





The role of within-class consensus on mastery goal structures in predicting socio-emotional outcomes

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Background. Within-class consensus on mastery goal structures describes the extent to which students agree in their perceptions of mastery goal structures. Research on (work) teams suggests that higher levels of consensus within a group indicate a well-functioning social environment and are thus positively related to beneficial socio-emotional outcomes. However, the potential of within-class consensus to predict socio-emotional outcomes has not yet been explored in research on mastery goal structures.

Aims. This study aimed to test whether within-class consensus on the three mastery goal structures dimensions of task, autonomy, and recognition/evaluation has predictive power for socio-emotional outcomes in terms of classroom climate, negative classmate reactions to errors, and cooperative learning.

Sample. A total of 1,455 Austrian secondary school students (65.70% female) in 157 classrooms participated in this study.

Methods. Students responded to items measuring their perceptions of mastery goal structures, classroom climate, error climate, and cooperative learning. Items assessing mastery goal structures, error climate, and cooperative learning referred to the subject of mathematics and items assessing classroom climate referred to positive classmate relations without focusing on a subject.

Results. Results from multilevel structural equation models revealed that within-class consensus on all mastery goal structures dimensions predicted a less negative error climate. Additionally, consensus regarding task and autonomy predicted more frequent use of cooperative learning strategies, and consensus regarding task predicted a more positive classroom climate.

Conclusions. Our findings show that higher levels of within-class consensus on mastery goal structures enhance beneficial socio-emotional outcomes. Moreover, the results emphasize the value of expanding the scope of educational research to the study of within-class consensus.

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Classrooms can be differentiated according to their prevailing motivational climate. The concept of classroom goal structures sees motivational climate as manifested in teachers' instructional practices and the messages they convey to their students, that is, the classroom goal structures they create (e.g., Miller & Murdock, 2007; Urdan & Schönfelder, 2006). Researchers agree that, among the different types of classroom goal structures, only a mastery goal structure that foregrounds students' efforts, deep understanding, and individual improvement is unequivocally positive for students (e.g., Ames, 1992; Patrick & Ryan, 2008). Early work in the field of classroom goal structures research identified three core dimensions of mastery goal structures capturing (1) the ways teachers design tasks, (2) the provision of autonomy in the classroom, and (3) teachers' recognition and evaluation practices (Ames, 1992).

Within groups – such as the group of students in a class – group members rely on one another to define aspects of their social reality (Festinger, 1950; Griffith, 2000; Levine & Moreland, 1990). Through interactions, group members construct a shared sense of social reality on elements relevant to the group (Bliese & Halverson, 1998; Echterhoff, Higgins, & Levine, 2009). Hence, one can assume that students' perceptions of the motivational climate, that is, their mastery goal structures, evolve in a process of socially shared reality construction. A commonly employed measure of the shared-ness of perceptions within groups is the extent of consensus among group members (e.g., Bliese & Britt, 2001). In the classroom context, consensus – here more specifically referred to as within-class consensus (e.g., Schweig, 2016) – describes the degree to which students in the same class agree in their perceptions of classroom features. Exploring within-class consensus on classroom goal structures provides a completely different perspective than that traditionally pursued within this line of research, which mainly focuses on mean levels of students' perceptions. Hence, the extent of consensus might reveal distinct information about the learning environment in class compared to mean levels.

However, what can within-class consensus reveal about classrooms? Research suggests that higher levels of consensus reflect a well-functioning social environment, whereas the absence of consensus leads to within-group stress and puts strains on interpersonal relations (Cole & Bedeian, 2007; Festinger, 1950; Levine & Moreland, 1990). The extent of consensus within a group is thus an indicator of the quality of the social environment (Bliese & Britt, 2001; Bliese & Halverson, 1998). As such, within-class consensus should be positively related to beneficial socio-emotional outcomes. Research conducted in the field of social and organizational psychology mostly confirms this notion and has established links between consensus within (work) teams and a number of socio-emotional variables (e.g., Cole & Bedeian, 2007; Sanders, Geurts, & van Riemsdijk, 2011; Sanders & Schyns, 2006). Still, there is a complete lack of studies in the area of classroom goal structures research – and the field of educational psychology more generally – on the socio-emotional implications of varying degrees of consensus within classes.

This study therefore aimed to shed light on the relations between within-class consensus on mastery goal structures and socio-emotional outcomes. Relying on Ames' (1992) conceptualization of mastery goal structures, we investigate within-class consensus on the three mastery goal structures dimensions of task, autonomy, and recognition/evaluation. We consider the following socio-emotional outcomes: a positive classroom social climate in the sense of student cohesiveness and positive peer relations (e.g., Aldridge, Fraser, & Huang, 1999; Allodi, 2010), a positive error climate as indicated by lower levels of negative classmate reactions to errors (e.g., Steuer, Rosentritt-Brunn, & Dresel, 2013), and students' employment of cooperative strategies (e.g., Fernandez-Rio, Cecchini, Méndez-Giménez, Méndez-Alonso, & Prieto, 2017).

Classroom goal structures

The term classroom goal structure describes the motivational climate that pervades a particular classroom setting (e.g., Ames, 1992; Meece, Anderman, & Anderman, 2006). Researchers working within the theoretical framework of classroom goal structures contrast mastery goal structures and performance goals structures, each reflecting a unique set of instructional practices and messages teachers communicate to their students about the nature of learning. If teachers place emphasis on students' real learning and understanding and recognize each student's individual improvement, they establish a *mastery goal structure* (e.g., Miller & Murdock, 2007; Patrick, Kaplan, & Ryan, 2011; Urdan & Schönfelder, 2006). On the other hand, if teachers focus on the importance of outperforming others or surpassing normative standards, a *performance goal structure*¹ arises (Patrick *et al.*, 2011). Empirical evidence collected over the past few decades has consistently demonstrated positive relations between mastery goal structures and adaptive outcomes, such as beneficial motivational orientations or learning strategies (e.g., Lau & Lee, 2008; Meece *et al.*, 2006; Murayama & Elliot, 2009). Performance goal structures, by contrast, have mainly been linked to maladaptive aspects, such as negative affect or less adaptive motivational patterns (Anderman, 1999; Wolters, 2004). Hence, researchers on classroom goal structures are united in their view that mastery goal structures represent the most favourable type of classroom goal structures. It is against this background that the present work focuses on mastery goal structures.

With an eye towards creating adaptive classroom environments, researchers have striven to identify the concrete dimensions of instructional practices that form a mastery goal structure (e.g., Lüftenegger, Tran, Bardach, Schober, & Spiel, 2017; Tapola & Niemivirta, 2008). In her seminal work, Carole Ames (1992) proposed three dimensions of mastery goal structures, that is, *task*, *authority*, and *recognition/evaluation*. In classes with high mastery goal structures, *tasks* are meaningful, challenging, and interesting, and teachers encourage students to self-regulate their work on tasks, for example, by setting goals or monitoring their learning. Furthermore, teachers share *authority* in decision-making with their students, meaning that they support students' autonomy with regard to both learning-related and social-related matters in the classroom (Ames, 1992; Epstein, 1988; Lüftenegger *et al.*, 2017; Patrick *et al.*, 2011). For the sake of conceptual clarity, researchers have recently proposed labelling this dimension autonomy instead of authority (Lüftenegger *et al.*, 2017). Finally, the *recognition/evaluation* practices teachers employ focus on each student's individual progress instead of comparing students, and teachers provide students with feedback on their learning (Ames, 1992).

Mastery goal structures as shared social reality

Classrooms are inherently social environments. In every classroom, students have social interactions and build social relationships with their classmates and teachers (Urden & Schönfelder, 2006). As such, the motivational climate within a class, that is, the prevailing mastery goal structure, also arises from social interactions. It has even been suggested that mastery goal structures are primarily manifested in the quality of social relationships between the teacher and students and among students (Patrick *et al.*, 2011). By the same

¹ It should be noted that some researchers further distinguish between performance-approach and performance-avoidance goal structures (e.g., Schwinger & Stiensmeier-Pelster, 2011).

token, social processes are involved in the formation of students' perceptions and, relatedly, their assessments of mastery goal structures.

Operationally, this social component becomes apparent in the phrasing of items measuring mastery goal structures, which typically refer to the group of students within a class rather than the individual student (e.g., 'In this class, we should set learning goals for ourselves', Lüftenegger *et al.*, 2017). Accordingly, it is assumed that a certain degree of alignment, that is, shared perceptions, exists among the students in a given class rating their mastery goal structures (e.g., Morin, Marsh, Nagengast, & Scalas, 2014). A widespread measure of the shared-ness of perceptions within groups is the extent of consensus among group members on a particular aspect of interest (e.g., Bliese & Britt, 2001; Bliese & Halverson, 1998). In the class context, within-class consensus describes the level of agreement within a class on classroom features, such as mastery goal structures (e.g., Bardach, Yanagida, Schober, & Lüftenegger, 2017; Schweig, 2016).

From a conceptual point of view, group members – including students within classes – rely on one another to define their social reality (Festinger, 1950; Griffith, 2000; Levine & Moreland, 1990), because humans have a fundamental need to experience a shared reality with others (Echterhoff *et al.*, 2009). Shared realities on characteristics relevant to the group are attractive, as they allow group members to experience a more valid and reliable view of the world and obtain or maintain a sense of connectedness and belonging. Shared perceptions thus serve both epistemic and relational motives (Echterhoff *et al.*, 2009; also see e.g., Bar-Tal, 2000; Fiske, 2007; Hardin & Conley, 2001; Hardin & Higgins, 1996; Jost, Ledgerwood, & Hardin, 2007). In the classroom context, students can satisfy their epistemic motives, that is, the urge to achieve a confident understanding of the world (Echterhoff & Higgins, 2017) – or in the present case, more specifically the prevailing motivational climate – by experiencing commonality with other students' understandings of the motivational climate and its numerous manifestations, such as the messages teachers communicate to students and how they structure class. Sharing the same perceptions of mastery goal structures also makes it easier to affiliate and feel connected to others, thereby fulfilling students' relational needs (Echterhoff & Higgins, 2017; Echterhoff *et al.*, 2009). Hence, group members such as students within classes attempt to create a shared social reality on aspects important to the group (Bliese & Halverson, 1998; Echterhoff *et al.*, 2009; Festinger, 1950), like the quality of the motivational climate within a classroom setting.

Shared-ness of perceptions on mastery goal structures – An indicator for the quality of the social environment?

The degree to which a shared reality is present is not only meaningful in itself and for all those involved in its creation, but is also an indicator for the quality of the social environment (e.g., Bliese & Britt, 2001). In line with this, researchers assume that a successfully established shared reality, measured as the extent of consensus within a group, reflects a well-functioning and non-stressful social environment. By contrast, a lack of shared reality, that is, low consensus, is believed to signal within-group stress and cause interpersonal tensions (e.g., Bliese & Halverson, 1998; Cole & Bedeian, 2007; Festinger, 1950; Levine & Moreland, 1990).

The results of studies conducted in the field of social and organizational psychology mainly confirm the view that consensus is indicative of a positive social environment. For instance, consensus with regard to positive leadership climate, procedural justice climate, or positive peer relations has been found to be positively related to outcomes such as

affective commitment to colleagues, organizational commitment, and well-being (Bliese & Halverson, 1998; Sanders *et al.*, 2011; Walumbwa, Wu, & Orwa, 2008). However, in the field of educational psychology, whether varying levels of consensus on classroom features such as mastery goal structures reflect differences in the quality of the classroom social environment has not yet been tested. The few studies exploring the effects of shared perceptions on several different classroom climate constructs have almost exclusively focused on achievement (e.g., Schenke, Ruzek, Lam, Karabenick, & Eccles, 2017; Schweig, 2016), with one notable exception that also considered students' motivation (Bardach *et al.*, 2017). This study therefore builds on the convincing theoretical rationale for investigating the socio-emotional effects of consensus (e.g., Bliese & Britt, 2001; Festinger, 1950; Levine & Moreland, 1990) as well as the existing empirical evidence from social and organizational psychology research and aims to shed light on whether within-class consensus on mastery goal structures is a substantial predictor of beneficial socio-emotional outcomes.

Socio-emotional outcomes

In this study, we investigate three socio-emotional variables as potential outcomes of within-class consensus on mastery goal structures, namely classroom climate, error climate, and students' use of cooperative learning strategies. Whilst classroom climate and error climate describe aspects of the classroom environment, cooperative learning captures students' approaches to learning in terms of particular learning strategies used. All three socio-emotional outcomes are described in this section.

Firstly, we consider a positive *classroom climate* (Johnson & Johnson, 1983; also referred to as social climate, Allodi, 2010; classroom socio-psychological environment, Haertel, Walberg, & Haertel, 1981; or learning environment, Fraser, Aldridge, & Adolphe, 2010). The concept of classroom climate represents a widely adopted approach to capturing the social classroom environment. Here, we focus on the classroom climate aspects of student cohesiveness and positive peer relations (e.g., Aldridge *et al.*, 1999; Allodi, 2010). While consensus effects on cohesiveness and positive peer relations have not yet been empirically tested within educational psychology, studies conducted in the field of social and organizational psychology have revealed relations between consensus and cohesiveness in (work) teams as well as affective commitment among colleagues (Cole & Bedeian, 2007; Sanders & Schyns, 2006; Sanders *et al.*, 2011).

Secondly, in addition to classroom climate as a macroscopic construct referring to student cohesion and supportive peer relations more broadly, we include a further climate construct more closely tied to specific classroom situations: The *error climate* specifically describes how errors are dealt with in the social context of the classroom. In classrooms with a positive error climate, errors are evaluated and used as integral parts of the learning process (Steuer *et al.*, 2013). As a multi-faceted construct, error climate is comprised of a number of distinct dimensions. In this study, we rely on the error climate dimension tapping students' perception that their classmates react negatively to errors (e.g., Meyer, Seidel, & Prenzel, 2006). Negative reactions by classmates include laughing, taunting, and making fun of the student who made the mistake (Steuer *et al.*, 2013). Given that consensus within groups is believed to be indicative of a well-functioning and non-stressful social environment (e.g., Bliese & Halverson, 1998; Cole & Bedeian, 2007; Festinger, 1950; Levine & Moreland, 1990), high consensus within classes might go along with more positive manifestations of the error climate construct in the sense of lower levels of stress-evoking negative classmate reactions to errors.

Thirdly, we acknowledge that students' learning approaches can also centre on social processes (e.g., Hadwin, Järvelä, & Miller, 2011; Panadero & Järvelä, 2015). By interacting with one another in cooperative settings, students can improve their academic knowledge and skills (Dansereau, 1988; Slavin, 2014). We thus consider students' engagement in *cooperative learning strategies* (e.g., Fernandez-Rio *et al.*, 2017) as a further outcome variable. A potential relation between within-class consensus and cooperative learning, such that students in classrooms with higher levels of consensus regarding classroom constructs might work more cooperatively, was suggested in the literature (Schweig, 2016).

The present investigation

In the present research, we sought to investigate how within-class consensus on the three mastery goal structures dimensions of task, autonomy, and recognition/evaluation affects socio-emotional outcomes. Applying principles from shared reality theory (Echterhoff *et al.*, 2009) to the classroom, we propose that the students in a given class aspire to experience a shared reality with regard to the motivational climate that characterizes their class. Sharing the same perceptions of the motivational climate – expressed in the design of tasks, the amount of autonomy students are allowed, and teachers' recognition and evaluation practices (Ames, 1992) – might fulfil students' relational as well as epistemic motives. In addition, the extent to which a shared reality is present serves as an indicator of the quality of the classroom social environment (e.g., Bliese & Britt, 2001; Bliese & Halverson, 1998; Cole & Bedeian, 2007). In this study, we use within-class consensus as a proxy for the shared-ness in students' perceptions (e.g., Bliese & Britt, 2001; Bliese & Halverson, 1998) and draw on findings about the socio-emotional implications of consensus from the fields of social and organizational psychology (e.g., Sanders *et al.*, 2011; Walumbwa *et al.*, 2008) as well as theories on the role of consensus by researchers in educational settings (Schweig, 2016). More specifically, we hypothesize that within-class consensus on each of the three mastery goal structures will positively predict a positive classroom climate (Hypothesis 1), negatively predict the error climate in terms of negative classmate reactions (Hypothesis 2), and positively predict the more frequent use of cooperative learning strategies (Hypothesis 3).

As within-class consensus is a naturally classroom-level construct, we applied multilevel modelling to investigate our hypotheses. All effects were estimated on the classroom level. To control for level effects, the effect of the mean levels of each of the three mastery goal structures dimensions on the outcomes were additionally considered in the analyses.

Method

Sample

The sample for this study was drawn from a larger survey on lifelong learning competencies in Austria (Spiel, Schober, Jöstl, & Bergsmann, 2013). Subsamples of this larger survey focusing on distinct research questions (classroom goal structure and students' academic functioning, Bergsmann, Lüftenegger, Jöstl, Schober, & Spiel, 2013; lifelong learning competences in Austrian schools, Klug, Lüftenegger, Bergsmann, Spiel, & Schober, 2016; giftedness in mathematics, Lüftenegger *et al.*, 2015) have been analysed and published before. In this study, we re-analysed the data set used by Bergsmann *et al.*

(2013). Schools and classes volunteered to participate in the study. Prior to data collection, both parents and students were informed about the survey, the voluntary nature of participation, and the confidential use of data. Less than 1% of students were prohibited from participating by their parents. Students did not receive compensation for their participation in the study. After receiving instructions from trained research assistants, the students completed the online questionnaire during normal classroom hours in their school computer laboratory.

For the analyses in this study, classes in which data were only available for fewer than five students and cases where students had missing values on all dependent variables were excluded, leading to a smaller sample size than that analysed by Bergsmann *et al.* (2013). The sample analysed in this study consisted of 1,455 Austrian secondary school students (65.70% female) from 157 classrooms, who were 14.31 years old on average ($SD = 2.18$). The average number of students per class was 9.27 ($SD = 2.75$). The reason for the small class sizes is that the larger survey (Spiel *et al.*, 2013) investigated not only the domain of mathematics, but also of German. The subject examined for each student was determined randomly prior to data collection, and different students in each class answered either a version of the questionnaire referring to German or a version referring to mathematics. In this study, we focused on the subject of mathematics and thus analysed the data from students who had filled out the mathematics version of the questionnaire (see also Bergsmann *et al.*, 2013). Mathematics is one of the most frequently studied subjects in research on consensus among students within classes (e.g., Schweig, 2016) as well as one of the most frequently studied subjects in research on classroom goal structures (e.g., Kaplan, Gheen, & Midgley, 2002; Skaalvik & Federici, 2016). Considering that ours was the first study to investigate the relations between within-class consensus on classroom goal structures (or any other classroom climate construct) and socio-emotional outcomes, we decided to focus on the context of mathematics classes, which have been studied extensively in both lines of research we connect here, that is, research on within-class consensus and research on classroom goal structures. Furthermore, the results of a recent study on within-class consensus on classroom goal structures reveal that the effects of consensus – here with regard to the outcomes of motivation and achievement – (slightly) differ between the ‘learning environments’ of mathematics and language classes, indicating that it might be appropriate to either analyse different subjects separately or specifically address one of them (Bardach *et al.*, 2017).

Measures

All items were formatted on a 4-point scale ranging from 1 (disagree) to 4 (agree), and, in the case of cooperative learning, from 1 (never) to 4 (often). The items for mastery goal structures, error climate, and cooperative learning were operationalized with respect to the subject of mathematics. Classroom climate items referred to student cohesiveness and classmate relations more generally without focusing on a subject.

Mastery goal structures dimensions

Students responded to three scales about their perceptions of mastery goal structures (Bergsmann *et al.*, 2013). The task scale consisted of six items (sample item: ‘In math class, we are supposed to try out different ways of learning’; $\alpha = .83$), the autonomy scale of eight items (sample item: ‘In math class we can choose between different exercises’;

$\alpha = .85$), and the recognition/evaluation scale of four items (sample item: 'In math class a student will be praised if the teacher sees that he or she has improved'; $\alpha = .75$).

Classroom climate

Three items were used to gauge students' perceptions of the classroom climate in terms of the prevailing tone of cohesiveness and positive relationships among classmates (Eder & Mayr, 2000, sample item: 'In our class, it is important for everyone that we all get along well'; $\alpha = .84$).

Error climate – Negative classmate reactions

Negative classmate reaction to errors was measured with items based on Steuer *et al.* (2013). Four items were employed (sample item: 'If someone makes a mistake in math class, the other students will make fun of it'; $\alpha = .90$).

Cooperative learning

The items measuring students' cooperative learning were developed in collaboration with students (Bergsmann *et al.*, 2013). Following a short introduction ('Think about how you usually prepare for a math test. How often do you do the following?'), four items addressed students' use of cooperative learning strategies (e.g., 'I discuss the material with my classmates'; $\alpha = .77$).

Statistical analyses and missing data

All analyses were conducted in Mplus version 7.4 (Muthén & Muthén, 1998–2015) using robust maximum likelihood estimation. In this study, the amount of missing data on the item level ranged from 0.5% to 9.8%. Full Information Maximum Likelihood estimation (FIML, Enders, 2010) was employed to deal with missing data.

Consensus on the three mastery goal structures dimensions was assessed with the inter-rater agreement index for multiple items, $rwg_{S(j)}^*$ (Lindell & Brandt, 1997; Lindell, Brandt, & Whitney, 1999). $rwg_{S(j)}^*$ is constructed by comparing the observed within-group variance to the expected variance if all of the item variation within the group were attributable to measurement error, based on a uniform distribution (Schweig, 2016). For a scale with four response categories, $rwg_{S(j)}^*$ ranges between $-.8$ and 1 , with higher values representing greater within-classroom consensus. Positive values indicate that consensus within the group is stronger than would be expected by chance, whereas negative values indicate that consensus is less than would be expected by chance (Lindell *et al.*, 1999). Because $rwg_{S(j)}^*$ is a correlation coefficient, we applied Fishers z -transformation to all $rwg_{S(j)}^*$ values prior to using them as independent variables in subsequent analyses.

A series of multilevel confirmatory factor models (ML-CFA) was estimated to investigate the adequacy of the measurement models for all scales. To ensure a common metric at both the individual student and classroom levels (Marsh *et al.*, 2009), factor loadings were tested for cross-level invariance using chi-square difference tests based on the Satorra-Bentler scaled chi-square (Satorra, 2000). Given that the chi-square test is known to be highly sensitive to sample size (West, Taylor, & Wu, 2012), that is, easily becomes overpowered, all tests were conducted with a statistical significance level of $\alpha = .001$. Additionally, we compared the BIC values of the models with invariant factor

loadings to those of the models with factor loadings freely estimated at both levels (see Van de Schoot, Lugtig, & Hox, 2012).

The models set up to test our hypotheses are multilevel structural equation models (ML-SEMs, e.g., Marsh *et al.*, 2009; Morin *et al.*, 2014). Due to model complexity, we investigated the effects of within-class consensus on each mastery goal structures dimension on all outcome variables in three separate ML-SEMs. Hence, one ML-SEM was set up for each mastery goal structure dimension, including consensus on the respective dimension and the mean levels of the dimension (as a control variable) as well as all three outcome variables, that is, classroom climate, error climate, and use of cooperative learning strategies.

Goodness of fit of the models was assessed with the robust comparative fit index (robust CFI) and the robust root mean square error of approximation (robust RMSEA). Typical cut-off scores reflecting excellent and adequate fit to the data, respectively, were considered: (1) robust CFI > .95 and .90; (2) robust RMSEA < .06 and .08 (Hu & Bentler, 1999). Both unstandardized and standardized regression coefficients are reported for the models and can be interpreted as in multiple regression or SEM. We furthermore report effect size indicators, which can be interpreted according to Cohen's guidelines (Cohen, 1988), with values over .10, .30, and .50 reflecting small, moderate, and large effect sizes, respectively (for details on how to obtain proper estimates of the standardized predictive coefficients and effect sizes in the context of ML-SEMs, see Marsh *et al.*, 2012; Morin *et al.*, 2014). All significance testing was performed at the .05 level.

Results

The inter-rater agreement index $\text{rwg}_{(j)}^*$ (Lindell & Brandt, 1997; Lindell *et al.*, 1999) varied strongly in this study, with some classes showing very high consensus and several classes with $\text{rwg}_{(j)}^*$ values of <0. Descriptive statistics, intraclass correlation coefficients, and latent correlations between all variables on the classroom level can be found in Table 1. The high latent correlations of $\geq .95$ on the classroom level between the three mastery goal structures dimensions are in line with theoretical considerations within classroom goal structures research. Here, it is generally assumed that the three dimensions together constitute the prevailing motivational climate in classrooms, that is, a superordinate mastery goal structure (e.g., Lüftenegger *et al.*, 2017). Usually, a second-order mastery goal structure factor is created and used in analyses (e.g., Lüftenegger, van de Schoot, Schober, Finsterwald, & Spiel, 2014). In this study, however, we were interested in consensus and level effects for each individual dimension and therefore analysed them separately.

Model fit indices indicated a (very) good level of fit for all ML-CFAs (see Table 2). None of the chi-square difference tests were statistically significant, providing support for the cross-level invariance of factor loadings. Furthermore, models with factor loadings constrained to invariance across levels had a lower BIC than models with freely estimated factor loadings at both levels. McDonald's (1970) ω reliability coefficient showed a satisfactory level of internal consistency reliability for all scales (see Table 2).

The ML-SEMs set up to test the hypotheses fit the data well, $\chi^2(256) = 556.64$, robust CFI = 0.969, robust RMSEA = 0.026 for the ML-SEM for task, $\chi^2(325) = 947.98$, robust CFI = 0.940, robust RMSEA = 0.034 for the ML-SEM for autonomy, and $\chi^2(193) = 477.95$, robust CFI = .962, robust RMSEA = 0.030 for the ML-SEM for recognition/evaluation. Within-class consensus on task positively predicted a positive classroom

Table 1. Descriptive statistics, bivariate correlations, and intraclass correlation coefficients on the classroom level

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Consensus task (z transformed)	0.596								
2. Consensus autonomy (z transformed)	0.528	0.372							
3. Consensus recognition/evaluation (z transformed)	0.080	-0.166	0.310						
4. Task	0.140	-0.132	0.342	0.956					
5. Autonomy	0.167	-0.153	0.517	0.948	0.967				
6. Recognition/Evaluation	0.226	0.116	0.169	0.179	0.116	0.216			
7. Classroom climate	- 0.209	- 0.354	-0.073	0.597	0.501	0.383	- 0.382		
8. Negative classmate reactions to errors	0.453	0.360	0.250	0.081	-0.021	0.090	0.221	0.002	
9. Cooperative learning strategies	0.313	0.315	0.402	2.611	2.515	2.895	3.180	2.055	2.518
M	0.263	0.239	0.257	0.379	0.391	0.302	0.321	0.487	0.173
SD	—	—	—	0.303	0.347	0.235	0.203	0.288	0.059
ICC									

Note. N = 1,455 students from 157 classrooms; ICC = Intraclass correlation coefficient (proportion of between classroom variance on total variance); Statistically significant correlation coefficient at $\alpha = .05$ are boldface.

Table 2. Multilevel confirmatory factor analysis result: model fit, testing within-level and between-level factorial invariance and composite reliability coefficient for all scales of mastery goal structures, negative classmate reactions to errors, and cooperative learning

Scale	χ^2	df	Robust CFI	Robust RMSEA	BIC	Chi-square difference test			McDonald's ω	
						$\Delta\chi^2$	Δdf	p	within	between
Mastery goal structure										
Task										
Configural invariance	52.91	19	0.989	0.032	20,513.68	7.356	5	0.195	0.784	0.994
Metric invariance	58.12	24	0.988	0.029	20,539.67					
Autonomy										
Configural invariance	238.31	40	0.937	0.061	2,7581.70	7.984	7	0.334	0.798	0.992
Metric invariance	244.55	47	0.936	0.056	2,7539.80					
Recognition/Evaluation										
Configural invariance	11.59	4	0.994	0.036	1,3326.37	2.486	3	0.478	0.799	0.988
Metric invariance	13.42	7	0.995	0.026	1,3307.53					
Classroom climate										
Configural invariance	2.58	1	0.999	0.040	8,764.63	12.329	2	0.002	0.807	0.996
Metric invariance	14.91	3	0.996	0.037	8,754.47					
Negative classmate reactions to errors										
Configural invariance	5.78	5	1.000	0.010	13,402.48	1.108	3	0.775	0.892	0.997
Metric invariance	6.44	8	1.000	0.000	13,022.13					
Cooperative learning strategies										
Configural invariance	11.28	5	1.000	0.010	15,337.76	1.205	3	0.752	0.781	0.986
Metric invariance	12.43	8	1.000	0.000	15,357.20					

Note. Robust CFI according to Brosseau-Liard and Savalei (2014); Robust RMSEA according to Brosseau-Liard, Savalei, and Li (2012).

climate in terms of higher levels of student cohesiveness and positive peer relations (standardized $\hat{\beta} = .10, p < .05$). A negative association between within-class consensus on task and negative classmate reaction to errors was found, meaning that higher degrees of within-class consensus were related to a more positive error climate (standardized $\hat{\beta} = -.14, p < .01$). Additionally, within-class consensus on task was positively correlated with more frequent use of cooperative learning strategies (standardized $\hat{\beta} = .11, p < .01$). Within-class consensus on autonomy was not related to classroom climate, negatively related to negative classmate reactions to errors (standardized $\hat{\beta} = -.16, p < .01$), and positively related to cooperative learning (standardized $\hat{\beta} = .09, p < .01$). Within-class consensus on recognition/evaluation was not related to either classroom climate or cooperative learning. A negative relation with negative classmate reactions to errors was found (standardized $\hat{\beta} = -.22, p < .01$). Table 3 displays all consensus effects and the effects of the control variables, that is, the mean levels of the mastery goal structures dimensions (standardized and unstandardized solutions). Figure 1 provides a graphical representation of the three ML-SEMs, including all effects and factor loadings (unstandardized solutions).

Discussion

Students' perceptions of the motivational climate in class, that is, perceived mastery goal structures, do not evolve in a vacuum – rather, these perceptions are shaped through continuous interactions among students in a process of socially shared reality construction (e.g., Bliese & Halverson, 1998; Echterhoff *et al.*, 2009). Building on a conceptualization of mastery goal structures as shared perceptions, this study addressed the role the degree of shared-ness of perceptions – measured as within-class consensus on mastery goal structures – might play in predicting socio-emotional outcomes.

In line with our assumptions, within-class consensus on task predicted a positive classroom climate in the sense of cohesiveness and positive peer relations. By contrast, the consensus effects of autonomy and recognition/evaluation were not statistically significant. Thus, we were able to partially replicate the results of studies on consensus carried out within social and organizational psychology research, which found consensus within (work) teams to be positively related to cohesiveness (e.g., Cole & Bedeian, 2007; Sanders & Schyns, 2006). Researchers in the field of educational psychology have similarly proposed that consensus within classrooms implies cohesiveness among students (Schweig, 2016). However, our study is the first to empirically test this assumption with a sample of students and thus makes a notable contribution to the current literature. One reason why consensus effects occurred for only one of the three investigated dimensions could be that in this study, the measure of classroom climate differed from all other constructs in that it was not operationalized with respect to mathematics but instead referred to cohesiveness and positive peer relations more generally. It might be that consensus on mastery goal structures dimensions with respect to a given subject would be a stronger predictor of classroom climate with respect to that same subject – in the case of our study, mathematics.

As stated in our hypotheses, higher levels of within-class consensus on the three mastery goal structures dimensions of task, autonomy, and recognition/evaluation lowered negative classmate reactions to errors and therefore indicated a more positive error climate. Classmate reactions such as laughing at or making fun of students who make mistakes most likely emerge from an atmosphere of stress and tensions among students. In

Table 3. Multilevel structural equation modelling results: consensus on mastery goal structures predicting classroom climate, negative classmate reactions to errors, and cooperative learning on class level

Model	Classroom climate			Negative classmate reactions to errors			Cooperative learning strategies		
	Est. (SE)	Std. Est.	ES	Est. (SE)	Std. Est.	ES	Est. (SE)	Std. Est.	ES
Task									
Consensus task	0.25 (0.11)	0.10	0.22	- 0.43 (0.14)	-0.14	-0.33	0.37 (0.11)	0.11	0.23
Level task	0.13 (0.12)	0.07	0.16	0.78 (0.13)	0.34	0.81	0.01 (0.09)	0.00	0.01
Autonomy									
Consensus Aut.	0.18 (0.13)	0.06	0.14	- 0.56 (0.17)	-0.16	-0.38	0.33 (0.11)	0.09	0.19
Level Aut.	0.10 (0.10)	0.06	0.13	0.51 (0.12)	0.25	0.59	0.01 (0.08)	0.01	0.01
Recognition/Evaluation									
Consensus Rec./Ev.	0.11 (0.15)	0.04	0.09	- 0.73 (0.21)	-0.22	-0.53	0.22 (0.16)	0.07	0.14
Level Rec./Ev.	0.17 (0.22)	0.07	0.15	1.04 (0.30)	0.33	0.77	-0.03 (0.19)	-0.01	-0.02

Note. ES = Effect size; Est. = Unstandardized estimate; SE = Standard error; Std. Est. = Standardized Estimate; Statistically significant results at $\alpha = .05$ are boldface.

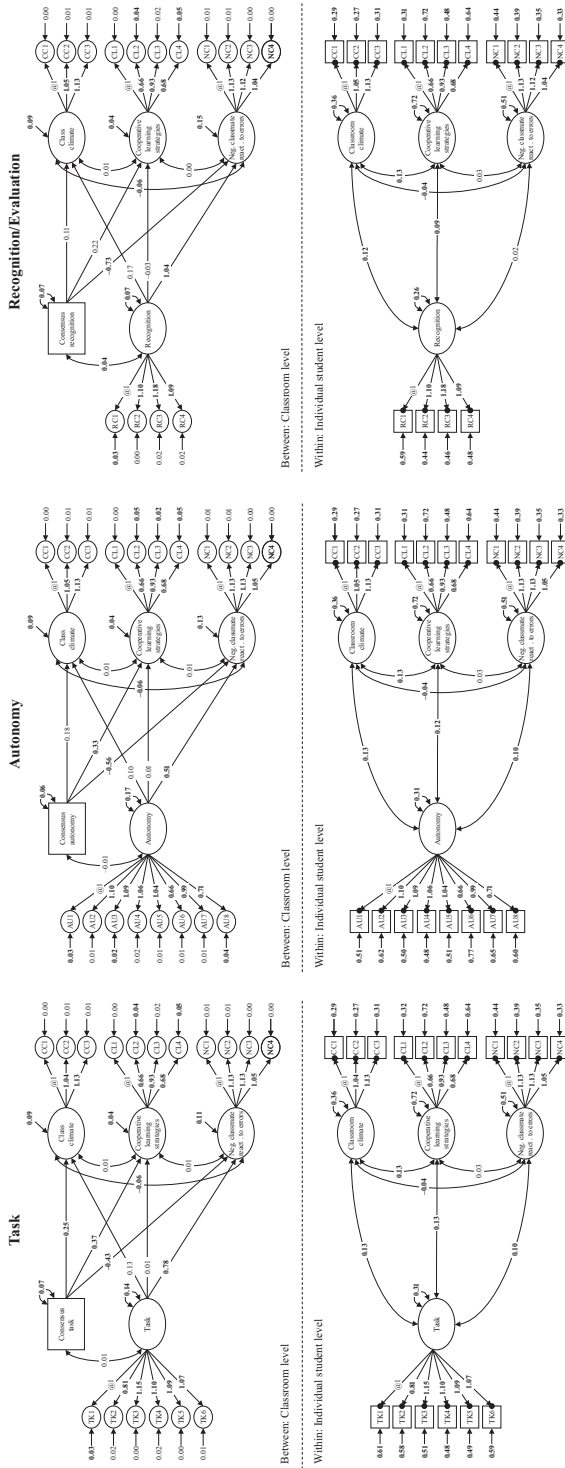


Figure 1. Doubly latent multilevel models for task, autonomy, and recognition/evaluation: Unstandardized solution. Note. Statistically significant results at $\alpha = .05$ are shown in bold. Parameter constraints are indicated with @; CC1-CC3 = item 1–3 of Class Climate, CLI-CL4 = item 1–4 of Cooperative Learning Strategies, NCI-NC4 = item 1–4 for Negative Classmate Reactions to Errors, TK1-TK6 = items 1–6 of Task, AUI-AU8 = item 1–8 of Autonomy, RCI-RC4 = items 1–4 of Recognition/Evaluation.

line with this, the results of our study suggest that consensus counteracts the establishment of a stressful environment (e.g., Bliese & Britt, 2001; Bliese & Halverson, 1998; Festinger, 1950) as expressed by the negative effects on negative classmate reactions to errors. The fact that consensus effects occurred for all three dimensions underlines the substantial role of within-class consensus in predicting classmate-focused error climate.

Moreover, consensus on task and consensus on autonomy predicted more frequent use of cooperative learning strategies, whereas no significant relation between consensus on recognition/evaluation and cooperative learning was found. Our results thus support our hypotheses when it comes to task and autonomy but not recognition/evaluation. Schweig (2016) suggested that students in classrooms with higher levels of consensus might work more cooperatively, but did not empirically test this. The current study's findings regarding consensus on task and autonomy provide support to this notion and indicate the importance of shared perceptions on task and autonomy for students' engagement in cooperative learning. We cautiously suggest that one explanation for why consensus effects were restricted to task and autonomy could be that the dimensions of task and autonomy both primarily focus on specific aspects of learning (e.g., Ames, 1992; Lüftenegger *et al.*, 2014). For instance, in this study, the task dimension comprised items such as 'In math class we should test ourselves to make sure we know the material', describing the specific aspect of student self-assessment. The autonomy dimension primarily included items with a clear focus on specific learning-related decisions, such as 'In math class we can choose between different exercises'. On the other hand, the recognition/evaluation dimension covered broader features like teachers valuing student improvement and efforts. Like task and autonomy, cooperative learning builds on specific, rather tangible aspects of students' learning. The greater proximity between the content of cooperative learning and that of task and autonomy as opposed to recognition/evaluation might therefore explain the presence of consensus effects for the dimensions of task and autonomy and their absence for recognition/evaluation.

Finally, it should be noted that the control variables on the classroom level, that is, the mean levels of all mastery goal structures dimensions, did not predict classroom climate and cooperative learning. In the case of error climate, the levels of the three dimensions were even associated with negative manifestations of the error climate construct. These additional findings underscore the unique role of consensus in predicting socio-emotional outcomes.

Limitations and future lines of research

Some caveats to the present study and promising directions for future research need to be mentioned. First, a limitation arises from the fact that our analyses are based on cross-sectional correlational data, meaning that no conclusions about causation can be drawn. We therefore recommend that the proposed relations found in this study be verified in longitudinal studies and experimental work. Second, studies like the one presented here relying on quantitative measures of consensus should be complemented by qualitative interviews or classroom observations (e.g., Urdan, 2004) to gain a more comprehensive understanding of consensus on mastery goal structures and its outcomes. By doing so, researchers could find out whether high and low consensus classes can be differentiated via observable criteria (e.g., social interaction frequency, González-Romá, Peiró, & Tordeira, 2002; or teacher behaviour, Schweig, 2016). Third, we exclusively focused on mastery goal structures in the present study. As such, subsequent research would do well

to systematically include performance (approach and avoidance) goal structures along with mastery goal structures. Research questions that may be addressed could concern whether the positive effects of consensus on socio-emotional outcomes are restricted to mastery goal structures or equally pertain to performance goal structures. As the negative effects found for performance goal structures were based on analyses of the level of these classroom goal structures types, it might be that consensus operates differently in this regard, for example, even producing positive socio-emotional outcomes. Moreover, it might be illuminating to explore whether controlling for the effects of consensus on performance goal structures influences the effects of consensus on mastery goal structures on socio-emotional outcomes. Expanding analyses of within-class consensus to include interactions between consensus and levels of performance as well as mastery goal structures in future work might furthermore considerably advance the field of research on within-class consensus.

Conclusions

Taken together, our findings demonstrate that the extent to which students share the same perceptions of mastery goal structures is linked to socio-emotional outcomes. Our study is not only the first within the area of classroom goal structures research to test the assumption that within-class consensus reflects a positive social environment (e.g., Bliese & Britt, 2001), but also the first study within educational psychology research as a whole on this topic. Hence, our work makes a substantial contribution to the extant literature on mastery goal structures and covers new ground in educational research. In light of this, we generally advocate for greater consideration of socially shared perceptions in research conducted in educational settings. It has long been acknowledged that students' subjective perceptions of their classroom environment, that is, the psychological environment, play a vital role in understanding educational processes (e.g., Ames, 1992; Meece, Herman, & Mc Combs, 2003; Ryan, Gheen, & Midgley, 1998). Defining the classroom environment in terms of students' shared perceptions, that is, the socially shared psychological environment, allows educational processes to be examined from a different angle and reveals a distinct set of information. It is our conviction that these two perspectives – students' subjective perceptions and their socially shared perceptions – can be regarded as two sides of the same coin, capturing different aspects of the same classroom environment.

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