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# Academic stress: links with emotional problems and motivational climate among upper secondary school students

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**ABSTRACT**

This study investigates the levels of and associations among academic stress, perceived motivational climate and emotional problems in students at Norwegian upper secondary schools. A structural equation model with a sample of 1379 students ($M_{age}$ 16.5 years old) tested the associations between perceived mastery and performance climates and emotional problems via associations with academic stress. Levels of academic stress and emotional problems were found to be higher among female participants than male participants. Performance climate was related to higher academic stress; it was also related to more emotional problems through its association with academic stress. Mastery climate was associated with lower academic stress, and both directly and indirectly (via academic stress) related to less emotional problems. There was a strong link between academic stress and emotional problems, and this was significantly stronger among female participants. Practical implications are suggested.

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Motivational climate; academic stress; emotional problems; gender differences; mastery climate; performance climate; Norway

## Introduction

The proportion of Norwegian adolescents reporting emotional problems has increased radically in the past 10–15 years (Folkehelseinstituttet, 2018). A similar trend has been observed in other western countries (Inchley et al., 2020). A link between school-related stress and emotional problems has been suggested (Pascoe et al., 2020). A study conducted across most countries of Europe and most regions of Canada promoted by the WHO indicates there has been an increase in school pressure especially among older adolescents (Inchley et al., 2020). Moreover, a national report (Eriksen et al., 2017) suggests that school-related stress partially explains the increase in emotional problems among Norwegian adolescents. However, research addressing the level of academic stress and its link with indications of emotional problems among students in upper secondary school is limited.

Evidence on the degree to which perceptions of the learning environment influence students' emotional health is limited, yet aspects such as teacher support and school connectedness have been indicated as potentially important and more research is needed (Kidger et al., 2012). These aspects of interpersonal qualities in the school context are likely to entwine with how the motivational climate is perceived by the students (Patrick et al., 2011; Skaalvik & Skaalvik, 2013), which has

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indeed been linked to their emotional health (Baudoin & Galand, 2017; Stornes et al., 2008; Stornes & Bru, 2011). The motivational climate is regarded a central aspect of the learning environment, and two main types of such climates have been defined: A mastery, and a performance climate. These types of climates critically differ in what is valued and defined as success in the environment, specifically the extent to which individual effort and progress or normative results are emphasised (Meece et al., 2006; Patrick et al., 2011). Such differences in how competence and success are defined is likely to affect students' level of academic stress, which makes motivational climate particularly relevant to include in an investigation of academic stress as a potential link between aspects of the learning environment and adolescents' emotional problems. Therefore, this study will investigate the associations between motivational climate, academic stress, and emotional problems in a sample of Norwegian upper secondary school students.

### *Emotional problems among adolescents*

Research indicates that emotional problems, i.e., symptoms of anxiety and depression, are prevalent in adolescents, particularly among older adolescents (Gunnell et al., 2018; Inchley et al., 2020). The prevalence of emotional problems among adolescents in Norway is comparable with that of other western countries (Mykletun et al., 2009). Good emotional health is crucial for ensuring healthy transitions from adolescence to adulthood (Inchley et al., 2020), hence it is important to find ways to help adolescents to cope with stress to reduce emotional problems (Inchley et al., 2020; Pascoe et al., 2020). Emotional problems developed early in life have a high chance of becoming chronic (Mykletun et al., 2009) and continue into adulthood either through heterotypic continuity or psychopathological progression (Rutter et al., 2006). Hence this should be taken seriously.

### *Perceived academic stress and links with emotional problems*

Stress is commonly defined as an experience in which individuals appraise demands surpassing their coping resources (Lazarus, 1991, 2006). Following this definition, academic stress refers to academic demands that are perceived to exceed students' internal or external coping resources (Walburg, 2014). There is little scientific research on the levels of academic stress experienced by adolescent students. However, adjacent studies have been conducted on school burnout, which is related to academic stress, and its influence on emotional problems (Salmela-Aro et al., 2009; Walburg, 2014).

Lazarus' (1991) theory of stress proposes that stress is strongly linked to emotions through the coping process employed. However, studies that empirically investigate the association between academic stress and emotional problems in upper secondary school students are rare. Nonetheless, one recent study reported an association between school stress and emotional problems (Haugan et al., 2021). School-related stress has also been found to be a risk factor for psychosomatic symptoms (Murberg & Bru, 2007) and experiences of high demands in school, have been found to be associated with symptoms of chronic stress (Schraml et al., 2012). Associations between school-related burnout and internalising symptoms like anxiety and depression have also been reported (Salmela-Aro et al., 2009; Slivar, 2001; Walburg, 2014). Therefore, in the current study, we expected that students' academic stress would be associated with self-reported emotional problems.

### *Motivational climate and stress*

The concept of motivational climate was introduced by the achievement goal theory (Ames, 1992; Meece et al., 2006; Patrick et al., 2011). This theory identifies two qualitatively different motivational climates that signals purposes for engaging in academic tasks and what constitutes success (Patrick et al., 2011). A mastery climate is characterised by a learning environment that values real learning and understanding in preference to mere memorisation. Personal effort and improvements are set

in focus and individual improvements is an important criterion for defining individual academic success (Meece et al., 2006; Patrick et al., 2011). In a performance climate learning is predominantly a means of achieving recognition of worth, and success is indicated by performing better than others (Meece et al., 2006; Patrick et al., 2011).

Stress is experienced when demands are appraised as exceeding available resources (Lazarus, 2006). A mastery climate, in which the learning processes are valued with the individual frame of reference, the defining of reachable learning goals for the individual student is likely to foster less situations in which demands are appraised as exceeding resources; therefore, mastery climate could reduce the risk of experiencing academic stress. On the other hand, in a performance climate, with a predominant focus on comparable results, many students are likely to perceive that they do not have the resources they need to accomplish these valued results or attain the position in the academic hierarchy that they strive for, and therefore, experience stress. Furthermore, perceiving a strong focus on ability and results can increase the barriers for requesting support, in that help-seeking could expose one's inabilities. Indeed, perceived performance climate in class has been associated with less help-seeking behaviour (Federici et al., 2015). As seeking academic or social support represent important strategies for coping with stress (Thoits, 2011), a performance climate could increase the risk of academic stress manifesting.

To the best of our knowledge, no previous studies have investigated the link between perceived motivational climates and academic stress, and such stress as an intermediate variable between motivational climates and emotional problems. However, some studies have investigated the associations between motivational climates and emotional problems among younger adolescents. Findings of these studies indicate that a mastery climate is associated with lower levels of depression (Wang, 2009) and positive emotions (Kaplan & Midgley, 1999), whereas a performance climate has been found to be moderately positively associated with academic anxiety (Baudoin & Galand, 2017; Federici et al., 2015) and self-reported emotional problems (Baudoin & Galand, 2017; Stornes & Bru, 2011).

Thus, based on theoretical reasoning and aforementioned empirical research, it is expected that perceived mastery climate will be associated with lower levels of academic stress and emotional problems, whereas perceived performance climate will be associated with higher levels of academic stress and emotional problems. A substantial proportion of the variance accounted for in emotional problems is expected to be indirect, via academic stress.

### *Gender differences*

During adolescence an increase in affective disorders is observed among girls during adolescence; however, this is less evident among boys (Bale & Epperson, 2015). Fifteen-year-old girls report more emotional problems compared to their male counterparts (Inchley et al., 2020). From 2008 to 2016, there has been a marked increase in anxiety and depression disorders, especially among girls; this increase is especially evident in anxiety (Folkehelseinstituttet, 2018). Hormonal changes can play a role in these developmental differences between genders and may underlie that adolescent girls also seem to have a stronger emotional response to stress than adolescent boys (Bale & Epperson, 2015). The higher impact of stress or burnout among girls has also been supported elsewhere (Lillejord et al., 2017; Slivar, 2001). However, social factors can also play an important role. Gender differences in perceived school demands and stress are argued to be reasons for this (Giota & Gustafsson, 2017).

Regarding academic stress, adolescent female students seem to perceive more stress related to academic performances than their male counterparts (Klinger et al., 2015; Låftman et al., 2013; Östberg et al., 2015; Walburg, 2014). This may happen because girls have higher expectations regarding their own academic performances (Dalen, 2014), they are more focused on results and grades and tend to worry more about the future than boys (Östberg et al., 2015); thus, they may become more

stressed from such expectations than boys. It is also generally more socially accepted for girls to put more effort into performing well in school (Låftman et al., 2013). Consequently, girls are more prone to report more worrying and psychosomatic symptoms related to academic stress than boys (Murberg & Bru, 2004).

This leads to the expectation that the association between academic stress and emotional problems is stronger for female students than for their male counterparts.

In light of research indicating that girls are more learning goal-oriented than boys (Anderman & Young, 1994; Diseth & Samdal, 2014), a mastery climate may be more crucial for their adjustment compared to boys. Furthermore, research has indicated performance-approach goals to be more facilitative for boys (Midgley et al., 2001). This aligns with other research finding females to be less likely to self-select into competitive situations (Niederle & Vesterlund, 2011). Yet, this seems to be task-dependent and primarily apply to mathematics and other science subjects (Dreber et al., 2014). Since findings concerning gender differences are ambiguous (Linnenbrink-Garcia et al., 2008) and there is limited empirical evidence regarding the specific links with academic stress and emotional problems, this prevents us from making hypothesis for gender differences for these associations.

### *The current study*

In light of previous studies indicating that adolescents struggle with high levels of academic stress there is a need to investigate the potential sources of such stress in learning environments (Lillejord et al., 2017). Very little research has been carried out on upper secondary school students' perceptions of motivational climate and how this is related to academic stress and emotional problems. There is also a need to further explore the link between academic stress and emotional problems among adolescent students. This study aims to contribute to this field by addressing the following research questions:

- What are the levels of academic stress and emotional problems among male and female students in Norwegian upper secondary schools?
  - Academic stress was expected to be higher among females (H1).
  - Emotional problems were expected to be higher among females (H2).
- What are the associations between academic stress and emotional problems?
  - The association between academic stress and emotional stress was expected to be relatively strong (H3) and higher among females than males (H4).
- What are the associations of perceived motivational climates with academic stress and emotional problems?
  - Mastery climate was expected to be linked to less emotional problems, primarily via less academic stress (H5).
  - Performance climate was expected to be linked to more emotional problems, primarily via more academic stress (H6).
- In addition, as secondary aims, gender differences of levels of motivational climates, as well as strengths of potential associations of motivational climates with academic stress and emotional problems were explored.

## Method

### *Participants*

In total, 1379 first-grade students (52% male and 48% female students, $M_{age}$ = 16.5 years old) from 82 classes of 7 public upper secondary schools in the southwest of Norway participated in the study. The response rate was 90%. Students enrolled in a vocational programme formed 54% of the

sample, while 46% were attending an academic track. The schools were selected purposively (Trochim et al., 2016) in collaboration with the county administration to represent a variety of study programmes, urban and district locations and achievement level requirements for enrolment. Students with migratory backgrounds (i.e., neither of the parents was born in Norway) were 17% of the sample, which is similar to their distribution within the Norwegian youth population (Kale & Hjelde, 2017).

## Measures

### Motivational climate

Two subscales assessing perceptions of the motivational climate in class, i.e., the degree to which participants perceive a mastery and/or a performance climate, were used. Eight items (four covering a mastery climate, and four covering a performance climate) deriving from Patterns of Adaptive Learning Survey (PALS; Midgley et al., 2000), translated to Norwegian and slightly modified to fit the Norwegian upper secondary school context were applied. The items are introduced with "*In my class...*" followed by a description of a mastery climate (e.g., *it is ok to make mistakes, as long as you learn from it*) or performance climate (e.g., *students are more concerned about grades than exploring the material*). Responses were given on a six-point Likert-type scale ranging from 1 (completely disagree) to 6 (completely agree). The wording of items and standardised loadings for this and other scales are provided in the Appendix.

A confirmatory factor analysis (CFA) with maximum likelihood estimation with robust standard errors (MLR) was performed to test the two-factor structure of the scale (Mplus Version 8.0; Muthén & Muthén, 1998–2017). After allowing the residuals of one pair of items to covary (see Appendix for rationale), the model obtained an acceptable fit: $\chi^2(18) = 153.46$, $p = .00$, CFI = 0.92, TLI = 0.88, RMSEA = 0.074 (90% CI 0.063, 0.085), and SRMR = 0.047. Standardised factor loadings ranged 0.45–0.79. We tested the measurement invariance across genders in a multigroup model in which loadings and intercepts were specified as invariant across groups. After correlating the errors of a pair of items among female participants, the model fit the data adequately, supporting partial scalar invariance: $\chi^2(47) = 188.08$, $p = .00$, CFI = 0.92, TLI = 0.91, RMSEA = 0.066 (90% CI 0.056, 0.076), and SRMR = 0.062.

### Emotional problems

Emotional problems were measured by the widely used 10-item version of the Hopkins Symptom Checklist (SCL-10; Strand et al., 2003) (e.g., *Feeling of worthlessness*; *Feeling tense or keyed up*). The scale covers symptoms of depression and anxiety. Responses were rated on a four-point Likert-type scale ranging from 1 (not at all) to 4 (very much). In a CFA, the one-factor structure fit the data adequately after correlating the errors of one pair of items: $\chi^2(34) = 300.03$ $p = .00$, CFI = 0.95, TLI = 0.94, RMSEA = 0.075 (90% CI 0.068, 0.083), and SRMR = .034. The rationale for this residual correlation is given in the appendix. With one exception (the item concerning sleeping problem), standardised factor loadings were ≥ .70, indicating that the majority of items are good indicators of a latent variable labelled "Emotional problems". Scalar invariance was observed across genders: $\chi^2(86) = 388.50$ $p = .00$, CFI = 0.94, TLI = 0.94, RMSEA = 0.071 (90% CI 0.064, 0.079), SRMR = 0.049.

### Academic stress

Academic stress was assessed using five items slightly adapted from Murberg and Bru (2004). Participants indicated the extent to which they had experienced academic stress (e.g., *You have been worried about not performing well enough*) in the last month on a six-point Likert-type scale ranging from 0 (no strain) to 5 (severe strain). In a CFA, the model obtained an adequate fit after correlating the errors of two items: $\chi^2(4) = 16.13$, $p = .00$, CFI = 0.99, TLI = 0.98, RMSEA = 0.047 (90% CI 0.025, 0.072), and SRMR = .013. The rationale for this residual correlation is given in the Appendix.

Standardised factor loadings for items were ≥ .68, indicating that all items were good indicators of the latent variable. Scalar invariance was observed across genders: $\chi^2(16) = 88.94$ $p = .00$, CFI = 0.96, TLI = 0.95, RMSEA = 0.081 (90% CI 0.065, 0.098), and SRMR = 0.043.

### Control variables

Gender (male = 0, female = 1) was controlled for because it is likely to account for covariance between academic stress and emotional problems and possibly also between motivational climates and academic stress. Study track (vocational = 0, academic = 1) was entered as a control variable due to differences in learning formats that could account for covariances between motivational climates and academic stress. Finally, prior academic achievements could account for covariances between motivational climates and academic stress and was therefore controlled for. Prior academic achievement was recorded as the grade point average of three core subjects (Norwegian, Mathematics, and English) from lower secondary school, ranging from 1 (lowest) to 6 (highest). The control variables were obtained from the county's register.

## Procedure

An electronic survey was administered by the students' teacher in a normal classroom setting, when participants were in the second semester of the first year of upper secondary school. Written and oral information was provided to the students prior to participation, and informed consent was obtained in the initial part of the electronic survey. This consent also included participants' agreement to allow the matching of self-reports with data from the county's register, for the control variables. Participants were allowed to withdraw from the study at any given point. To withdraw they just closed the survey, and all their previous responses were deleted. Students who completed the survey responded to all items, thus missing on item level was non-existing. There were only a very few missing data on register data; the full information maximum likelihood (FIML) procedure was used to handle missing data, as it is the default in Mplus. The procedures developed ensured that the project protected students' confidentiality and adhered to ethical standards and were approved by the Norwegian Center for Research Data (NSD).

## Strategy of analysis

We computed the means, standard deviations, and correlations among the manifest variables (mean scores across items) as descriptive statistics. We ran structural equation modelling (SEM) using Mplus Version 8.0 with MLR (Muthén & Muthén, 1998–2017) to test the expected paths between perception of the motivational climate and participants' emotional problems, directly, and indirectly via academic stress. The school track (vocational vs. academic), gender, and grades achieved in lower secondary school were introduced as control variables. Subsequently, a multigroup model was tested across the two gender groups, to explore whether gender moderated any of the associations.

As the model included indirect associations, we used the recommended strategy of the bias-corrected bootstrap (MacKinnon et al., 2004). However, because the bootstrap strategy cannot be combined with MLR in Mplus, we first tested the models with MLR, after which the results were confirmed through the bootstrap procedure using the maximum likelihood (ML) estimator.

We evaluated the goodness of fit of the model by examining the value of the chi-square ($\chi^2$), which is expected to be insignificant for models that fit the data properly. However, the chi-square index is sensitive to the size of the sample and tends to become significant for large samples. Therefore, other indices of fit were also examined according to Hooper et al. (2008), whereby good fit was indicated by RMSEA < 0.070 (including the 90% confidence interval with an upper limit of 0.080 considered acceptable), SRMR < 0.080, and CFI and TLI > 0.95. As per recommendations, fit

criteria were not regarded as universal thresholds; rather, models were evaluated based on sound overall considerations.

Moderations by gender were further investigated by identifying paths that differed significantly across genders. To this end, we ran the model with the structural paths among the latent variables constrained to be equal across the two gender groups. The paths were then freed one by one, in separate models. The paths that produced a significant chi-square decrease, computing the chi-square difference with Satorra's corrections for MLR (Satorra & Bentler, 2001), when they were allowed to be estimated freely in comparison to the reference model were concluded to differ significantly across genders.

## Results

### Descriptive statistics

Descriptive statistics for the study variables are given separately for male and female participants in Table 1. In both groups, the mean scores for perceived performance climate were relatively similar to those of perceived mastery climate. However, male participants had slightly higher scores than female participants in both performance and mastery climate. Percentages with mean scores $\geq 4.5$, indicating quite or complete agreement, were 43.1% (male participants) and 30.3% (female participants) for perceived performance climate, and 41.4% (male participants) and 31.3% (female participants) for perceived mastery climate. Female participants recorded higher scores for academic stress than male participants. A total of 50.5% of the female participants had scores $\geq 3.5$, indicating high levels of academic stress. For male participants, the same proportion was 27.4%. Female participants also exhibited higher scores of emotional problems. Of the female participants, 51.4% scored above the cut-off of 1.85 for SCL-10 (Strand et al., 2003) compared to 24.9% of male participants. Of the female participants, 29.4% had a mean score $\geq 2.5$ as did 11.1% of the male participants, reflecting a general tendency to respond with quite or very strong complaints for symptoms of emotional problems.

Mastery climate was negatively correlated with academic stress and emotional problems, whereas performance climate was positively correlated with academic stress and emotional problems. Academic stress was also positively correlated with emotional problems (Table 2).

### Test of the structural equation model

The structural equation model (Figure 1) fit the data adequately: $\chi^2(278) = 1230.97$, $p = .00$, CFI = 0.93, TLI = 0.92, RMSEA = 0.050 (90% CI 0.047, 0.053), and SRMR = 0.042. In the model, mastery climate was negatively associated with academic stress and emotional problems. Performance climate was positively associated with academic stress, but it was not directly associated with emotional problems. Academic stress was positively associated with emotional problems, and the effects of the associations between perceived climate and emotional problems were via academic stress, partially for mastery climate and completely for performance climate: The indirect association (standardised) from mastery climate via academic stress was −0.09, $p = .00$ (95% CI: −0.12,

**Table 1.** Descriptive statistics of the manifest variables.

| | Males ($n = 712$) | | Females ($n = 667$) | | Tests of differences | | |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | Cohen's *d* | *t* | *p* |
| Performance climate | 4.19 | 0.88 | 3.90 | 0.92 | 0.32 | 5.88 | .00 |
| Mastery climate | 4.04 | 1.03 | 3.88 | 0.94 | 0.16 | 3.02 | .00 |
| Academic stress | 2.74 | 1.20 | 3.36 | 1.14 | 0.53 | −9.82 | .00 |
| Emotional problems | 1.56 | 0.63 | 2.03 | 0.80 | 0.65 | −12.34 | .00 |

Note: Performance climate and mastery climate were rated from 1 to 6, academic stress was rated from 0 to 5, and emotional problems were rated from 1 to 4.

**Table 2.** Bivariate correlations between manifest study variables, and with control variables.

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Performance climate | – | | | | | |
| 2. Mastery climate | −.10** | – | | | | |
| 3. Academic stress | .23** | −.25** | – | | | |
| 4. Emotional problems | .09** | −.25** | .48** | – | | |
| 5. Gender | −.16** | −.08* | .26** | .32** | – | |
| 6. Study track | .10** | −.22** | .18** | .08** | .21** | – |
| 7. Prior grades | .06* | −.17** | .09** | .05 | .27** | .57** |

Note: * $p < .05$ (two-tailed), ** $p < .01$ (two-tailed). Gender is coded: 0 = Male; 1 = Female. Study track is coded: 0 = Vocational track; 1 = Academic track.

−0.06), and the indirect association (standardised) from performance climate via academic stress was .15, $p = .00$ (95% CI: 0.11, 0.18).

Among the control variables, gender demonstrated the strongest associations in the SEM model (only associations with $p < .05$ are mentioned in the following); being a female was associated with more academic stress ($\beta = .33$, $p < .01$) and more emotional problems ($\beta = .21$, $p < .01$), while being a male was associated with a stronger performance climate ($\beta = .23$, $p < .01$). Study track showed weak associations with performance climate ($\beta = .17$, $p < .01$, more in academic), mastery climate ($\beta = .19$, $p < .01$, more in vocational), academic stress ($\beta = .11$, $p < .01$, more in academic), and emotional problems ($\beta = .08$, $p < .01$, more in vocational). Academic achievement level (prior grades) was weakly and negatively associated with mastery climate ($\beta = -.08$, $p = .03$) and academic stress ($\beta = -.14$, $p < .01$).

To explore gender differences in the associations between motivational climate, academic stress and emotional problems, we tested a multigroup model by gender. This model showed adequate fit to the data: $\chi^2(555) = 1497.55$, $p = .00$, CFI = 0.92, TLI = 0.92, RMSEA = 0.050 (90% CI .047, .053). The only path that significantly differed across genders was the association between academic stress and emotional problems; this association was stronger for female participants ($\beta = .52$, / $B = 0.40$, $p < .01$) than male participants ($\beta = .44$/$B = 0.24$, $p < .01$).

## Discussion

This study addresses academic stress among upper secondary school students and how it is related to perceived motivational climate and emotional problems. We proposed and tested a structural equation model of the associations between motivational climate dimensions (mastery and

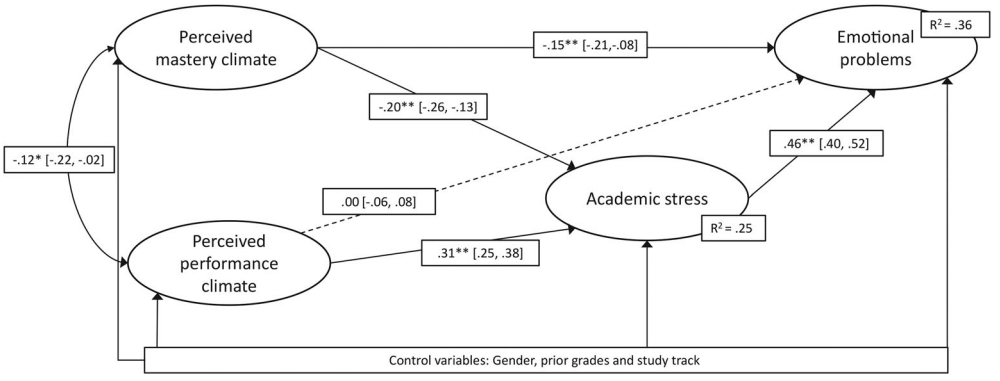


**Figure 1.** Standardised estimates from the structural equation model for the whole sample ($N = 1379$), with 95% confidence intervals in brackets. Note: * = $p < .05$, ** = $p < .01$. Results for the control variables and the measurement part of the model are not reported in the figure to increase readability.

performance climate) and emotional problems via academic stress. Gender differences in the levels of these variables, and whether gender moderated any of the associations were also examined.

As expected, (H1), the proportion of students reporting high levels of academic stress was substantial and higher among female participants. The results indicated that about 50% of the female participants experienced high academic stress, compared to about 27% of male participants. Although some level of stress is necessary for optimal effort and performance, these high levels of stress suggest that academic stress is a serious challenge among upper secondary school students and especially among females. This aligns with the finding that girls invest heavily in schoolwork and that working hard to attain higher academic achievements is expected more from girls than boys (Låftman et al., 2013). This may reflect a tendency of girls to be more committed to school achievements than boys, given that strong commitment increases the risk of stressful appraisals (Lazarus, 1991).

As for academic stress, scores on emotional problems were high and higher among female participants (supporting H2). More than 50% of the female participants scored above the cut-off score for SCL-10, which could indicate a risk for anxiety or depression (Strand et al., 2003). The comparable percentage for male participants was 25. Both percentages are high and concerning. The findings seem to reflect the high numbers of emotional problems found among adolescents, in previous literature and indicated both by self-report and the use of medication to manage anxiety and depression (Folkehelseinstituttet, 2018; Inchley et al., 2020). However, the percentage scoring above the established cut-off is remarkably high and could reflect that the threshold for expressing emotional problems among young people may have decreased since the cut-off was established. One reason could be an increased openness and de-stigmatisation regarding emotional problems (Sælid et al., 2021). Hence, one could question whether the cut-off score for SCL-10 needs to be re-examined. If the cut-off score was set to 2.5, reflecting a more general tendency to respond with some or several complaints, approximately 30% of female participants scored above this cut-off. However, this would still be a concerningly high percentage compared to the number of youths in this age-group that are registered as having anxiety and depression and receiving help for the same (Folkehelseinstituttet, 2018).

Regarding perceived mastery and performance climates, the means among both female and male participants indicated relatively similar levels of both types of climates, with slightly higher scores for performance climate. Other studies have, conversely, found that mean levels of perceived mastery climate exceed that of perceived performance climate, however, these studies included younger students and did not investigate levels in gender groups (Shim et al., 2013; Stornes et al., 2008).

As expected, the results from the structural equation model showed a moderate tendency of perceived performance climate to be associated with higher academic stress, whereas perceived mastery climate was linked to lower academic stress. Although the association from mastery climate to academic stress was relatively weak, it supports the notion that focus on learning is likely to promote a balance between resources for learning and academic demands and thus experience less academic stress. As previous research indicates a positive association between performance climate and anxiety and shame at both individual and classroom level (Baudoin & Galand, 2017), results could also suggest that a performance climate involving comparisons of abilities and academic results for many students contribute to perceived imbalance between such resources and demands and give rise to academic stress.

The significant association between perceived performance climate and emotional problems was completely via academic stress (supporting H6). This may indicate that a perceived performance climate could be a risk factor for emotional problems through increased academic stress. While the hypothesised negative indirect association between perceived mastery climate and emotional problems via academic stress was also supported (H5), an additional direct association (negative) was revealed. This suggest that the role of mastery climate in emotional problems may be multiple and could influence emotional problems both directly and via academic stress. Mastery climate focuses on the learning process and has been found to be related to intrinsic motivation (Skaalvik

& Skaalvik, 2013); this involves positive emotions such as vitality and enthusiasm (Ryan & Deci, 2000). Hence, our findings are in line with the notion that a strong mastery climate induces positive emotions, which act as buffers against emotional problems.

Academic stress was strongly associated with emotional problems (supporting H3), and thus in line with theoretical reasoning and the few previous studies that have examined this relationship (Haugan et al., 2021; Slivar, 2001). This is regarded as an important empirical finding that aligns with the argument that succeeding in school is increasingly important for many young people (Eriksen et al., 2017; Inchley et al., 2020). Moreover, it is in line with the view that academic stress could contribute to increased emotional problems among adolescents (Eriksen et al., 2017; Pascoe et al., 2020). However, more longitudinal studies are needed to make firm conclusions.

Gender moderated the link between academic stress and emotional problems (supporting H4). As anticipated, academic stress was more strongly linked to emotional problems among female students. This may reflect that girls consider school to be more important than boys (Låftman et al., 2013; Schraml et al., 2012), especially since when a person considers something to be at stake, it has the potential to elicit higher levels of stress (Emmons, 1991; Lazarus, 1991; Leibowitz-Levy, 2008). Moreover, since adolescent girls are believed to have a stronger stress response than boys (Bale & Epperson, 2015; Hodes & Epperson, 2019), and report more emotional problems (Inchley et al., 2020) than males, this may also explain the stronger link between academic stress and emotional problems among females. Hence, findings suggest that perceived academic stress may have more negative influence on girls in terms of emotional problems. That girls scored markedly higher on academic stress and emotional problems than boys are worthy of attention. A meta-analytic review suggests that, overall, adolescent girls are more emotionally expressive than boys (Chaplin & Aldao, 2013). Hence, both high levels of reported academic stress and its robust associations with emotional problems must be taken seriously.

### *Strengths and limitations of the study*

The sample of the study was rather large, and even though it was drawn from a single region in Norway and was not random, it represented a solid variation reflecting the Norwegian upper secondary student population in several ways. The response rate was satisfactory. The inclusion of relevant control variables contributed to the reliability of the associations found between the variables, and the robust statistical methods strengthened the statistical validity of the study.

The study had a cross-sectional design and causal inferences cannot be made. As notified by Bollen and Pearl (2013) regarding structural equation modelling, good model fit does not prove any causal assumptions, it only makes them more plausible. The specification of the tested model was based on sound theories about the role of perceived motivational climate, yet other theoretical perspectives could generate alternative and plausible models (Bollen & Pearl, 2013). Longitudinal studies that could better assess directionality and longitudinal relationships between motivational climate, academic stress and emotional problems are needed.

The latent variable approach is considered a strength, in that it could account for measurement errors. However, the covariance between certain residuals indicated that the indicators do not perfectly reflect the latent phenomena, yet allowing such covariance to be accounted for in the SEM-model can be important to avoid misleading results (Cole et al., 2007). Nonetheless, the two-factor measurement model of motivational climate was not optimal with some relatively low loadings, and it was only partial invariant across gender. The slightly low internal consistency reliability of performance climate also calls for future studies that could seek to strengthen this scale. For instance, one could investigate if motivational climate should be conceptualised and measured as more than two dimensions. While we cannot rule out whether the challenges with the measurement models may have affected the result, the results were in line with expectations.

Although the associations between motivational climates and academic stress were significant and in the hypothesised directions, they were not strong. One may speculate whether students perceive different levels of mastery and performance climate across subjects, and if a subject-specific approach to assessing motivational climate would have demonstrated stronger associations.

### *Concluding remarks and practical implications*

The results of this study suggest that levels of academic stress and emotional problems are concerningly high among upper secondary school students, particularly among girls. Moreover, there was a strong link between academic stress and emotional problems. These findings underscore the need for efforts to reduce academic stress and emotional problems among upper secondary school students, and further suggest that reducing perceived performance climate and enhancing mastery climate could have potential to reduce academic stress. A practical pool of classroom strategies has been proposed in TARGET, a framework for teachers to emphasise goal-related messages (Lüftenegger et al., 2014). These instructional strategies involve meaningful and interesting tasks (T), shared authority (A) between teacher and students, recognition (R) of progress and effort to all students, flexible and heterogeneous groupings (G), unofficial evaluation (E) based on improvement and effort, and flexible time (T) use (Ames, 1992; Patrick et al., 2011). Further empirical studies on the influence of such frameworks are needed, given that evidence on the links between learning environments and emotional health is limited (Kidger et al., 2012). Nonetheless, the results of the current study indicate that it is important for schools to be consciously aware of the qualities of the motivational climate in their classes, to optimise the conditions for students to deal with academic challenges in health-promoting ways.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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