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Achievement motives and emotional processes in children during problem-solving: Two experimental studies of their relation to performance in different achievement goal conditions

Gunnar Bjørnebekk · Torgrim Gjesme · Robin Ulriksen

Abstract In two studies, the influence of key emotional and motivational factors on performance in different achievement goal-type situations is examined. In study 1, based on 314 sixth-graders, two types of goal situations were induced; performance and mastery. The goals were examined with respect to important antecedents (e.g., motive dispositions) and several consequences (e.g., performance, satisfaction, pleasant affect, worry, and emotionality). The results showed that the motive to achieve success (M_s) produced positive affects, satisfaction, and increased performance, whereas the motive to avoid failure (M_f) produced worries and performance reduction. In study 2, based on 331 sixth-graders, three types of goal situations were induced; performance–approach, performance–avoidance, and mastery goals. The findings revealed that the most important single factors positively related to performance were M_s and mastery–goal situation. In addition, high M_s pupils performed better under mastery condition than under performance condition. Finally, avoidance-goal situation accentuate the negative effects of high M_f on performance.

Keywords Achievement goals · Motivation · Emotional processes · Performance · Achievement motives

G. Bjørnebekk (✉)
The Norwegian Center for Child Behavioral Development,
Postboks 7053 Majorstuen, 0306 Oslo, Norway
e-mail: gunnar.bjornebekk@atferdssenteret.no

T. Gjesme · R. Ulriksen
Institute for Educational Research, University of Oslo,
Oslo, Norway

Introduction

Investigating potential person × situation interactions is essential if one is to make reasonable suggestions to teachers regarding the creation of an optimal achievement climate. Two major constructs in contemporary research on achievement motivation are achievement goals and achievement motives. In Elliot's hierarchal model (1999) motives and achievement goals are viewed as working together to regulate achievement behavior. Achievement motives include the motive to approach success (M_s) and the motive to avoid failure (M_f). All individuals are assumed to have both motives, but their strength differs according to the individual. The motives are defined as capacities to anticipate pleasure or pain, respectively, in achievement situations. A classroom setting represents an important area for display of achievement-related activities, which cannot be developed in a motivational vacuum. Further, it is obvious that any situation which represents a challenge to achieving success also poses the threat of failure. Accordingly, in a classroom setting achievement motives could play an important role in pupil performance and in activation of emotional processes related to approach and avoidance motivation. The effect of motives has, however, been shown to vary depending on the features of the current situation (e.g., Nygård 1975). Earlier studies suggest that achievement goal focus may be one of these features (Barron and Harackiewicz 2001; Harackiewicz and Elliot 1993).

There are assumed to be two primary goals or reasons determining why individuals engage in achievement behavior. A mastery goal orientation reflects a focus on developing competence and improving skills whereas a performance goal orientation reflects a focus on demonstrating competence (Linnenbrink 2004). According to achievement goal theory, goal orientations provide a

framework for interpreting and reacting to events (Dweck and Leggett 1988). The orientations are presumed to differ as a function of situational demands (Maehr 1984), and their consequences are presumed to vary across individuals. For example, the results from Elliot and Harackiewicz's studies (1994, 1996) indicate that performance focus leads to enhanced intrinsic motivation in achievement-oriented individuals (e.g., high in M_s), whereas individuals low in achievement orientation display the highest levels of intrinsic motivation when provided with mastery-focused goals. The principal idea behind the current study is that the disposition effects on motivational outcomes such as performance, satisfaction during problem-solving and state test anxiety appear both to occur directly and to be moderated by contextual-based goals. More precisely, our primary purpose is to probe motives as forerunners of different kinds of motivations during problem-solving and performance in different types of achievement goal conditions. Second, we wish to examine the role of worry and satisfaction during problem-solving in mediating the relation between motives and level of performance. We will also examine the main effects of achievement goal conditions. In the following paragraphs, the two major motivational constructs are presented first and then their main effects on motivational outcomes. This is followed by discussion on how individual differences can lead to different outcomes in performance and mastery goal contexts.

The relations between achievement motives, affects and performance during problem-solving

McClelland defined motive as "a strong affective association, characterized by an anticipatory goal reaction, and based on past association of certain cues with pleasure and pain" (1955, p. 226). The affectively charged anticipatory state energizes either approach processes (when positive affect is anticipated) or avoidance processes (when negative affect is anticipated). The motive to achieve success (M_s) refers to the capacity to anticipate pleasant affective changes occurring in performance situations perceived as challenging. Conversely, the motive to avoid failure (M_f) refers to the capacity to anticipate unpleasant affective changes occurring in performance situations where there is some uncertainty concerning the outcome (Gjesme and Nygård 1970). All individuals are assumed to have both a motive to achieve success (M_s) and a motive to avoid failure (M_f), but the strength of the achievement motives differs from one individual to another (Atkinson 1957). The anticipation of failure as a possible outcome in an achievement task arouses the latent motive to avoid failure (M_f). The anticipation of success arouses the latent need for achievement or the motive to achieve success (M_s).

This implies that in achievement situations two motivational tendencies are situationally aroused: the tendency to strive for success (T_s) and the tendency to avoid failure (T_f). T_s is an approach tendency that instigates actions directed at achieving success and is thought to be related to satisfaction and activated pleasant affect during problem-solving (Atkinson 1964; Bjørnebekk and Gjesme 2009). T_f is an avoidance tendency which directs the individual's behavior away from the achievement task and the possibility of failure and is thought to be related to state test anxiety (Elliot and McGregor 1999). When the task appears to the person to be either extremely difficult or very easy, that is, when the probability of success (P_s) is either very high or very low, neither the motive to achieve success (M_s) nor the motive to avoid failure (M_f) is strongly aroused. When the probability of success is intermediate, both achievement motives are strongly aroused and differences in strength of motives are maximized (Gjesme 1983a, p. 146). Thus, a pupil may very well have a strong motive to approach success without being motivated for school work, i.e., without having his/her motives aroused in the school situation. This is likely to be the case if the probability of success is very high or very low (Atkinson 1964), the psychological distance to goal in time is long (Bjørnebekk 2009a; Gjesme 1974), or the perceived instrumentality of the activity is low (Raynor 1974). Thus, it is important to distinguish between motive and motivation, the first referring to a personality characteristic which may or may not manifest itself in a particular situation, and the second to its manifestation in a specific situation. Several empirical studies have shown that achievement motives are of significance in relation to performance and satisfaction at school or during problem-solving. The motive to approach success is positively related to performance (Atkinson and Litwin 1960; Bjørnebekk 2009a) and satisfaction and approach motivation (T_s) during problem-solving (Bjørnebekk and Gjesme 2009; Gjesme 1983a). Conversely, the motive to avoid failure is negatively related to performance (Bjørnebekk 2009a; Cock and Halvari 2001) and task well-being (Bjørnebekk 2009a; Gjesme 1983a).

Achievement goal focus as predictor and moderator of the motivation–performance relation

Teachers commonly use goals as a strategy to motivate their pupils in the classroom. The type of academic goal pursued by students is also considered one of the most important variables in motivational research in educational contexts (Bjørnebekk 2008b; Elliot 1999). It is possible that, more than any other research program, research on achievement goals has been conducted with an eye toward classroom application (Urdan and Turner

2005, p. 298). Differently from action-state orientation, which reflects a goal striving approach to motivation (Kuhl 1994), achievement goals reflect social cognitions about the purpose and reasons for achievement and the type of standard by which individuals can judge their performance in reaching that goal (Pintrich 2000). The personal achievement goals that pupils adopt in the classroom are believed to be influenced by the goal message that is made apparent in the achievement context (Ames 1992). There may be many different goal orientations, but the two that are always represented in the theories are labeled mastery and performance goals (Ames and Archer 1988). The first group encompasses individuals who exhibit their own abilities and try to perform better—or at least no worse—than others. The goals of the individuals in this group are called performance goals (Elliott and Dweck 1988) or ability-focused goals (Maehr and Midgley 1991). The second group encompasses individuals who look upon learning as an objective in itself and seek to improve personal achievement. The goals of the individuals in this group are called mastery goals (Elliot and Harackiewicz 1996) or learning goals (Dweck and Leggett 1988). Researchers in achievement goal theory generally associate performance goals with a number of negative processes and consequences. For example, it is assumed that a person who has set a performance goal will give up more easily in the face of difficulty (Dweck 1986). It is also assumed that performance goals are linked to decreased motivation (Nicholls 1989) as well as to a tendency to use strategies that promote surface processing of the material, such as rehearsal strategies (Nolan 1988). Mastery goals, on the other hand, are seen as linked to a number of positive processes and consequences. It is assumed that a person who has set a mastery goal will show considerable perseverance in encountering opposition (Dweck and Leggett 1988), will seek out optimal challenges (Dweck 1986), will tend to use strategies that promote deeper processing of the material (Ames 1984), and will become intrinsically motivated (Elliot and Harackiewicz 1996). Owing to inconsistent evidence about the relations among performance goal orientation, activation of approach motivation, and performance outcomes, however, a trichotomous model, which differentiates between performance approach, performance avoidance, and mastery goal orientation was proposed (Elliot 1997). Each of the three achievement goals has been shown to be related to emotional processes during problem-solving and performance. According to Tyson, Linnenbrink–Garcia and Hill's recent review (2009) adoption of performance–avoidance goals is associated with lower achievement and outcomes related to activation of avoidance motivation. Furthermore, 40% of the correlations showed a positive correlation

between adoption of mastery goals and achievement and between adoption of a performance–approach goal and achievement. Only adoption of mastery goals, however, seems to be consistently associated with emotional processes related to activation of approach motivation. More recently, a 2×2 framework grounded in both the mastery–performance distinction and the distinction between approach goals and avoidance goals has been considered (Bjørnebekk and Diseth 2010; Elliot and McGregor 2001). The mastery avoidance goal was not included in the present research because it was presumed to be less relevant to the age group under consideration.

Much of this previous work, however, has focused on students' personal goal orientations (e.g., Dweck 1986) or students' perceptions of the contexts (e.g., Roeser et al. 1996). Experimental manipulation of the classroom goal structure provides the greatest insight into how changes to the learning context can alter pupils' performance and affects during problem-solving. Research using experimental manipulation of classroom goals and their results is however limited (e.g., Linnenbrink 2004).

According to Atkinson's theory (1964), activation of achievement motives depends on the strength of the motives and the probabilities of success. Both the performance focus and the mastery focus make competence salient and thereby facilitate the activation of the motives. Achievement goals reflect normative standards for performance (e.g., performance goals) or are based on task characteristics and personal improvement (e.g., mastery goals), and these foci may activate the motive to achieve success and the motive to avoid failure differently. According to Dweck (1986), performance goals can evoke evaluation anxiety (e.g., state test anxiety) and disrupt task involvement, whereas mastery goals may promote task involvement (e.g., satisfaction during problem-solving) because they highlight self-referential evaluation and ongoing improvement. Considering these effects together, and because pupils high in M_f characteristically avoid normative comparison and are likely to experience performance anxiety in achievement settings (Atkinson 1964), the high M_f-group should be more performance-oriented.

Also, recent studies have tested out the hypothesis that the motivational outcome of achievement goals can be differentiated according to individual differences in motivation-related dispositions. Earlier experiments on intrinsic motivation indicate that individuals low in the motive to achieve success (M_s) respond most positively to assigned mastery focus (Durik and Harackiewicz 2003; Elliot and Harackiewicz 1994; Harackiewicz and Elliot 1993), whereas performance goals prove optimal for those high in the motive to achieve success (Elliot and Harackiewicz 1994), or those high in the motive to achieve success who

enjoy solving tasks regardless of goal focus (Durik and Harackiewicz 2003). The motive to avoid failure was not included in these studies.

A clear understanding of the effects of goal climates on motivational outcomes such as performance and affects during problem-solving may require investigation of motives as moderators of the effects of classroom goals. Surprisingly, it appears that no published study has examined the relationship between achievement motives and motivational outcomes such as performance and affects during problem-solving in children under different goal conditions. In earlier experiments which investigated the interactive effects of the motive to achieve success and evaluative focus of assigned task-specific goals on intrinsic motivation, the participants were undergraduates enrolled in introductory-level psychology courses (e.g., Elliot and Harackiewicz 1994). If the relationship between individual differences in motives and assigned goal–focus could be measured in a youth population, it would be a valuable addition to the existing literature and could promote further research on the development of such relationships in school settings.

Affective experiences during problem-solving mediating the relation between achievement motives or achievement goals and the level of performance

State test anxiety consists of two distinct components; worry reflecting cognitive reactions to a performance situation (e.g., concern over performance), and emotionality, reflecting physiological and affective reactions (e.g., accelerated heart rate). Research has revealed that worry undermines performance in testing situations, whereas emotionality does not (Brodish and Devine 2009; Elliot and McGregor 1999; Gjesme 1983b). The motive to avoid failure represents a dispositional tendency to experience negative affects and cognitions during performance situations (e.g., worries and unpleasant affects). According to Elliot's (2006) and Elliot and McGregor's (1999) hierarchical model of approach–avoidance motivation, the motive to avoid failure gives rise to avoidance goals and worry is posited as the mechanism responsible for the deleterious influence of avoidance goals on performance (Elliot 2006; Elliot and McGregor 1999). Bjørnebekk's (2009a) study indicates, however, that for children the motive to avoid failure directly influences performance and task well-being during problem-solving and is not mediated by performance–avoidance goals. A recent study by Bjørnebekk and Gjesme (2009) substantiated a partial mediation process caused by avoidance motivation (T_f) on the negative relationship between the motive to avoid failure and performance.

On the other hand, once the motive to achieve success is activated; it energizes the individual, ultimately making him or her aware of the possibility of success. Therefore, the motive to achieve success is assumed to be positively related to positive cognitions and mood states during problem-solving (e.g., satisfaction during problem-solving or/and pleasant affects). The hierarchical model further proposes that the effect of the motive to achieve success on performance is mediated by performance approach goals and the relationship between the motive to achieve success and satisfaction during problem-solving is mediated by mastery–approach goals (Elliot 1997; Elliot and Church 1997). In Bjørnebekk (2009a), the assumed mediation on the relationship between the motive to achieve success and performance was not independently substantiated since achievement goals did not predict performance, while controlling for scores on the motives. In the latter study, however, a model with mastery–approach goal adoption mediating the relationship between the motive to achieve success and task well-being was supported. In Bjørnebekk and Gjesme (2009), an approach motivation mediational analysis failed to yield a significant relationship between approach motivation and performance; therefore, approach motivation failed to satisfy the third requirement for mediation between the motive to achieve success and performance. In Puca and Schmalt's study (1999), the relationship between achievement motives (M_s–M_f) and performance was mediated by task enjoyment. Unfortunately, in this study as well the participants were university students. The motive to avoid failure is assumed to dampen the positive motivation and increase avoidance motivation (e.g., state test anxiety) and the motive to approach success is assumed to increase positive motivation and the tendency to undertake an activity. This conception combined with the assumption that performance level is a function of motivational strength implies that there should be a positive relationship between the strength of the motive to achieve success and performance level, and a negative relationship between the strength of the motive to avoid failure and performance level (see, for example, Nygård 1975). Furthermore, it implies that worry might account for the relationship between the motive to avoid failure and performance and satisfaction/activated positive affect during problem-solving for the relationship between the motive to approach success and performance.

We have decided not to posit any hypotheses although we do have some presentiments as to what the data analysis will reveal. Likewise, no specific hypotheses are presented for gender differences.

Study 1

Method

Participants

The sample consisted of 314 sixth-graders (11–12-year-olds) from 18 school classes in Oslo. The classes were selected from schools which scored on the same level in the Norwegian national test in mathematics and reading. In terms of composition, the sample consisted of 164 boys and 150 girls. Fifteen percent of the pupils in the schools where the classes were recruited had Norwegian as their second language. Most of the pupils with a non-Norwegian background were from Asia (mainly Pakistan). The average mathematics and reading scores for the schools in the sample were 55 and 59, respectively. The average scores in Oslo schools were 53 and 54, respectively. The raw scores were converted to standardized T-scores on a national basis: $M = 50$ and $SD = 10$. As we can see, important characteristics of the participants in the present study were that the majority had Norwegian as their first language and as a group they scored above average on the nationwide tests. Data collection was conducted by the third author and a graduate student research assistant. After securing the principal's permission, they contacted the selected classes' primary teacher and the parents' council working committee. Pupils were told that their participation in the study was voluntary and they were free to withdraw at any time and were assured of confidentiality. Only two pupils refused to participate in the study. No remuneration or other incentive was offered, and the pupils were not required to provide their name or any identifying information. Participation in the study was therefore anonymous and voluntary.

Assessment of variables

Motives The achievement motives scale (AMS) (Gjesme and Nygård 1970) is used to assess achievement motives. The AMS is based on achievement motivation theory and consists of (a) items referring to both positive and negative affects and (b) items focusing on situations that supposedly arouse a similar degree of uncertainty as to the possibility of success. To illustrate, the following item is intended to measure M_s: "*I feel pleasure at working on tasks that are fairly difficult for me,*" whereas the following item is meant to measure M_f: "*I become anxious when I meet a problem I don't understand at once.*" The AMS consists of 30 statements about the affect experienced in connection with achievement situations which are rated on a scale from one (not at all true of me) to four (very true of me). Results regarding the reliability and validity of the scale as applied to elementary school pupils were summarized by Christophersen and Rand (1982). The scale has also been examined and given a positive evaluation by several researchers and has been described as well-tuned to the motive concept within achievement motivation theory (e.g., Bjørnebekk 2009b; Halvari 1997; Kuhl 1982; Thrash et al. 2007).

Pleasant affects This scale was constructed using the terms from the schematic model presented by Yik et al. (1999) as guidelines. Three core affect items for every eight octants were collected systematically to sample and cover each region of the circular structure of the affect. In this study, we only used the pleasant affect scales. The pleasant affect factor consisted of the octants "pleasantness," "pleasant deactivation," and "pleasant activation." All items are in state form and relate to the problem-solving situation. The pleasant affect factor comprises nine specific core affect-related adjectives, rated on a five-point scale from "very slightly/not at all" to "very much." The adjectives are "inspired," "relief," "enthusiastic,"" happy," "contented," "excited," "engaged," "interested," and "delighted." In the instructions for the scales in the study, participants were asked to indicate "*to what extent did you feel this way during the problem-solving session*?" The scales have been successfully used in previous research on Norwegian elementary school pupils (Bjørnebekk 2007, 2009a). In the present study, a principal factor analysis showed that only one factor had eigenvalues greater than one (the first two eigenvalues were, respectively, 4.37 and 0.88). All items loaded satisfactorily on the pleasant affects factor (i.e. >40). The factor accounted for 49% of the total variance. Reliability for the scale was 0.86.

Satisfaction during problem-solving (SDPS) This scale is a five-item state version that measures overall satisfaction with the experience of taking part in a problem-solving session with a version of Updegraff, Gable, and Taylor's end-of-study satisfaction scale (2004). SDPS measures the cognitive judgmental aspect of task well-being (e.g., "Looking back, the last half hour has been fine"). Responses were rated on a scale from one (is not at all true of me) to four (is very true of me). Bjørnebekk's (2007, 2009a) empirical studies documented the reliability and validity of using this measure for Norwegian elementary school children. In the present study, a principal factor analysis showed as expected that only one factor had eigenvalues greater than one. All items loaded satisfactorily on the SPDS factor (i.e., >40). The factor accounted for 59% of the total variance. Reliability for the scale was 0.85.

State test anxiety measure (STA) Six worry and six emotionality items were employed. The worry items dealt with worry about the tasks, cognitive concern about failing,

and negative self-evaluation experienced during problem-solving sessions (e.g., "I worried about getting too many answers wrong while I was solving the problems"). The emotionality items concerned attention directed toward cues of physiological arousal, such as heart racing, upset stomach, and trembling in connection with the problem-solving session (e.g., "Once in a while my heart pounded hard while I was solving the problems"). In the instructions for the scales in the study, participants were asked: "How did you feel while you were solving the problems?" The items were taken from the Norwegian translations of the STAIC A-State scale (Spielberger 1973) and the Test Anxiety Scale for Children (TASC; Sarason et al. 1958) and were constructed to measure worry (W) and emotionality (E) during problem-solving sessions. Bjørnebekk's (2008a) and Gjesme's (1983b) empirical studies have documented the reliability and validity of using this measure for Norwegian elementary school children. In the present sample, a principal factor analysis with oblimin rotation showed that two factors had eigenvalues greater than one (the first three eigenvalues were, respectively, 5.99, 1.25, and 0.92). The two-factor solution accounted for 64% of the total variance. All items loaded satisfactorily on their primary factor (i.e. >40). The emotionality item, however, "My body and legs became restless when I was faced with problems that were difficult for me to solve" also loaded substantially (in the pattern matrix) on the worry factor (0.41).

Tasks   There were three different types of verbal problems and four different types of numerical problems. The first set of verbal problems were anagrams of four to seven letters that were to be put together to make nouns. Second were verbal analogies with one pair of related words and another unpaired word. The pupils were asked to choose one word from among four that had the same relation to the unpaired word as the first pair of words. Third, six words were presented, one of which was the antonym of a word written in capital letters. The pupils were asked to underline the antonym.

With regard to the numerical problems, first, nine or ten two-, three- and four-digit numbers were spread out within a square in which the students were asked to draw a ring around the number that was twice as great as another number in the square. Second, two lines of numbers were presented, and students were asked to draw a ring around the number on the second line that could be subtracted from a number in the first line to achieve the sum of 25. Third, eight numbers were presented, of which two were to be added together to achieve the sum of 1,000. The pupils were instructed to draw rings around those two numbers. The fourth problem consisted of four numbers that were to be added together in each task square. There were two

reasons for using two types of problems: (1) girls perform better in perceptual speed and some verbal tasks, whereas boys outperform girls in mental rotation and some mathematical tasks (Hyde 2005) and (2) the effect of numerical problems on failure-oriented pupils.

Earlier studies have revealed that the tasks were described as intermediately challenging in a difficulty estimate given by 580 sixth-graders *immediately* after the completion of each of these seven tasks. A five-point scale was employed: "Very hard" (5), "Hard" (4), "Medium" (3), "Easy" (2), and "Very easy" (1). The rating was done after the completion of each task; it is therefore not necessarily representative of the difficulty impression (the probability of success; P_s) which was effective during work on the task. The ratings were, however, based on very recent experience with the tasks and probably represent P_s indications of some validity (Bjørnebekk and Gjesme 2009).

Experimental procedure

The experiment was carried out in a group-testing session.

Procedure   The 18 school classes were randomly assigned to two different experimental conditions, mastery goal, and performance goal. Before the experimental procedures were induced, the pupils' motive dispositions were assessed. Each class received the instructions for the condition it was assigned to. Then, pupils received a booklet of problem tasks. The pupils in the two conditions received a test booklet containing identical sets of tasks (41 problems). After the pupils had received the booklets, and after examples of all types of tasks had been illustrated, the specific instruction for the two experimental achievement goal conditions followed:

Performance goal condition   "The problems you have the opportunity to answer today were constructed in a way which will allow you to compare your results with others. What we are interested in is how well you perform on the tasks as compared with other sixth-graders. When you have finished, you will have the opportunity to know how well you performed compared with others."

Mastery goal condition   "The problems you have the opportunity to answer today were constructed in a way which will allow you to discover new ways and strategies to solve them if you are working carefully on them. What we are interested in is how much you improve your skills by working with this type of problem. When you have finished, you will have the opportunity to learn whether you did well and made progress toward mastering these tasks."

Under both conditions, the pupils were given 20 min to work with the booklet. After the participants performed the anagram problems, they were asked to indicate the purpose of the task (as a manipulation check) and to fill out scales indicating state test anxiety, satisfaction, and pleasant affect during problem-solving. Coding of subjects' open-ended responses revealed that nearly all participants correctly stated the purpose of the experiment and suggests that the experimental manipulations worked.

Treatment of data We conducted multilevel analyses, using the SPSS version 15.0 linear mixed model program to analyze the data, with sex, motives, the achievement conditions, and their interactions at level 1 and classes at level 2. First, we conducted preliminary analyses in which we proportioned the total variance of the dependent variables into within-classes and between-classes components (model 0). The intraclass correlation for each variable was estimated by dividing the variance associated with the intercept by the sum of the residual variance plus the variance associated with the intercept (Singer and Willett 2003). Second, we tested the significance of each of the random components using restricted maximum likelihood (REML) estimation (Raudenbush and Bryk 2002). Third, after non-significant random error terms were dropped from the model, we examined our hypotheses with multilevel regression analyses for each of the dependent variables. The achievement goal conditions were dummy coded by zero (performance goal condition) and one (mastery goal condition), and sex by zero representing boys and one representing girls, respectively. All interaction product terms were constructed using mean-deviated main effects. Significant interaction effects were interpreted by generating predicted values from the regression equations using scores of one standard deviation above (high) and below (low) the mean for the continuous variables (Aiken and West 1991). Multilevel analyses were also used to test potential mediation (Krull and MacKinnon 2001) by

performing a Sobel's test (1982). Descriptive statistics, reliabilities and correlations at the within-class level among the variables are presented in Table 1.

The intraclass correlations (ICC) were evaluated for our dependent variables (e.g., satisfaction, pleasant affect, worry, emotionality, and total performance) by dividing the variance associated with the intercept by the sum of the residual variance plus the variance associated with the intercept (Singer and Willett 2003). The ICCs were weak and ranged from 0.01 (emotionality) to 0.15 (satisfaction), indicating that most of the variance was at the individual level. ICC values were significant in one out of five cases (satisfaction). For the other four cases, multilevel regression was used for consistency and because it best represented the structure of the data. The slopes of the motive to achieve success and the motive to avoid failure did not evidence significant variation among classes, so the motive effects were treated as fixed in the final model. The low correlation between M_s, M_f, the achievement goal condition, and sex (ranging from 0.02 to 0.12) suggest that multicollinearity is not a concern in analyses in which these variables are evaluated simultaneously. Each two-way interaction was tested separately, however, because of concerns about multicollinearity (i.e., $M_s \times M_f$, $M_s \times$ AGC, $M_s \times$ sex, $M_f \times$ sex, $M_f \times$ AGC, AGC $\times$ sex). The usual requirement for developing a regression equation that includes a three-way interaction is that all the first- and second-order terms must be included in the equation (Aiken and West 1991). To avoid the data being stretched too thinly, an approach–avoidance interaction model (i.e., $M_s \times$ AGC, $M_f \times$ AGC, $M_s \times M_f$, and $M_s \times M_f \times$ AGC), an avoidance–sex interaction model (i.e., Sex $\times$ AGC, $M_f \times$ sex, AGC $\times M_f$, and $M_f \times$ sex $\times$ AGC), and an approach–sex interaction model (i.e., Sex $\times$ AGC, $M_s \times$ Sex, AGC $\times M_s$, and $M_s \times$ sex $\times$ AGC) were tested separately. When a three-way interaction was significant, we included all of the variables in the model in the equation. Thus, in the first model, the dependent variables

Table 1 Descriptive statistics, reliabilities, and intercorrelations among the variables in study 1

N = 314	M	SD	α	1	2	3	4	5	6	7	8	9
1. Gender	–	–	–	1								
2. Motive to achieve success	39.8	9.1	0.90	0.12*	1							
3. Motive to avoid failure	28.3	8.5	0.88	0.02	−0.09	1						
4. Achievement goal condition	–	–	–	0.02	0.10	0.06	1					
5. Worry	10.7	4.2	0.87	0.15**	0.10	0.27**	−0.04	1				
6. Emotionality	9.1	3.6	0.85	0.06	0.02	0.06	−0.09	0.69**	1			
7. Pleasant affect	26.1	7.4	0.86	−0.00	0.39**	−0.05	0.09	0.06	0.09	1		
8. Satisfaction	13.0	3.9	0.85	0.08	0.34**	−0.10	0.05	0.04	0.63**	1		
9. Performance	19.7	8.4	0.91	0.00	0.33**	−0.26**	−0.03	−0.19**	−0.11*	0.16**	0.01	1

* $p < 0.05$; ** $p < 0.01$ (two-tailed)

were regressed on M_s, M_f, sex, and the achievement goal conditions. In the next model, the two-way interactions were included. In the last model, the three-way interactions were added. In all models, classes were included as a level 2 variable. Any effects not reported were non-significant.

Results

As seen from Table 1, there were some significant correlations between M_s and performance, positive affects, and satisfaction. The relationship between M_f and worry, as well as a negative relation between M_f and performance, was also significant. Moreover, the positive relationship between the achievement goal conditions and satisfaction was significant. Pupils in the mastery goal condition scored higher on satisfaction than pupils in the performance goal condition.

Worry and emotionality

Table 2 revealed the roles of gender, the motive to approach success, the motive to avoid failure, the achievement goal conditions, and their interactions in the prediction of worry and emotionality during the problem-solving session. The final moderated multilevel regression model accounted for 8.8% of the variance of worry. As shown in Table 2, gender positively predicted worry during problem-solving. The worries of girls were higher than the worries of boys during the problem-solving session ($B = 112$; $p < 0.05$). The motive to achieve success ($B = 0.05$; $p < 0.05$) and the motive to avoid failure ($B = 0.14$; $p < 0.01$) were also positively related to worry. The achievement goal conditions were shown to be
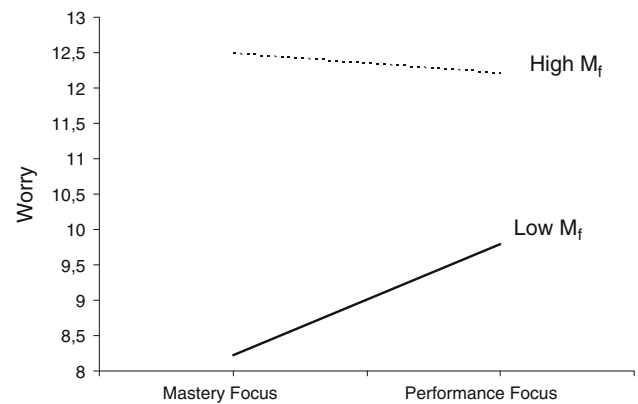

Fig. 1 Worry as a function of combinations of the motive to avoid failure (M_f) and the achievement goal conditions

unrelated to worry. As can be seen in model 2, however, there was a significant achievement goal condition × motive to avoid failure (M_f) interaction in the prediction of worry ($B = 0.11$; $p < 0.05$). The interaction is graphically portrayed in Fig. 1. The worries of pupils low in the motive to avoid failure were higher under the performance goal condition than under the mastery goal condition.

The second multilevel regression model focused on the same relationships with one difference, i.e., the outcome variable was emotionality. None of the main variables were significantly related to emotionality during problem-solving. The effect of the achievement goal condition was however marginally significant ($B = -0.75$; $p < 0.10$), and the interaction between the motive to avoid failure and the achievement goal condition was significantly related to emotionality during problem-solving ($B = 0.10$; $p < 0.05$).

Table 2 Multilevel regressions: Sex, motives, and achievement goal condition at level 1 and classes at level 2 as predictors of worry and emotionality during problem-solving

Fixed effects	Worry				Emotionality			
	Model 1		Model 2		Model 1		Model 2	
	Coefficient	t	Coefficient	t	Coefficient	t	Coefficient	t
Intercept	10.45**	25.81	10.42**	25.88	9.30**	24.88	9.28**	24.26
Sex	1.12*	2.44	1.09*	2.40	0.43	1.07	0.42	1.04
Motive to achieve success	0.05*	2.05	0.05*	2.00	0.01	0.57	0.01	0.45
Motive to avoid failure	0.14**	5.24	0.09*	2.31	0.03	1.17	2.516	
Achievement goal condition	−0.61	1.32	0.60	−1.30	−0.75†	−1.74	−1.33*	−2.32
M_f × Achievement goal			0.11*	2.07			0.10*	1.97
Sex × Achievement goal							1.26†	1.56
ΔR^2	7.8%		1%		0.5%		1.1%	
ICC	2%				1%			

M_s Motive to achieve success, M_f Motive to avoid failure

* $p < 0.05$; ** $p < 0.01$ (two-tailed); † $p < 0.10$ (one-tailed)

Pupils in the performance goal condition had marginally significantly higher emotionality scores during the problem-solving session ($M = 9.46$, SD $= 4.06$) than the pupils in the mastery goal condition ($M = 8.79$, SD $= 3.12$). Moreover, the significant achievement goal condition × motive to avoid failure (M_f) interaction indicates that the scores on emotionality of pupils low in M_f increased from the mastery goal condition to the performance goal condition.

Satisfaction and pleasant affects

The third multilevel regression analysis focused on satisfaction during the problem-solving session and, as before, the variables were entered into the regression equation as described in Table 3. On this occasion, there were three significant predictors; the motive to achieve success ($B = 0.12$, $p < 0.01$), the motive to avoid failure ($B = -0.05$, $p < 0.05$), and the achievement goal condition ($B = 1.55$, $p < 0.05$). Pupils in the mastery goal condition were more satisfied during the problem-solving session than were the pupils in the performance goal condition.

In the analogous multilevel regression analysis on pleasant affect, the model accounted for 14.1% of the variance. As evident in Table 3, the model yields one significant main effect: level of motive to achieve success showed a positive link to pleasant affect during problem-solving ($B = 0.32$, $p < 0.001$). As can be seen, there was also a significant motive to avoid failure × motive to achieve success interaction predicting level of pleasant affect ($B = -0.01$, $p < 0.05$). As depicted in Fig. 2, pupils scoring high on the motive to achieve success and low on
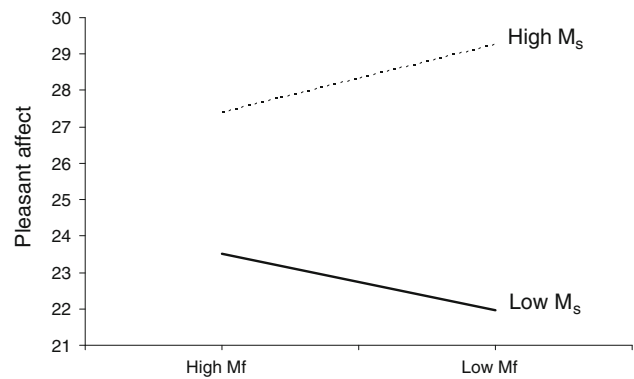

Fig. 2 Pleasant affect during problem-solving as a function of combinations of the motive to achieve success (M_s) and the motive to avoid failure (M_f)

the motive to avoid failure had the highest scores on pleasant affect during problem-solving, whereas pupils scoring low on both motives had the lowest.

Performance

Regressing total performance on the proposed antecedents yielded a significant effect for the overall model. The final moderated hierarchical regression model accounted for 21% of the variance in total performance. As shown in Table 4, the motive to achieve success emerged as a positive predictor of performance in step 1 ($B = 0.35$, $p < 0.01$) and the motive to avoid failure as a negative ($B = -0.21$, $p < 0.01$). Neither the achievement goal condition nor the interactions were statistically significantly related to performance.

Table 3 Multilevel regressions: Sex, motives, and achievement goal condition at level 1 and classes at level 2 as predictors of satisfaction and pleasant affects during problem-solving

Fixed effects	Satisfaction		Pleasant affect			
	Model 1		Model 1		Model 2	
	Coefficient	t	Coefficient	t	Coefficient	t
Intercept	11.94**	23.30	26.04**	33.06	25.94**	32.85
Sex	0.27	0.67	−0.77	−0.99	−0.86	−1.11
Motive to achieve success	0.12**	5.04	0.32**	7.18	0.31**	6.99
Motive to avoid failure	−0.05*	−2.25	−0.02	−0.45	−0.01	−0.29
Achievement goal condition	1.55*	2.33	0.70	0.73	0.84	0.87
$M_f \times M_s$					−0.01*	−2.22
ΔR^2	9%		12.6%		1.5%	
ICC	15%			5%		

M_s Motive to achieve success, M_f Motive to avoid failure

* $p < 0.05$; ** $p < 0.01$ (two-tailed)

Table 4 Multilevel regressions: Sex, motives, and achievement goal condition at level 1 and classes at level 2 as predictors of performance

Fixed effects	Performance			
	Model 1		Model 2	
	Coefficient	t	Coefficient	t
Intercept	20.50**	18.23	19.70**	16.09
Sex	−0.51	−0.60	1.24	0.96
Motive to achieve success	0.35**	7.03	0.34**	6.85
Motive to avoid failure	−0.21**	−4.20	−0.21**	−4.17
Achievement goal condition	−1.03	−0.71	0.41	0.24
Sex × Achievement goal			−3.07†	−1.79
ΔR^2	20%		1%	
ICC	3%			

M_s Motive to achieve success, M_f Motive to avoid failure

* $p < 0.05$; ** $p < 0.01$ (two-tailed)

Mediational analysis

Multilevel mediation analyses were used to test the mediation models (Krull and MacKinnon 1999) with classes included as a level 2 variable in all models. The level 1 predictors were mean-centered. To reveal whether worry mediates the motive to avoid failure–performance linkage and pleasant affects/satisfaction during problem-solving mediate the motive to achieve success-performance linkage, several stages of analysis are necessary. First, the predictor–criterion correlation must be significant. The analysis satisfied this requirement by establishing a positive relationship between the motive to achieve success and performance ($B = 0.37$; $p < 0.01$), as well as a negative relationship between the motive to avoid failure and performance ($B = -0.026$; $p < 0.01$). Second, a relationship between the predictor variable and the hypothesized mediator must be established to document the first link in the mediational chain. The relationships between the motive to approach success and satisfaction ($B = 0.13$; $p < 0.01$) pleasant affect ($B = 0.32$; $p < 0.01$) and between the motive to avoid failure and worry ($B = 0.14$; $p < 0.01$) were significant. Third, to complete the mediational chain, a relationship between the mediator and the outcome variable must be established while controlling for the predictor variable and the direct relationship between the predictor variable and the outcome measure should be reduced. To test the final link, we conducted a series of analyses in which performance was also regressed on the motives with affects during problem-solving (i.e., worry, pleasant affect, and satisfaction) and classes (as a level 2 variable) in the equation. The mediational analyses failed to yield a significant relationship between satisfaction and performance and between pleasant affect and performance while controlling for scores on the motive to achieve

success and classes; therefore, satisfaction and pleasant affect failed to satisfy the third requirement for mediation. In the avoidance mediational analyses, the relationship between worry and performance was still significant, while controlling for scores on the motive to avoid failure ($B = -0.24$, $p < 0.05$). The coefficient for the direct relationship between the motive to avoid failure and performance dropped from -0.26 to -0.22 in this analysis. The utilization of Sobel's procedure (1982) for testing the significance of indirect, mediational relationships substantiated only a partial mediation process of worry on the relationship between the motive to avoid failure and performance ($z = -1.99$, $p < 0.05$).

Discussion

The objective in this study was to shed light on the influence of key motivational variables on performance and satisfaction in two different goal-type conditions. This type of research seems particularly important for making recommendations to teachers because it can link specific changes in teachers' instructions with various student outcomes in the classroom. The results revealed that the motive to avoid failure was a positive predictor of worry and a negative predictor of performance. Conversely, the motive to achieve success was a positive predictor of satisfaction during problem-solving, activated pleasant affect, and performance. Furthermore, the results indicate that the assignment of achievement goals can both undermine and enhance satisfaction during problem-solving. In line with earlier studies, it was found that a mastery-focused goal has a more positive effect on satisfaction during problem-solving than does the performance-focused goal. However, the achievement goal conditions effect on pleasant affect and worry were not significant and of the emotional processes during problem-solving only worry significantly mediated the relationship between the motives and performance. Thus, in line with earlier studies (e.g., Bjørnebekk 2009a, b; Bjørnebekk and Gjesme 2009), the results of the present study suggest that for children the achievement motives influence performance more directly.

Several significant Person × Situation interactions were also revealed. In line with the results of Harackiewicz and her colleagues (Elliot and Harackiewicz 1994; Harackiewicz and Elliot 1993; Senko and Harackiewicz 2005), the results of the present study indicate that mastery emphasis leads to higher satisfaction during problem-solving for those low in the motive to achieve success than a performance emphasis. These results suggest that children low in the motive to approach success enjoy mastery-focused situations more than performance-focused situations when the context is commonly associated with the normal school. The level of worry differs significantly as a

function of the interaction between individual differences in the motive to avoid failure and achievement goal emphasis. Furthermore, a mastery goal emphasis had the most positive outcome (i.e., reduced worry) for those who were low in fear of failure (M_f). A possible explanation might be that we used tasks of intermediate difficulty in this study (cf. Fig. 1). According to Atkinson's theory (1964), the motives should be most aroused in these situations. The increased level of activated avoidance motivation (T_f) may thereby over-shadow the effect of achievement goal emphasis for the individuals high in the motive to avoid failure but not for the individuals who are low in it. The strong main effects of the motives on performance and of the motive to achieve suc-cess on pleasant affect, in both achievement goal conditions, support this explanation. In sum, it can be assumed that children with high arousability in challenging situations (high M_s or high M_f) are less likely to adjust their goals, cognitions or feelings in the presence of a stimulus that signals different evaluations of their competence (i.e., mastery vs. performance).

Nevertheless, there are limitations: the achievement goal emphasis was investigated cross-sectionally (between sub-jects). Thus, there is a need for a longitudinal design to test the proposed causal sequences within subjects. Another limitation of the current study is that there was no perfor-mance–avoidance group, but only a mastery and perfor-mance group. Furthermore, perhaps the achievement goal manipulation was simply too mild to produce the effects others have found. The approach to measure state test anxi-ety, satisfaction, and pleasant affect during problem-solving raises issues, however, regarding: causality, since it is pos-sible that how an individual performs on the tasks influences their affects and satisfaction, reversing the direction of the mediational chain (Brodish and Devine 2009, p. 181). Measuring state anxiety, satisfaction, and pleasant affect during the problem-solving session may however contami-nate participants' subsequent performance. In the next study, some of these shortcomings are considered.

Study 2

Method

Participants

The sample consisted of 331 sixth-graders (11–12-year-olds) from 16 school classes in Oslo. As in study 1, the classes were selected from schools which scored on the same level in the Norwegian national test in mathematics and reading. The average mathematics and reading scores of the sample were 56 and 58, respectively. The partici-pants in the present study scored above average on the nationwide tests. In terms of composition, the sample consisted of 162 boys and 169 girls.

Experimental procedure

The experiment was carried out in a group-testing session.

Procedure   The 16 school classes were randomly assigned to three different experimental conditions, i.e., mastery goal, performance–approach goal, and performance–avoidance goal. Before the experimental procedures were induced, the pupils' motive dispositions were assessed. Each class received the instructions for the condition it was assigned to. Then, pupils received a booklet of problem tasks. The pupils in the two conditions received a test booklet containing identical sets of tasks (40 problems). After the pupils had received the booklets, and after examples of all types of tasks had been illustrated, the specific instruction for the two experimental conditions followed.

The achievement goal manipulation was based on that used by Elliot et al. (2005). Participants in the *performance approach* and *performance–avoidance goals* condition were informed, "The purpose of this study is to compare sixth-graders with one another in their ability to solve these problems." In the performance–approach goal condition they were then told that previous work had indicated that most sixth-graders are fairly similar in their ability to solve problems but that some students stand out because they do it exceptionally well. Thus, the problem-solving session would provide the opportunity "to demonstrate that you are an exceptional problem solver." In the performance–avoidance goal condition they were told that previous tests had indicated that most sixth-graders are fairly similar in their ability to solve problems, but that some pupils stand out because they do so poorly. Thus, the session would provide some insight into whether they were a poor prob-lem-solver. Participants in the *mastery condition* were informed, "The purpose of this study is to collect data on sixth-graders' reactions to the problems." They were additionally told that the session would provide them with the opportunity to "get to know these problems and learn how to solve the problems well." All the pupils were informed that they would receive personal feedback after they completed the task. In the performance–approach condition, they were told that they would be informed "whether you did well compared with others," in the performance–avoidance condition they were told that they would be informed "whether you did poorly compared with others," and in the mastery goal condition they were told that they would be informed "whether you learned how to solve the problems well."

Before starting, pupils were asked to answer some questions about their *approach motivation (T_s)* and

avoidance motivation (T_f). They also filled out a questionnaire containing a manipulation check which asked: "What was the goal that you were given for this task?" and they responded with one of the following: "To demonstrate that I am an exceptionally good problem-solver," "To demonstrate that I am not an extremely poor problem-solver," or "To learn how to solve problems." When they had finished, the instructions were repeated.

Measures

Motives See study 1.

Approach (T_s) and Avoidance (T_f) motivation To ascertain the amount of approach (T_s) and avoidance (T_f) motivation in the achievement situation, a state version of the AMS was used (Bjørnebekk and Gjesme 2009; Gjesme 1983a). In the state version, the items did not focus on situations that are assumed to arouse the same degree of uncertainty as to the possibility of success (P_s). Instead, they focused on "*in this situation*," in order to measure different degrees of aroused and manifested achievement motivation (T_s and T_f). The construction of this scale harmonizes both with achievement motivation theory (cf. Atkinson 1964) and with the principles on which the achievement motives scale was constructed (cf. Nygård and Gjesme 1973). Gjesme's (1983a) empirical study has documented the reliability and validity of using an approach–avoidance motivation questionnaire for middle-school pupils. Approach motivation (T_s) was assessed using six items from the motive to achieve success (M_s) section of the achievement motives scale. These items are statements about positive affect: for example, "*I am attracted to this situation*" and "*I find this situation challenging.*" Avoidance motivation (T_f) was assessed by employing six items from the motive to avoid failure (M_f) section of the achievement motives scale. These items deal with negative affect in state form. To illustrate, "*I am afraid of failing in this situation*" and "*I feel anxious about this situation.*" Participants rated the items on the same four-point scale used with approach motivation. In the present sample, a principal factor analysis with varimax rotation showed that two factors had eigenvalues greater than one (the first three eigenvalues were, respectively, 3.44, 3.03, and 0.88). The two-factor solution accounted for 54% of the total variance. All items loaded satisfactorily on their primary factor (i.e., >40).

Tasks See study 1.

Treatment of data We conducted preliminary analyses in which we proportioned the total variance of the dependent variables into within-classes and between-classes components. The ICC was evaluated for our dependent variables (e.g., T_s, T_f and performance). The ICCs were weak and ranged from 0.05 (approach motivation) to 0.08 (performance), indicating that most of the variance was at the individual level. None of the ICC values reached statistical significance. Hence, the data can be analyzed without using multilevel modeling.

A test of orthogonal contrasts tested the effects of the goal conditions: the mastery–performance contrast compared the mastery condition (coded +2) with the performance conditions (−1 each), and the performance–avoidance contrast compared the performance–approach (+1) and the performance–avoidance condition (−1). When the analyses revealed a significant approach–avoidance effect, we ran a new analysis where the approach–mastery contrast compared the performance–approach condition (+1) with the mastery condition (−1), and the avoidance–mastery compared the performance–avoidance (−1) and mastery group (+1).

We ran corresponding models to the basic models in study 1: an approach–avoidance interaction model (i.e., $M_s \times$ mastery–performance, $M_s \times$ performance–avoidance, $M_f \times$ mastery–performance, $M_f \times$ performance–avoidance, $M_s \times M_f$, $M_s \times M_f \times$ mastery–performance, and $M_s \times M_f \times$ approach–avoidance), an avoidance–gender interaction model (i.e., gender $\times$ mastery–performance, gender $\times$ approach–avoidance, $M_f \times$ gender, $M_f \times$ mastery–approach, $M_f \times$ approach–avoidance, $M_f \times$ gender $\times$ mastery–performance and $M_f \times$ gender $\times$ approach–avoidance), and an approach–gender interaction model (i.e., gender $\times$ mastery–performance, gender $\times$ approach–avoidance, $M_s \times$ gender, $M_s \times$ mastery–approach, $M_s \times$ approach–avoidance, $M_s \times$ gender $\times$ mastery–performance, and $M_s \times$ gender $\times$ approach–avoidance) were tested separately.

Manipulation check A chi-square test of independence revealed that goal manipulation was successful, χ^2 (4, $N = 331$) = 260.57, $p < 0.001$. Indeed the pupils' achievement goal reports corresponded to their achievement goal conditions.

Results

As shown in Table 5, for all measures the Cronbach's alpha levels are acceptable. In addition, it is interesting that the motive to achieve success and approach motivation (T_s) was positively related to performance, whereas the motive to avoid failure, the achievement goal conditions and avoidance motivation (T_f) were negatively correlated with total performance.

Table 5 Descriptive statistics, reliabilities, and intercorrelations among the variables in study 2

$N = 331$	M	SD	α	1	2	3	4	5	6	7
1. Gender	–	–	–	1						
2. Motive to achieve success	44.5	6.7	0.85	−0.01	1					
3. Motive to avoid failure	29.9	8.5	0.89	−0.01	−0.24**	1				
4. Achievement goal condition	–	–	–	0.09	0.07	−0.07	1			
5. Approach motivation	16.7	3.7	0.81	−0.07	0.55**	−0.12*	0.05	1		
6. Avoidance motivation	10.7	3.7	0.80	0.02	−0.16**	0.58**	0.02	−0.04	1	
7. Performance	23.2	8.9	0.88	−0.01	0.26**	−0.15**	−0.17**	0.22**	−0.17**	1

* $p < 0.05$; ** $p < 0.01$ (two-tailed)

Approach motivation (T_s)

Regressing T_s on the proposed antecedents yielded a significant effect for the overall approach–avoidance interaction model, $F_{12,\ 318} = 14.57$, $p < 0.0001$, $R^2 = 0.36$. Gender was shown to be unrelated to Ts. In the second step, the achievement motives made a significant contribution, $F_{2,327} = 70.52$, $p < 0.001$, $R^2 = 0.30$. Only M_s, $\beta = 0.55$, $t_{1,\ 327} = 11.61$, $p < 0.001$, yielded a significant unique contribution, however. In the third step, the goal conditions made a marginally significant contribution, $F_{2,\ 325} = 2.37$, $p < 0.10$, $R^2 = 0.01$. Performance–approach goal participants scored higher on approach motivation (Ts) than the performance–avoidance participants, $\beta = 0.08$, $t_{1,\ 325} = 1.70, p < 0.10$. There was no significant difference between the performance and mastery participants. In terms of interactions, the two-way interaction between M_s and M_f made only a marginally significant contribution, $F_{1,\ 324} = 2.77$, $p < 0.10$, $R^2 = 0.006$. More importantly, the two-way interactions $M_s \times$ mastery–performance (Fig. 3a), $F_{1,\ 325} = 5.78$, $p < 0.05$, $R^2 = 0.012$, $M_f \times$ mastery–performance (Fig. 3b), $F_{1,\ 325} = 4.95$, $p < 0.05$, $R^2 = 0.010$, $M_f \times$ approach–avoidance (Fig. 3c), $F_{1,\ 325} = 5.16$, $p < 0.05$, $R^2 = 0.011$, were significant as well. The M_s, M_f, and mastery–performance interactions were qualified by the marginally significant $M_s \times M_f \times$ mastery–performance, $F_{1,\ 322} = 2.86$, $p < 0.10$, $R^2 = 0.007$. The approach motivation (T_s) of success-oriented pupils (high M_s-low M_f) is

highest, whereas the approach motivation of the failure-oriented pupils (low M_s-high M_f) is lowest under the mastery goal condition. Moreover, as depicted in Fig. 3c, pupils high in M_f decreased their T_s in the performance–avoidance condition, but not in the performance–avoidance condition.

Gender, as both main and interaction effects, revealed few clear-cut significant results and explained variances of less than 1% of total variance on all three dependent variables. In Fig. 5c, however, we have illustrated a tendency of gender differences in performance as a function of motives and achievement goal conditions.

Avoidance motivation (T_f)

Regressing T_f on the proposed antecedents yielded a significant effect for the overall approach–avoidance interaction model, $F_{12,\ 318} = 15.74$, $p < 0.0001$, $R^2 = 0.37$. In the first step, gender was unrelated to avoidance motivation, whereas the motives accounted for an additional proportion of variance in the second step, $F_{2,\ 327} = 81.10$, $p < 0.0001$, R^2 change = 0.33. Only M_f, $\beta = 0.57$, $t_{1,\ 327} = 12.26$, $p < 0.001$, however, yielded a significant unique contribution. In the second step, there was a marginally significant difference between the mastery and the performance goal participants. Performance goal participants scored higher on avoidance motivation (T_f) than the mastery participants, $\beta = -0.08$, $t_{1,\ 325} = -1.68$, $p < 0.10$. In terms of interactions, both the two-ways
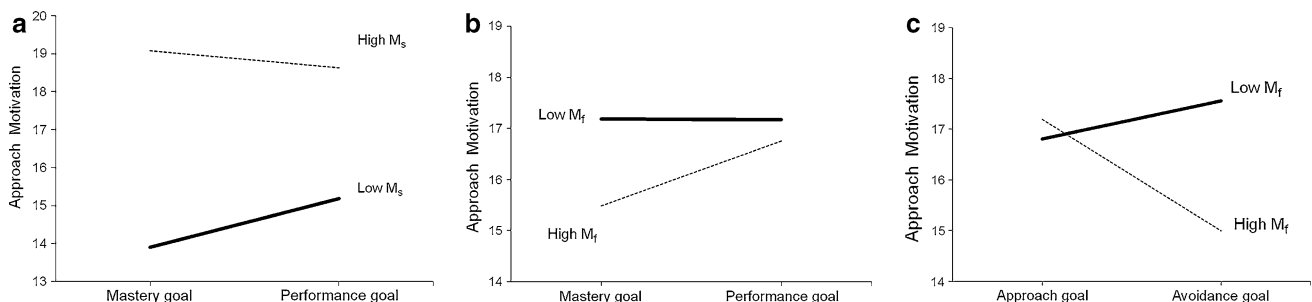

Fig. 3 Approach motivation (T_s) as a function of combinations of the motive to approach success (M_s), the motive to avoid failure (M_f), and the mastery, performance–approach, and performance–avoidance goal conditions

Fig. 4 Avoidance motivation as a function of combinations of the motive to approach success (M_s), the motive to avoid failure (M_f), and the achievement goal conditions
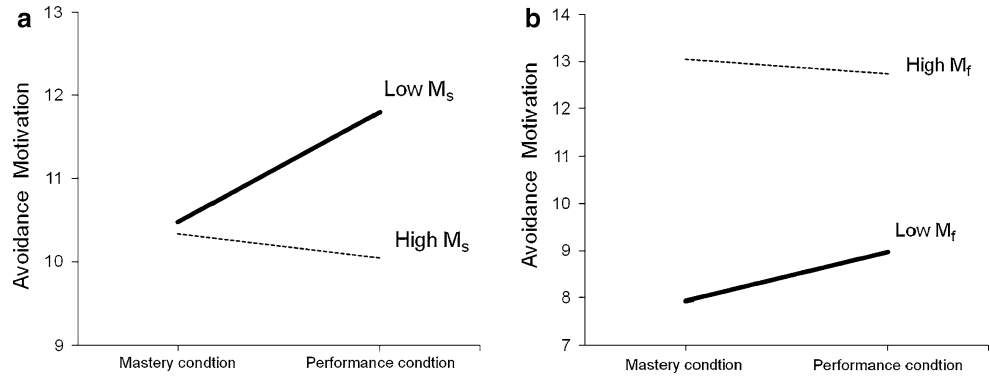
between M_s and mastery–performance goals (Fig. 4a), $F_{1,327} = 3.60$, $p < 0.05$, $R^2 = 0.011$, and M_f and mastery–performance goals (Fig. 4b), $F_{1,327} = 3.70$, $p < 0.05$, $R^2 = 0.008$, yielded a significant effect on T_f. The interaction between M_f and approach–avoidance goals was marginally significant, $F_{1,327} = 3.02$, $p < 0.10$, $R^2 = 0.006$. Finally, there was a significant $M_f \times$ gender $\times$ approach–avoidance interaction, $F_{1,323} = 3.87$, $p < 0.05$, $R^2 = 0.01$, indicating that the avoidance motivation of girls high in M_f lowers their avoidance motivation (T_f) from the performance–approach to the performance–avoidance condition. For boys, T_f remained about the same.

Performance

Regressing total performance on the proposed antecedents yielded a significant effect for the overall approach–avoidance interaction model, $F_{12, 314} = 5.67$, $p < 0.0001$, $R^2 = 0.18$. Gender was shown to be unrelated to performance. In the second step, the achievement motives made a significant contribution, $F_{2,327} = 13.47$, $p < 0.001$, $R^2 = 0.08$. M_s was positively related to performance, $\beta = 0.25$, $t_{1, 327} = 4.35$, $p < 0.001$, and M_f was negatively related, $\beta = -0.10$, $t_{1, 327} = -1.75$, $p < 0.10$. In the third step, the goal conditions made a significant contribution,

$F_{2, 321} = 6.89$, $p < 0.001$, $R^2 = 0.04$. Mastery goal participants performed better than the performance goal participants, $\beta = 0.19$, $t_{1, 325} = 3.63$, $p < 0.001$. There was no significant difference between the approach and avoidance participants. In terms of interactions, the two-way interactions $M_s \times$ mastery–performance, $F_{1, 320} = 7.48$, $p < 0.001$, $R^2 = 0.02$, $M_f \times$ mastery–performance, $F_{1, 320} = 10.27$, $p < 0.001$, $R^2 = 0.028$, and gender $\times M_f$, $F_{1, 320} = 12.11$, $p < 0.001$, $R^2 = 0.032$, were significant. The former indicated that pupils high in M_s (Fig. 5a) and low in M_f (Fig. 5b) performed significantly better under the mastery condition compared with the performance conditions. The latter indicated that anxiety (M_f) only influenced boys negatively (Fig. 5c). Moreover, the three-way interaction $M_s \times M_f \times$ approach–avoidance (Fig. 6), $F_{1, 317} = 6.69$, $p < 0.01$, $R^2 = 0.018$, indicated that pupils with high anxiety (M_f) can perform well in performance approach conditions, but only if they also score high on the motive to achieve success (M_s).

Mediational analysis

To reveal whether approach motivation mediates the motive to achieve success–performance linkage and
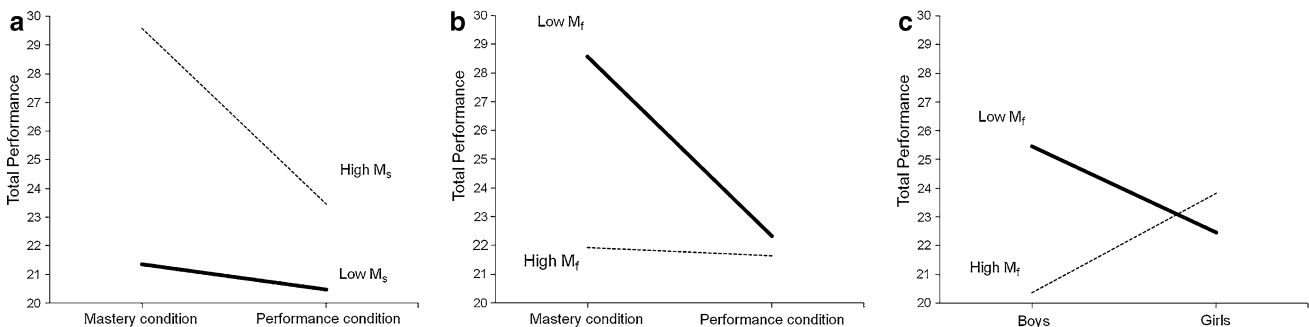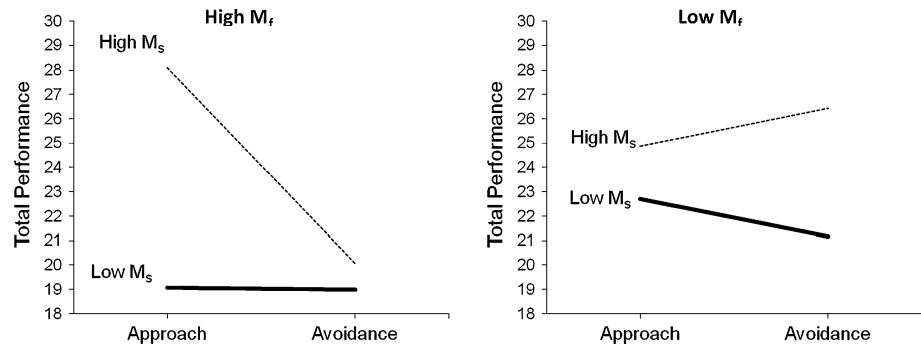

Fig. 5 Performance as a function of combinations of the motive to approach success (M_s), the motive to avoid failure (M_f), the mastery–performance goal conditions, and as a function of gender (**c**)

avoidance motivation mediates the motive to avoid failure–performance linkage, several stages of analysis are necessary. First, the predictor–criterion correlation must be significant. The preceding analysis satisfied this requirement by establishing a positive relationship between the motive to achieve success and performance, as well as a negative relationship between the motive to avoid failure and performance. Second, a relationship between the predictor variable and the hypothesized mediator must be established to document the first link in the mediational chain. As we can see in Table 5, the correlations between the motive to approach success and approach motivation and between the motive to avoid failure and avoidance motivation are both significant. Third, to complete the mediational chain, a relationship between the mediator and the outcome variable must be established while controlling for the predictor variable, and the direct relationship between the predictor variable and the outcome measure should be reduced. To test the final link, we conducted a series of analyses in which performance was regressed on the motives with approach/avoidance motivation also in the equation. The approach motivation mediational analyses revealed one significant relationship for approach motivation. The beta coefficient for the direct relationship between the motive to approach success and performance dropped from 0.26 to 0.19 in this analysis. The utilization of Sobel's procedure (1982) for testing the significance of indirect, mediational relationships substantiated a marginally significant *partial mediation* effect of approach motivation on the relationship between the motive to approach success and performance ($z = -1.77$, $p = 0.07$). The avoidance motivation mediational analyses revealed one significant relationship for avoidance motivation, indicating that pupils with high levels of avoidance motivation performed worse. The direct effect for the motive to avoid failure no longer attained significance with avoidance motivation in the equation, and the decrease in the beta coefficient for this effect (from -0.15 to -0.08) provides evidence that avoidance motivation mediated the direct effect of the motive to avoid failure on performance ($z = -2.11$, $p < 0.05$).

Discussion and summary

In study 2, our aim was to extend the two achievement goal conditions with a performance–avoidance condition and additionally to investigate important antecedents and consequences of approach motivation (T_s) and avoidance motivation (T_f) on performance, including possible effects of gender. The motive to achieve success (M_s) and the motive to avoid failure (M_f) played a major role regarding approach (T_s) and avoidance motivation (T_f), respectively. As far as performance is concerned, the most important single factors were M_s and the mastery–goal situation.

The performance–approach participants scored higher on approach motivation (T_s) than the performance–avoidance participants. No significant difference in T_s between performance and mastery participants was observed. Regarding avoidance motivation (T_f), pupils low in M_s increased their T_f–scores from the mastery- to the performance goal conditions. As far as performance was concerned, pupils high in M_s performed significantly better under the mastery condition than the performance conditions. It was also noted from Fig. 6 that pupils high in both M_s and M_f ("the perfectionists") had a significantly higher performance in the performance–approach condition compared with the performance–avoidance condition. Furthermore, it was seen that the performance–avoidance goal condition reduced both high M_f girls' and high M_f boys' performance. Conversely, the performance scores for the pupils high in M_s/low in M_f (Fig. 6) increased in the performance–avoidance condition compared with the performance–approach condition. Hence, an avoidance–goal situation might be good for some pupils' performance. In general, however, an avoidance–goal situation seems to accentuate the negative effects of a high avoidance motive (M_f) on performance. Moreover, in experiment 2 avoidance motivation was validated as a mediator of the relationship between the motive to avoid failure and performance. Finally, the highest performance was found among boys with low M_f in the mastery situation. In sum, it is important to highlight that motivation in achievement settings is complex and achievement goals are only one of several

types of operative variable. In particular, the individuals' motive dispositions (i.e., M_s and M_f) seem to play a major role in the motivational processes and in the outcomes (e.g., performance). Nevertheless, there is a limitation: there is a need for a longitudinal design to test the proposed causal sequences within subjects.

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