What influences motivation in Physical Education? A multilevel approach for identifying climate determinants of achievement motivation

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Abstract

The present research tested the longitudinal and hierarchical influences of students' climate perception on the development of achievement motives in Physical Education (PE). Students from Switzerland (N = 919; 45 classes; 50.1% female, age: M = 13.2, SD = 0.6) responded to the questionnaire. Perceived climate was measured using the German LASSO scales (Von Saldern & Littig, 1987), namely teacher care, classmate cooperativeness and satisfaction with teaching. To assess sport specific achievement motives (Hope of Success, HS; Fear of Failure, FF), we used a validated German scale from Elbe, Wenhold, and Müller (2005). Multilevel analysis revealed a link between perceived climate on change of students' motivation in PE. The investigation also identified factors determining motivation decline caused by the classroom environment and teachers. Moreover, results showed significant gender effects on both motives and a significant impact of individual teacher care on the HS. This was also found for individual and aggregated satisfaction with teaching. The latter was significant for FF on both levels. Interestingly, teacher care showed inhibitory effects on both achievement motives. These findings suggest that students in PE may have unique behaviour which requires a different teaching approach than in normal classroom. This describes a specific learning environment in PE classes. Results are discussed based on students' unique needs and gender effects.

Keywords: achievement motivation, longitudinal study, multilevel analysis, physical education, climate perceptions

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Introduction

A learning environment in a typical classroom is characterized by active interactions between learner and instructor or between learner and other learners. In contrast to distance learning environments and normal classrooms, Physical Education (PE) offers a whole range of opportunities for intensive social interactions that first need to be organized (Hascher, 2004; Telama & Polvi, 2007). Therefore, learning in PE classes is always about controlling these social interactions and entailed emotions. Awareness of interaction patterns in the classroom can help PE teachers to manage the classroom and reach the particular important curricular goal of enhancing motivation (Roberts, Treasure, & Conroy, 2007; Vallerand, 2007).

School climate as social learning environment is an important aspect of student experience and a particularly powerful predictor of motivational factors (Hamre & Pianta, 2010; Weigand & Burton, 2002; Wang, Haertel, & Walber, 1993). A comprehensive understanding of students' behavior on learning patterns has to include the structur and processes of classroom interactions. Furthermore, motivation is a strong determinant of achievement in the classroom (Anderman & Anderman, 2013). This makes PE a fascinating research field for achievement motivation (Heckhausen, 1971). Therefore, it is important to determine which environmental factors influence motives in school classes in general and in PE. In order to obtain findings about mechanisms the motivation of students in general as well as in PE classes needs to be promoted. Yet, climate in PE class has special characteristics: PE is characterized by content that is closely related to the real world and to the leisure time of children and youth. Moreover, PE classes are marked by the occurrence of intense emotional moments. These moments make PE an authentic and fascinating research field. Unfortunately, there are limited empirical findings on this topic in PE, whereas there is some good evidence on it in other subjects (Hamre & Pianta, 2010). Thus, this study describes the specific characteristics of PE and examines the effect of climate perception (Von Saldern & Littig, 1987) on the change of students' achievement motivation (Atkinson, 1957) for the first time.

Achievement motivation

There is a long history of motivational research grounded in achievement motive theory in Anglo-American studies (McClelland, Atkinson, Clark, & Lowell, 1953; Spence, 1989) as well as in the German speaking countries (Brunstein & Heckhausen, 2006). The construction of achievement motivation (AM) is based on Atkinson's (1957) expectancy-value theory, which is frequently used in educational psychology research (Widgfield & Cambria, 2010). AM results from the emotional conflict between *Hope of Success* (*HS*) and *Fear of Failure* (*FF*, Weiner, 1994). Two motives and four situational variables are responsible for this conflict (Schneider & Schmalt, 2000). The first motive, *HS*, concerns the ability to be proud of achievements and supports students' goal orientation in performance situations. The second motive, *FF*, describes the attitude of feeling ashamed at having failed to achieve an objective and thus accelerates one's decision to leave the current operation (Atkinson, 1957, 1964). The entire directive is reinforced regardless of

the actual success or failure (Heckhausen, 1977). Emotions and daily experience play an important role. Each personal variable (*HS*, *FF*) is linked to two situational variables, *probability of success* and *incentive value* (Atkinson, 1964), and results in two motive tendencies. These two tendencies are related to each other and predict a resultant motivational behavior. When the tendency to seek success is predominant the person is success motivated, and when the tendency toward *FF* is predominant the person is failure motivated (Atkinson, 1957, 1964).

Achievement motivation in school

Achievement motivation is considered to be one of the crucial determinants of students' achievement and academic success (Anderman & Anderman, 2013). Studies in general school settings have shown that AM predicts students' task and activity choice, persistence in performance situations, and attitude towards the subject to a high extent (Wigfield & Cambria, 2010).

Success-motivated people (people with a higher extent of HS) want to improve their own ability, acquire new skills, and improve their skills in tasks. They attribute success to effort and talent and failure to insufficient effort (Weiner, 1974). Even in failure, their personal skill is never in question. Success triggers joy and pride in their achievements and acknowledgement of their own ability. *Success-motivated* people do not allow detrimental reviews and feelings of pride about success outweigh their feelings of shame about failure. Effects in the form of self-assessment emotions enhance the performance-motivated behavior (Heckhausen & Heckhausen, 2010). However, the entire directive is amplified, not only one individual element. Only positive self-affirmation explains why this directive is relatively constant despite the number of failures.

In contrast, *failure-motivated* people (people with a higher extent of FF) attribute failure to a lack of talent and have no clear preferences in their explanation of success (Weiner, 1972). They see failure as shameful and disheartening and interpret it as a sign of a lack of skills. Like *success-motivated* people, they take stock of their performance, but their emotional assessment is determined by detrimental and stressful emotions. Further, failure-motivated people avoid self-assessment (Brunstein & Heckhausen, 2010). They consider protecting their self-esteem more important than the task in which they are currently engaged. As a consequence, they do not choose tasks with moderate difficulty, because otherwise the negative assessment would constantly increase. The only self-affirming element of failure avoidance is the reduction of negative reinforcement. Possible actions are choosing extremely easy or extremely difficult tasks or low stamina and this behavior suggests an appropriate means of excluding or minimizing the probability of failure. This behavior seems to be a functional and comprehensible way to preserve one's self-worth. Nevertheless, some authors suggest that failure avoidance in school is disadvantageous for the improvement of competence because it suggests defensive and sporadic overall efficiency (Brunstein & Heckhausen 2010; Covington, 1999, 2000; Martin & Marsh, 2003; De Castella, Don Byrne, & Covington, 2013).

AM strongly depends on a persons' age and development (Wigfield, Eccles, Roeser, & Davis-Kean, 2006), but students of the age of 12 (similar to the students in this study) are

able to link ability with strain when explaining their performance (Nicholls, 1978). From secondary school on, HS and FF seem relatively time-stable, and a certain action directive takes control, continuously confirming the affective process (Pekrun, 2006). Development of HS needs forms of self- or external evaluation with an individual reference standard so that performance can be associated with one's own endurance and effort (for more detail see Dickhauser & Rheinberg, 2003). The directive of FF comes from social reference norms and excessive demand. To modify FF, one should focus on performance confidence. It might be helpful to work simultaneously on objectives, causal attribution, and achievement-related emotions. A way to achieve this in natural performance situations, such as classrooms, is by supplementing individualized feedback with the often-used social comparison (Brunstein & Heckhausen, 2010).

The concept of motivation is rarely explicitly defined, but in a school context it is often related to learning motivation (Murphy & Alexander, 2000; Pintrich, 2003). Moreover, AM offers many references for learning motivation (Urhahne, 2008). For example, educational standards announce students' mastery goals at the end of a class. Teachers try to promote the performance readiness of students, and international school performance pays attention to performance deficiencies and opportunities to improve performance by students of various nations. All cases reflect the basic idea of AM: The aim is to reach a normative quality scale in the best possible way.

Only a few studies on AM have been conducted in school settings. Most AM research has been conducted on competitive sports (Thomassen & Halvari, 1996, 2007; Schorer, Baker, Lotz, & Büsch, 2010). However, in the education literature, Badola (2013) showed that students' AM differs in urban and rural schools. The author also found a difference between the AM of boys and girls. Some findings suggest that social interactions in school have an influence on AM. For instance, cooperative learning improves AM, especially for female students (Järvelä, Volet, & Järvenoja, 2010; Wang, 2012). Findings also underline the importance of teacher judgment for the development of AM. A discrepancy between teachers' and students' judgement can mediate students' attribution of success (Zhou & Urhahne, 2012).

Achievement motivation in Physical Education.

Motivation to participate in PE seems to decline over the late elementary and high school years (Ntoumanis, Barkoukis, & Thøgersen- Ntoumani, 2009; Xiang, McBride, & Guan, 2004). Undoubtedly, school can play an important role in the prevention of this decline in motivation. One study found that teaching students appropriate self-motivation and goal setting skills during PE class has a positive impact on motivation (MacNamara, Collins, Bailey, Toms, Ford, & Pearce, 2011).

There are also limited approaches with the AM in PE (DSB-SPRINT, 2006; Erdmann & Amesberger, 2008; Erdmann, 1983). This is surprising because in 1971 Heckhausen already described PE classes as a fascinating field for AM research. Recent findings from the German DSB-SPRINT Study (Gerlach, Kussin, Brandl-Bredenbeck, & Brettschneider, 2006) showed that climate had significant correlations with AM during PE class; climate had a negative relation with FF and, on the contrary, a positive relation

with HS. Goudas and Biddle (1994) revealed a substantial correlation between motivational climate and motivation based on cross-sectional data. Erdmann and Amesberger (2008) describe intervention studies in PE (e.g., Breuer, 1982) that reduced FF and modified HS through PE teacher behaviour. The interventions integrated determinants of AM (Dickhauser & Rheinberg, 2003) and their consequences for teaching. Climate, task situations and performance evaluation played the key role in this motive change.

Social climate

There is no commonly accepted definition of climate, but most concepts have their origin in the habitat concept of Lewin (1963). The concept of *motivational climate* (Nicholls, 1989; Ames, 1992; Epstein, 1989) has a long history in Anglo-American countries. It describes the climate in the classroom as resulting from teachers' goal-orientation. There are noteworthy results on motivational climate from studies in real-school settings (Valentini & Rudisill, 2006). The *motivational climate* in PE classes has been well assessed. Most of the results come from the LAPOPECQ questionnaire (Papaioannou, 1994) and Epsteins' TARGET dimensions (Epstein, 1989). Results suggest that social factors and climate have an effect on psychological mediators and motivation in PE (Kalaja, Jaakkola, Watt, Liukkonen, & Ommundsen, 2009; Pannekoek, Piek, & Hagger, 2013; Sproule, Wang, Morgan, McNeill, & McMorris, 2007). Braithwaite, Spray, and Warburton (2011) offer a detailed overview of intervention studies. Papaionannou, Kosmidou, Tsigilis, and Milosis (2007) provide a description of the assessment instrument, and Harwood, Spray, and Keegan (2008) offer a critical review.

A different theoretical approach is the German concept of *social climate* (Eder, 1996), which refers to a multidimensional (level-structured) climate. Social climate focuses on the teacher-student relationship, the student-student relationship, and the character of teaching. The three dimensions cannot be strictly separated as one may influence the other (Eder, 2010; Von Saldern, 1987). The concept of *social climate* (Eder, 1996) is well-established in the German-speaking world. In addition, Eder (1996) stresses that there is a meaningful difference between perceived individual climate, aggregated climate, and collective climate. Frequently used instruments in the German speaking countries are the LASSO Scales (Von Salder & Littig, 1987) and the LFSK (Linz Questionnaire of School and Classroom Climate, Eder, 1996). A critical examination of culture-specific concepts could lead to a deeper understanding of the mechanisms influencing the development of motivation in a cross-cultural perspective.

Individual and classroom climate – The LASSO scales

One essential element of the teacher-student relationship is students' perception of the pedagogical commitment of their teachers (Eder, 1996). Students can detect whether the teacher's personality agrees with their achievement and learning objectives and whether the teacher takes responsibility for their success or failures. The construct of teacher care (*"Fürsorglichkeit der Lehrkraft"*, Von Saldern & Littig, 1987) is an indicator of a trusting, caring, and supportive environment and an individualized teacher-student relation-

ship. Teacher care is relevant for students' active participation during class as well as for their individual learning progress (Eccles & Midgley, 1989).

A further aspect of climate is the relationship between classmates, which primarily involve competition or cohesion (Eder, 1996). The construction of students' cooperativeness ("*Hilfsbereitschaft der Mitschüler*", Von Saldern & Littig, 1987) defines a perceived atmosphere of helpfulness and understanding between classmates. Such a climate promotes the development of students and favors personality growth (Marshall & Weinstein, 1984).

The third dimension of climate describes the character of teaching and the teacher's methodological access to social climate. Students constantly perceive the character of teaching, interpret it, and use it for their individual learning (Hambre & Pianta, 2010). Thus, beneficial and satisfying learning can only exist with the involvement of students. An important part of the character of teaching is students' satisfaction with teaching (*"Zufriedenheit mit der Unterrichtsgestaltung"*, Von Saldern & Littig, 1987). It indicates the extent to which students approve of their teachers' teaching style.

Evidence shows that the teacher-student relationship can have a positive impact on student motivation. A large-scale investigation found effects of perceived teacher care on student motivation (Bieg, Backes, & Mittag, 2011). Further, investigations in mathematics classes have shown effects of perceived individual climate on motivation, resulting in a less marked decline in motivation (Fischer & Rustenmeyer, 2007).

A greater willingness to work hard can be assumed when students are satisfied with and approve of the lesson (Von Saldern, 1991). In fact, when students in math classes regard the teaching as stimulating and original they show a higher rate of participation (Fischer & Rustenmeyer, 2007). Hastily given instructions and a focus only on correct answers is related with a negative perception of the teacher in science classes (Ryan & Patrick, 2001). In contrast, a perception of teachers that focuses on understanding and independent acting is positively related with student satisfaction (Nolen, 2003). Heterogeneity in classroom ability and individualized instructional methods may also influence student perceptions of the classroom through the way teachers organize and teach the class (Wang & Eccles, 2014)

Effects and consequences of climate perceptions

There is a theoretical and empirical link between social environment and students' personality development. In the transactional model of climate perception in school, Pekrun (1985b, p. 529; see also Gruehn, 2000) describes the link between physical and social environment as well as the effects of environment on students. If students frequently observe environmental events (e.g., praise for good performance), then these events will represent components of the perceived atmosphere in class and constitute climate perceptions. Climate perception depends on the following four conditions: First, it is dependent on the currently existing objective environmental processes and structures. Second, it is dependent on the climate perceptions of other group members (e.g., the classmates). The influence of this perception increases when other people share their perceptions. A match or mismatch between shared perceptions may lead to a differential effect. Climate per-

ceptions can only have relevant impact on individual behavior when students are aware of the extent of agreement or discrepancy between perceptions of the environment. The third condition climate perception is dependent on is the cognitive schemata of the perceiver, which represent stored ideas on environmental processes and structures in his or her memory. This schema determines the cognitive representations of a person's subjective significance of an individual environment and controls which environmental operations are perceived and committed to memory. Finally, climate perception is also dependent on the intra-psychic processes of the perceiver. They are primarily of an emotional and motivational nature. Intra-psychic processes, such as the person's current mood, affect both the direction and the assessment of the cognitive representation of environmental perceptions.

The situation created by these four components can now trigger new intra-psychic processes and procedures, which in turn manifest behavioral change (Pekrun, 1985a). This behavior may have an effect on the school environment, as long as it is perceived as such. On the other hand, it may have an influence on the students' own long-term performance and personality development in that it triggers learning processes that lead to changes in cognitive schemata.

Climate perceptions and motivation in PE

PE is characterized by several peculiarities. For example, PE teachers give more verbal instructions and act more physically than teachers in any other subject (Friedrich, 2013), and boys and girls frequently report negative experiences caused by subject-specific aspects (Wolters, 2008; Wolters & Gebken, 2008). These experiences will be discussed in the following, as they provide a means of understanding the unique social climate and climate specifics in PE.

It is evident that social climate in PE reflects students' experience during lessons (Heemsoth & Miethling, 2012; Gerlach, 2005). Specifics of PE can complicate the perception of the teacher during class. Students are quick to perceive the teacher as unfair or biased due to the marked sense of justice they are socialized with at German secondary schools (Hascher, 2004). Furthermore, students frequently perceive the commitment of PE teachers as being too low or over-motivated (Gerlach, et al, 2006).

There are also known gender effects and stereotypes in the interaction between PE teachers and students. Girls report less criticism and a lack of responses from their teacher than boys, but they also feel more supported (Nicaise, Cogérino, Bois, & Amorose, 2006). In other studies, the influence of teachers' feedback on perception of competence and on self-concept was stronger for girls than for boys (Nicaise, Cogérino, Bois & Amorose, 2006, Mutz & Burrmann, 2014). Some authors found also differences in the rate of verbal interactions (Hannon & Ratliffe, 2007). Research from Sullivan (2003) describes girls' preferences of cooperative, aesthetically pleasing and expressive activities such as gymnastics, swimming, tennis, or dance. This contrasts with the fact that basketball, soccer, and handball are the games played most often during PE class in Germany (Gerlach, Kussin, Brandl-Bredenbeck, and Brettschneider, 2006). Gerlach and colleagues (2006) as well as Nicaise and colleagues (2007) noted that the common and frequent use

of physical and offensive games corresponds to boys' preferences. A recent study on co-educational PE found measurable disadvantages for girls in terms of lower self-concept perceptions, higher anxiety reports and lower grades (Mutz & Burrmann, 2014).

Failure in group challenges also has major social consequences (Hascher, 2004). For example, conceding a goal in soccer will disappoint the whole team, not only the goal-keeper. Due to the increased range of movement in PE, existing conflicts escalate more easily than in other subjects. Moreover, Hascher (2004) refers to the ever-present physical exposure: A failed attempt at a forward-roll in floor gymnastics will be witnessed by many classmates. Therefore, individual failure and individual success are both much more intense in PE.

Research shows that single-gender PE classes have a higher level of physical performance than co-educated classes. The different class environment of single-gender classes gives the students a more positive perception of personal safety. Without the other gender, the social consequences of failure are much lower (Wilson, 2012). An intervention study shows that working with many different students on individual-based activities can be conducive to the development of helping behavior in PE class (Polvi & Telama, 2000).

It is also known that some students perceive PE as incriminatory and stressful (Hascher, 2004). PE is directly linked with physical exertion, and some students are not willing to put in the required effort to improve their abilities (Hascher, 2004; Krieger & Miethling, 2001). For example, performing on the rings requires a level of strength few students can muster. Thus, students are confronted more intensely with their own weakness in PE than in other subjects.

Overall, the concept of climate has been investigated thoroughly with different motivational theories in the Anglo-American literature. However, the German discussion of individual and aggregated classroom climate does not take this research into sufficient account (Heemsoth & Miethling, 2012). This has significant theoretical consequences for the assessment of climate (Eder, 2010; Papaioannou, Marsh & Theodorakis, 2004) and has further empirical implications due to the clustered structure and the level-structured climate of school. This approach can serve in order to connect findings from PE to general educational research and could link research on climate and motivation in the German speaking and Anglo-American countries.

The current study

In the present study, we use a large-scale and longitudinal sample of middle school students and include multi-level climate predictors to explain achievement motives. We aim to analyze (1) the development of sport-specific AM as an effect of individual and aggregated climate perceptions (teacher care, students' cooperativeness, and their satisfaction with teaching in PE). In addition, we (2) control for background characteristics of students' gender. In particular, we use a theoretically suggested (Hox, 2002) multi-level approach that takes into account both individual and aggregated perceptions. On the basis of previous studies, we hypothesize that (1) better student perception of social

climate favors the development of HS and reduces the development of FF. In addition, we expect (2) that boys and girls perceive climate in different ways in favour of boys and that gender has a predictive influence on outcome motives.

Methods

Participants and design

The research hypotheses were analyzed with questionnaire data from Basel *IMplementation in Physical Education and the Quality of Teaching study (IMPEQT)*[5]. The students were from 45 classes from the Swiss cantons of Zurich, Aargau, and Basel-Land. At the beginning of the study, all students attended the 7th grade and had a mean age of 13.2 years ($SD = 0.6$). Table 1 shows the sample of each measurement. The German questionnaire was completed by 920 students (girls = 50.1%) for the first measurement in March 2012 (t1) and by 767 students for the second measurement in March 2013 (t2). There were no systematic differences between the panel study participants and dropouts. The sample shows a clustered mean of 15 (SD = 1) students per class, which is sufficient for a hierarchical analysis (Hox, 2002).

Measures

Procedure. PE teachers and students from participating schools were provided with consent forms and written information about the purpose of the study. Students completed questionnaires at the beginning of a regular PE lesson. Verbal and written instructions were given to the students regarding the content and the completion of questionnaires. Table 2 shows all scales used in the study. Items were answered on a 4-point Likert scale from 0 = "not true" to 3 = "is exactly right."

Table 1:
Students' sampling distribution from the IMPEQT study

	t1			t2			t1 & t2		
	N	girls	boys	N	girls	boys	N	girls	boys
Sample	920	457 (50%)	463 (50%)	767	403 (53%)	364 (47%)	668	356 (53%)	312 (47%)

Achievement Motive Scale Sport (AMS-Sport). The AMS-Sport (Elbe et al., 2005) is a questionnaire adapted from the original Achievement Motive Scale by Nygard and Gjesme (1973). In this study, the short German version of AMS-Sport was adapted for use in PE and consisted of the two AM variables Hope of Success (*HS*) and Fear of Failure (*FF)* on t1 and t2. AMS-Sport allows both personality variables to be high or low scaled at the same time. AMS-Sport is considered a validated and reliable tool for the assessment of AM and predicts *HS* and *FF* (DSB-SPRINT, 2006; Elbe et al., 2005; Elbe & Wenhold, 2005).

The Landau Social Climate Scales (LASSO). LASSO (Von Saldern & Littig, 1987) is the most elaborate instrument for capturing learning environment (Eder, 2010) and has already been used in the DSB-SPRINT Study (Deutscher Sportbund, 2006). Scales from LASSO assessed students' perception of the learning environment in t1. To capture all dimensions of climate, we used three appropriate LASSO scales: "teacher care" *(Fürsorglichkeit der Lehrkraft)*, "students cooperativeness" *(Hilfsbereitschaft der Mitschüler)*, and "satisfaction with teaching" *(Zufriedenheit mit der Unterrichtsgestaltung*; Von Saldern & Littig, 1987). Confirmatory factor analysis (CFA) was applied in Mplus 7 for statistical examination of the current data. Exploratory factor analysis showed good model fits (CFI = .98, TLI = .96, RMSEA =. 050, SRMR = .020) and a three-factorial structure. More restrictive conditions of confirmatory factor analysis including the multi-level structure confirmed this three-factorial solution (CFI = .97; TLI = .96, RMSEA = .046; SRMR = .037). The structure reflects the three-factor structure postulated a priori (see Table 2).

Table 2 presents the means, standard deviations, and internal consistencies (Cronbach's α) for all scales on each measurement. All Cronbach's α were sufficiently high.

Analysis

Students were clustered in classes and were not randomly selected. Therefore, we found a complex multi-level data structure. This clustering effect introduces problems related to appropriate levels of analysis, aggregation bias, and heterogeneity of regression. Hierarchical linear modeling (HLM, Raudenbush & Bryk (2002) is a strategy for analyzing multi-level data that combines analysis at both the individual (*within analysis*) and the collective level (*between analysis*) (Bryk & Raudenbush, 1992; Hox, 2002). It is possible to simultaneously include the individual-level effects (level 1), the average class-level effects (level 2), and potential compositional effects. Compositional effects occur when the aggregated perception of social climate or gender ratio influences the outcome variable, while the perception of the individual climate is controlled (Raudenbush & Bryk, 2002). *Within analyses* are located at level 1, but the crucial difference from a normal regression is that the difference between the classes is kept constant. Therefore, calculations are based on individuals but are calculated per group. In contrast, *between analyses* are located at level 2 and are based on each group, using the mean of all group members.

Table 2:

Means, standard deviations, Cronbach's α coefficients, and sample size for each measurement

Student–Student Relationship			t1	t2
Student Cooperativeness 4 items	e.g. "If anyone needs assistance in Physical Education, he can rely on his classmates." (LASSO, Von Saldern & Littig, 1987)	α	.78	-
		M	2.08	-
		SD	.61	-
		N	919	-
Character of Teaching				
Satisfaction with Teaching 4 items	e.g. "Almost all students appreciate the lessons of the teacher." (LASSO, Von Saldern & Littig, 1987)	α	.88	-
		M	2.03	-
		SD	.68	-
		N	919	-
Teacher–Student Relationship				
Teacher Care 4 items	e.g. "Our Physical Education teacher cares about the problems of students." (LASSO, Von Saldern & Littig, 1987)	α	.75	-
		M	1.86	-
		SD	.66	-
		N	919	-
AMS-Sport				
Fear of Failure 4 items	e.g. "I become anxious when I cannot meet the demands of an athletic task immediately." (Elbe et al., 2005)	α	.76	.78
		M	.91	.95
		SD	.69	.70
		N	872	757
AMS-Sport				
Hope of Success 5 items	e.g. "I enjoy athletic tasks in Physical Education that are slightly difficult for me." (Elbe et al., 2005)	α	.90	.90
		M	1.81	1.72
		SD	.81	.81
		N	876	761

Notes: "-": not assessed

With regard to hierarchical structure and statistical challenges (Lütke et al., 2009), the hypotheses of this study can be tested. It is first necessary to consider the relation between the predictors when modeling on an individual and collective level. This is especially necessary for investigating social climate because the data were collected on the individual level and subsequently aggregated for a higher level. Second, it is necessary to consider the centering of data on level 1. Predictors are often centered on the group mean in studies on the quality of teaching. This allows an explanation of the variance between students within a class and between classes. The "problem" is that both within and be-

tween effects can be found in a regression weight on level 2 (Raudenbush & Bryk, 2002). By testing the two levels simultaneously, one can center the predictors better on the grand mean (Hox, 2002). Thus, the regression weight indicates the independent and correct effect of every level and eliminates compositional effects.

Multilevel analysis

We used *HLM 7 – hierarchical linear and nonlinear modeling* (by Raudenbush, Bryk, & Congdon, 2010) for statistical analysis. All variables (except gender and bound variable) were first z-standardized in SPSS, allowing the coefficient to almost be interpreted as standardized regression coefficient. In the analysis of the variables and variances, we assumed that error terms do not correlate and are normally distributed. There was no centering in any of the parameters, except in the models M5 and M6, where the climate parameters on level 1 were centered on the grand mean. The analyses from M3 on do not have any fixing error terms (residue) because preliminary analysis showed no significant variance between classes. Further, two levels of analysis were specified. Individual level 1 (within) encompassed the repeated observations (t1, t2) of *Hope of Success* (*HS*) and *Fear of Failure* (*FF*), gender (0 = females, 1 = males), and the perception of the LASSO scales *"student cooperativeness"* (*COOP*), *"satisfaction with teaching"* (*SATIS*), and *"teacher care"* (*CARE*). Motivational variables from t2 were analyzed as bound variables. Class level 2 (between) encompassed the aggregated LASSO scales (*COOP_ag*, *SATIS_ag*, *CARE_ag*) and the inclass gender composition (*Gender_ag*).

Results

Prediction of Hope of Success

Following Bryk and Raudenbush (1992), we first tested a one-way ANOVA with random effects (M0) with no predictors. The intraclass correlation (ICC) was sufficient and reached .05. Hence, 5% of *HS* variance can be found between classes. *Within analyses* showed a significant negative effect of perceived *CARE* on students' *HS* (M2). Other climate factors had lower and non-significant effects. As can be seen in the β coefficients in Table 4, previous *HS* had the highest effect on outcome *HS* in all models, including between analyses of level 2 (M1–M6). A significant gender effect was found in every model (M1, M2, M3, M5). The gender composition of the classes was also significant (M4, M6). Perceived *SATIS_ag* had the highest significant effects on *HS* on level 2. Furthermore, negative effects of *CARE_ag* were present but decreased in significance until the final models (M6 and M7; p-value = .01). Effects of *COOP_ag* were constantly very low and never clearly significant in any model. Analysis of variance [(σ2(anova) - σ2(ran.coef)) / σ2(anova)], Bryk & Raudenbush, 1992) showed 34% of the explained variance from outcome *HS*.

Table 3:
Hierarchical Linear Model determining Hope of Success with β coefficients
for the intercept HS on t2

Variables	M0	M1	M2	M3	M4	M5	M6
Individual Level							
Hope of Success t1	-	.464***	.464***	.463***	.464***	.470***	.472***
Student Gender	-	.169**	.153**	.157*	-	.154*	-
Student Cooperativeness	-	-	-.015	-	-	-.026	-.030
Satisfaction with Teaching	-	-	.058	-	-	.016	.016
Teacher Care	-	-	-.071*	-	-	-.056	-.056
Classroom Level							
Student Gender (ag)	-	-	-	-	.185**	-	.181**
Student Cooperativeness (ag)	-	-	-	.049	.080	.030	.041
Satisfaction with Teaching (ag)	-	-	-	.257**	.249*	.093*	.090*
Teacher Care (ag)	-	-	-	-.250**	-.250*	-.050	-.051

Variance Component							
τ_{00}	.034	.001	< .001	< .001	< .001	< .001	< .001
σ^2	.615	.408	.407	.406	.406	.405	0.404
SD	.185	.024	.014	.012	.011	.012	.010
d.f.	45	45	45	42	41	42	41
χ^2	77.07	42.72	38.85	36.18	34.93	35.85	34.68
p-value	.002	>.5	>.5	>.5	>.5	>.5	>.5

Notes: Student Gender, 0 = females, 1 = males, ag = aggregated, absolute variance components for individual ($\sigma2$) and class level ($\tau00$) with p-value of $\chi2$-test, *p < .05, **p < .01, ***p < .001; - not included

Prediction of Fear of Failure

When testing ICC, we again found a sufficient value of .05 (M0). Random-coefficient regression models (Bryk & Raudenbush, 1992) examined the effect of perceived individual climate on *FF* (M2). M2 showed non-significant and small effects of perceived climate. The highest climate effect (-.05) in M2 was negative for *COOP*. As in the HS analysis, previous *FF* had the highest effect on outcome *FF* in all models (M1-M6). Further, a significant negative gender effect on *FF* was found (M1, M2, M3, M5). This was also found for gender composition in between analysis (M4, M6). The final models (M5, M6) showed independent positive effects of rated *SATIS* and negative (n.s.) effects of *COOP* on *FF* within classes. Also, a significant negative effect on outcome *FF* was found in the perceived *SATIS_ag*. Effects of *CARE_ag* were consistently positive (n.s.). We found an explained variance of 17% (Bryk & Raudenbush, 1992). Table 5 shows all model analyses and β coefficients for *FF*.

Table 4:
Hierarchical Linear Model determining Fear of Failure with β coefficients
for the intercept FF on t2

Variables	M0	M1	M2	M3	M4	M5	M6
Individual Level							
Fear of Failure t1	-	.295***	.292***	.292***	.291***	.294***	.293***
Student Gender	-	-.120*	-.172**	-.140*	-	-.148*	-
Student Cooperativeness	-	-	-.051	-	-	-.060	-.053
Satisfaction with Teaching	-	-	.037	-	-	.061*	.062*
Teacher Care	-	-	.015	-	-	.002	-.001
Classroom Level							
Student Gender (ag)	-	-	-	-	-.196**	-	-.200**
Student Cooperativeness (ag)	-	-	-	-.018	-.035	-.009	-.009
Satisfaction with Teaching (ag)	-	-	-	-.044	-.036	-.079*	-.073*
Teacher Care (ag)	-	-	-	.061	.061	.062	.063

Variance Component							
τ_{00}	.024	.007	.006	.007	.007	.006	.006
σ^2	.462	.384	.383	.384	.383	.383	.382
SD	.155	.080	.079	.083	.081	.079	.078
d.f.	45	45	45	42	41	42	41
χ^2	74.43	51.68	50.17	48.59	47.78	47.55	46.88
p-value	.004	.229	.276	.224	.217	.257	.244

Notes: Student Gender, 0 = females, 1 = males, ag = aggregated, absolute variance components for individual ($\sigma2$) and class level ($\tau00$) with p-value of $\chi2$-test, *p < .05, **p < .01, ***p < .001; - not included

Discussion

This study employed a multilevel approach to the influence of social environmental factors on students. It was designed to determine the extent to which students' perception of climate predict change of achievement motives in an authentic learning environment of PE classes. Knowledge about students' motives and the extent of students' readiness in learning situations is highly relevant for teaching practice and student understanding. Besides an innovative research methodology, we used instruments developed in the German speaking countries based on theory-families in German traditions in order to identify differences and similarities in an intercultural perspective. We focused on three aspects of social climate that are commonly used in the German-speaking countries: student cooperativeness, satisfaction with teaching, and teacher care. We analyzed these effects using a longitudinal approach, which integrated previous motivation on an indi-

vidual level. Gender was either an individual or a collective predictor. At the same time, the final models examined perceived climate variables as well as on the individual as on the class level. Our findings suggest that factors at all levels (individual, classroom) influence both indicators of achievement motivation. As hypothesized, climate perception stongly depends on gender and gender composition in PE classes. Boys and girls' ratings differ and have differential effects on achievement motives. Furthermore, we found climate factors that have a relevant influence on HS and FF. This influence varied depending on the level assessed. Finally, the effects of climate peception also varied depending on the achievement motive.

Effects of individual climate on achievement motives

Gender perception has a strong influence on HS and FF. Boys perceive climate differently than girls. The influence of climate perception on HS seems lower for girls, but climate perception has a lower influence on FF for boys. This is consistent in all of our findings. These results suggest that girls' perception of climate hinders the development of AM, which is consistent with previous findings from Nicause et al. (2006) and Mutz and Burrmann (2014). These authors suggested that the enhanced teacher feedback for boys led to a higher perception of competence and had more influence on their self-concept.

In detail, we found a significant negative influence of teacher care on HS. Its effects on FF are relatively neutral. This is inconsistent with research in general school settings and explains the specific role of climate in PE classes. Bieg et al. (2011) found that the perception of teacher care supports student motivation. It seems that students' perception of PE teachers suffers under the unique conditions in PE. It is known that students in PE class prefer to have a learning environment that leads them to perceive it as non-threatening and challenging (Koka & Hein, 2003). They also like teachers to provide positive general feedback to create a more stimulating learning environment. A possible explanation could be that the frequent rate of verbal interactions of PE teachers (Friedrich, 2013) diminishes students' HS when teachers are unable to interact in such an atmosphere. In this context, Hovelynck and colleagues (2007) gave practical advice in order to promote the student-teacher relationship during PE class. They emphasised listening to relational messages to hear the "topic" and understand the "issue". Thus, teachers can identify the social development stage of a class and interact accordingly (for more detail see Hovelynck et al., 2007, p. 108).

Although not significant, it is noteworthy that students' cooperativeness seems to have an influence on the development of FF, which suggests classmates have an influence on students' individual experience in PE. Gerlach (2005) produced similar findings, noting that peer groups have substantial positive influence on individuals' achievement motives. This seems logical due to the higher personal and cooperative interactions between students during PE classes. Prior findings from Järvelä et al. (2010) indicated that frequent changes in learning partners improve AM in school. Compared to other effect sizes on an individual level, it seems that classmates support individuals' FF development better than teachers do in PE class. Students with a high FF see their own failure as shameful.

But classmates can have a positive influence on these shameful feelings, probably in the form of support for performance confidence (Brunstein & Heckhausen, 2006).

Effects of classroom climate on achievement motives

Aggregated climate predictors describe the mean climate perception in a class. In general, we found higher effect sizes on the classroom level. This means that the effects of mean climate perception have more influence on the development of achievement motives, which is consistent with previous findings showing sustainable effects of learning environment from an aggregated classroom level (Gruehn, 2000).

The gender composition of PE classes has a significant influence on students' perception of climate. The influence of climate perception on HS is higher when there are more boys in a class. For FF, the influence of climate is less marked when the gender composition includes more boys. Further, there is a difference between boys and girls in their perception of the mean climate. This also means that the effect of mean climate perception on HS is higher for boys. This supports our hypothesis that gender perception of climate has a high predictive influence on achievement motives.

As with the individual level, mean perception of teacher care had a negative effect on HS. The more students in a class perceive the teacher as unfair or biased the individual reduction of HS strengthens. For boys this effect is less marked, but the effect size stays identical when controlling for gender composition. In detail, aggregated data of climate perceptions can't explain the motivational variables. However, peers, gender differences in self-concept, gender constructions and gender roles probably become relevant in this context (Bracken, 2009; Marsh & Jackson, 1986). For example, it is known that boys in PE classes can propose requests much easier than girls (Firley-Lorenz, 2003; Scheffel & Palzkill, 1994). Peculiarities of PE may amplifiy this effect. It seems that the class as a group of individuals can handle unprofessional teacher expertice only with a motiv decline. Hovelynck et al. (2007) see the teacher as a "change agent". Showing teacher care in this perspective means helping the class to deal with their problems (e.g. intrapersonal conflicts or tensions).

Furthermore, the results showed a significant positive effect of mean satisfaction with teaching on HS but no influence on the development of FF. This is inconsistent with findings from individual climate perception but emphasizes the role of variables on a class level. The mean student perception of satisfaction with teaching seems to outbalance individual perception.

Furthermore, the mean perception of students' cooperativeness had a positive influence on HS and a negative influence on FF. These effects suggest, similar to individual effects, that classmates have an influence on student achievement motives. Effect sizes seem to be higher when gender composition is controlled. Surprisingly, this effect is stronger for *HS*, but it shows that success-motivated students prefer same-sex classmates. Consistent with prior studies, this could mean that same-sex constellations share requirements for helping hands (Wilson, 2012). Furthermore, the organization of PE classes in terms of same-gender classes has to be discussed. It seems that students in such

classes are more objective and understand achievement-related emotions during PE class better than PE teachers do. This, in turn, can lead to a modification of achievement motives (Dickhauser & Rheinberg, 2003).

Finally, we constructed a multilevel model that took individual and aggregated climate perception into account simultaneously. The model clearly confirmed the importance of climate in PE. Perception of satisfaction with teaching had an especially significant high influence. The effects on FF in this model showed that perception of climate can have a negative influence on an individual and a positive impact on the mean class level. A further finding is that the perception of satisfaction with teaching supports the development of HS but also the development of FF (on an individual level). This contradicts our hypothesis, as we assumed that a higher perception of climate would slow down the development of FF. Nicaise et al. (2006) report a possible explanation for these contrasting effects. Girls perceive a higher frequency of encouragement and technical information, while boys receive more criticism from their teachers, who are also more likely to ignore boys' technical errors (Nicaise et al., 2006; Nicaise et al., 2007). This can probably lead to a different perception of satisfaction with teaching. We can find another explanation in the transactional model designed by Pekrun (1985b) where climate perception depends on the intra-psychic processes of the perceiver. These processes can affect the direction and assessment of environmental perception. For example, it is known that perceived teacher popularity (Kunter & Baumert, 2006), grading practices, and a sporting climate at home (DSG-SPRINT Study, 2006) influence students' ratings. Futher, this model shows that the individual perception of student cooperativeness is more important than the mean perception for limiting the development of FF. The results suggest that the mean perception of satisfaction with teaching has more influence than individuals' experience on the development of a positive HS. Lastly, this model confirms the previously discussed detrimental effects of teacher care on HS and FF.

Overall, the results indicate that students have specific needs and subject-specific behavior in PE. Any and all actions of teachers will be understood in the context of the relationship with the students. In theory, climate perceptions only occur when students frequently observe an event (Pekrun, 1985b). This means that professional teacher-student interactions have the potential to prevent a decline in motivation. Therefore, facilitating students' social development in class serves as reaching the important curricular goal and further supports a better learning environment. Findings from Koka and Hein (2003) show possibilities in the form of an adequate feedback culture in PE. Further findings suggest that teachers' judgment of students' success in PE is subject to a gender role understanding and possibly influences the development of students' achievement motives (Zhou & Urhahne, 2012; Mutz & Burrmann, 2014). This may occur especially when teachers judge girls' success. A recent study by Kunter, Klusmann, Baumert, Richter, Voss, and Hachfeld (2013) found higher efficiency in constructive learning support in teachers whose educational knowledge was more up to date. When we consider that 70% of the teachers in the present study were short on experience, these findings suggest that it would be beneficial to include more educational psychology in PE teacher education.

Limitations and further research

Several limitations must be noted. First, this study's sample was comprised of Swiss students in selected cantons and was not representative of the population. Therefore, any generalizations must be approached with caution. We focused only on PE classrooms, and the results should be generalized to PE only. Replication of these findings should divide samples into co-educative and mono-educative classes. For instance, we assumed that the students' perception of climate might influence their thoughts and feelings about PE. This may apply to the perception of teacher care. Future studies would benefit from taking individual and contextual characteristics into account when analyzing individual climate perception. Similarly, a further teacher self-evaluation can provide a more detailed assessment. In addition, future studies should investigate the relation between motivational climate as discussed in Anglo-American studies (Papaioannou et al., 2007) and social climate as used in German speaking countries. Both research histories could benefit from future findings.

Despite its limitations, this study extends previous research in a number of ways. The study advances our understanding of how multilevel climate interacts with achievement motives. This is especially interesting in PE. The study not only shows how a supportive PE classroom climate leads to a positive development of HS and FF but also elucidates the problematic situations during class. The study also provides insight into the measurement and analysis of setting-level constructs by examining multilevel predictors of classroom climate from longitudinal perspectives. These findings underscore the importance of assessing classrooms with a multilevel approach to better understand classroom climate, especially when monitoring important motivational outcomes.

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