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# Stress and anxiety in schools: a multilevel analysis of individual and class-level effects of achievement and competitiveness

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Stress and anxiety are commonly experienced by students in schools. Both phenomena are mutually dependent and associated with various negative outcomes. A range of variables have been addressed when explaining the development of stress and anxiety and the need to consider classroom-level effects becomes clear. So far, the effects of individual as well as classroom-level competitiveness on stress and anxiety have not been focused. This study aims to address this research gap and examines associations between achievement, competitiveness, stress and anxiety. Therefore, cross-sectional self-reports of 591 students from 10 secondary schools in Germany were collected using a paper-pencil-questionnaire in regular classrooms and analyzed using hierarchical linear modeling. The results highlight the relevance of achievement and competitiveness for the experience of anxiety and stress of students. Academic achievement on individual and class level were related to individual and classroom levels of stress and anxiety. Similarly, competitiveness on both levels was positively associated with the experiences of stress and anxiety. Consequently, the study highlights the relevance of achievement and competitiveness for the experience of anxiety and stress of students and emphasizes a need for adequate educational support.

## KEYWORDS

stress, anxiety, competition, achievement, reference group effects

## 1 Introduction

Stress and anxiety depict common emotional responses of students in schools. Both phenomena are mutually dependent and are associated with various negative academic outcomes, such as students' learning capacity and lower achievement (Pascoe et al., 2020). High levels of stress caused by schools are thereby reported across different countries (Cosma et al., 2020; Klinger et al., 2015; Ravens-Sieberer et al., 2009). The results of the HBSC-study (World Health Organization. Regional Office for Europe., 2020) indicate that more than a third of adolescents report feelings of school-related pressure. Additional results of the PISA study focusing on school well-being highlighted that anxiety regarding schoolwork is one of the main sources of stress (OECD, 2017). Across OECD countries, 59% of students reported that they often worry about test difficulty, 66% about poor grades, and 55% of students felt anxious even if they are well prepared. In the German context, a recent study focusing on 7,000 students, highlighted that 40% of students perceived school-related stress (Bodanowitz, 2017). Similarly, in a sample

of primary school children, a third of all participants reported school as the main stressor (Beisenkamp et al., 2012). The German education trend report from 2021 further indicated that more than half of the students experience at least moderate school-related anxiety at the end of 4th grade (Stanat et al., 2022). Similar levels become clear in context of German secondary schools, where about 44% reported a medium to high level of achievement anxiety (Fischer et al., 2022).

Addressing the reported levels of stress and anxiety is a crucial challenge in educational settings. Designing adequate support requires insights in causal mechanisms and variables related to the development of stress and anxiety in educational context. Among other variables, achievement is repeatedly related to stress (e.g., Grützmacher and Raufelder, 2019) and anxiety (e.g., Pekrun et al., 2023). In addition to effects of individual achievement, classroom characteristics such as the classroom level of achievement (Goetz et al., 2004) and competitiveness (Lätsch, 2017) are being discussed as associated variables. The paper at hand aims to extend the current state of research on this interplay by providing insights from the context of the German educational system into the roles of individual and group-level achievement and competitiveness for explaining school-related stress and anxiety.

## 1.1 Stress and anxiety in academic contexts

Stress is commonly defined as an everyday human experience, wherein demands and stimuli (stressors) require individuals to adapt to a situation (Selye, 1976). According to the transactional model of stress by Lazarus and Folkman (1984), such adaptations can be explained by dual cognitive appraisal processes. In a primary process, individuals assess their changing external environment and the extent to which their wellbeing is at risk or opposing to individual goals, evaluating external demands as a potential challenge, harm, or threat. In a secondary appraisal, individuals subsequently evaluate to which extent their own abilities and resources are sufficient to overcome this challenge. In consequence, stress arises when external or internal demands strain or exceed the individual's ability to adapt (Lazarus and Folkman, 1984). Common external demands that might trigger stress-related reactions comprise daily and life events as well as chronic stressors. While daily events describe minor hassles that happen frequently, chronic stressors persist for longer periods of time (e.g., unemployment; Epel et al., 2018).

In academic settings, students face a wide range of daily obstacles and commonly report experiencing stress as individual responses to external demands in schools (Pascoe et al., 2020). The meta-analysis by Pascoe et al. (2020) indicate that students report a high-level of academic stress, that impact their mental and physical health, leading to a range of academic problems (e.g., reduced learning capacity, lower achievement).

Stress and anxiety are strongly interconnected, as stress reactions commonly comprise psychological responses with cognitive and affective components (Epel et al., 2018; Lazarus and Folkman, 1984). Anxiety might be regarded as one specific emotional stress reaction, which arises in the case of uncertain, existential threats (Lazarus, 1993; Putwain, 2007). Epel et al. (2018)

state that although anxiety is a possible component of a stress reaction, a differentiation can be made in that anxiety as an emotional reaction only exists over a short period of time and in relation to a specific situation, while a perception of stress can persist for weeks or months. Therefore, stress and anxiety should not be considered synonymous.

In academic settings, achievement anxiety is commonly described as a fear experienced in performance settings (Beilock et al., 2018). It arises during demanding tasks (e.g., tests) or from the apprehension of engaging with a specific domain (e.g., math; Angelidis et al., 2019; Beilock et al., 2018; Putman et al., 2014). Such anxiety includes two interrelated components, worry and arousal (Beilock et al., 2018), compromising an individual's capacity to execute at task level (Powell, 2004).

Anxiety in schools is often described as one of different emotional responses related to achievement. Similar to the explanation of stress, appraisal models also clarify the emergence of such emotional responses. The control-value theory (CVT; Pekrun, 2006) stands out as one of the most renowned models for explaining achievement emotions and provides an integrative framework for analyzing emotions experienced in academic contexts. The basic assumption of the CVT is that two types of appraisals are responsible for which emotions are experienced in learning and performance situations: On the one hand, the subjective control (e.g., success expectations) over achievement activities and their outcomes, as well as, on the other hand, the subjective values of these activities and outcomes (e.g., importance of success; Pekrun, 2006). Based on the CVT, anxiety arises in situations with a high expectancy of failure which is appraised as potentially harmful and partially controllable (Pekrun, 2006). In such situations, it is uncertain whether one might prevent the harmful, negative outcome. Consequences of achievement-related anxieties include lower cognitive and emotional well-being (Steinmayr et al., 2016), negative attitudes, avoidance behaviors, and lower academic resources (e.g., working memory; Beilock et al., 2018, lower self-concept; Putwain et al., 2010, lower achievement; Balogun et al., 2017; D'Agostino et al., 2022).

Anxiety and individual achievement share a reciprocal connection, creating a vicious circle of increased anxiety and decreased academic performance (Goetz et al., 2008). In a 5-year longitudinal study, Pekrun et al. (2017) underscored the reciprocal influences between (negative) emotions and achievement. On the one hand, achievement negatively predicted negative emotions (e.g., anxiety), on the other hand, negative emotions negatively predicted achievement. Again, these reciprocal effects can be understood in the context of the CVT, where emotions impact achievement by influencing cognitive resources, interest, and motivation, in interaction with external task demands (Pekrun, 2006). On the other side, success in learning influences students' anxiety, as achievement strengthens perceived competence and control, which in turn has positive effects on the development of positive emotions (Pekrun et al., 2017).

In addition to effects of individual achievement, research confirmed a link between the classroom level of achievement and individual anxiety. Pekrun et al. (2019) described the "happy-fish-little-pond effect" (HFLPE), following the well-known "big-fish-little-pond effect" (BFLPE; e.g., Marsh et al., 2008), suggesting

that whilst individual achievement has a positive impact on emotional well-being, group-level achievement has a negative impact. This effect is explained by arguing that high-achieving groups provide less opportunities to succeed and to develop positive self-perceptions of ability (Pekrun et al., 2019). In line with this, studies by Goetz et al. (2008) and Frenzel et al. (2007) highlight that due to the positive effects of individual achievement and negative effects of class achievement, students with the same grades might show different emotional reactions depending on the classroom level of achievement. Besides individual and classroom achievement characteristics, additional variables, such as students' goals and values, play a pivotal role in the appraisal processes related to stress and anxiety (Lazarus and Folkman, 1984). Among these, competitiveness at both the student- and classroom level could be highly relevant.

## 1.2 Competitiveness in schools

Competition is described as an “ubiquitous” part of social life (Haran et al., 2023) and can be observed across different fields and disciplines (e.g., sports; Schütz and Schultheiss, 2020, economics; Cahlíková et al., 2020). Across those areas, associations between individual's competitiveness and a range of variables have been well-documented (e.g., optimism; Tjosvold et al., 2008, satisfaction and stress; Fletcher et al., 2008, approach and avoidance motivational processes; Murayama and Elliot, 2012).

A large body of research focuses competitiveness in the context of educational research (e.g., Aelenei et al., 2020; Chen, 2014; Elliot et al., 2018; Johnson and Johnson, 2013). Here, several studies indicate relationships between variations of competitiveness and educational outcomes, primarily academic achievement (e.g., DiMenichi and Tricomi, 2015; Elliot et al., 2018; Wehrens et al., 2010). A strong emphasis on winning in competitive scenarios may result in anxiety, helplessness, and burnout (Johnson and Johnson, 2005). Besides that, competitiveness is associated with low self-esteem as well as high self-doubt, neuroticism, and the experience of stress (Fassl et al., 2020).

In educational contexts, competitiveness can be regarded as a dispositional preference to compete in achievement situations (Murayama and Elliot, 2012). As this characteristic is relatively stable over time, competitiveness is often described as a personality trait (Elliot et al., 2018; Newby and Klein, 2014). The concept of competitiveness is not univocal and can be seen as the motivational orientation to outperform others or to elevate one's own performance (Ersilia, 2018). This implies that competition does not always mean competing with others. Individuals might also compete against their own benchmarks, indicating an internal need to perform well (Newby and Klein, 2014). Franken and Brown (1995) suggest different reasons why people engage in competition and indicate a chance for self-improvement. In the case of interpersonal competition, individuals prefer to compete with others in achievement situations (Murayama and Elliot, 2012). Here, a social competitive situation is evoked in which achieving the individual goal is dependent on others failure (Deutsch, 1949). In achievement situations, a strong intersocial competitiveness results in a focus on social comparisons as well as increased concerns

about the own academic performance (Eccles and Wigfield, 2002; Elliot et al., 2018). In their meta-analysis, Murayama and Elliot (2012) analyzed the influence of interpersonal competition on performance. Although they could not identify direct influences, the authors developed a model of inconsistent mediation in which the relation of competitiveness and performance is either mediated by performance-approach goals or performance-avoidance goals. Here, competitiveness represents a positive predictor for both, approach and avoidance goals, whereby performance-approach goals lead to higher performance and avoidance goals result in decreased performance. In addition to effects of competitiveness as an individual trait/characteristic, competitiveness might also be regarded as a shared characteristic of classrooms and as a component of classroom climate (Cohen et al., 2009; Loukas and Murphy, 2007). Variables on classroom and school level might not only shape single student's competitiveness but also impact the competitive classroom climate, depicting the collective perception and development of competitive orientations in the classrooms (Evans et al., 2009; Stornes et al., 2008).

## 1.3 The link between competitiveness, achievement, stress, and anxiety

The relationship between competitiveness, achievement, and emotions can be conceptualized against the background of the CVT. In CVT, the value component is differentiated into an intrinsic and extrinsic subjective value component of a learning outcome (Pekrun, 2006). While individual competitiveness might increase the intrinsic value of individual success, classroom competitiveness could increase the extrinsic value of the outcome. In competitive classrooms, achievement could be strived for in order to fulfill class norms and to be accepted as a valuable member of the social group. It can be presumed that both facets of outcome values can be integrated into an overall outcome value (Pekrun, 2006). In that regard, Pekrun (2006) argues that “it is assumed that features of environments delivering information related to controllability and academic values are of critical importance for students' emotions” (p. 325). Therefore, experiencing competitiveness might be regarded as a potential external stressor that could impact students' socio-emotional situation and behavior (Lätsch, 2017). In classrooms characterized by pressure to perform, achievement depicts an important dimension of social comparison, with students learning early that achievement determines their social status (Sicard et al., 2022; Sutton and Keogh, 2000; Wehrens et al., 2010). Social comparison, especially in high-achieving classrooms, can evoke achievement-related stress and anxiety (Dijkstra et al., 2008). According to the person-environment-fit theory, the subjective perception of the congruence between personal and situational factors is relevant for the individual experience and the development of positive outcomes, such as satisfaction and academic success (Bohndick et al., 2018; Etzel and Nagy, 2016). Here, the subjective perception of achievement can be described as a personal factor and the achievement of the class as a situational factor. In addition, the fit between personal characteristics and the classroom climate (e.g., classroom competitiveness) is also relevant (Kristof, 1996).

## 1.4 Research questions

Achievement and competitiveness are key elements of academic activities and may be associated with anxiety and stress. However, especially the identified positive and negative effects of competitiveness (e.g., on performance) at both individual and classroom level are not consistent (e.g., [Lätsch, 2017](#); [Murayama and Elliot, 2012](#)), which provides an interesting starting point for further research. In addition, achievement and competitiveness at individual and classroom level have not yet been analyzed alongside. Further, achievement is usually measured by grades or standardized tests. However, the importance of subjective perceptions of personal and situational factors is emphasized ([Bohndick et al., 2018](#); [Etzel and Nagy, 2016](#)). As individual and classroom-related perspectives seem to be important in understanding students' perception of stress and anxiety, this article aims to address the aforementioned gaps in a multilevel approach and provide answers to the following research questions:

*RQ1 (Individual level): To what extent are individual experiences of stress and anxiety related to the self-rated school achievement and the individual competitiveness?*

*RQ2 (Classroom level): To what extent are individual experiences of stress and anxiety related to the classroom level of achievement and classroom competitive climate?*

*RQ3 (Classroom level): To what extent are experiences of stress and anxiety on a classroom level related to the classroom level of achievement and classroom competitive climate?*

Based on the theoretical assumptions, we expect that associations between students' experience in school and competitiveness as well as achievement become clear on both, classroom and individual, levels. More precisely, we assume that (1) low school achievement as well as high competitiveness enhance the experience of school-related stress and anxiety on an individual level, that (2) students experience more stress and anxiety in classrooms with a high classroom level of achievement and classroom competitive climate as well as, that (3) high classroom levels of achievement and classroom competitive climate are related to high experiences of stress and anxiety on a classroom level.

## 2 Materials and methods

### 2.1 Participants

To answer the research questions described, we collected data of 591 students from 51 classrooms in 10 secondary schools across grades 6 and 7 ( $12.29 \pm 0.82$  years; 46% female). The German school system used to be classified as a tripartite educational system. After primary school, students were allocated three educational tracks in lower secondary education. These secondary schools lead to either lower (at Hauptschule), intermediate (at Realschule) or upper (at Gymnasium) secondary school certificate. Further, comprehensive schools represent an additional school type (extended tripartite system). In integrative comprehensive schools (integrierte Gesamtschule), students are not separated by educational track, but usually ability grouped in specific subjects ([Henniges et al., 2019](#)). More recent developments move toward a

bipartite educational system in some states. In the study at hand, three intermediate schools (Realschulen) (tier 2), three integrative comprehensive schools (Gesamtschulen) and four upper secondary schools (Gymnasien) participated in this study. [Table 1](#) presents an overview of the sample.

### 2.2 Procedure

Prior to data collection, the study was reviewed and written approved by the local education authorities as well as the ethics committee of Leibniz University Hannover in fall 2022. Written and informed consent by the parents or legal guardians was required before participation in this study. The data collection took place in June 2023 and depicts the second measurement time point of a longitudinal study (December 2022 to December 2023). The data was collected via self-reports. Completion of the paper-pencil-questionnaire took up to 15 min and was voluntary for students. Therefore, the first author of this article or supervised students presented the questionnaire to the classes, monitored its procedure, and clarified potential comprehension difficulties.

### 2.3 Measures

The questionnaire used in the survey comprised three parts. In an initial introduction of the survey to the participants, they were informed that the following questionnaire addresses their experiences of achievement demands and the school. It was explained that statements were formulated to which they could agree or disagree. They were further informed that the participation in the survey is completely anonymous as well as voluntary. The following first section of the survey involved questions about demographic information (grade level, age, gender, and self-evaluation of current achievement and related satisfaction). The second section of the survey contained items aligning with the dimensions of interest outlined in the research questions (competitiveness, school-related stress, achievement anxiety). A comprehensive description of the items and scales applied to assess the key dimensions of interest in the study can be found below. An overview of all included items and scales is also provided in [Appendix 1](#). The last section of the survey included the student version of the SDQ (*Strengths and Difficulties Questionnaire*; [Goodman, 2005](#)), which is not relevant for the subsequent analysis in the paper at hand.

#### 2.3.1 Competitiveness and competitive classroom climate

Individual *competitiveness* was assessed using a one-dimensional five-item scale. The scale was self-developed in orientation to existing scales ([Fend et al., 2014](#); [König et al., 2011](#); [Modick, 1977](#); [Schick, 2007](#); [Schmidt-Denter and Schick, 2005](#); [Schuler and Prochaska, 2001](#)), emphasizing both inter-individual and intra-individual competition. Students were asked to rate facets of competitiveness on a five-point Likert-scale (1 = "not true at all," 5 = "exactly true"; e.g., "It is important to me that my

TABLE 1 Sample distribution.

	N	Gender	Age	Grade
Integrative comprehensive schools (N = 3)	159	45% female, 50% male	12.59 (0.93)	50% Grade 6, 50% Grade 7
Upper secondary school (N = 4)	325	40% female, 48% male	12.11 (0.68)	65% Grade 6, 35% Grade 7
Intermediate schools (N = 3)	110	41% female, 51% male	12.42 (0.88)	54% Grade 6, 46% Grade 7

grades and evaluations are better than those of my classmates”). The internal consistency of the scale was satisfactory (Cronbach’s  $\alpha = 0.83$ ). The class mean of the scale scores was regarded as a Level-2 (classroom) variable depicting the *competitive classroom climate*. Although the perception of classroom climate is subjective, earlier research indicated that the shared perception within classes can be represented by aggregated data, in this case the class mean value (Nolen, 2003).

### 2.3.2 School-related stress

The *school-related stress* was assessed using a six-item scale based on existing stress scales (Gusy et al., 2016; Mansel and Hurrelmann, 1991). Students were asked to answer items on a five-point likert scale (1 = “not true at all,” 5 = “exactly true”; e.g., “I am very exhausted by completing school tasks”). The internal consistency of the scale was high (Cronbach’s  $\alpha = 0.91$ ).

### 2.3.3 Achievement anxiety

A seven-item scale was used to assess the *achievement anxiety* (in line with Helmke, 1982). Students were asked to rate different aspects of achievement anxiety (e.g., “I worry about being called on in class and saying something wrong”) on a five-point Likert scale (1 = “not true at all,” 5 = “exactly true”). The internal consistency of the scale was satisfactory (Cronbach’s  $\alpha = 0.85$ ).

### 2.3.4 School achievement

The current level of *school achievement* was measured using a student self-rating. Students were asked to rate the global school achievement in the last 6 months on a one-item ten-point Likert-type scale (“Evaluate your school achievement in the current school semester”; 1 = “very poor,” 10 = “very good”).

## 2.4 Data analysis

In a first step, we identified missing data in the dataset. Results of Little’s MCAR test ( $p > 0.05$ ) confirmed the assumption of randomly missing values. A total of 0%–1.5% of the data were missing across the dimensions of competitiveness, stress, and anxiety. Concerning the achievement variables, a total of 7.5% of student-ratings were missing. For these reasons, we excluded missing values from further analyses.

In a second step, we conducted multiple regression analyses to address the aforementioned research questions. Here, we followed the analytical routines and approach described by Krull et al. (2022) in previous research on classroom climate. As we were

interested in effects of classroom-level variables and due to the nested structure of the data (students in classrooms), we followed a multilevel approach (random intercept models with students nested in classrooms). As a prerequisite, the assumptions of normal distribution, homoscedasticity, and outliers at level 1 and 2 as well as the linearity and absence of multicollinearity were confirmed.

To address research question 1, we set up separate random-intercept models with either stress (Model 1a) or anxiety (Model 1b) as dependent variable. The self-rated level of achievement as well as students’ competitiveness were included as predictors within the model. In addition, gender (2 = female) was included. The level 1 predictors of self-rated school achievement and competitiveness were centered using the *Center Within Cluster* (CWC) method, following the argumentation by Enders and Tofghi (2007).

To address research question 2, we additionally included the classroom mean of self-rated individual achievement, as well as the classroom mean of the individual competitiveness as level 2 predictors (Model 2). The classroom means (Level 2) were subsequently centered using *Grand Mean Centering* (CGM; Enders and Tofghi, 2007). Furthermore, we controlled for grade level as an additional level 2 characteristic.

To address research question 3, anxiety or stress were included as dependent variable. The classroom mean of self-rated individual achievement, the classroom mean of competitiveness, and grade level were included as the sole predictors (Model 3). Here, as described by Krull et al. (2022), “as the level 1 criterion was predicted by no other level 1 variable, level 2 effect sizes were related to differences in the classroom means of the criterion variable” (p. 161) (means-as-outcomes-model).

All models were estimated using Maximum Likelihood (ML) estimation method using R (R Core Team, 2024) and the *nlme* package (Pinheiro et al., 2023).

## 3 Results

### 3.1 Descriptive statistics and correlations

An overview of the descriptive statistics as well as correlations of all variables on individual level can be found in Table 2. All variables correlated significantly, except gender. With regard to gender, only the correlation with achievement anxiety was found to be significant ( $r = 0.31$ ,  $p < 0.001$ ), indicating that being female is associated with stronger anxiety. There is a positive correlation between self-rated school achievement and competitiveness ( $r = 0.22$ ,  $p < 0.001$ ) and negative correlations between school achievement and stress ( $r = -0.32$ ,  $p < 0.001$ ) as well as anxiety ( $r = -0.34$ ,  $p < 0.001$ ). Thus, a high-level of achievement is associated with a more competitive orientation in students as well as with less stress and anxiety. Competitiveness

and stress ( $r = 0.14$ ,  $p < 0.01$ ) and anxiety ( $r = 0.15$ ,  $p < 0.01$ ) correlate positively. This indicates that students being competitive seems to be more stressed and anxious. Besides that, there is a positive correlation between stress and anxiety ( $r = 0.65$ ,  $p < 0.001$ ), which underlines that both phenomena occur simultaneously.

An overview of the descriptive statistics as well as correlations of all variables on classroom level can be found in [Table 3](#). The correlation between the class-mean self-rated class achievement and the competitive classroom climate is positive ( $r = 0.20$ ,  $p < 0.001$ ), which underlines that higher-achieving classes seem to be more competitive. The class-mean achievement and the classroom level of stress correlate negatively ( $r = -0.26$ ,  $p < 0.001$ ). Class-mean achievement and classroom anxiety are negatively associated as well ( $r = -0.30$ ,  $p < 0.001$ ). This means that higher achievement is also associated with less stress and anxiety at class level, as has already been identified at individual student level. At the same time, the same directions of effect can be seen at class level as at individual level with regard to competitiveness. There are positive relations between competitive classroom climate and stress ( $r = 0.28$ ,  $p < 0.001$ ) as well as anxiety ( $r = 0.37$ ,  $p < 0.001$ ), indicating that in competitive classes students feel more stressed and anxious. The correlations between grade level and class achievement ( $r = -0.40$ ,  $p < 0.001$ ) as well as competitive classes and grade level ( $r = -0.19$ ,  $p < 0.001$ ) are negative, so that in grade 7 students perceive lower achievement and are less competitive. Further correlations exist between classroom stress and anxiety ( $r = 0.70$ ,  $p < 0.001$ ), indicating that higher levels of stress in classrooms also co-occur with higher levels of anxiety on average.

### 3.2 Associations between individual experiences of stress and anxiety and individual levels of school achievement and competitiveness (RQ1)

The results of the multilevel regression analyses examining the relationship between stress and individual as well as class levels of achievement and competitiveness can be found in [Table 4](#). Corresponding models explaining anxiety are depicted in [Table 5](#).

When focusing stress as the dependent variable ([Table 4](#)), it becomes clear that all level 1 variables depict significant predictors (Model 1). Higher levels of self-rated school achievement reduce the experience of school-related stress ( $\beta = -0.35$ ; CI  $[-0.43, -0.27]$ ). In contrast, higher levels of competitiveness enhance the individual level of stress ( $\beta = 0.18$ ; CI  $[0.10, 0.26]$ ). Further, gender as control variable predicts the individual stress experience significantly as well, whereby female participants experience more stress ( $\beta = 0.22$ ; CI  $[0.05, 0.38]$ ).

Similar patterns of results become clear when focusing achievement anxiety as dependent variable. The model suggests that a high self-rated school achievement reduces the anxiety ( $\beta = -0.36$ ; CI  $[-0.43, -0.18]$ ) and competitiveness enhances the experience of anxiety ( $\beta = 0.18$ ; CI  $[-0.10, 0.26]$ ). Here, the control variable gender predicts anxiety level as well, indicating more anxious female students ( $\beta = 0.62$ ; CI  $[0.47, 0.78]$ ).

### 3.3 Associations between individual experiences of stress and anxiety and classroom level of school achievement and competitive classroom climate (RQ2)

In a second step, the classroom level of school achievement and competitive classroom climate were included as additional predictors in the models (Model 2).

After including these level 2 variables, the effects of the L1-variables remain. On classroom level, class achievement ( $\beta = -0.16$ ; CI  $[-0.27, -0.05]$ ) as well as competitive classroom climate predict the experience of stress ( $\beta = 0.15$ ; CI  $[0.04, 0.25]$ ). No significant effect of grade level ( $\beta = -0.06$ ; CI  $[-0.30, 0.18]$ ) can be described. When focusing achievement anxiety, the pattern of level 1 effects remains. On classroom level, again, class achievement ( $\beta = -0.15$ ; CI  $[-0.24, -0.06]$ ) as well as the competitive classroom climate depicts significant predictors ( $\beta = 0.17$ ; CI  $[0.08, 0.26]$ ). No significant effect of grade level ( $\beta = -0.03$ ; CI  $[-0.22, 0.16]$ ) can be described.

### 3.4 Associations between classroom experiences of stress and anxiety and classroom level of school achievement and competitive classroom climate (RQ3)

In a last step, the analyses focused the associations between the intensity of class-level stress as well as anxiety and class achievement, competitive classroom climate and grade level. Effects of class achievement and competitive classroom climate on both, classroom stress level and the experience of anxiety become clear. Class achievement predicts classroom stress ( $\beta = -0.16$ ; CI  $[-0.27, -0.05]$ ) and classroom level of anxiety ( $\beta = -0.15$ ; CI  $[-0.25, -0.05]$ ) negatively, while the competitive climate represents a positive predictor of stress ( $\beta = 0.14$ ; CI  $[0.03, 0.25]$ ) and anxiety ( $\beta = 0.16$ ; CI  $[0.07, 0.26]$ ). Again, the effects of grade level are not significant.

Overall, effects on both levels of analyses become clear, which underlines the importance of individual as well as classroom characteristics for the prediction of school-related stress and achievement anxiety. The multilevel analyses indicated that achievement and competitiveness represent predictors of school-related stress and achievement anxiety. A higher-level of perceived individual achievement as well as a high-achieving classroom seem to be positive resources for students as they relate to lower experiences of both stress and anxiety. In contrast, being competitive on an individual level as well as being a student in a classroom with a competitive classroom climate represent risk factors as they are associated with higher levels of stress and anxiety. These effects do not only become clear in the statistical prediction of the individual level of stress and anxiety but also on the classroom level of stress and

TABLE 2 Correlation matrix of all individual variables.

	<i>M</i>	<i>SD</i>	1	2	3	4
1 Student achievement	6.75	1.66	–			
2 Competitiveness	14.91	4.74	0.22***	–		
3 Stress	17.77	6.24	–0.32***	0.14**	–	
4 Anxiety	20.51	7.23	–0.34***	0.15**	0.65***	–
5 Gender <sup>a</sup>	0.47	0.05	0.01	0.02	0.11	0.31***

<sup>a</sup>Gender: 1 = male, 2 = female. Scale scores depict sum values. \**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001.

TABLE 3 Correlation matrix of all classroom level variables.

	<i>M</i>	<i>SD</i>	1	2	3	4
1 Aggregated class achievement	6.75	0.57	–			
2 Competitive classroom climate	14.92	1.61	0.20***	–		
3 Classroom stress	17.76	2.59	–0.26***	0.28***	–	
4 Classroom anxiety	20.51	2.73	–0.30***	0.37***	0.70***	–
5 Grade level	0.56		–0.40***	–0.19***	–0.02	0.04

Scale scores depict sum values. \**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001.

TABLE 4 Results of regression analyses for stress (DV).

	Model 1			Model 2			Model 3		
	Individual predictors			+ Class-level predictors			Means-as-outcome		
	<i>β</i>	<i>p</i>	CI	<i>β</i>	<i>p</i>	CI	<i>β</i>	<i>p</i>	CI
<b>Individual level:</b>									
Achievement	–0.35	***	[–0.43, –0.27]	–0.35	***	[–0.42, –0.27]			
Competitiveness	0.18	***	[0.10, 0.26]	0.18	***	[0.10, 0.26]			
Gender <sup>a</sup>	0.22	**	[0.05, 0.38]	0.22	**	[0.06, 0.38]			
<b>Class level:</b>									
Achievement				–0.16	**	[–0.27, –0.05]	–0.16	**	[–0.27, –0.05]
Competitive classroom climate				0.12	**	[0.04, 0.25]	0.14	*	[0.03, 0.25]
Grade level				–0.06	0.63	[–0.30, 0.18]	–0.06	0.61	[–0.31, 0.18]
<b>Random effects:</b>									
<i>σ</i> <sup>2</sup>		0.77			0.76			0.91	
<i>T</i> <sub>00</sub>		0.09			0.06			0.05	
ICC		0.11			0.08			0.06	
Marginal <i>R</i> <sup>2</sup> /Conditional <i>R</i> <sup>2</sup>		0.14/0.23			0.17/0.24			0.04/0.09	

<sup>a</sup>Gender: 1 = male, 2 = female. All continuous variables were standardized, so that unstandardized beta weights which are reported in the table correspond to standardized beta weights. The individual predictor variables were centered by the method Center Within Cluster (CWC), the class predictors by Grand Mean Centering (CGM). Exact *p*-values are depicted in the case that they are not below 0.05. 95% CI based on the likelihood ratio test. \**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001.

anxiety. Thus, a competitive, low-achieving student reports high-levels of stress and achievement. Furthermore, the average of students in a classroom is less stressed and anxious, when the average of students in the classroom is high-achieving but less competitive.

## 4 Discussion

In the present study, we investigated effects of individual achievement and competitiveness as well as the classroom levels of achievement and competitiveness (competitive classroom

TABLE 5 Results of regression analyses for anxiety (DV).

	Model 1			Model 2			Model 3		
	Individual predictors			+ Class-level predictors			Means-as-outcome		
	$\beta$	$p$	CI	$\beta$	$p$	CI	$\beta$	$p$	CI
<b>Individual level:</b>									
Achievement	-0.36	***	[-0.43, -0.18]	-0.36	***	[-0.44, -0.29]			
Competitiveness	0.18	***	[0.10, 0.26]	0.18	***	[0.10, 0.26]			
Gender <sup>a</sup>	0.62	***	[0.47, 0.78]	0.63	***	[0.48, 0.78]			
<b>Class level:</b>									
Achievement				-0.04	**	[-0.24, -0.06]	-0.15	**	[-0.25, -0.05]
Competitive classroom climate				0.15	***	[0.08, 0.26]	0.16	**	[0.07, 0.26]
Grade level				0.08	0.72	[-0.22, 0.16]	-0.03	0.81	[-0.24, 0.18]
<b>Random effects:</b>									
$\sigma^2$		0.71			0.71			0.95	
$T_{00}$		0.05			0.02			0.01	
ICC		0.07			0.02			0.01	
Marginal $R^2$ /Conditional $R^2$		0.23/0.29			0.27/0.29			0.04/0.05	

<sup>a</sup>Gender: 1 = male, 2 = female. All continuous variables were standardized, so that unstandardized beta weights which are reported in the table correspond to standardized beta weights. The individual predictor variables were centered by the method Center Within Cluster (CWC), the class predictors by Grand Mean Centering (CGM). Exact p-values are depicted in the case that they are not below 0.05. 95% CI based on the likelihood ratio test. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

climate) on school-related stress and achievement anxiety. We analyzed these relationships using a multilevel regression approach following the assumptions that individual experiences of stress and anxiety of students are predicted by self-rated achievement and competitiveness on individual level as well as classroom mean levels of self-rated achievement and competitiveness. In line with our first hypothesis, low individual school achievement and a strong individual competitiveness enhance the experience of stress and anxiety. This is in line with previous findings (e.g., [Dijkstra et al., 2008](#); [Goetz et al., 2008](#)). In comparison, the effects of achievement are stronger than those of competitiveness. An explanation for this finding might be seen in the fact that competitiveness has ambiguous effects ([Haran et al., 2023](#)) and positive effects of competitiveness might partly compensate for stress and anxiety. [Johnson and Johnson \(2005\)](#) described that such positive effects of competitiveness become clear under certain conditions, e.g., when competition is perceived as personally worthwhile beyond winning. As a consequence, striving to be better than others would only influence students negatively, if nothing but winning is important and alternative achievement results are therefore experienced as failures.

The assumption that students experience more stress and anxiety in high-achieving classrooms cannot be confirmed. These results are therefore not in line with previous studies, especially in context of the *HFLPE* (e.g., [Frenzel et al., 2007](#); [Goetz et al., 2008](#); [Pekrun et al., 2019](#)). On the contrary, the results indicate that in classrooms with a high subjective perception of achievement, students reported lower levels of school-related stress and achievement anxiety. One potential

explanation for this might be, that in high-achieving classes students experience more enjoyment and satisfaction related to learning as well as a more positive general classroom climate. In addition, students in these classes may perceive that they can fulfill academic demands and teachers' expectations, and therefore put themselves under less pressure. This might be explained with regard to alternative reference group effects (e.g., the basking-in-reflected-glory effect; *BIRGE*), which suggest positive effects of high-achieving reference groups on students' self-perceptions, especially their self-concept (e.g., [Marsh et al., 2000](#)). It seems reasonable, that this effect can also be extended to the experience of stress and anxiety. It has been repeatedly discussed whether the *BFLPE* or the *BIRGE* is predominant, with various studies investigating different influencing factors ([Wolff et al., 2021](#)). The present study could be an example of the predominance of the *BIRGE*. At the same time, it must be acknowledged that the work at hand is not a direct replication of previous work on the *HFLPE*, as we only considered cross-sectional data and focused on self-reports.

In our results, the experience of stress and anxiety was positively associated with a competitive classroom climate. In line with this, [Roeser and Eccles \(1998\)](#) noted that perception of competition and comparison in secondary schools can be psychologically burdening for many adolescents. The results indicate that facets of classroom climate impact the emotional experience of students, as numerous other studies have demonstrated (e.g., [Loukas and Murphy, 2007](#); [Coelho et al., 2020](#)). Especially in situations of repeated failure, competitive classroom climate may provoke students to experience anxiety and hopelessness as they believe



that they have not adequate competencies to succeed (Covington, 2000). Nonetheless, the results of the study at hand highlighted that the effects of achievement and competitiveness are similar across the facets of stress and anxiety. This finding is not surprising, as both constructs are strongly associated. As described in the theoretical background, anxiety might be reaction to a stress experience (Balogun et al., 2017; Hoferichter and Raufelder, 2013).

#### 4.1 Limitations of the present study

The interpretation of the described findings must be restricted in view of various limitations of the study at hand. Firstly, the analyses focused cross-sectional data and do not allow for causal interference. Despite our efforts to avoid any causal language, it must be stated that inverse effects are also conceivable. For example, previous research identified anxiety as a factor that determines whether competition is approached or avoided (Murayama and Elliot, 2012). Secondly, this study focuses on (shared) students' characteristics. In addition, it can be assumed that additional variables on teacher- and school level (e.g., teacher behavior) are meaningful for the explanation of school-related stress and anxiety. Thirdly, the analyses were based on students' self-ratings. Thus, responses might be biased by various personal characteristics. The competitive classroom climate was analyzed by aggregating the self-rated individual competitiveness of the students in a classroom, which does not necessarily represent the individual perception of the competitive classroom climate. Achievement measured by standardized tests scores could potentially provide different results. In addition, competitiveness was operationalized as consisting of inter- as well as intraindividual competitive behaviors. In contrast, Murayama and Elliot (2012) however argue that both facets should be regarded separately.

#### 4.2 Implications and future research

Due to the high number of students experiencing stress (e.g., Pascoe et al., 2020), it is important to support students to cope with school-related stressors and to address resulting emotions as anxiety, in order to prevent long-term negative consequences. One approach is to pay less emphasis on social or critical reference norms in school. Instead, students should be honored and valued for their individual development, abilities, and performance. In addition, it is important to educate students about the importance of such individual frame of reference. As students tend to compare themselves (Mussweiler, 2003), teachers should not strengthen social comparison and competition. Rather, teachers should focus on creating cooperative instead of competitive learning environments.

Future research might address additional variables that are discussed as relevant predictors of school-related stress and anxiety. For example, positive and negative effects of competitiveness in dependence to individual dispositions were discussed as

competitiveness might be negative if success is given too much relevance. Again, multi-level approaches might be an interesting perspective by analyzing the extent to which not only individual orientations affects students, but also if classroom climate is associated with students' mental experiences.

In addition to a focus on individual emotional outcomes, future studies might examine effects of competitiveness on social relationships within a classroom. In a vocational context Tjosvold et al. (2008) state that people who are perceived as competitive are viewed more negatively by their peers. It is also assumed that competitive groups are less cohesive (Schwieren and Weichselbaumer, 2008).

## 5 Conclusion

The results of the study highlight the relevance of achievement and competitiveness for the experience of anxiety and stress of students. In an achievement-oriented society, achievement plays an important role for individual development, which might particularly impact low-achieving students. Here, there is a risk of a vicious cycle, in which these students not only experience more stress and anxiety, but also may experience further academic failure as a consequence of their mental burden. As stress and anxiety are common in students and negative long-term consequences are assumed, addressing these factors seems particularly important. Even if both constructs are explained by individual perceptions, the present study highlights the relevance to consider classroom characteristics. Achievement and competitiveness are not only significant predictors at the individual level, but also at the classroom level.

## Data availability statement

The datasets presented in this article are not readily available because the written consents of the parents only include the anonymized publication of results and no publication of the complete data. Requests to access the datasets should be directed to [saskia.becker@ifs.uni-hannover.de](mailto:saskia.becker@ifs.uni-hannover.de).

## Ethics statement

The studies involving humans were approved by Ethics Committee of Leibniz University Hannover and the Hanover University of Music, Drama and Media. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

## Author contributions

SB: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. MB-R: Conceptualization, Methodology, Supervision, Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

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## Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2024.1519161/full#supplementary-material>

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