Intraindividual relations between achievement goals and discrete achievement emotions: An experience sampling approach

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A B S T R A C T

Theories on the link between achievement goals and achievement emotions focus on their within-person functional relationship (i.e., intraindividual relations). However, empirical studies have failed to analyze these intraindividual relations and have instead examined between-person covariation of the two constructs (i.e., interindividual relations). Aiming to better connect theory and empirical research, the present study ($N = 120$ 10th grade students) analyzed intraindividual relations by assessing students' state goals and emotions using experience sampling ($N = 1409$ assessments within persons). In order to replicate previous findings on interindividual relations, students' trait goals and emotions were assessed using self-report questionnaires. Despite being statistically independent, both types of relations were consistent with theoretical expectations, as shown by multi-level modeling: Mastery goals were positive predictors of enjoyment and negative predictors of boredom and anger; performance-approach goals were positive predictors of pride; and performance-avoidance goals were positive predictors of anxiety and shame. Reasons for the convergence of intra- and interindividual findings, directions for future research, and implications for educational practice are discussed.

"Tell me what you want and I tell you what you feel" (adapted proverb, Brillat-Savarin, 1825/1999)

1. Introduction

Achievement emotions have attracted increasing attention during the last 20 years due to cumulative empirical evidence showing that they can exert profound effects on students' learning and academic agency. Achievement emotions shape students' learning behavior, influence their academic attainment, guide their decisions to persist or drop out of academic programs, and represent core elements of their psychological well-being (Pekrun & Linnenbrink-Garcia, 2014). Given our current knowledge on the relevance of achievement emotions, it is important to examine

their antecedents. Knowledge on the origins of achievement emotions is needed for the development of classroom practices and intervention programs that foster adaptive achievement emotions and reduce maladaptive emotions. Among the potentially relevant proximal antecedents of achievement emotions, students' achievement goals are likely of pivotal importance (Huang, 2011; Linnenbrink-Garcia & Barger, 2014; Pekrun, Elliot, & Maier, 2006). Learning environments, as distal antecedents of students' achievement emotions, could be designed in such a way that they positively influence students' achievement goals, thus also fostering their emotions.

Several theoretical models have been proffered to explain the link between achievement goals and emotions (e.g., Linnenbrink & Pintrich, 2002; Pekrun et al., 2006, Pekrun, Elliot, & Maier, 2009), and numerous empirical studies have been conducted to test these models. However, while these theoretical models refer to within-person functioning (i.e., intraindividual relations), the available empirical evidence is nearly exclusively based on the analysis of between-person covariation of the two constructs (i.e., interindividual relations). Consequently, the existing empirical findings do

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not provide direct evidence on the validity of the theories.

Generally, most psychological theories focus on intraindividual psychological functioning, and the same holds true for educational theories of student learning. However, despite this within-person focus, empirical studies typically have examined interindividual (i.e., between-person) relations between variables. Voelkle, Brose, Schmiedek, and Lindenberger (2014) estimated that about 90% of empirical research in psychology is based on the analysis of between-person variation. However, it is not possible to infer intraindividual relations from findings on relations based on interindividual data (and vice versa), as both types of relations refer to different distributions of variables, namely to distributions within persons (intraindividual approach) versus between persons (interindividual approach; Molenaar, 2004; Molenaar & Campbell, 2009). As noted by Schmitz and Skinner (1993, p. 1010), "These two correlations [i.e., interindividual vs. intraindividual correlations] are statistically independent, and their direction and magnitude can vary widely" (see also Schmitz, 1987; Voelkle et al., 2014). A classic example illustrating the independence of inter- and intra-individual relations was provided by Schmitz and Skinner (1993): The positive interindividual correlation between sleep duration and frequency of migraine headaches seemingly implies that sleeping late can lead to headaches (or vice versa). Such a conclusion would be misleading, however, because these two variables are correlated negatively within individuals, implying that headaches occur in combination with shorter duration of sleep.

The present study had two primary aims. First, we sought to replicate previous findings on the interindividual relations between three commonly endorsed achievement goals (mastery, performance-approach, performance-avoidance) and six discrete achievement emotions (enjoyment, pride, anxiety, shame, anger, boredom). To evaluate interindividual relations, we used self-report scales to assess students' relatively enduring, trait-like (henceforth "trait") achievement goals and emotions. Second, and most importantly, we sought to move beyond the traditional interindividual perspective by analyzing the intraindividual relations of these variables. To do so, we assessed students' state achievement goals and achievement emotions employing the experience sampling method (Hektner, Schmidt, & Csikszentmihalyi, 2007) with multiple assessments within each student.

1.1. Concepts of achievement goals and achievement emotions

Achievement goals are defined as "competence-based aims used to guide behavior" (Elliot, Murayama, & Pekrun, 2011, p. 632). Two basic types of achievement goals are mastery goals, which refer to attaining mastery standards and developing competence, and performance goals, which refer to attaining normative standards (i.e., performance relative to others; Linnenbrink-Garcia & Barger, 2014), often to demonstrate competence. Further, in the trichotomous achievement goal framework (Elliot & Harackiewicz, 1996), two types of performance goals have been differentiated, namely *performance-approach* goals, which refer to outperforming others, and *performance-avoidance* goals, which refer to not performing poorly relative to others. In the present research, we adopt this trichotomous goal framework, because the goals addressed in this framework are the most frequently endorsed by high school students (Elliot & McGregor, 2001; Pekrun et al., 2006, 2009).

Achievement emotions can be defined as emotions regarding achievement activities or achievement outcomes (Pekrun, 2006). In addition to this object focus (activity vs. outcome), achievement emotions can be grouped according to their valence (positive vs. negative). Taking both object focus and valence into account renders a 2 × 2 taxonomy (Pekrun et al., 2006) grouping these emotions as follows: (a) activity/positive (e.g., enjoyment), (b) activity/

negative (e.g., boredom, anger), (c) outcome/positive (e.g., hope, pride), and (d) outcome/negative (e.g., anxiety, hopelessness, shame).

1.2. Previous research

1.2.1. Theoretical assumptions

Pekrun et al. (2006, 2009) developed a theoretical model that links the goals from the trichotomous achievement goal framework (i.e., mastery, performance-approach, and performance-avoidance; Elliot & Harackiewicz, 1996) to various discrete achievement emotions. The authors grounded their work in Pekrun's (2006) control-value theory which posits that the perceived controllability and the subjective value of achievement activities and outcomes function as proximal antecedents of achievement emotions. Mastery goals are proposed to focus attention on the controllability and positive value of achievement activities, thus fostering positive activity emotions (e.g., enjoyment) and reducing negative activity emotions (e.g., boredom and anger). Performance-approach goals are proposed to focus attention on attaining success outcomes, the controllability of these outcomes, and their positive value, implying that they should promote positive outcome emotions (e.g., pride). Performance-avoidance goals focus attention on possible failure outcomes, the uncontrollability of these outcomes, and their negative value, implying that they promote negative outcome emotions (e.g., anxiety and shame).

1.2.2. Empirical findings

Based on empirical reviews by Huang (2011) and Linnenbrink-Garcia and Barger (2014), and an additional search of the literature using the PsycINFO and ERIC databases, we found that there are at least 94 studies on the relations between achievement goals and affect or emotions (77 studies were reported by Huang, 2011, 9 additional studies by Linnenbrink-Garcia and Barger (2014), and 8 additional studies were identified in our search). Overall, the findings support the predictions from Pekrun et al.'s (2006, 2009) model. Specifically, multiple studies have found that mastery goals relate positively to students' enjoyment (e.g., Daniels et al., 2008, 2009; King, McInerney, & Watkins, 2012; Shih, 2008) and that performance-avoidance goals relate positively to students' anxiety (e.g., Bong, 2009; Duchesne & Ratelle, 2010; Putwain & Symes, 2012; Shih, 2005; Sideridis, 2008). Both of these links are well documented, and the findings are largely consistent across studies (Huang, 2011). For emotions other than enjoyment and anxiety, the empirical evidence for relations with achievement goals is scarce, but also largely supports the expected relations. For example, Daniels et al. (2008, 2009) found that mastery goals were negatively related to boredom and anger, King et al. (2012) found performance-approach goals to be positively related to hope and pride, and Pekrun et al. (2006, 2009) reported positive relations of performance-avoidance goals with hopelessness and shame.

All of the available studies, however, have examined the interindividual relations (i.e., between-person covariation) of achievement goals and emotions, with only two exceptions. Schantz and Conroy (2009) investigated the intraindividual relations between goals from the 2 × 2 achievement goal framework and affect (happy vs. unhappy) during a round of golf (18 holes) in collegiate golfers. Goals and affect were assessed immediately before teeing off on every hole. Results showed that golfers reported higher levels of happiness at the beginning of holes if they had low performance-approach goals or low mastery-avoidance goals during the round (means over round) or endorsed lower-than-usual mastery-avoidance goals for that hole. Rebar and Conroy (2013) investigated the impact of experimentally manipulated state achievement goals from the 2 × 2 framework on undergraduate students' experiences

of pride and shame following experimentally manipulated competence feedback. The assessment was embedded in a 24-round game of Tetris. Situation-specific achievement goals moderated the effects of feedback (competence, incompetence, no feedback) on pride and shame. In line with Pekrun et al.'s (2006, 2009) theoretical propositions, performance-approach goals enhanced pride responses to competence feedback, but did not have an impact on shame responses to incompetence feedback. By contrast, performance-avoidance goals enhanced shame responses to incompetence feedback, but did not have an impact on pride responses to competence feedback. Mastery goals had no impact on pride and shame responses to competence-based feedback.

In sum, while there are a number of findings on interindividual relations between achievement goals and achievement emotions that are in line with Pekrun et al.'s (2006, 2009) theoretical proposition; the scarce empirical evidence on intraindividual relations between achievement goals and emotions is restricted to a few emotions (happiness, pride, and shame). Furthermore, neither of the two existing studies on intraindividual relations examined the goal-emotion link in a classroom setting.

1.3. The present study

We aimed to examine the relations between students' achievement goals and achievement emotions by analyzing both interindividual (i.e., between-person) and intraindividual (i.e., within-person) covariation in a classroom setting. Regarding interindividual relations, we expected to confirm the propositions by Pekrun et al. (2006; see Fig. 1 for an overview) and to replicate the findings from previous studies: (1) mastery goals positively predict enjoyment and negatively predict boredom and anger, (2) performance-approach goals positively predict pride, and (3) performance-avoidance goals 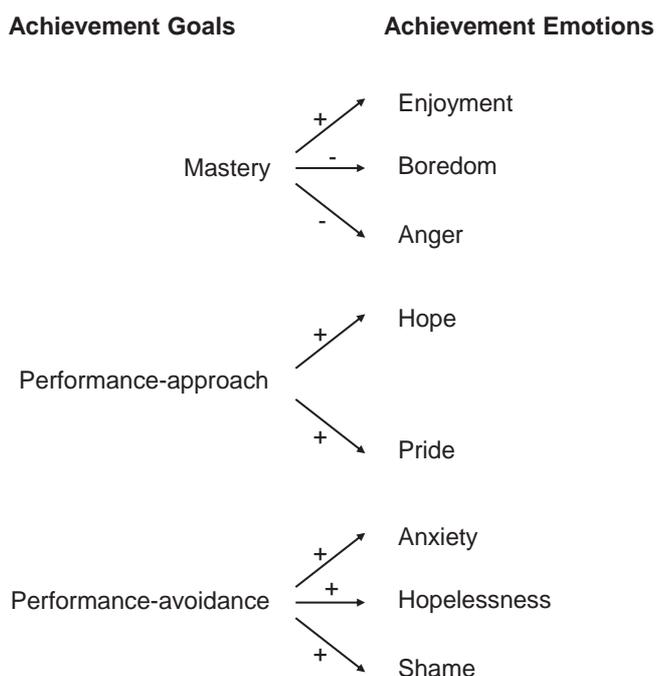positively predict anxiety and shame. With regard to intraindividual relations, we aimed to investigate whether these theoretical propositions hold for intraindividual functioning. This is a critically important issue, given that the

Pekrun et al. (2006, 2009) model, as well as other theories on the achievement goal-emotion link (e.g., Linnenbrink & Pintrich, 2002), address the relations between achievement goals and emotions in terms of intraindividual psychological functioning (see Linnenbrink-Garcia & Barger, 2014).

For the interindividual analysis, paper-and-pencil questionnaires were used to assess students' trait achievement goals and emotions related to four major subject domains (mathematics, German, English, and French). For the intraindividual analysis, the experience sampling method (ESM; Csikszentmihalyi & Larson, 1987; Hektner et al., 2007) was used to assess goals and emotions multiple times within each student in regular classroom settings in the same subject domains. To make sure that our results were not mere epiphenomena of other variables, we controlled for students' sex, age, academic achievement, and the respective subject domain in all analyses.

2. Method

2.1. Sample and procedure

The sample consisted of $N = 120$ Swiss 10th grade students (37% female; mean age = 15.61 years, $SD = 0.59$). Participants were randomly selected from 35 classrooms (two to four students from each classroom) from seven upper-track schools (Gymnasium) in the German-speaking parts of Switzerland. There were, on average, 19.8 students (56% female) in each classroom, and the student composition of classrooms was the same across the four subject domains considered in our study (mathematics, German, English, and French). Students were instructed by different teachers across those four subject domains.

The procedure included the following steps. First, in their classrooms, students completed a paper-and-pencil questionnaire focusing on demographic information. Second, ESM data were collected for a period of ten school days in the second term of the academic year using handheld devices (iPod Touch 4G; experience-sampling-software: iDialog Pad; Kubiak & Krog, 2012). Participants were asked to use the handheld device to record their current goals and immediate emotional experiences in their mathematics, German, English, and French classes.

Students were instructed to activate their handheld devices at the beginning of their classes; each class lasted 45 min. After activating the device, students were asked to indicate the subject of the class. Subsequently, the device randomly emitted one audible signal during class time indicating that a digital questionnaire was available for students to immediately complete.

The device displayed one question at a time. Items were designed to assess achievement goals and achievement emotions. Within the two blocks assessing goals and emotions, items were presented in an order that was completely randomized across assessments and students. In total, 1779 questionnaires were initiated and a total of 1409 (79%) questionnaires were completed. The reasons that were indicated for not completing the questionnaire were the following: taking a test (51%); performing other priority tasks (25%); not attending class because the teacher was absent (17%); the presence of a different teacher than usual (7%). On average, each student completed 11.74 questionnaires throughout the ten days ($SD = 5.32$; minimum = 1, maximum = 26). On average, 3.55, 2.54, 2.89, and 2.75 of the questionnaires were related to mathematics, German, English, and French, respectively.

Third, immediately after the ten state-assessment days, students completed a paper-and-pencil questionnaire assessing their trait achievement goals and emotions. We assessed these variables after the state assessment because the state reports were the most important variables in our study; we wanted to avoid any influence

Achievement Goals   **Achievement Emotions**

Fig. 1. Theoretical propositions on the relations between achievement goals and achievement emotions (adapted from Pekrun et al., 2006, 2009).

of the trait assessment on the state reports. After the trait assessment, students returned the handheld devices to the testing personnel.

2.2. Study measures

In line with principles of ESM methodology (Hektner et al., 2007), state goals and emotions were assessed using single-item measures. Although multi-item measures may be more reliable, such measures take more time to complete than single-item measures and could severely compromise the validity of state assessments. More specifically, when participants are asked to report about state goals and emotions, longer self-report measures could negatively influence participants' responses by providing more time to reflect and prompting recall biases. In addition, by requiring more time to respond, multi-item scales might end up assessing participants' emotional response to completing the questionnaire, rather than their emotions concerning the classroom activity that they are currently engaged in. For these reasons, single-item state measures are deemed appropriate for use in ESM studies (for other ESM emotion studies using single item measures, see e.g., Nett, Goetz, & Hall, 2011; Tong et al., 2007).

The reliability and validity of single-item measures has been supported by findings from Wanous, Reichers, and Hudy (1997) and a recent analysis by Gogol et al. (2014) focusing on motivational and emotional constructs in education. We investigated the reliability of the single-item measures used in the present study by computing ICC(2) for the state variables and by correlating trait scores and aggregated state scores. Results of these analyses are outlined in the Appendix and indicate that the single-item measures were indeed reliable.

2.2.1. Achievement goals

The goals of the trichotomous achievement goal model were assessed with slightly adapted items from Elliot and McGregor (2001) Achievement Goal Questionnaire (AGQ). In both the trait and state assessments, participants responded on a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*). In the trait assessment, the three goals were each assessed with respect to the domains of mathematics, German, English, and French. The items were as follows: *"My goal in [DOMAIN] is to learn as much as possible"* (mastery goal), *"My goal in [DOMAIN] is to perform better than the other students"* (performance-approach goal), and *"My goal in [DOMAIN] is to avoid performing poorly compared to others"* (performance-avoidance goal). The items for the state assessment were *"My goal at this moment is to learn as much as possible"* (mastery goal), *"My goal at this moment is to perform better than the other students"* (performance-approach goal), and *"My goal at this moment is to avoid performing poorly compared to others"* (performance-avoidance goal).

2.2.2. Achievement emotions

In both the trait and state assessments, we measured students' enjoyment, pride, anxiety, shame, anger, and boredom. Participants responded using a five-point Likert-type scale (1 = *not at all* to 5 = *very strongly*). The trait emotions were assessed with respect to the domains of mathematics, German, English, and French using the following item format: "In [DOMAIN] classes I usually experience [EMOTION]". A parallel wording was used for the items in the state assessment, similar to previous state assessments in the classroom context (e.g., Goetz, Bieg, Lüdtke, Pekrun, & Hall, 2013). The intensity of each of the six emotions was assessed with the item "*At this moment I am experiencing* [EMOTION]".

2.2.3. Covariates: sex, age, academic achievement, and school subject

To ensure that any observed relations were not mere artifacts of other plausible variables, we assessed and controlled for sex, age, academic achievement, and school subject in our analyses. These variables were included because they have been shown to influence students' emotions (for sex, see e.g., Frenzel, Pekrun, & Goetz, 2007; Goetz, Frenzel, Pekrun, Hall, & Lüdtke, 2007; for age, academic achievement, and school subject, see Goetz et al., 2007). Students' sex and age were assessed via self-report. School subject was also assessed from students' self-report. Academic achievement was assessed in terms of students' midyear grades (i.e., the last grades obtained before the present study) in mathematics, German, English, and French, which were obtained from the school administration. In the Swiss school system, there are two terms in the school year; midyear grades reflect students' achievement before the data assessment of the present study, which was conducted in the second term. Academic achievement was included as a covariate in order to control for the effect of this source of achievement feedback on academic emotions. Grades ranged from 1 (poor) to 6 (excellent).

2.3. Data analysis

The data were used to examine the interindividual and intraindividual relations between the three goals and the six emotions. For the interindividual analyses, the trait assessments of goals and emotions were used. For each of the six emotions, a multiple regression equation was modeled, with the three goals included as predictors. As the trait data were available for four different subjects, these regression analyses were based on 480 cases (120 students × 4 domains). Thus, observations were nested within school subjects, with school subjects representing a fixed rather than a random factor. In line with previous research dealing with such a data structure (e.g., Huang, 2014; Möhring, 2012), we controlled for the effects of the subject domain by including dummy variables, namely three variables representing the four domains (German, English, French, and mathematics as the reference domain; Goldstein, 2010; e.g., dummy variable 1: German = 1, other domains = 0). In addition to the subject domain, we controlled for sex, age, and academic achievement by also including them as covariates.

For the intraindividual analyses, the state assessments of goals and emotions were used. For each of the six state emotions, a multilevel multiple regression equation was modeled to examine the predictive value of the three state goals. The data of the state assessment (i.e., ESM) had a two-level structure, with points of time for the ESM assessments (Level 1; total $N = 1409$ assessments) nested within persons (Level 2; $N = 120$). In order to account for clustering in the state data (ESM assessments within persons), we used multilevel modeling with M*plus* 7.11 (Muthén & Muthén, 1998−2012). Similar to the interindividual analyses, we included three dummy variables accounting for the four school subjects (mathematics as reference domain) at Level 1 to take the effects of the subject domain into account. At Level 1, we included state goals as well as the three dummy variables accounting for the subject domains as predictors of state achievement emotions. At Level 2 (person level), sex, age, and academic achievement in the four subject domains were included as covariates. Each of the multiple regression models was structured as a random intercepts and slopes model with predictors of state emotions on level 1 and predictors of the intercepts on level 2 (intercepts as outcomes model).

3. Results

3.1. Preliminary analysis

Table 1 provides the means and standard deviations for the study variables. For state achievement goals and emotions, the values are based on person-aggregated scores. For all variables, the values are reported separately for the domains of mathematics, German, English and French.

Table 2 shows variance components and intra-class correlations (ICCs) for the state assessment. The two-level models reflect the structure of assessments nested within persons. The ICCs for achievement goals and achievement emotions are similar in magnitude (ICCs range from .257 to .332 for goals, and from .204 to .325 for emotions). Thus, most of the variance in both constructs originated from situational variation within persons.

Table 3 shows the correlations between trait achievement goals and trait achievement emotions. These correlations are based on person values which represent the mean level of each construct across the four domains.

Table 4 shows the correlations between state achievement goals and state achievement emotions, based on a two-level model without predictors (null-model) and with assessments nested within persons. As such, the correlations at Level 1 are based on the intraindividual distributions of variables, and the correlations at Level 2 are based on the interindividual distributions of variables. The Level 1 correlations show whether a higher score on a variable in a given situation is associated with a higher score on the other variable in the same situation. The Level 2 correlations show the between-person correlations between the aggregated state variables. Thus, they show whether persons having higher scores on one variable also have higher scores on the other variable across situations.

At Level 1, the correlations ranged from $|.30|$ to $|.48|$ for achievement goals and from $|.01|$ to $|.51|$ for achievement emotions. The correlations between achievement goals and achievement emotions ranged from $|.02|$ to $|.28|$. At Level 2, the correlations ranged from $|.36|$ to $|.90|$ for achievement goals and from $|.08|$ to

$|.94|$ for achievement emotions. The correlations between goals and emotions ranged from $|.08|$ to $|.58|$. As noted, the level 1 and level 2 correlations are statistically independent from each other as they refer to different distributions (within vs. between persons), and some of the correlations do in fact show substantial differences across the two levels (e.g., the correlations between performance-approach and performance-avoidance goals).

3.2. Main analyses

3.2.1. Interindividual analysis (trait assessment)

Table 5 shows the results of the multiple regression analyses for each of the six trait emotions including the three trait goals as predictors. The results are in line with our theoretical expectations. Mastery goals were positive predictors of enjoyment ($b = .40$, $p < .001$), and negative predictors of anger ($b = -0.31$, $p < .001$) and boredom ($b = -0.40$, $p < .001$). Performance-approach goals were positive predictors of pride ($b = 0.44$, $p < .001$), and performance-avoidance goals were positive predictors of anxiety ($b = 0.15$, $p < .01$) and shame ($b = 0.10$, $p < .05$). In addition to these expected relations, mastery goals positively predicted pride ($b = 0.12$, $p < .01$). Further, performance-approach goals positively predicted enjoyment ($b = 0.23$, $p < .01$), and performance-avoidance goals positively predicted anger ($b = 0.22$, $p < .05$).

We also found a number of significant effects of the covariates. Age was a positive predictor of pride. Mathematics and German achievement positively predicted enjoyment, and English achievement positively predicted pride and boredom. With respect to the school subjects, as compared to mathematics, students reported higher levels of enjoyment in German and English, lower levels of anxiety and anger in German and English, and lower shame in German.

3.2.2. Intraindividual analyses (state assessment)

Table 6 shows the results of the multilevel multiple regression analyses for each of the six state emotions with the three state goals as predictors. For the relations proposed by the Pekrun et al. (2006, 2009) model, the results were fully consistent with the

Table 1
Descriptive statistics for the study variables.

	Mathematics		German		English		French	
	M	SD	M	SD	M	SD	M	SD
Achievement goals − trait								
Mastery goals	3.26	1.13	3.41	1.05	3.31	1.09	3.86	1.09
Performance-approach goals	2.30	1.13	2.22	1.12	2.38	1.16	2.54	1.23
Performance-avoidance goals	2.67	1.20	2.61	1.19	2.68	1.26	2.85	1.26
Achievement goals − state								
Mastery goals	3.17	0.89	3.00	0.98	2.79	0.93	3.12	0.94
Performance-approach goals	2.27	0.84	2.28	0.93	2.19	0.92	2.31	0.90
Performance-avoidance goals	2.66	0.91	2.66	1.04	2.37	1.01	2.65	0.95
Achievement emotions − trait								
Enjoyment	2.52	1.19	2.77	0.91	2.94	1.09	3.21	1.04
Pride	2.07	1.10	2.26	1.03	2.17	1.11	2.39	1.16
Anxiety	1.68	1.06	1.68	1.02	1.32	0.74	1.27	0.63
Shame	1.56	0.90	1.45	0.71	1.35	0.73	1.36	0.69
Anger	2.35	1.17	2.23	1.08	1.77	1.00	1.74	0.96
Boredom	2.78	1.16	2.83	0.97	2.90	1.20	2.54	1.09
Achievement emotions − state								
Enjoyment	2.70	0.88	2.71	0.91	2.81	0.88	2.92	0.83
Pride	2.10	0.99	2.03	0.88	2.07	0.92	2.10	0.89
Anxiety	1.72	1.01	1.62	0.90	1.42	0.67	1.38	0.62
Shame	1.66	0.90	1.53	0.81	1.32	0.56	1.42	0.65
Anger	2.21	1.03	2.07	0.98	1.79	0.83	1.82	0.85
Boredom	2.52	0.95	2.54	0.91	2.52	1.04	2.48	1.04
Academic achievement	4.44	0.77	4.47	0.93	4.69	0.54	4.64	0.60

Note. For the state variables, mean values and standard deviations are based on person-aggregated scores. $N = 120$ students; $N = 1409$ state assessments within students.

Table 2
Variance components and intra-class correlations (ICCs) for State achievement goals and state achievement emotions.

	Variance level 1 — Situation	Variance level 2 — Person	ICC
Achievement goals			
Mastery goals	1.009	0.350	.257
Performance-approach goals	0.848	0.409	.325
Performance-avoidance goals	0.962	0.479	.332
Achievement emotions			
Enjoyment	1.021	0.297	.225
Pride	0.897	0.431	.325
Anxiety	0.800	0.221	.216
Shame	0.596	0.189	.240
Anger	1.096	0.281	.204
Boredom	1.120	0.388	.257

Note. ICC: Variance on Level 2 divided by total variance. $N_{Level\ 1} = 1409$ (assessments within students), $N_{Level\ 2} = 120$ (students).

Table 3
Correlations between trait achievement goals and trait achievement emotions.

	1	2	3	4	5	6	7	8
1 Mastery goals	—							
2 Performance-approach goals	.30***	—						
3 Performance-avoidance goals	.33***	.86***	—					
4 Enjoyment	.53***	.29**	.30**	—				
5 Pride	.22*	.46***	.40***	.42***	—			
6 Anxiety	−.01	.24*	.22*	−.09	.18*	—		
7 Shame	.02	.24*	.22*	−.01	.24**	.80***	—	
8 Anger	−.28**	.19*	.19*	−.34***	.18*	.51***	.42***	—
9 Boredom	−.38***	−.06	−.04	−.50***	.24**	.27***	.21*	.50***

Note. Correlations are based on person values which represent the mean level of each construct across the four domains of mathematics, German, English, and French. $N = 120$ (students).
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4
Correlations between achievement goals and achievement emotions of the state assessment (two-level model).

	1	2	3	4	5	6	7	8	9
1 Mastery goals	—	.36***	.53***	.49***	.23	−.14	−.14	−.40***	−.58***
2 Performance-approach goals	.30***	—	.90***	.23*	.31**	.43***	.41***	.35**	−.08
3 Performance-avoidance goals	.32***	.48***	—	.22*	.22*	.28*	.26*	.22	−.20
4 Enjoyment	.24***	.28***	.13**	—	.56***	−.14	.08	−.23*	−.32**
5 Pride	.20***	.24***	.14**	.41***	—	.26*	.39**	.24*	.15
6 Anxiety	.03	.02	.09	−.14***	−.02	—	.94***	.71***	.31**
7 Shame	.04	.05	.09*	−.10**	.01	.51***	—	.66***	.35**
8 Anger	−.06	−.02	.02	−.28***	−.09*	.35***	.40***	—	.57***
9 Boredom	−.28***	−.11**	−.04	−.24***	−.09*	.08	.19***	.26***	—

Note. Correlations above the diagonal are between person correlations (level 2, person); correlations below the diagonal are within person correlations (level 1, situation). $N_{Level\ 1} = 1409$ (assessments within students), $N_{Level\ 2} = 120$ (students).
*$p < .05$. **$p < .01$. ***$p < .001$.

interindividual findings. Mastery goals were positive predictors of enjoyment ($b = 0.22$, $p < .001$), and negative predictors of anger ($b = −0.12$, $p < .01$) and boredom ($b = −0.29$, $p < .001$). Performance-approach goals were positive predictors of pride ($b = 0.18$, $p < .001$), and performance-avoidance goals were positive predictors of anxiety ($b = 0.10$, $p < .05$) and shame ($b = 0.07$, $p < .05$). In addition to these expected relations, mastery goals positively predicted pride ($b = 0.15$, $p < .001$). Further, performance-approach goals positively predicted enjoyment ($b = 0.13$, $p < .01$) and shame ($b = 0.07$, $p < .05$).

Again, there also were a number of significant effects of the covariates. Males reported higher levels of enjoyment. Further, mathematics achievement negatively predicted anger. Finally, as compared to mathematics, students experienced higher levels of enjoyment and lower levels of anxiety, shame, and anger in German and English.

4. Discussion

This research examined whether theoretical propositions on the relations between achievement goals and achievement emotions, as outlined by Pekrun et al. (2006, 2009), are supported when adopting an intraindividual empirical approach. Although findings of previous studies were largely in line with these propositions (for reviews see Huang, 2011; Linnenbrink-Garcia & Barger, 2014), they were based on interindividual analyses and failed to examine the intraindividual relations of achievement goals and emotions. This limitation is crucial, as interindividual findings cannot provide support for models that actually address the *intraindividual* mechanisms linking goals and emotions (Linnenbrink & Pintrich, 2002; Pekrun et al., 2006, 2009).

4.1. Intraindividual versus interindividual relations between achievement goals and achievement emotions

4.1.1. Correlational analysis

The present study examined three types of correlations between achievement goals and emotions: (a) interindividual correlations between trait goals and trait emotions, (b) interindividual correlations between aggregated state goals and state emotions (Level 2

Table 5
Multiple regression analyses for trait achievement goals as predictors of trait achievement emotions.

Predictor variable	Enjoyment	Pride	Anxiety	Shame	Anger	Boredom
Achievement goals						
Mastery goals	0.40***	0.12**	−0.04	−0.07	−0.31***	−0.40***
Performance-approach goals	0.23**	0.44***	−0.04	−0.02	−0.04	−0.06
Performance-avoidance goals	−0.07	−0.05	0.15**	0.10*	0.22*	0.12
Demographic variables						
Sex	0.10	−0.08	−0.12	−0.14	−0.03	−0.13
Age	−0.03	0.20*	−0.04	−0.04	−0.03	0.12
Academic achievement						
Mathematics	0.14*	−0.07	0.04	0.05	−0.02	−0.06
German	0.21*	−0.01	−0.02	0.07	0.03	−0.04
English	−0.14	0.29**	0.03	−0.14	0.09	0.22*
French	−0.05	0.04	0.03	0.07	−0.02	−0.13
School subject						
German	0.36**	0.06	−0.37*	−0.20*	−0.54***	0.17
English	0.40**	0.13	−0.41***	−0.17	−0.44**	0.01
French	0.20	0.20	0.01	−0.10	−0.04	0.13

Note. Separate models were run for each emotion. Sex was coded 0 for female and 1 for male. School subjects were dummy coded with mathematics as reference category.
$N = 480$ assessments (120 students, with four assessments per student related to the domains of mathematics, German, English, and French). Coefficients are unstandardized regression coefficients.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 6
Two-level multiple regression analyses for state achievement goals as predictors of state achievement emotions.

Predictor variable	Enjoyment	Pride	Anxiety	Shame	Anger	Boredom
Level 1						
Achievement goals						
Mastery goals	0.22***	0.15***	−0.01	−0.01	−0.12**	−0.29***
Performance-approach goals	0.13**	0.18***	0.03	0.07*	0.03	−0.05
Performance-avoidance goals	0.02	−0.01	0.10*	0.07*	0.06	0.05
School subjects						
German	0.19*	0.06	−0.15*	−0.21**	−0.23*	−0.04
English	0.22**	0.07	−0.24**	−0.19**	−0.26*	−0.05
French	0.09	0.03	−0.02	−0.09	−0.07	−0.03
Level 2						
Demographic variables						
Sex	0.20*	0.15	−0.05	0.07	0.11	−0.01
Age	−0.01	0.16	0.09	0.07	0.10	0.19
Academic achievement						
Mathematics	0.08	−0.14	−0.08	−0.09	−0.16*	−0.07
German	0.18	−0.19	−0.04	−0.04	−0.18	−0.10
English	−0.13	0.17	−0.07	0.02	0.08	0.16
French	−0.04	0.03	0.09	0.06	0.05	−0.06

Note. Separate models were estimated for each emotion. Sex was coded 0 for female and 1 for male. School subjects were dummy coded with mathematics as reference category. $N_{Level\ 1} = 1409$ (assessments within students), $N_{Level\ 2} = 120$ (students). Unstandardized coefficients are shown.
*$p < .05$. **$p < .01$. ***$p < .001$.

in multi-level analysis), and (c) intraindividual correlations of these goals and emotions (Level 1 in multi-level analysis). The interindividual correlations at the trait level (Table 3) and at the person level using aggregated state data (Table 4) were equivalent, indicating that the aggregated state data behaved in similar ways as the trait data. By contrast, some of the intraindividual correlations differed from these interindividual correlations.

Specifically, performance-approach and performance-avoidance goals were clearly separated at the intraindividual level ($r = .48$), in contrast to their strong correlation at the interindividual level ($rs = .86$ and $.90$ for trait goals and aggregated state goals, respectively). This result is in line with findings by Rebar and Conroy (2013) who reported that intraindividual correlations among achievement goals ranged from −.06 to .61, whereas interindividual correlations ranged from .75 to .96. Similarly, achievement emotions were more clearly separated at the intraindividual level. For example, the intraindividual correlation between state anxiety and state shame was $r = .51$ (Table 4), whereas the interindividual correlations were $rs = .80$ and $.94$ (for trait emotions and aggregated state emotions, respectively; Tables 3 and 4).

A possible explanation for these striking differences in the size of correlations is that individual differences in response biases, such as the tendency to agree to self-report items, might boost interindividual correlations, but do not play as much of a role in intraindividual correlations. Furthermore, the strength of relations between variables may depend on the situational specificity of the assessment, with state assessments being more specific than trait assessments. Within a given situation, specific emotions (e.g., boredom) may co-occur with various different levels of another emotion (e.g., anger), depending on the specifics of the situation. For example, in some situations boredom may be high and anger low, whereas in other situations, both may be high. Accordingly, correlations between these emotions across situations may be low. In contrast, interindividual relations between trait variables are based on (mentally) averaged recollections across situations, which may boost relations between these variables.

4.1.2. Interindividual regression analysis: replicating previous findings

Our results on the interindividual relations between

achievement goals and achievement emotions were in line with the results of previous studies (for reviews see Huang, 2011; Linnenbrink-Garcia & Barger, 2014) and proved to be robust when controlling for students' sex, age, and academic achievement, as well as the subject domain in which the constructs were assessed. Specifically, mastery goals were a predictor of activity emotions (positive for enjoyment, negative for boredom and anger; for similar results see e.g., Daniels et al., 2008, 2009; King et al., 2012; Shih, 2008), and performance-based goals were a positive predictor of outcome emotions (performance-approach goals for pride, and performance-avoidance goals for anxiety and shame; for similar results see e.g., King et al., 2012). In sum, the results of the interindividual regression analyses replicated previous findings and supported the theoretical predictions.

Moreover, beyond these expected links, we found three additional relations which have also been reported in previous studies (Linnenbrink-Garcia & Barger, 2014). First, mastery goals positively predicted pride (for similar results see e.g., King et al., 2012; Pekrun et al., 2006, 2009). It might be that students not only focus on achievement activities per se when oriented toward mastery goals, but also think about possible positive outcomes of gaining mastery, which might facilitate pride. Second, performance-approach goals positively predicted enjoyment (for similar results see e.g., Daniels et al., 2008, 2009; King et al., 2012). This result indicates that performance-approach goals might focus attention not only on the outcomes of the learning process, but also on the learning process itself, with progress toward the goal sparking enjoyment (Linnenbrink & Pintrich, 2002). Finally, performance-avoidance goals positively predicted anger (for similar results see e.g., Pekrun, Elliot, & Maier, 2009), which might be explained by the "aversive nature of task engagement during avoidance goal pursuit" (Pekrun et al., 2009, p. 129).

4.1.3. Intraindividual multi-level regression analysis

Our results on the intraindividual relations between achievement goals and achievement emotions were equivalent with the results of the interindividual analysis: Mastery goals were a positive predictor of enjoyment and a negative predictor of boredom and anger; performance-approach goals were a positive predictor of pride; and performance-avoidance goals were a positive predictor of anxiety and shame. In sum, findings from the intraindividual analysis directly support the propositions of the Pekrun et al. (2006, 2009) model and complement previous interindividual findings.

Again, we found a few additional associations. In line with the interindividual findings, mastery goals positively predicted pride, and performance-approach goals positively predicted enjoyment. Additionally, performance-approach goals positively predicted shame (for similar results see e.g., King et al., 2012; Pekrun et al., 2006). As argued by Linnenbrink-Garcia and Barger (2014), performance-approach goals, given their focus on being competent relative to others, focus attention on the self, and shame is an emotion that, likewise, implicates the self. As such, students with high levels of performance-approach goals might be prone to experience not only positive self-related achievement emotions like pride, but also negative self-related emotions like shame. However, it is important to note that the relation between performance-approach goals and shame, although reaching significance, was weak.

4.1.4. Equivalence of interindividual and intraindividual relations

As noted, inter- and intraindividual relations between variables are statistically independent (e.g., Schmitz & Skinner, 1993; for the independence of relations across higher levels of aggregation, see Robinson, 1950). The psychological mechanisms thought to link achievement goals and achievement emotions pertain to intra-individual processes, as addressed in current models of the achievement goal-emotion link (Linnenbrink & Pintrich, 2002; Pekrun et al., 2006, 2009). From this perspective, the empirical support for the proposed intraindividual links between achievement goals and emotions that is provided by the current study is of pivotal importance for validating these models.

It is less obvious why many of the interindividual relations between achievement goals and emotions, as documented in previous research as well as the present study, are the same as these intraindividual relations. Given the multitude of factors that can render interindividual and intraindividual relations non-equivalent (see Voelkle et al., 2014), why should the interindividual and intra-individual relations between achievement goals and emotions show convergence? For example, why should mastery goals not only positively predict higher state enjoyment in a given situation, but also predict students' ongoing enjoyment across time and situations?

We believe that there are sound reasons to assume that interindividual and intraindividual relations between psychological variables often coincide. Specifically, it can be assumed that interindividual relations between variables often result from the repeated occurrence of the respective intraindividual functional effects (Fleeson, 2001; Fleeson & Gallagher, 2009). For example, let us assume that individual trait mastery goals promote activation of situational mastery goals in academic settings, and that these situational goals, in turn, facilitate students' enjoyment of learning. Over time, repeated activation of situational mastery goals and their positive influence on enjoyment would imply that both students' trait mastery goals and their trait enjoyment of learning (i.e., habitual enjoyment) are strengthened. By contrast, students low in trait mastery goals would be less likely to endorse state mastery goals, and would experience enjoyment less frequently. As such, the positive intraindividual effects of state mastery goals on state emotion would translate into a positive interindividual relation between trait mastery goals and trait enjoyment. Overall, such an equivalence of interindividual and intraindividual relations may be more typical for psychological functioning than instances in which the two diverge.

4.2. Study limitations

Some limitations of the present study should be noted and can be used to suggest directions for future research. First, we assessed only a restricted number of achievement goals (three, based on the trichotomous achievement goal framework) and achievement emotions (six) in our study. Using ESM within regular lessons did not allow including more goals and emotions, due to the need to keep interruption of lessons to a minimum (and to obtain approval for the study procedure). Although the achievement goals and achievement emotions assessed in our study are those endorsed most frequently by high school students, future studies would do well to include a broader variety of achievement goals (e.g., 2 × 2, 3 × 2, potential-based; Elliot & McGregor, 2001; Elliot, Murayama, Kobeisy, & Lichtenfeld, in press; Elliot et al., 2011) and achievement emotions (e.g., social achievement emotions like admiration, envy, or contempt; Pekrun & Stephens, 2012).

Second, both achievement goals and emotions were obtained from students' self-reports, which might have resulted in some amount of common method bias (although we controlled for important confounding, objective variables including sex, age, achievement, and subject domain; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). To more fully control for such possible bias, future studies might use additional data sources like physiological indicators and behavioral observation to assess students' emotions

(e.g., measuring students' emotion via behavioral indicators of facial or postural expression).

Furthermore, although we controlled for important confounding variables, it cannot be completely ruled out that other variables had an impact on the observed relations between achievement goals and emotions. Thus, future studies might control for additional confounding variables such as students' interest in the course subject which may influence both their mastery goal focus and their enjoyment.

Finally, the ESM approach that we used for jointly examining inter- and intraindividual relations does not allow one to derive conclusions on the causal ordering of variables. Given that we collected data during lessons and across different school subjects, our state data were not equidistant in nature. The number of lessons differed across weeks and subjects, and different subjects were taught on different days during the week and at different time points during the day. As such, it was not possible to use the data for an analysis of causal relationships (e.g., cross-lagged analysis). Future studies should focus on examining the causal links between state goals and emotions by using equidistant assessments (e.g., by using diaries with daily measures; e.g., Krejtz, Nezlek, Michnicka, Holas, & Rusanowska, 2014).

From a theoretical perspective, in the model developed by Pekrun et al. (2006, 2009) goals are posited to influence students' emotions. However, it may also be that emotions influence students' achievement goal adoption. To the extent that both causal directions are operative, achievement goals and achievement emotions could be linked by reciprocal causation over time (Linnenbrink & Pintrich, 2002; also see Linnenbrink-Garcia & Barger, 2014; Pekrun, 2006). With respect to possible classroom interventions, reciprocal causality would imply that it may be optimal to target both goals and emotions in interventions, as either variable might have a positive influence on the other. Promoting one of the two variables might be the starting point of self-enhancing processes (e.g., an upward spiral of mastery goals enhancing enjoyment and vice versa). Similar to research on the reciprocal causal links between academic self-concept and achievement (e.g., Marsh & Martin, 2011), experimental research (e.g., Pekrun, Cusack, Murayama, Elliot, & Thomas, 2014) and longitudinal studies are needed to disentangle the causal effects that underlie the observed relations between achievement goals and achievement emotions.

5. Conclusion

The present study is the first investigation examining the link between students' achievement goals and their achievement emotions using a combined interindividual and intraindividual analysis. Based on an assessment of students' trait and state achievement goals and emotions in a real-life classroom context, the findings confirm that achievement goals and emotions are closely related. More specifically, they support propositions of Pekrun et al.'s (2006, 2009) model in showing that mastery goals relate to students' activity emotions (positive to enjoyment, negative to boredom and anger), and that performance-based goals relate to students' outcome emotions (performance-approach goals positively related to pride, performance-avoidance goals positively related to anxiety and shame). These findings were robust across different sets of interindividual and intraindividual analyses, indicating that interindividual versus intraindividual relations between achievement goals and emotions are likely to be equivalent.

This is an encouraging finding for both theory development and educational practice. As aptly argued by Voelkle et al. (2014), findings on the intraindividual level are a prerequisite to support theoretical assumptions on intraindividual functioning and to develop intervention programs for individuals. For example, although previous findings have shown a positive relation between mastery goals and enjoyment at the interindividual level, these findings are not sufficient to justify investing effort in treatment interventions that aim to enhance students' enjoyment by fostering their mastery goals. However, the present study indicates that this relation also holds at the intraindividual level. As such, the present findings do encourage the development of classroom practices and treatment interventions that foster students' adaptive emotions and reduce their maladaptive emotions by changing their goal foci. For example, future studies might investigate whether teachers' displays of enthusiasm (Keller, Goetz, Hensley, Becker, & Morger, 2014) can foster students' mastery goal adoption and, consequently, enhance students' enjoyment and reduce their boredom and anger in the classroom and beyond (e.g., when doing homework assignments). Similarly, positive feedback on mastery and performance might foster students' mastery and performance-approach goals which in turn can be assumed to increase students' positive emotions such as hope for success and enjoyment of learning.

Appendix. Reliability of the single-item measures

We computed the reliability of the single-item measures that were used in the present study.

State assessment

ICC(2) was computed, which is a form of intra-class correlation (ICC(1); proportion of variance at a given level). ICC(2) is a function of ICC(1) and the average number of observations within the clusters of a given level (Lüdtke, Trautwein, Kunter, & Baumert, 2007). In the context of the present study, ICC(2) can be interpreted as a measure of the reliability of aggregated (i.e., mean) state scores (Lüdtke et al., 2007). Table A1 shows the ICC(2)s across subjects and for each subject separately. Overall, ICC(2)s ranged from .734 to .921. Therefore, the aggregated state scores show good reliability both across subjects and for subjects individually.

Trait assessment

In order to match the trait assessments to the state assessments, we used slightly modified single items for the trait assessment. As opposed to the state assessments, the reliability of the trait assessments could not be examined in the context of the present study. However, we did compute the correlations between the trait scores and the aggregated state scores (within students) for each subject in order to examine the convergent validity between state and trait assessments. Table A2 shows that these correlations were found to be significant and to range from .26 to .71, with an average correlation of .45. It can be assumed that if the trait assessments were unreliable, they would not correlate with the state assessments. Therefore, given the reliability of the aggregated state assessments (see Table A1) and the convergent validity between state and trait assessments, we conclude that there is at least some indication of reliability of the trait assessments in the present study.

Table A1

Reliabilities (Intra-class Correlations − ICC(2)) of State Achievement Goals and State Achievement Emotions Across School Subjects and for each School Subject Separately

	Intra-class correlation ICC(2)				
	Total	Mathematics	German	English	French
Achievement goals					
Mastery goals	.802	.853	.842	.866	.901
Performance-approach goals	.850	.898	.820	.892	.892
Performance-avoidance goals	.854	.898	.890	.863	.889
Achievement emotions					
Enjoyment	.773	.835	.801	.830	.844
Pride	.850	.888	.847	.846	.875
Anxiety	.764	.855	.766	.734	.802
Shame	.788	.881	.858	.742	.846
Anger	.751	.851	.752	.848	.781
Boredom	.802	.900	.827	.921	.817

Note. ICC(2) = Reliability of the mean score of the state scores of one student. $N_{\text{Level 1}}$ = 1409 (assessments within students), $N_{\text{Level 2}}$ = 120 (students).

Table A2

Correlations Between Trait Scores and Aggregated (mean) State Scores of Achievement Goals and Achievement Emotions Scores for Each School Subject

	School subject			
	Mathematics	German	English	French
Achievement goals				
Mastery goals	.37***	.51***	.38***	.51***
Performance-approach goals	.52***	.45***	.48***	.61***
Performance-avoidance goals	.53***	.55***	.52***	.71***
Achievement emotions				
Enjoyment	.34***	.42***	.31***	.34***
Pride	.51***	.57***	.39***	.44***
Anxiety	.45***	.45***	.26**	.53***
Shame	.26**	.47***	.34***	.49***
Anger	.34***	.46***	.26**	.42***
Boredom	.48***	.59***	.26**	.51***

Note. Only correlations between the same constructs are indicated (e.g., trait mastery goals with state mastery goals). N = 120 (students).
**$p < .01$. ***$p < .001$.

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