Dominant Goal Orientations Predict Differences in Academic Achievement during Adolescence through Metacognitive Self-Regulation

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Abstract

This study investigated whether academic achievement was predicted by the goal which generally drives a student's learning behaviour. Secondly, the role of metacognitive self-regulation was examined. The dominant goal orientation was assessed using a new method. 735 adolescents aged 10-19 years read vignettes of students that reflect four goal orientations. Participants indicated which student they resembled most, which revealed their dominant goal orientation. Age, sex and level of parental education were controlled for. Results showed that students with motivation goals of the mastery and performance-approach types obtained higher grades than students characterized by the performance-avoidance and work-avoidance goal type. A mediation analysis showed that goal orientations predicted achievement through the level of metacognitive self-regulation. Intrinsically motivated students showed the best metacognitive self-regulation skills of all students, whereas work-avoidant students had the lowest level of self-regulation skills. The scores of students with performance goals fell in-between. The research showed that the higher grades obtained by performance-approach students, compared to performance-avoidant and work-avoidant students, can partially be explained by their higher levels of metacognitive self-regulation. Thus, goal orientation predicted achievement differences through metacognitive self-regulation skills. This suggests that intrinsic motivation and self-regulation skills should ideally be supported in the classroom. Furthermore, it suggests that teachers could use vignettes to distinguish different types of students in order to identify students who are vulnerable to lower academic achievement.

Keywords: achievement, adolescence, goal orientation, metacognitive self-regulation

1. Introduction

School motivation has often been conceptualized as the striving to reach certain goals (Dweck, 1986; Elliot, McGregor, & Gable, 1999). These achievement goals reflect a student's underlying reason to put effort into school. With increasing age, less adaptive motivational goals become more prevalent (e.g., Wang & Pomerantz, 2009). It is likely that this is related to the major physical and psychological changes students go through in adolescence (e.g., Giedd, 2008). The decrease of motivation during adolescence can have a major effect on academic achievement. However, it is still unclear how much variation in achievement can be explained by the

goal that a student endorses for most learning activities: a student's dominant goal orientation. Therefore, the first aim of this study was to examine whether adolescents' dominant goal orientations predicted differences in academic achievement. Secondly, the role of metacognitive self-regulation was examined in the relation between goals and achievement, as metacognitive self-regulation has been shown to relate to both goals (Greene & Miller, 1996; Vrugt & Oort, 2008) and achievement (Credé & Phillips, 2011).

Goal orientations concern the reasons to engage in learning activities (Dweck, 1986). Students differ with regard to their goal orientation. Different conceptualisations of goal orientations are seen in the literature, as the evolution of achievement goals theories has undergone large changes throughout the years (Elliot, Murayama, & Pekrun, 2011; Gegenfurtner & Hagenauer, 2013; Huang, 2012; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010; Senko, Hulleman, & Harackiewicz, 2011). Goal types delineated are for instance mastery, performance, and work-avoidance goals (Dweck, 1986; Elliot et al., 1999). Students who endorse *mastery* goals consider learning and the development of new skills as ends in themselves. These students focus on deep understanding and gaining insight into the study material. *Performance-oriented* students focus on extrinsic rewards and others' judgments of their performance instead of the content of the study material. *Work-avoidant* students on the other hand do not like to engage in learning activities. They invest as little effort as possible in school. Often, the performance-type is bifurcated in approach and avoidance goals (Elliott & Church, 1997; Elliott & Harackiewicz, 1996). Performance-approach students aim to demonstrate superior ability and are focused on rewards. Performance-avoidant students primarily engage in learning activities to avoid failures, embarrassment or punishment in the classroom. They strive to avoid being seen as a poor performer. The many different achievement goal models differ in conceptualisation, the label used for the constructs and the number of factors; and consensus has not been reached about which model is the best (Huang, 2012; Hulleman et al., 2010). The four types of goal orientations described above are therefore only one possible model to conceptualize goal orientations.

Furthermore, there is a lot of variety in the way in which goal orientations are measured (Hulleman et al., 2010). Different questionnaires are used to study goal orientations from a multiple goal perspective. This entails that each participant receives a rating on each of the different goals. e.g., a participant could score low on performance goals, and higher on mastery goals; and high on avoidance, low on approach. However, the validity of the measures has been questioned, and it has been argued that survey-based methods for goal orientations should be supplemented with other methods (Senko et al., 2011). In educational practice, teachers will be more likely to associate their students with one dominant goal orientation and classify them accordingly, rather than to rate their students on a scale for each of the different goals, differentiating between approach and avoidance. Therefore, we propose a different methodology that allows for easy classification of students according to their dominant goal orientation. Goal orientations were assessed using short student characterizations, so-called *vignettes* (Authors, 2013), each of which reflects the behaviour of a student characterized by one of the four goal orientations. Respondents indicated which of the students they resembled most. This method suits adolescents, as they are better able to evaluate themselves relative to peers (Brown, 2004), than to rate their own behaviour on a scale. Furthermore, the single response option minimizes the chance of response biases. The applied value of the vignettes is that it can be used as a simple tool for teachers to identify the main goal a student is striving for. It allows for easy classification by the teacher, and therefore students with less-adaptive goals are easily identified.

Previous research has shown that goal orientations can predict academic achievement in children, adolescents and undergraduates, although the amount of variance explained by goals is small (Diseth, 2011; Elliot et al., 1999; Freudenthaler, Spinath, & Neubauer, 2008; Keys, Conley, Duncan, & Domina, 2012; Patrick, Ryan, & Pintrich, 1999; Simons, Dewitte, & Lens, 2004; Steinmayr, Bipp, & Spinath, 2011; Steinmayr & Spinath, 2008, 2009; Wigfield & Cambria, 2010; Wolters, 2004; Huang, 2012). Independent of age, positive relations with academic achievement have been found for performance-approach goals (Daniels et al., 2008; Elliot et al., 1999; Wigfield & Cambria, 2010), and mastery goals (Bipp, Steinmayr, & Spinath, 2012; Daniels et al., 2008; Keys et al., 2012; Steinmayr et al., 2011). Yet, a large review study showed that mastery goals do often not relate to academic achievement (Hulleman et al., 2010). For work-avoidance and performance-avoidance goals, a negative relation has been shown with achievement (Wigfield & Cambria, 2010). Sex-specific associations between goals and achievement were found in some (Steinmayr & Spinath, 2008), but not all studies (Bouffard, Boisvert, Vezeau, & Larouche, 1995). Differences between studies have been attributed to differences in conceptualisations or measurement (Hulleman et al., 2010).

Besides achievement, goal orientations have been shown to relate to metacognitive self-regulation, which is the awareness of and control over the cognitive processes important for learning. Metacognitive self-regulatory

activities involve planning, monitoring and evaluating one's learning behaviour. These activities have shown positive relations with mastery and performance-approach goals, and negative relations with performance-avoidance goals (Vrugt & Oort, 2008).

A large meta-analysis has suggested that other variables should be explored with stronger power to predict academic achievement (Huang, 2012). Therefore, the present study used a new assessment method to identify the student's dominant goal orientation (either mastery, performance-approach, performance-avoidance or work-avoidant). The dominant goal orientations were related to academic achievement. Additionally, the mediating effect of metacognitive self-regulation was examined. We controlled for several context variables (age, sex, level of parental education) to enrich the analysis of the relations between goals and achievement. With respect to age, we differentiated between early adolescence (10-14 years) and late adolescence (14-19 years). Goal orientation vignettes were completed in a school setting by adolescents aged 10-19 years. The level of achievement of performance-approach and mastery students was expected to be higher than the level of achievement of work-avoidant and performance-avoidant students. Furthermore, mastery oriented students were expected to display the highest levels of metacognitive self-regulation, and work-avoidant students the lowest levels. Metacognitive self-regulation scores of performance-oriented students were expected to fall in between those of mastery and work-avoidant students. We hypothesized that metacognitive self-regulation mediated the relation between goals and achievement.

2. Method

2.1 Participants

A total number of 735 adolescents (46% boys) from grade 7 to 12 (*M* age = 14.8; *SD* = 1.72; range = 10.4-18.9 years) participated in this research. Nearly all participants (98%) had the Dutch nationality. All participants followed high educational tracks. Level of Parental Education (LPE) was measured on a scale from 1 (primary school) to 8 (university degree or higher) (De Bie, 1987). LPE was "low/medium" (at most secondary vocational education) in 35% of the sample, and "high" in 65% of the sample. Initially, 786 adolescents from grade 7 to 12 participated in this research. Data from 51 participants were left out of the analysis due to missing values. Two age groups were compared: adolescents younger than 14 years (*N* = 271, *M* age = 13.1, *SD* = 0.56) and 14 years and older (*N* = 464, *M* age = 15.9, *SD* = 1.27).

2.2 Procedure

Data were derived from a large cross-sectional study on development during adolescence. Participants were recruited from four secondary schools in the south-east of the Netherlands. Students and their parents were informed about the research via information letters. If both the student and parents agreed to participate, they returned the informed consent and a questionnaire on background characteristics to the school. Response rate was about 30%. Participating students completed a questionnaire in the classroom, during a regular school hour. Students completed the questionnaire independently. Two trained researchers gave instructions to the group of students and checked whether the questionnaire was complete when it was handed in. The whole procedure took students 40 minutes to complete, of which 10 minutes was spent on the goal orientation vignettes and metacognitive self-regulation questions. School grades were obtained from the school's administration afterwards. Ethical approval for this study was given by the ethical committee of Vrije Universiteit Amsterdam.

2.3 Measures

2.3.1 Goal Orientations

Goal orientations were assessed with *vignettes* (Authors, 2013). These are short characterizations of students who differ in goal orientation. Five different types of students were distinguished: mastery, performance-approach, performance-avoidant and two work-avoidant students (one best described as "lazy"; the other as "indifferent about school"). A full description of the vignettes can be found in Appendix A. Respondents were asked to read all the vignettes and select the one that reflects the goal orientation they mainly endorse for all academic activities. Vignettes were presented in a fixed order: (1) Performance-avoidant, (2) Work-avoidant [indifferent], (3) Performance-approach, (4) Mastery and (5) Work-avoidant [lazy].

2.3.2 Academic Achievement

Academic achievement was estimated by averaging the grades for Dutch (native language), English (foreign language) and mathematics. These three subjects were chosen because grades in these subjects yield a valid estimation of school performance (Reed, Ouwehand, Van der Elst, Boschloo, & Jolles, 2010). Furthermore, the

Dutch secondary education policy emphasizes the importance of these three subjects (Ministry of Education, Culture and Science, 2006). End of term grades for the three subjects were obtained for the year in which the research was conducted. In the Dutch educational system a ten-point grading system is used, with a 6 as a minimum pass grade. The most common grades in secondary education are 6 and 7. The grades 1-3 and 9-10 are seldom awarded. See Appendix B for additional information about the Dutch grading systems and how Dutch grades relate to grades from USA or UK. To correct for school differences in grading policies, we transformed the average grades into z-scores based on the mean grade per school and its standard deviation. In this way, the distribution of scores became similar for each school. The standardized mean grade for Dutch, English and mathematics was used in our analyses as a measure of academic achievement.

2.3.3 Metacognitive Self-Regulation

Self-regulation was assessed using the Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ is a self-report instrument designed to assess motivational orientations and use of learning strategies (Pintrich, Smith, García, & McKeachie, 1991). In the present research, we included the subscale Metacognitive Self-Regulation from the Learning Strategies Section. This subscale includes 12 items related to three general processes that make up metacognitive self-regulatory activities: planning, monitoring and regulating. Items are scored on a 7-point Likert-scale, ranging from 1 (not at all true) to 7 (very true). Internal consistency of the scale in our sample was $\alpha = .62$. Total score on the scale [range = 12-84] was used as dependent variable. The higher the score, the better the metacognitive self-regulation skills.

2.4 Data Analyses

All analyses were performed with the Statistical Package for Social Sciences 20.0. Frequency analysis showed that the work-avoidant [indifferent] goal orientation was reported infrequently (1.8%). Therefore, data of this vignette was combined with the work-avoidant [lazy] orientation into one work-avoidant category. Consequently, four goal orientations were included in our analyses: mastery, performance-approach, performance-avoidance and work-avoidant goals. First, a MANOVA was performed to examine whether students with different main goal orientations differed on both achievement (standardized mean grade) and metacognitive self-regulation (sum score of MSLQ subscale). Goal orientation, age group and sex were independent variables and LPE was included as a covariate. Next we examined whether the effect of goal orientation on achievement was mediated by metacognitive self-regulation. A mediation analysis for multicategorical independent variables was performed, with a general linear model approach to estimate direct and indirect effect (Hayes & Preacher, submitted). Indicator dummy coding was used for goal orientation (X). Performance-approach was selected as reference category because these goals were often positively related to grades (Wigfield & Cambria, 2010). Age group and sex were included as covariates. The mediation approach of Hayes and Preacher (submitted) includes 1) dummy coding goal orientation into 3 dummy (D) variables, 2) estimation of two linear models, one for the mediator metacognitive self-regulation (M) and one for the outcome variable academic achievement (Y), with two covariates age-group and sex (W) as an OLS regression-based path analysis:

$$M = i_M + a_1 D_1 + a_2 D_2 + a_3 D_3 + d_1 W_1 + d_2 W_2 + e_M$$

$$Y = i_Y + c'_1 D_1 + c'_2 D_2 + c'_3 D_3 + bM + d_3 W_1 + d_4 W_2 + e_Y$$

where c_i' represents the relative direct effect of X on Y. For the inference of relative indirect effect, a bootstrapping method was used, with 5000 samples used for indirect effect confidence intervals. Age group and sex were included as covariates in the model. Level of significance was set at 0.05.

3. Results

3.1 Academic Achievement

First, it was checked whether our sample was a good representation of the school population with respect to school grades. The standardized mean grades of students in the sample were compared with the grades of their classmates. GLM analysis with participation, educational track and school year as independent variables showed a significant difference in grades (standardized mean grade participants: $M = 0.11$, $SE = 0.04$; standardized mean grade classmates not in sample: $M = -0.05$, $SE = 0.03$; $F(1, 1654) = 8.67$, $p = .003$). However, the effect size was very small (partial $\eta^2 = 0.005$). Combined with the very large N for this analysis ($N = 1676$), we therefore assume that the grades of our sample were comparable to the grades of their classmates.

In our sample, 41% of the students endorsed a mastery goal, 24% a performance-approach goal, 19% a performance-avoidance goal and 16% a work-avoidant goal. There were age ($\chi(3) = 15.9$, $p = .001$) and sex

differences ($\chi(3) = 13.9$, $p = .003$) in this distribution. Characteristics of students endorsing different types of goals can be found in Table 1.

Table 1. Participant characteristics

Characteristics	Mastery ($N = 301$)	Performance-approach ($N = 180$)	Performance-avoidance ($N = 137$)	Work-avoidant ($N = 117$)
Age-group				
10-14 years	50%	23%	16%	11%
14-19 years	36%	25%	20%	19%
Sex				
Boy	38%	25%	16%	21%
Girl	43%	24%	21%	12%

The covariate LPE was significantly related to achievement ($F(1, 718) = 24.3$, $p = .000$). After controlling for the effect of LPE, there was a main effect of goal orientation on achievement ($F(3, 718) = 6.83$, $p = .000$, *partial η^2* $= .028$), indicating that academic achievement was different for students with different goal orientations. Furthermore, there was a main effect of sex on achievement ($F(1, 718) = 11.8$, $p = .001$, *partial η^2* $= .016$), showing that girls had better grades than boys. No main effects were found for age group ($F(1, 718) = 2.92$, $p > .05$). There were no significant interaction effects between the independent variables.

Follow-up analyses revealed that students with performance-approach goals did not differ from students with mastery goals with respect to average grade (see Table 2). Both goals did however differ significantly from work-avoidant goals (*Performance-approach: MD z = .50; Mastery: MD z = .37*) and performance-avoidance goals (*Performance-approach: MD: z = .37; Mastery MD: z = .24*). Mastery and performance-approach students received higher grades than work-avoidant and performance-avoidant students.

Table 2. Follow-up analyses: differences in academic achievement

Reference category		MD	SE	p	95% CI Lower Bound	95% CI Upper Bound
Mastery	Performance-approach	.127	.095	.179	-.059	.313
	Performance-avoidance	-.239	.106	.025*	-.448	-.030
	Work-avoidant	-.373	.117	.001**	-.602	-.144
Performance-approach	Performance-avoidance	-.366	.118	.002**	-.598	-.135
	Work-avoidant	-.500	.127	.000**	-.750	-.250
Performance-avoidance	Work-avoidant	-.134	.136	.327	-.401	.134

Note. $p < .05$, ** $p < .001$.

To illustrate, the performance-approach student earned an average grade of 6.8 on a scale from 1 to 10, whereas the work-avoidant student earned a 6.4 on average. This 0.4 difference on a ten point scale is comparable to a difference between a B and C (UK) or a B+ and B (USA) (see Appendix B).

3.2 Metacognitive Self-Regulation

Students with different goal orientations were compared with regard to metacognitive self-regulation. The MANOVA showed a significant main effect of goals ($F(3, 719) = 49.8$, $p < .000$, *partial η^2* = .127). Post-hoc analysis with Bonferroni correction revealed significant differences between all different types of goals (see Figure 1). Mastery goals were related to the highest levels of metacognitive self-regulation, whereas work-avoidance goals were related to the lowest levels. The scores obtained by students who primarily endorsed performance goals were in-between, whereby performance-approach goals were related to better metacognitive self-regulation skills than performance-avoidance goals.
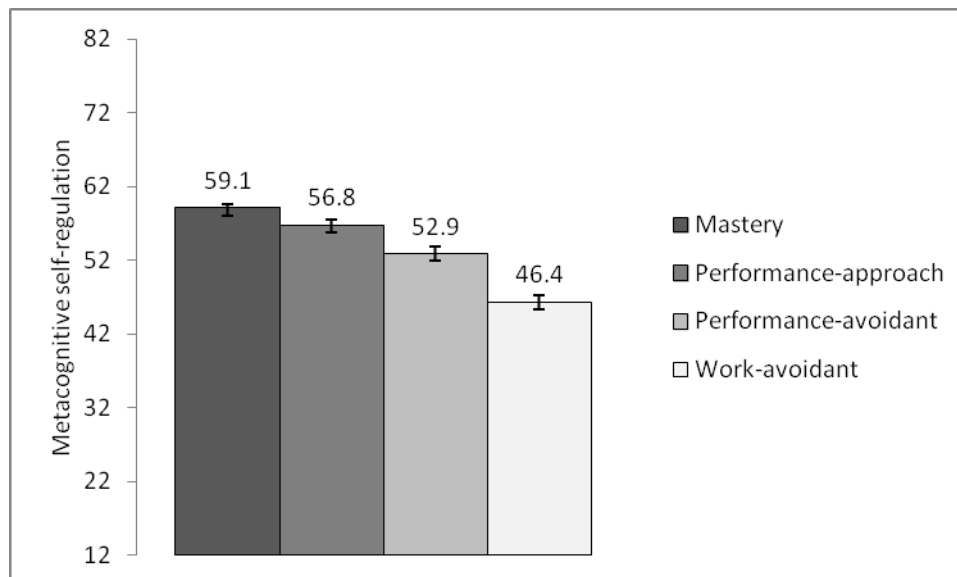

Figure 1. Metacognitive self-regulation levels per goal orientation

Furthermore, there was a main effect of age group ($F(1, 719) = 18.6$, $p = .000$, *partial η^2* = .025). This indicates that young adolescents had higher levels of metacognitive self-regulation than their older counterparts. There was no main effect of sex ($F(1, 719) = .111$, $p > .05$), indicating that levels of metacognitive self-regulation were the same amongst boys and girls. There were no significant interaction effects.

3.3 The Mediation Model

The total model explained 6.39% of the variance in achievement ($F(6, 728) = 8.28$, $p = .000$). The omnibus test of direct effect showed an improvement in fit when metacognitive self-regulation was added to the model, which was significant ($F(3, 728) = 5.11$, $p = .002$). Yet, although significant, the amount of extra variance explained by adding metacognitive self-regulation to the model was very small (1.97%). Sex, not age group, was a significant covariate ($t = -3.22$, $p = .001$). Thus, there was a partial mediation effect: when controlled for sex, both goals and metacognitive self-regulation were related to achievement. The mediation model is shown in Figure 2.
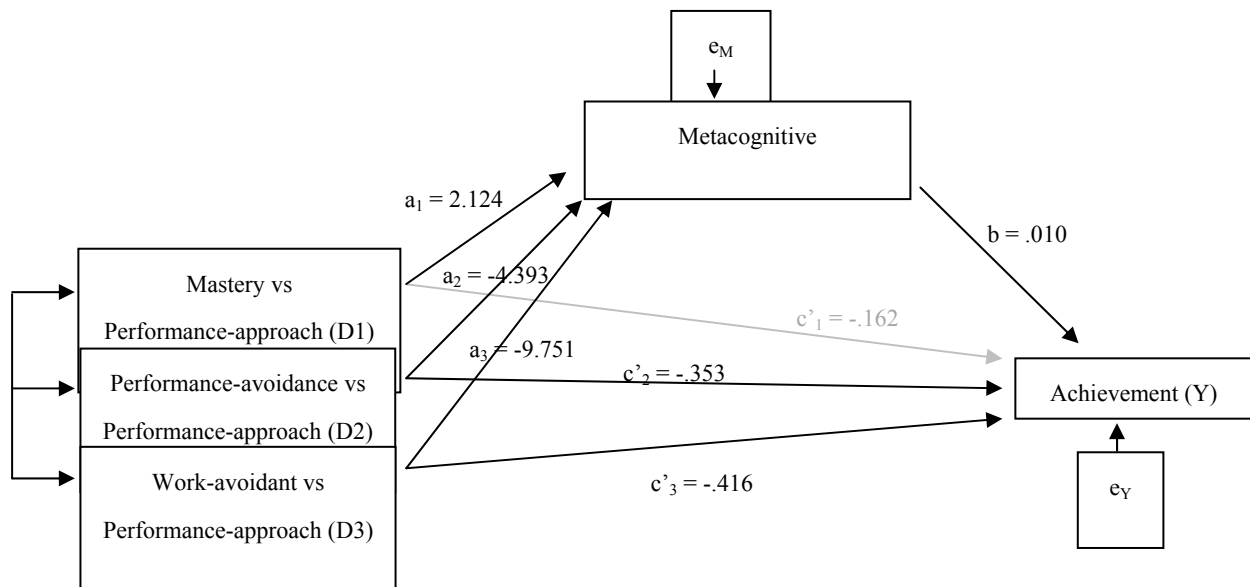
Figure 2. The mediation model

The OLS regression of direct effect on metacognitive self-regulation (path a_i in Figure 2) showed that goal orientation predicted metacognitive self-regulation ($F(5, 729) = 42.0$, $p = .000$, $R^2 = .22$). With respect to achievement, the relative direct effect of goal orientation on achievement (path c'_1 in Figure 2) was different from zero for the comparisons of performance-avoidance ($t = -3.16$, $p = .002$) and work-avoidance ($t = -3.41$, $p = .001$) with performance-approach (reference category), but not for the comparison between mastery and performance-approach ($t = -1.76$, $p > 0.05$). This indicates that performance-approach students achieved the same grades as mastery students, and that these grades were higher than the grades of both performance-avoidant and work-avoidant students. Next to goal orientation, also metacognitive self-regulation (path b in Figure 2) predicted achievement ($t = 2.40$, $p = .017$). Higher levels of self-regulation were related to better achievement.

The indirect effects analysis with bootstrapping yielded 95% confidence intervals for the relative indirect effects that excluded zero, indicating that all goals influenced achievement indirectly through metacognitive self-regulation (path a_ib in Figure 2) (mastery: 0.002 to 0.049 by bootstrapping; performance-avoidance: -.086 to -.008; and work-avoidance: -.173 to -.020). Thus, metacognitive self-regulation was a significant mediator.

In sum, the mediation analysis showed that goal orientations predicted achievement through the level of metacognitive self-regulation. It showed that the higher grades obtained by performance-approach students, compared to performance-avoidant and work-avoidant students, can partially be explained by their higher levels of metacognitive self-regulation.

4. Discussion

The present study used a new method to examine the achievement of students who differ in their dominant goal orientation, and examined a mediation effect of metacognitive self-regulation. The dominant goal orientation was conceptualised as the goal orientation that the student generally endorses for most learning activities. Findings show that students with dominant mastery or performance-approach goals obtained higher grades than students with dominant avoidance goals. Goal orientations were responsible for differences in grades ranging between $z = .24$ and $z = .50$. The largest difference in grades was found between performance-approach and work-avoidant students ($z = .50$). This reflects a difference of 0.4 on a 10-point scale, which is comparable to the difference between a B and C (UK) or a B+ and B (USA). Grades of mastery students did not significantly differ from grades of performance-approach students. The results were the same for both age groups and between the sexes. Metacognitive self-regulation mediated the relationship between goals and achievement, where a higher level of self-regulation was related to better achievement. Metacognitive self-regulation was the highest in mastery students, and the lowest in work-avoidant students. The scores obtained by performance students were in-between, where approach students reported more self-regulation than avoidant students.

The important new theoretical contribution of our vignette approach relates to revealing the *size* of the differences in achievement that can be explained by dominant goal orientations, partially through metacognitive

self-regulation. The relationships between goals, metacognitive self-regulation and academic achievement were the same in both age groups. The direction of these relationships was in accordance with previous research using a multiple goal perspective (Bartels & Magun-Jackson, 2009; Bong, 2009; Daniels et al., 2008; Diseth, 2011; Elliot et al., 1999; Greene & Miller, 1996; Koopman, Den Brok, Beijaard, & Teune, 2011; Simons et al., 2004; Vrugt & Oort, 2008; Wigfield & Cambria, 2010). Our results showed that there were no differences in grades between students with dominant mastery goals and students with performance-approach goals, even though mastery goals were related to more adaptive strategy use than performance goals. It has been suggested that an absence of grade differences may be related to differences in the allocation of study effort. Mastery students would focus their study efforts on information they find personally meaningful, whereas performance students would rather spend their study time on information that is considered relevant for the exam (Senko & Miles, 2008).

Nevertheless, our research suggests that mastery goals will be more beneficial than performance-approach goals in the long-term, as they were related to more adaptive strategy use. Furthermore, previous research has related mastery goals to more positive emotions than performance goals, as indicated by higher levels of well-being (Tuominen-Soini, Salmela-Aro, & Niemivirta, 2012), higher levels of enjoyment and lower levels of boredom (Daniels et al., 2008). In contrast, students with performance or work-avoidance goals seem to be emotionally more vulnerable, e.g., performance-avoidance goals have been related to a heightened vulnerability for school burnout (Tuominen-Soini et al., 2012). Poorer academic achievement by performance-avoidant students may be attributed to anxiety and fear of failure, which may prevent them from starting with their learning activities (Bong, 2009; Daniels et al., 2008; Tanaka, Takehara, & Yamauchi, 2006). Also, higher levels of surface processing and disorganization may explain why performance-avoidance goals were related to lower academic achievement than mastery goals (Diseth, 2011; Elliot et al., 1999; Greene & Miller, 1996; Greene, Miller, Crowson, Duke, & Akey, 2004).

Our results have the following implications for educational practice. First, it is important for teachers to focus on the goals their students dominantly endorse, as these have explanatory value both for their approach to learning (e.g., implementation and monitoring of strategies) and for their grades. The vignette approach (Authors, 2013) allows teachers to distinguish the different types of students and to identify students who are vulnerable to lower academic achievement. It has been shown that teachers can stimulate the endorsement of adaptive mastery goals by creating a mastery goal environment in the classroom, through emphasizing the importance of learning and knowing (Luo, Hogan, & Paris, 2011; O'Keefe, Ben-Eliyahu, & Linnenbrink-Garcia, 2013). In turn, changes in mastery goal orientation have been found to lead to changes in strategy use (Meece & Miller, 2001). Therefore, emphasizing the goals that are desired in the classroom can be an effective intervention with which to change a student's goal orientation, and in turn, academic achievement. Furthermore, our results suggest that students with avoidance goals may benefit from support in metacognitive self-regulation skills. Teaching these children the skills to learn could possibly increase their academic achievement. Yet, it should be considered that our observational study does not allow for causal inferences, or inferences about the long-term merits of the different goals. For future research, it would be interesting to examine whether interventions aimed at promoting mastery goals affect (long-term) achievement.

The effect sizes in our research were small, yet this is not unusual in achievement research (Freudenthaler et al., 2008; Steinmayr & Spinath, 2008). Multiple factors influence achievement, and achievement may also vary per school subject or class (Credé & Phillips, 2011). Consequently, students' average performance may be a less specific outcome measure than subject-specific achievement. Further, our sample may suffer from a selection bias for the work-avoidant students, as participation in the research was voluntary. Possibly, only the most motivated work-avoidant students decided to participate in this research, yielding an overestimation of their achievement. Further, it needs to be noted that there is a lack of consensus about achievement goal models. Recent research suggests a conceptualisation of goals different from the one used in our study, using a 3x2 framework of goal orientations (Elliot et al., 2011). Finally, it should be noted that this study did not address complexity in goal orientation. Students may change their goals per school subject or endorse multiple goals simultaneously (Meece et al., 2006). Yet, there is more evidence for dominant goal orientations, or goal stability, than for goal switching (Senko et al., 2011). Nevertheless, complexity in goal orientations should be addressed in further studies, preferably using a vignette approach.

In conclusion, this large observational study showed the value of vignettes in assessing the most dominant goal orientation, both for research and educational purposes. The goal that is mainly adopted by a student can easily be assessed and used to explain individual differences in academic achievement. Students with dominant

performance-approach or mastery goals had higher grades than work-avoidant or performance-avoidant students. The relation between goals and achievement was mediated by metacognitive self-regulation. This research suggests that mastery goals and metacognitive self-regulation skills should ideally be supported in the classroom.

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Appendix A

Mastery vignette

I am very curious and I like learning new material. A lot of subjects in school interest me. Of course I feel good when I receive a good grade, but I find mastering the material the most important thing.

Performance-approach vignette

In order to show my abilities, I want to receive good grades. I engage in learning because I want to receive higher grades than my classmates. I feel good when I am doing better than others. I think it is not so important to understand the material, as long as I receive good grades.

Performance-avoidance vignette

I think it is important to avoid looking stupid. Therefore, I worry when answering questions in the classroom and I worry when making a mistake. I want to avoid others thinking that I do not understand the material.

Work-avoidant [lazy] vignette

I do not think it is very important to put much effort in school. I do not like to learn. I don't feel like working hard to receive good grades. Therefore, I sometimes fail to do my homework.

Work-avoidant [indifferent] vignette

I do not put much effort into school. Most often, I do not make my homework, because I find other activities more important than learning. I do not like to learn new material. Grades are not important to me.

Appendix B

Table B.1. Dutch grading system

Grade	Frequency in secondary school examinations (2006)
10 = Outstanding	0.50%
9 = Very good	2.70%
8 = Good	14.00%
7 = More than satisfactory	40.00%
6 = Satisfactory	35.00%
5 = Almost satisfactory	6.80%
4 = Unsatisfactory	0.08%
3 = Very unsatisfactory	0.03%
2 = Poor	-
1 = Very poor	-

Note. Derived from Nuffic (Netherlands Organization for International Cooperation in Higher Education)

Table B.2. Dutch grades compared to UK and USA grades

Netherlands	UK	USA
10	A*	A+
9.5	A*	A+
9	A*	A+
8.5	A*	A+
8	A	A
7.5	A-	A
7	B	B+
6.5	C	B
6	D	C
5.5	E	D
5	F	F
4	F	F
3	F	F
2	F	F
1	F	F

Note. Fair comparisons with grading systems in other countries should be based on the frequency distribution.

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