interaction variables used in previous models. However, in this model, none of the interaction variables had a significant relation with any of the

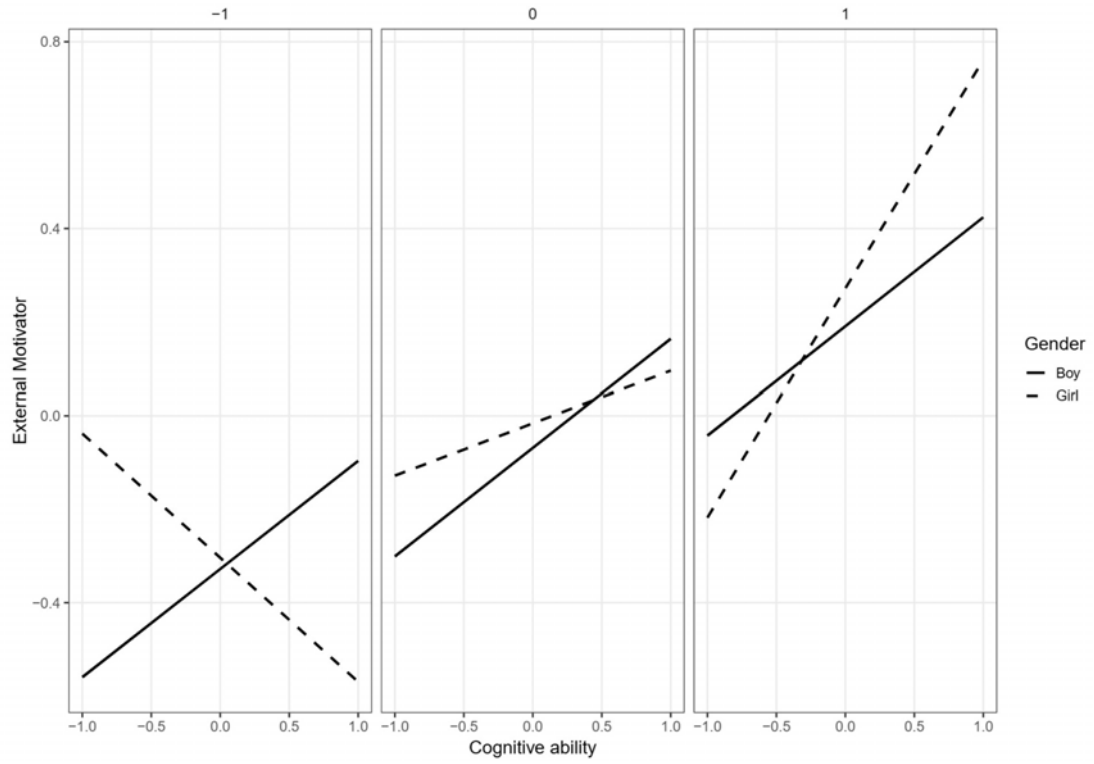

FIGURE 2
Standardized predicted relationship between cognitive ability and External Motivator, by gender across levels of parental education.

TABLE 6 Standardized regression coefficients for Models D1 and D2: associations between the factors Negative Emotions and External Motivator, student characteristics, and GPA (standard deviations in parentheses).

Model	Predictor variable	Negative Emotions	External Motivator	GPA	χ^2 (df)	RMSEA (90 % C.I)	CFI	TLI	SRMR
D1	Neg.Emo.			−0.270 (0.041)***	131.792 (12)	0.040 (0.034–0.046)	0.923	0.832	0.077
	Ext.Mot.			0.426 (0.032)***					
D2	Neg.Emo.			−0.278 (0.046)***	192.636 (25)	0.031 (0.027–0.035)	0.925	0.873	0.079
	Ext.Mot.			0.382 (0.028)***					
	Gender (girl = 1)	0.338 (0.044)***	0.068 (0.040)^{ns}	0.229 (0.026)***					
	Cog. ability	−0.118 (0.045)**	0.090 (0.047)^{ns}	0.248 (0.029)***					
	Par. edu.	−0.080 (0.049)^{ns}	0.106 (0.045)*	0.128 (0.027)***					

***$p < 0.001$.
**$p < 0.01$.
*$p < 0.05$.
ns, nonsignificant.

factors or with student achievement, and therefore that model is not presented.

6 Concluding discussion

The purpose of the study was to investigate students' perceptions of being graded with focus on two aspects, the perception that grades evoke negative emotions, and the perception that grades act as an external motivator. These aspects were related to the student characteristics of gender, cognitive ability, and parental education, as well as GPA. Critics of grades often claim that grades may create unhealthy pressure on the students and that grades constantly remind the students of their failures, affecting their self-belief (e.g., Anderson, 2018), which in turn may be negative for learning. Those who advocate the use of grades in schools often argue that high-stakes grading benefits students' learning, by making the students increase their effort

to learn more and advance within the education system and, to some extent, in the labor market (e.g. Bach and Fischer, 2020). This study shows that these perspectives coexist and should not be understood as dichotomous. Some students perceive that grades create stress and make them disengaged, and some students perceive that grades make them put in more effort and focus on school. Furthermore, both can be present within the same individual, depending on—for instance—time, subject, teacher, etc. Previous research has illustrated how students may perceive grades as positive and motivating on the one hand, while generating negative emotions and lowering academic self-concept on the other (Liljeröd et al., 2025). However, the findings of this study indicate that the representation of these perspectives differs across student groups with varying characteristics.

For example, the results show a clear overrepresentation among girls regarding the perception that grades create negative emotions. This aligns with previous research indicating that girls are more likely to experience pressure, stress, and decreased self-concept related to performance demands (Johansen and Røsand, 2024; Klapp et al., 2023; Östberg et al., 2015). For instance, Högberg et al. (2019) found that girls were more affected than boys when the Swedish grading system was changed to introduce grades earlier in school. An explanation may be that performance-based self-esteem is more common among girls (Schraml et al., 2011). When an individual's self-related perceptions are strongly related to performance, the risk of grades creating negative emotions may increase, since grades hold strong symbolic value as an indicator of academic ability.

In addition to gender differences, the results indicate that the perception that grades cause negative emotions is slightly more common among students with parents having a lower level of education, and for students scoring lower on cognitive ability tests. Studies have shown that students with low-educated parents generally experience a lower sense of belonging in school (Bakchich et al., 2023; Marksteiner and Kuger, 2016), which may be a part of the explanation. If students feel a greater sense of distance from school in general, this could manifest as anxiety about grades. In the other dimension, the perception that grades act as an external motivator, the results do not show any differences directly related to gender or cognitive ability, and only a weak correlation with parental education. Instead, the results suggest that there may be complex interactions involving the three background characteristics. The perception that grades act as an external motivator appears to be weakly positively associated with cognitive ability among boys, regardless of the level of parental education. For girls, this relationship seems to be negative when parental education is low and positive when parental education is high. Accordingly, the perception that grades can be helpful for studying appears to be most prevalent among girls with high cognitive ability and highly educated parents.

Regarding student achievement, the perception that grades evoke negative emotions is clearly related to lower achievement, and the perception that grades act as a motivational force is clearly related to higher achievement. These relations may not be very surprising, but they are nonetheless important to acknowledge. One way to interpret these results is that students' perceptions of grades contribute to the differentiation of high- and low-achieving students that is documented in previous research (Klapp, 2015, 2018). As mentioned, the perception that grades act as an external motivator is most frequent among students who possess a combination of characteristics already associated with academic success. However, since this study uses cross-sectional design, it is not possible to draw definite conclusions about causality in the relation between perceptions of being graded and achievement. A part of the negative emotions that students associate with grades may be a result of getting grades that are lower than one's peers, and part of the perception that grades make one put in more effort may be related to a feeling that good work "pays off" in terms of higher grades. Most likely, the relations in these matters are reciprocal. Previous studies have shown that students can enter feedback loops where negatively valenced achievement emotions lead to lower performance, which in turn causes them to experience even more negative achievement emotions (Pekrun et al., 2023).

It is also important to keep in mind that students' perceptions that grades make them more motivated in school do not necessarily lead to increased learning in the long run. If students' motivation and willingness to engage in schoolwork is primarily related to external rewards, there is a risk that the students develop performance- and avoidance behaviors, making them avoid the types of challenges necessary for long-term knowledge development (Pintrich, 2000). Furthermore, a strong focus on grades may reduce students' opportunities to be driven by intrinsic motivation (Chamberlin et al., 2018; Pulfrey et al., 2013).

6.1 Limitations and future research

The results of the study should be interpreted in light of the limitations that characterize the research design where the cross-sectional approach makes it difficult to draw causal conclusions. As already mentioned, this is particularly true for the relationships between students' perceptions of being affected by grades and their academic achievement. Furthermore, only three background variables are included in the study. There is a risk that additional factors, outside the scope of this study, may be crucial in understanding students' perceptions of being influenced by grades and how this impacts their achievement. Future research could provide further insights by more closely examining the relationships between students' perceptions of grades and academic performance, for example through a longitudinal design, and by exploring additional variables, such as migration background, self-concept, and sense of belonging.

The questionnaire responses are also affected by a high proportion of missing data, which is most likely due to the study utilizing the final of three survey distributions, resulting in survey fatigue among the selected participants. Moreover, the participating students are partially clustered in different schools across the country, although progression in the educational system has made every participant change school at least once. This makes the credibility of the study's results largely dependent on

the methods used to handle missing data and potential clustering effects: full information maximum likelihood, maximum likelihood complex, and calibrated weights. However, our view is that the methods employed are reliable, a belief further supported by the fact that the results of this study align with those of many other studies.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: The data analyzed in this study were obtained from the Evaluation Through Follow-up (Utvärdering genom uppföljning, UGU) database and Statistics Sweden's Educational Registers. These datasets are not publicly available due to legal and ethical restrictions protecting participant confidentiality. Access to the UGU data may be requested from the University of Gothenburg, and register data may be requested from Statistics Sweden, subject to ethical and institutional approval. Requests to access these datasets should be directed to ugu@ped.gu.se.

Ethics statement

Ethical approval was not required for the study involving humans in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and the institutional requirements.

Author contributions

HL: Data curation, Investigation, Formal analysis, Methodology, Conceptualization, Writing – original draft. AK: Validation, Formal analysis, Writing – review & editing, Investigation. AJ: Validation, Writing – review & editing.

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