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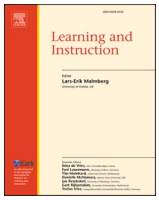

Trajectory subgroups of perceived emotional support from teachers: Associations with change in mastery climate and intentions to quit upper secondary school

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ABSTRACT

The aims of this three-wave longitudinal study were to identify and describe trajectories of perceived emotional support from teachers and investigate whether these trajectories were related to the development of intentions to quit upper secondary school via change in perceived mastery climate. Among 1379 Norwegian upper secondary school students, three trajectory subgroups were identified: stable high (84.9%), decreasing (7.8%), and low increasing (7.3%). The subgroups differed in levels of achievement ambition and academic self-concept. Further, a parallel process latent growth curve model revealed essential associations with change in intentions to quit school. Specifically, students with high probabilities of membership in the decreasing emotional support subgroup appeared to be at particular risk, perceiving a decrease in mastery climate that was related to a worrying development of intentions to quit school. The results are discussed considering the importance of a sustained supportive learning environment for late adolescents.

1. Introduction

The extent to which students feel emotionally supported by teachers who they can trust, who care about them, and who signal confidence in students' ability to realize their learning potential (Pianta et al., 2012; Wentzel, 2015) is regarded one of the most important characteristics of a supportive educational context (Eccles & Roeser, 2009). Numerous studies have suggested that this contributes to students' engagement and learning (Roorda et al., 2011, 2017) and is key to promote a mastery climate in class (Ames, 1992; Patrick et al., 2011; Stornes et al., 2008). Recently, poor perceived emotional support has been associated with intentions to quit school (Tvedt et al., 2021a), a warning sign of actual dropout (Vallerand et al., 1997; Vasalampi et al., 2018). While the negative consequences of dropout from school are well documented (Freudenberg & Ruglis, 2007; Organisation for Economic Co-operation and Development [OECD], 2020), there is a need for enhanced knowledge of how the psychosocial learning environment can restrain the development of intentions to quit school (Lillejord et al., 2015). Intentions to quit school represent students' serious considerations about leaving school (Frostad et al., 2015), and when assessed over time, it may express a gradual process towards dropout behavior (Rumberger, 2011).

Therefore, the present study provides detailed knowledge regarding the diversity in students' trajectories of perceived emotional support from teachers, including whether possible trajectory subgroups differ in achievement ambitions and academic self-concept, as well as the extent to which subgroup membership is associated with change in intentions to quit school. Based on previous work that emphasized motivational benefits of a mastery climate in class (Urdan & Kaplan, 2020; Patrick et al., 2011) and how an emotionally supportive teacher is crucial for establishing such climate (Ames, 1992), potential associations with change in intentions to quit were theorized to be *indirect,* via change in perceived mastery climate. As such, the study primarily concentrated on factors in the learning environment, which can be targeted by educational intervention efforts. Individual background variables, previously documented as predictors of dropout intentions and behavior (i.e., gender, study track, and prior GPA; Battin-Pearson et al., 2000; Tvedt et al., 2021a), were accounted for in the structural models.

First, the presence of trajectory subgroups of perceived emotional support during the first and second years of upper secondary school were explored using growth mixture modeling (GMM). Second, student characteristics (academic self-concept and achievement ambition)

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across subgroups were examined to improve understanding of how different types of students perceive being emotionally supported over time. Third, to examine whether membership in trajectory subgroups was associated with development in intentions to quit school indirectly via change in perceived mastery climate, membership information from GMM was treated as explanatory variables in a parallel process latent growth curve model (PP-LGCM). Fig. 1 is a conceptual model of the study.

The proposed directionality in Fig. 1 is justified by theory elaborated in subsequent sections. However, the empirically analyzed change processes were concurrent; therefore, the paths elucidate associations and do not claim causality.

1.1. The context of upper secondary school

Upper secondary education is not part of the compulsory educational system in Norway, yet 98% of all youth enter upper secondary directly after the final year of lower secondary school (Udir, 2020), i.e., the year they turn 16. Upper secondary completion rates are higher in academic (85%) than in vocational tracks (67%; OECD, 2020), and dropout is particularly prevalent after the second year (Udir, 2020). This study followed students during the first two years, permitting assessment while all students received education in schools. After these two years, most vocational programs proceed with two years of apprenticeships, whereas academic programs continue with a third year in school.

1.2. Trajectories of perceived emotional support

Perceived emotional support from teachers represents the affective dimension of student-perceived relationships with their teachers (Wentzel, 2015). While students in older age groups tend to experience weaker support from their teachers (Bokhorst et al., 2010; Bru et al., 2010), evidence suggests that the *importance* of emotional support is even greater in older age groups (Roorda et al., 2011).

Unfortunately, there is limited knowledge of teacher-student relationship trajectories during upper secondary school (Ettekal & Shi, 2020). However, using a traditional latent growth curve approach, De Wit et al. (2010) indicated an average decrease in perceived teacher support during high school, while another study Tvedt et al. (2021b) identified no average change over 13 months in upper secondary school. These studies were limited by the restrictive assumption that all students vary around the same growth pattern. However, compelling evidence from other age groups (Bosman et al., 2018; Spilt et al., 2012; Özdemir & Özdemir, 2020) has articulated between-student differences in these trajectories by acknowledging the presence of distinct trajectory subgroups. Such person-centered approaches enable investigating subgroups with similar developmental trajectories, which make them distinct from other subgroups (Morin et al., 2020). Atypical, yet genuine trajectories may thereby be uncovered, which is critical to understand non-normative or unexpected academic adjustment.

Students in upper secondary school are exposed to multiple and changing teachers and the diversity of student and institutional characteristics makes it reasonable that variability in perceived emotional support over time emerges as trajectory subgroups. Indeed, significant variance among students in their initial levels and rates of change over time has been reported (De Wit et al., 2010; Tvedt et al., 2021b). Person-centered research on closely related concepts also speaks to the plausibility of subgroups: Ratelle and Duchesne (2014) assessed perceived relatedness in school among students from grades 6 to 11 and identified four trajectory subgroups: *Stably low* (10%), *Stably moderate* (37%), *Moderate increasing* (48%), and *High increasing* (5%). Four trajectory subgroups of teacher-reported teacher-student warmth were also identified by Ettekal and Shi (2020) from grades 1 to 12: *Low-increasing* (7%), *Moderate* (9%), *High early-declining* (25%), and *High-declining* (59%). Among university students, Gillet et al. (2019) identified three trajectory subgroups of perceived global need support: *Low-decreasing* (27%), *Moderate decreasing* (12%), and *Moderate-increasing* (61%). Finally, Özdemir and Özdemir (2020) identified three trajectory subgroups of perceived teacher support among students from grades 7 to 9: *Average declining* (10%), *Average stable* (66%), and *High increasing* (24%).

Therefore, despite sparse evidence among late adolescents (Ettekal & Shi, 2020), it was expected that trajectory subgroups of perceived emotional support from teachers would appear in our sample of upper secondary school students. While the number and growth patterns of identified trajectory subgroups vary slightly across relevant studies, one pattern seems to transpire: most students follow trajectories of fairly stable, moderate, or high support from teachers. In addition, one or more subgroups tend to follow deviating paths, and students following these trajectories display disparate emotional, behavioral, or academic adjustment (Ettekal & Shi, 2020; Gillet et al., 2019; Ratelle & Duchesne, 2014; Özdemir & Özdemir, 2020). Accordingly, we expected that certain non-normative trajectory subgroups of perceived emotional support would display particular change in intentions to quit school.

1.3. Student characteristics in trajectory subgroups

Student-perceived support is a product of a teacher-student dialectic process in which teachers respond and relate differently to students depending on students' characteristics (Nurmi, 2012; Reeve, 2012). This process involves the mutual influence of student resources and the learning environment (Reeve, 2012), which is likely to produce differences in how student characteristics are distributed in trajectory subgroups of perceived emotional support. While prior person-centered studies of younger students have investigated the role of background variables (e.g., gender, ethnicity, SES, intellectual ability; Bosman et al., 2018; Özdemir & Özdemir, 2020; Spilt et al., 2012) the current study addresses the need for more knowledge regarding student motivational characteristics in such trajectories (Ratelle & Duchesne, 2014). Hence, salient motivational values and beliefs, represented by initial achievement ambitions and academic self-concept (Eccles & Wigfield, 2002) were investigated. Ultimately, this information could enable better identification of students at risk.

From a teacher-student dialectic perspective (Reeve, 2012),

Fig. 1. Conceptual model.

high-quality motivation (e.g., high achievement ambition and/or high academic self-concept) of students may lead to a reinforcing process of positive interactions with teachers that contribute to perceptions of being well emotionally supported. Contrastingly, students with a low academic self-concept may represent a segment more evidently in *need* of support, and thus receive more attention and encouragement from teachers (Mercer et al., 2011), potentially generating a positive trajectory of emotional support for these students.

Finally, while having high achievement ambitions is generally regarded as beneficial (Reeve, 2012), they can make individuals prone to stress, especially if goal attainment is considered uncertain (Lazarus, 2006). Having poor academic self-concept can induce such uncertainty. Students with a combination of high achievement ambition and poor academic self-concept are thus likely to be especially sensitive to negative changes in teacher support. Small or subtle signs of negative change may be overwhelming due to this sensitivity and increase the likelihood of unstable trajectories of perceived emotional support.

1.4. Mastery climate and the role of an emotionally supportive teacher

The construct of mastery climate stems from research on motivational climate (also termed *goal structure*) in the context of achievement goal theory (Ames, 1992; Urdan & Kaplan, 2020). If a student perceives that the motivational climate is characterized by valuing personal efforts and improvement rather than outperforming others, and that mistakes are a recognized part of the learning process, this indicates a strong mastery climate. A weak mastery climate could reflect a performance climate (Ames, 1992) or a learning environment with inconsistent or ambiguous norms. Students who perceive a strong mastery climate have more optimal motivation and attain favorable academic outcomes (Meece et al., 2006; Wang & Holcombe, 2010). Notably, a mastery climate is related to adaptive coping responses after failure (Patrick et al., 2011), suggesting that such a climate is particularly beneficial for students who experience frequent academic defeats.

All social agents in school can affect the motivational climate in class; however, teachers' behaviors and communication style are key determinants (Ames, 1992). Recommended strategies to promote a mastery climate involve recognition of efforts and endorsement of student perspectives (Lüftenegger et al., 2014), assumed to be catered by emotional support. Indeed, several studies have reported positive cross-sectional associations between perceived emotional support from teachers and a mastery climate (Patrick et al., 2011; Skaalvik & Skaalvik, 2013; Stornes et al., 2008). This indicates that when teachers are perceived as warm and caring, they proliferate a culture in which it feels safe and valued to invest and persevere in academic efforts independently of immediate success.

However, few studies have investigated these relationships in upper secondary school. Given the persistent need to address how teachers and educational contexts can optimize the motivational resources of their adolescent students (e.g., Lillejord et al., 2015), this is a critical gap in the literature.

1.5. Mastery climate as a resource to restrain intentions to quit school

A negative association between perceived mastery climate and intentions to quit school was recently reported in a study of upper secondary students and interpreted as mastery climate having a protective role against a dropout decision (Haugan et al., 2019). With this exception, few studies have examined the qualities of motivational climate related to intentions to quit school or dropout prevention. Nonetheless, studies consistently suggest that students who experience a strong mastery climate have a key motivational resilience (Skinner et al., 2020), which can be crucial to prevent intentions to quit school: Mastery climate is positively related to school identification (Wang & Holcombe, 2010), self-efficacy (Greene et al., 2004), effort, and adaptive help-seeking behavior (Skaalvik & Skaalvik, 2013). Furthermore, a mastery climate can be especially important for students with lower achievement (Eccles & Roeser, 2009), which is typical of students with stronger intentions to quit school (Tvedt et al., 2021a).

In summary, previous work suggests that students who perceive a strengthened mastery climate are likely to reduce their intentions to quit school. Conversely, if the climate is perceived as less appreciative of individual growth and with reduced generosity toward failure, an increase in intentions to quit is expected.

1.6. Current study

This study was designed to detail knowledge of trajectories of feeling emotionally supported by teachers, and how this can counteract a negative motivational process whose endpoint can be dropout from school. The following research questions were posed:

RQ 1: What trajectory subgroups of perceived emotional support from teachers emerge during the first and second years of upper secondary school? Based on previous work (Ettekal & Shi, 2020; Gillet et al., 2019; Ratelle & Duchesne, 2014; Özdemir & Özdemir, 2020), a total of three or four subgroups was considered most likely, with most students following trajectories of fairly stable moderate-to-high levels of support, and one or more subgroups displaying marked change or persistent low levels.

RQ 2: How do subgroups differ in students' initial achievement ambition and academic self-concept? Because a positive circle of initiative and interaction with teachers tends to occur for highly motivated students (Nurmi, 2012; Reeve, 2012), relatively high levels of achievement ambition and academic self-concept were expected in subgroups of stable moderate-to-high levels of perceived emotional support. However, different mechanisms can occur in particular combinations of these characteristics. Due to the a priori unknown trajectory patterns, we were reluctant to formulate more specific expectations.

RQ 3: To what extent is membership in trajectory subgroups related to change in intentions to quit school, indirectly via change in perceived mastery climate? We were guided by theory that (a) emotionally supportive teachers are important for establishing and maintaining a mastery climate in class (Ames, 1992; Patrick et al., 2011), and (b) a mastery climate provides the optimal conditions for sustained efforts and confidence among all learners (Eccles & Roeser, 2009; Urdan & Kaplan, 2020), which could potentially counteract the development of intentions to quit school. Accordingly, we hypothesized that membership in trajectory subgroups of emotional support would be associated with change in perceived mastery climate, which in turn would exhibit a negative association with change in intentions to quit school.

2. Methods

2.1. Sample and procedure

This study was part of a research project (Tvedt et al., 2021a; 2021b) with 1379 upper secondary school students (52% male; 94% aged 16–18 years $M = 16.25$ $SD = 0.49$, and 6% $\geq$ 19 years old at T1). Participants were recruited from seven public schools in the southwest of Norway. A slight majority (54%) followed a vocational track, and students with immigrant backgrounds formed 17% of the sample. Although not a probability sample, schools were selected purposively (Trochim et al., 2016) in collaboration with the county's school administration, aiming to resemble the student population considering gender, study programs, GPAs from lower secondary school, and city/suburban locations.

The study comprised three waves of self-reports combined with register data from the county's administration. Self-reports were obtained through electronic questionnaires in a normal classroom setting supervised by a teacher. The first wave (T1) was collected in the second semester of the first year in upper secondary school (February 2017), and the second and third waves (T2 and T3) were collected in the first

and second semester, respectively, of the following school year (October 2017 and March 2018). The total time span was 13 months. Consent to participate included consent to match self-reports with register data via a confidential coding system approved by the Norwegian Centre for Research Data. Gender, study track, and prior GPA were obtained from the county's register.

At T1, 90% of invited students participated ($N = 1379$), and all students who provided data at T1 were invited to do so at T2 ($N = 1073$) and T3 ($N = 1008$). Indeed, 86% of the participants provided data at two or more time points, and 65% of the participants provided data for all waves.

2.2. Missing data

Attrition at T2 and T3 was associated with lower GPA from lower secondary school ($r = -0.12$ and -0.11, $p < .01$, for T2 and T3, respectively) and higher intentions to quit at baseline ($r = 0.15$ and 0.12, $p < .01$); thus, missingness was not completely at random. Full information maximum likelihood (FIML) with auxiliary variables (see Supplemental Material) was therefore applied to increase the plausibility of the missing at random assumption (Enders, 2010).

2.3. Measures

Wordings of all self-reported items are provided in Supplemental Material.

2.3.1. Perceived emotional support

Emotional support from teachers was self-reported with five items (e.g., *I feel that my teachers care about me)*. Responses were provided on a six-point scale from 1 (*completely disagree*) to 6 (*completely agree*). The scale is widely used among younger students (e.g., Bru et al., 2010), and the upper secondary school version has demonstrated good psychometric qualities (Tvedt et al., 2021a). A composite score was formed for each time point (T1 $\alpha = 0.94$; T2 $\alpha = 0.94$; T3 $\alpha = 0.95$).

2.3.2. Perceived mastery climate

Students' perception of a mastery climate was self-reported via five items (e.g., *In my class, mistakes are okay as long as we are learning)*. The items were derived and slightly adjusted from the Classroom Mastery Goal Structure subscale from Patterns of Adaptive Learning Scales (PALS), which has been widely used and shown to be valid and reliable in various samples (Meece et al., 2006; Midgley et al., 2000; Urdan & Kaplan, 2020). Responses were made on a 6-point scale from 1 (*completely disagree*) to 6 (*completely agree*). A composite score was formed for each time point (T1 $\alpha = 0.78$; T2 $\alpha = 0.82$; T3 $\alpha = 0.82$).

2.3.3. Intentions to quit school

Intentions to quit school were self-reported via five items (e.g., *I consider leaving school and finding a job instead*) derived from Frostad et al. (2015), with the wordings reported in Tvedt et al. (2021a); both studies reported adequate psychometric properties. Responses were made on a six-point scale from 1 (*absolutely not true*) to 6 (*absolutely true*). A composite score was obtained for each time point (T1 $\alpha = 0.88$; T2 $\alpha = 0.89$; T3 $\alpha = 0.90$).

2.3.4. Achievement ambition

Three self-report items were created for this study to encompass achievement ambitions at T1. The items captured attitudes regarding the value of academic attainment (e.g., *It is important for me to get a good education*). Responses were provided on a six-point scale from 1 (*completely disagree*) to 6 (*completely agree*). A composite score was formed ($\alpha = 0.87$).

2.3.5. Academic self-concept

Academic self-concept was self-reported at T1 by a four item-scale (e.g., *I learn easily in all subjects)* previously used with primary and lower secondary students (Skaalvik & Skaalvik, 2009, 2013), in which it displayed good psychometric qualities. Responses were provided on a six-point scale from 1 (*completely disagree*) to 6 (*completely agree*). Two items were negatively worded and thus reverse-coded; higher scores indicated higher academic self-concept. A composite score was formed ($\alpha = 0.78$).

2.3.6. Control variables

Prior GPA was captured as the average grade point of three core subjects (Norwegian, Mathematics, and English) after the final year of lower secondary school (lowest = 1, highest = 6; $\alpha = 0.86$). These were obtained from the county register, together with gender (0 = male, 1 = female) and study track (0 = vocational track, 1 = academic track).

2.4. Analytic strategy

Analyses were conducted in Mplus 8.3, using maximum likelihood estimation with robust standard errors (MLR) to account for non-normal distributions of observed variables (Muthén & Muthén, 1998–2017). First, preliminary analyses were performed, including a measurement model of all constructs measured at T1, as well as examination of longitudinal measurement invariance of the three constructs assessed longitudinally. Model fit was evaluated according to Hooper et al. (2008), whereby good fit was indicated by CFI > 0.950, RMSEA < 0.070, and SRMR < 0.080. For longitudinal measurement invariance, a change less than 0.010 in CFI when comparing increasingly restrictive models was used as indication of invariance (Cheung & Rensvold, 2002). Although composite scores were used in the primary analyses, these steps were taken with the indicators to ensure the factorial structure and that the measures were consistent over time (Wang & Wang, 2020).

Second, the presence of trajectory subgroups was explored using growth mixture models (GMM). GMM is a person-centered extension of a latent growth curve model (LGCM) that can identify unknown a priori groups of individuals who follow discrete longitudinal trajectories over time (Morin et al., 2020; Wang & Wang, 2020). Individuals' membership in trajectory subgroups is inferred probabilistically; various solutions (models) estimate each case's probability of belonging to each identified subgroup. To determine the optimal model, a set of statistical criteria is assessed (AIC, BIC, entropy, the VLMR test, and average posterior probabilities [AvePP] for most likely membership), alongside the principles of parsimony and interpretability (Morin et al., 2020; Wang & Wang, 2020). Accordingly, a series of unconditional models with increasing numbers of subgroups were inspected.

Third, when the optimal model was chosen, student characteristics across subgroups were investigated by auxiliary approaches (BCH and R3STEP), which are recommended to avoid unwanted shifts in the classification model while also accounting for its inaccuracy (Asparouhov & Muthén, 2019). The BCH was used to estimate levels of achievement ambition and academic self-concept across subgroups, and R3STEP was used to test whether these levels differed significantly across subgroups while accounting for gender, study track, and prior GPA.

Fourth, to test whether trajectory membership was associated with the development of intentions to quit indirectly via change in mastery climate, a parallel process latent growth curve model (PP-LGCM) of mastery climate and intentions to quit was specified (Cheong et al., 2003; von Soest & Hagtvet, 2011), in which posterior probabilities from the GMM functioned as independent variables. The continuous posterior probabilities were chosen instead of categorized membership to account for the degree of uncertainty in the class membership information (Wang & Zhou, 2013). The slope of intentions to quit was treated as the final outcome, and the slope of mastery climate as the intermediate variable, according to theory (Ames, 1992; Eccles & Roeser, 2009; Patrick et al., 2011). Both slopes were regressed onto their respective intercepts to account for between-student differences at baseline,

together with the control variables (gender, study track, and prior GPA). To ensure that individual changes in perceived mastery climate and intentions to quit school could be appropriately captured by linear growth curve models, these unconditional models were established prior to the PP-LGCM.

Fifth, because of the nested structure of the data (students nested in classes), all models were additionally run with the complex option in Mplus, accounting for potential bias in standard errors (McNeish et al., 2017). Since some alteration in class structure occurred across academic years, this was conducted separately for each cluster variable. However, since only minor changes in standard errors and no change in significance levels appeared in these analyses, results from models without the complex option are reported to avoid inessential complexity.

3. Results

3.1. Preliminary results

The measurement model with all indicators loading on their expected factor yielded acceptable fit to the data: CFI = 0.927, RMSEA = 0.056 (90% CI: 0.053–0.060), SRMR = 0.052, supporting satisfactory structural validity of the measures (details in Supplemental Material). Longitudinal measurement invariance was supported by comparing a configural version of the measurement model (CFI = 0.940) against a metric (ΔCFI = 0.001) and scalar model (ΔCFI = −0.002; Cheung & Rensvold, 2002). Correlations, means, and standard deviations of the study variables are presented in Table 1.

3.2. Identification of trajectory subgroups

The first research question addressed identification of trajectory subgroups of perceived emotional support from teachers. The statistical criteria (Table 2) supported solutions with more than one trajectory. While BIC and AIC-values continued to decrease with increasing number of groups, the decrease was less steep when the number of groups exceeded three. A non-significant VLMR test and a drop in AvePP also disfavored the four-group solution, and the five-group solution comprised one subgroup of only 1% of the students. The statistical criteria thus suggested a three-group solution, which yielded high substantive interpretability and accorded with expectations. Sensitivity analyses that verified the robustness of the three-group solution are described in Supplemental Material.

The final solution (Fig. 2) consisted of one large group (84.9%) following trajectories of high and stable emotional support (*Stable-high*; the normative group) and two groups distinctly deviating from this: a decreasing group (7.8%; *Decreasing*), and a low-increasing group (7.3%; *Low-increasing*).

3.3. Student characteristics across trajectory subgroups

The second research question addressed student characteristics (achievement ambition and academic self-concept) across trajectory subgroups. As shown in Table 3, *Low-Increasing* was characterized by low achievement ambition and poor self-concept; these levels were significantly lower than those of *Stable-high* when adjusting for gender, study track, and prior GPA. Further, *Decreasing* displayed equally low academic self-concept as *Low-Increasing*, while the achievement ambitions of the former were pointedly higher. Also worth noting is that prior GPA in *Low-increasing* was significantly lower than in *Stable-high* ($Z = -3.49$, $p < .01$), while no difference was found between *Decreasing* and *Stable-high* ($Z = 0.13$, $p = .90$).

3.4. Parallel process latent growth curve model

The third research question addressed the extent to which membership in trajectory subgroups was indirectly related to change in intentions to quit school, via change in mastery climate. Prior to specifying the parallel process latent growth curve model (PP-LGCM), which included membership information from the GMM as independent variables, the unconditional growth curve models of mastery climate and intentions to quit were specified. Their respective growth factors and model fits are reported in Table 4. For mastery climate, two residuals (T1 and T3) were equated to obtain a well-fitting unconditional model. This equality was supported by a non-significant Wald test ($\chi^2(1) = 0.73$, $p = .39$) and retained in the PP-LGCM.

The posterior probabilities (range 0.0–1.0) of membership in either of the non-normative groups (*Decreasing* or *Low-increasing*) were applied in the PP-LGCM (Fig. 3), while the probability of membership in the normative group (*Stable-high*) was the reference. Consequently, a significant coefficient for either *Decreasing* or *Low-increasing* should be interpreted as a predicted divergence from the normative group. The model yielded good fit: $\chi^2(22) = 52$, $p < .01$; RMSEA 0.031 (90% CI: 0.020–0.043); CFI = 0.986; SRMR = 0.020.

Fig. 3 shows that a high probability of membership in *Decreasing* was associated with more negative change in mastery climate compared to membership in *Stable-high*. Conversely, probabilities of *Low-increasing* were associated with relatively more positive development of mastery climate, compared to *Stable-high*. A significant negative relationship was

Table 1
Correlations, means, and standard deviations of study variables.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Emotional support T1	–													
2. Emotional support T2	.50**	–												
3. Emotional support T3	.42**	.61**	–											
4. Academic self-concept T1	.28**	.19**	.19**	–										
5. Achievement ambition T1	.20**	.11**	.07*	.17**	–									
6. Mastery climate T1	.37**	.28**	.19**	.07*	.16**	–								
7. Mastery climate T2	.29**	.48**	.33**	.05	.10**	.52**	–							
8. Mastery climate T3	.26**	.36**	.41**	.05	.19**	.43**	.58**	–						
9. Intentions to quit T1	-.34**	-.24**	-.22**	-.28**	-.28**	-.19**	-.11**	-.15**	–					
10. Intentions to quit T2	-.29**	-.34**	-.25**	-.23**	-.24**	-.10**	-.14**	-.14**	.53**	–				
11. Intentions to quit T3	-.26**	-.31**	-.35**	-.19**	-.19**	-.14**	-.17**	-.21**	.44**	.57**	–			
12. Gender	-.06*	-.13**	-.09**	-.08**	.18**	-.07*	-.09**	-.09**	-.01	-.07*	-.07*	–		
13. Study track	-.09**	-.12**	-.08**	.06*	.15**	-.22**	-.31**	-.27**	-.11**	-.10**	-.11**	.21**	–	
14. Prior GPA	.06*	-.03	.00	.33**	.22**	-.17**	-.25**	-.22**	-.22**	-.23**	-.20**	.27**	.57**	–
Mean	4.50	4.50	4.53	3.70	5.07	4.17	4.28	4.16	1.78	1.79	1.84	0.48	0.46	3.59
Standard deviation	1.12	1.09	1.12	1.03	0.97	0.93	0.97	0.98	1.10	1.07	1.15	0.50	0.50	1.02

Note. All self-reported measures (variables no. 1–11) had the scoring range 1–6. Gender was coded 0 = male, 1 = female; and study track 0 = vocational, 1 = academic. Prior GPA range: 1–6.
*$p < .05$, **$p < .01$.

Table 2
Goodness of fit-statistics and group sizes for various growth mixture models.

No. groups	No. Free parameters	LL	aBIC	AIC	Entropy	*p*VLMR	AvePP	Group sizes	
								%	*N*
1	8	−4900	9833	9817	–	–	–	–	–
2	11	−4845	9735	9712	.83	< .01	.83–.97	90.4/9.6	1247/132
3[a]	**12**	**−4807**	**9662**	**9638**	**.81**	**< .01**	**.81–.94**	**84.9/7.8/7.3**	**1171/108/100**
4[a]	15	−4784	9629	9598	.82	.12	.68–.94	83.3/6.0/5.6/5.1	1149/83/77/70
5[a]	18	−4769	9612	9575	.82	< .01	.69–.92	80.5/9.4/4.8/4.2/1.0	1111/130/66/58/14

Note. LL = Log likelihood, aBIC = adjusted Bayesian information criterion, AIC = Akaike information criterion, VLMR = Vuong-Lo-Mendell-Rubin test, AvePP = Average posterior probabilities.
[a] No significant group-specific slope variance was found in this model; thus, this parameter was restricted to zero.

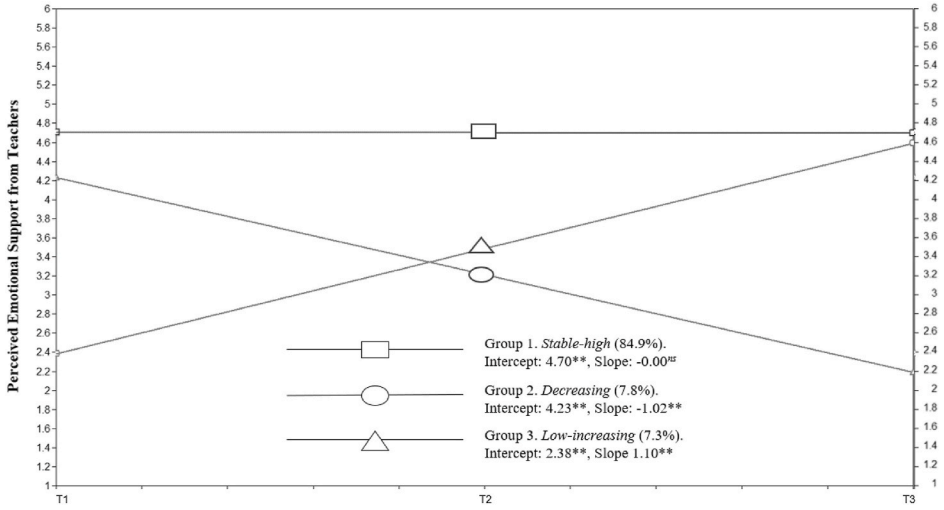

Fig. 2. Visual plot and growth factors of trajectory subgroups of perceived emotional support.

Table 3
Student characteristics across trajectory subgroups.

	1. *Stable-high*	2. *Decreasing*	3. *Low-increasing*	Differences across groups
Achievement ambition	5.08	5.37	4.54	1 > 3, 2 > 3
Academic self-concept	3.80	3.12	3.11	1 > 2, 1 > 3

Note. Results obtained by BCH for estimating means and R3STEP to test differences adjusting for gender, study track, and prior GPA. Marked differences were significant at $p < .05$.

found between change in perceived mastery climate and change in intentions to quit, indicating that students experiencing a decreasing mastery climate, were more likely to increase their intentions to quit. The indirect association between membership in *Decreasing* and change in intentions to quit was significant ($B = 0.35$, $p < .01$) and confirmed by the 95% confidence interval in a bias-corrected bootstrap analysis (MacKinnon et al., 2004). The indirect association of *Low-increasing* was not significant ($B = -0.16$, $p = .10$). To check the robustness of these findings, a sensitivity analysis was performed, in which achievement ambition and academic self-concept, as well as the interaction between them, were included in the final model (predicting both change in mastery climate and change in intentions to quit). The results given above were unchanged.

Finally, a follow-up analyses with the auxiliary BCH (Asparouhov & Muthén, 2019) provided levels of intentions to quit across subgroups by the final time point (T3): *Decreasing* had the highest mean level of intentions to quit ($M = 3.02$, $SE = 0.22$), followed by *Low-increasing* ($M = 2.44$, $SE = 0.25$), and *Stable-high* ($M = 1.66$, $SE = 0.04$).

4. Discussion

This study investigated trajectory subgroups of perceived emotional support from teachers, student characteristics (achievement ambition and academic self-concept) across subgroups, and whether membership in trajectory subgroups was indirectly associated with change in intentions to quit school via change in perceived mastery climate. Thus, we aimed to elucidate possible mechanisms that can culminate in dropout from upper secondary school.

Table 4
Results from unconditional latent growth curve models.

	Intercept	Slope	Intercept—Slope Correlation	Model Fit		
	Mean (Variance)	Mean (Variance)	*r*	$\chi^2(df)$	RMSEA	CFI
Intentions to quit	1.78** (0.72**)	0.06** (0.12**)	-.25*	0.04 (1)	.000	1.00
Mastery climate	4.19** (0.56**)	0.01[ns] (0.11**)	-.32**	14.6 (2)	.068	.98

Note. Means of intercepts and slopes are unstandardized metrics.
*p < .05, **p < .01.

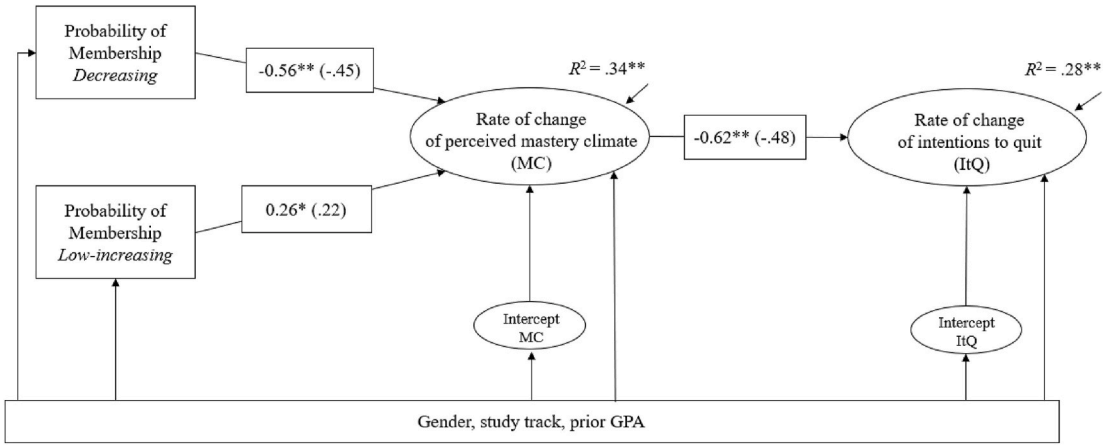

Fig. 3. Parallel Process Latent Growth Curve Model (PP-LGCM) with Probabilities of Trajectory Subgroup Membership as Independent Variables.
Note. Unstandardized coefficients, standardized in parentheses. Probability of membership in *Stable-high* (normative) was the reference. *$p < .05$, **$p < .01$.

4.1. Three trajectory subgroups of perceived emotional support

Consistent with our expectations, the resource of having emotionally supportive teachers over time was not uniformly experienced by students. Three trajectory subgroups were identified: (1) high and stable levels of perceived emotional support (84.9%), (2) decreasing levels (7.8%), and (3) low but increasing levels (7.3%). In relation to prior person-centered studies with younger students (e.g., Bosman et al., 2018; Özdemir & Özdemir, 2020), a larger proportion of students with high and stable support were currently identified, which is promising given numerous studies linking emotional support to engagement and learning (e.g., Roorda et al., 2017). However, the two non-normative subgroups raise concerns. The decreasing subgroup comprised students whose initial level was quite similar to that of the stable-high group, but showed a steep downward trend, which by Time 3 indicated "quite disagreement" that their teachers were emotionally supportive (Fig. 2). Conversely, students in the low-increasing group experienced initially low levels, but considerable enhancement of support.

4.2. Associations with change in perceived mastery climate and intentions to quit, in light of student characteristics

The parallel process latent growth curve model with trajectory membership as explanatory variables predominantly supported theoretical expectations. First, the relatively strong inverse association between change in mastery climate and change in intentions to quit expands on conclusions from repeated cross-sectional analyses (Haugan et al., 2019) and supports the potential of a mastery climate to prevent dropout. This indicates that intentions to quit school are less likely to develop when students experience a culture in which progression is explicitly valued more than grades or test scores, and failure is viewed as integral to the learning process (Urdan & Kaplan, 2020). Furthermore, patterns of student characteristics across subgroups illuminate these complex processes of change.

Findings regarding the *Decreasing* group indicate a student segment at risk. These students are apparently in a learning environment that over time poorly fits their needs (Eccles & Roeser, 2009), which seems to propel negative motivational development in the form of increased intentions to quit school. Compared to the normative group, they were more prone to experience a decrease in mastery climate, which was further associated with an increase in intentions to quit school. Indeed, the mean level of intentions to quit in this group by Time 3 was more than one standard deviation above the sample mean, implying a warning about disrupted educational progress (Vasalampi et al., 2018). The characteristics of this group, namely highly ambitious but with fragile academic self-concept, frame them as a late-onset risk group, and actualizes what Blondal and Adalbjarnardottir (2012) refer to as unexpected educational pathways. That their prior GPA did not differ from the normative group accentuates this, and may explain why their needs apparently slip under the radar of teachers. To teachers, these students may primarily appear engaged and self-driven. However, their poor academic self-concept could indicate that they have high needs when facing demanding tasks (Lazarus, 2006) and may also be key to why a decrease in mastery climate appears to be a salient mechanism for their increased intentions to quit school: A weakened mastery climate will provide elevated uncertainty about how academic mistakes are addressed, which may lead to a sense of hopelessness and increased intentions to quit school. Indeed, the combination of low academic self-concept and high achievement ambition resembles a profile found among younger students (Virtanen et al., 2019), and may be related to aspects of school burnout, which is associated with dropout from school (Bask & Salmela-Aro, 2013).

The *Low-increasing* subgroup exhibited equally low levels of academic self-concept as the *Decreasing* group, but otherwise portrayed a dissimilar student typography, namely the lowest level of achievement ambition and poor prior GPA. From a school dropout risk perspective (e.g., Battin-Pearson et al., 2000; Markussen et al., 2011), this group would be regarded a typical risk group; low ability beliefs, low value placed on educational attainment, and poor academic performance. Interestingly, the positive growth of perceived emotional support within this subgroup indicates that their need for relatedness with teachers is well identified and met, at least after some time in the system. However, the degree to which this strengthened support is efficient in hindering negative academic development remains ambiguous. Membership in the *Low-increasing* group was related to more positive trajectories of perceived mastery climate, although divergence from the normative group was relatively weak. This suggests that improvements in emotional support have a potential to strengthen a mastery climate among students with suboptimal academic beliefs. However, the non-significant indirect association between membership in this subgroup and change in intentions to quit indicates that it is more demanding to counteract a negative pathway of intentions to quit, at least during this limited period of time. More comprehensive support may be required. Indeed, other studies have provided modest support for a recovery hypothesis (i.e., low yet increasing social support reducing maladjustment; Bosman et al., 2018; Cornwell, 2003), and Cornwell (2003) showed that the impact of reduced social support was more decisive than that of strengthened support.

4.3. Methodological considerations

The current person-centered approach represents a strength in that atypical trajectories that would not have been crystallized from a traditional latent growth curve approach were identified. However, given the few previous person-centered studies in this age group, research from other educational contexts is needed.

Since the measured change processes were concurrent in the present design, causal relationships were not tested. Future designs with more time points over longer time could permit sequential ordering of the growth processes (von Soest & Hagtvet, 2011). Furthermore, while initial achievement ambition and academic self-concept were auxiliary variables in the current GMM, alternative perspectives (e.g., Skaalvik & Skaalvik, 2013) could guide valuable investigations of whether these characteristics change as functions of change in the learning environment.

Although self-reported dropout intentions are valuable, future work including dropout behavior is needed. Moreover, that the study relied on self-reported emotional support must be considered when determining practical implications. Future studies using combined data sources could illuminate the complex phenomenon of teacher-student relationships in relation to intentions to quit school.

4.4. Conclusions and practical implications

This study found heterogeneity in students' perceived emotional support from teachers over time and highlighted the saliency of a consistent supportive learning environment for late adolescents. While most students experience supportive teachers, two non-normative trajectory subgroups were identified. At particular risk was the group who experienced a substantive deterioration of emotional support that was related to a decrease in perceived mastery climate and a worrying development of intentions to quit school.

It is therefore imperative that teachers identify students who may have an understated need for encouragement and support, so that these students do not lose their motivation for schoolwork. Students with high achievement ambitions and low academic self-concept may display such vulnerability. If this identification fails, initially well-adjusted students may shift into negative pathways with an amplified risk of dropping out. This is an appeal to teachers and schools to systematically monitor all students' perception of teacher support, so that they are able to identify whether some students are heading towards negative development, and to intervene accordingly. Students at more traditional risk appeared to be well emotionally supported by teachers, although a more comprehensive support system seems required to counteract these students' development of intentions to quit. The role of emotional support thus appeared notably pivotal when decreasing over time (the negative pathway). This indicates that it requires more to repair than to tear down late adolescents' motivation for further schooling.

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Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.learninstruc.2021.101562.

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