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Believe, and You Will Achieve: Changes over Time in Self-Efficacy, Engagement, and Performance

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In order to answer the question whether changes in students' self-efficacy levels co-vary with similar changes in engagement and performance, a field study and an experimental study were conducted among university students. In order to do this, we adopted a subgroup approach. We created "natural" (Study 1) and manipulated (Study 2) subgroups based upon their change in self-efficacy over time and examined whether these subgroups showed similar changes over time in engagement and performance. The results of both studies are partly in line with Social Cognitive Theory, in that they confirm that changes in self-efficacy may have a significant impact on students' changes in cognition and motivation (i.e. engagement), as well as behavior (i.e. performance). More specifically, our results show that students' increases/decreases in self-efficacy were related to corresponding increases/decreases in their study engagement and task performance over time. Examining the consequences of changes in students' self-efficacy levels seems promising, both for research and practice.

Keywords: change and stability, engagement, performance, self-efficacy, subgroup approach, university students

INTRODUCTION

Students' capabilities greatly determine their academic motivation and success; however, the extent to which they *believe* in their capabilities is important as well. The most influential concept to assess this capability belief is *self-efficacy*, which is referred to as the "belief in one's capabilities to organise and execute the course of action required to produce given attainments" (Bandura, 1997, p. 3). Although self-efficacy has been the subject of ample research, to date research on the effects of self-efficacy on motivation

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and performance is mostly correlational in nature (e.g. Diseth, 2011; Ouweneel, Le Blanc, & Schaufeli, 2011), assuming that students are homogeneous with regard to changes in their self-efficacy levels over time (Von Eye, Bogat, & Rhodes, 2006).

However, as self-efficacy is context-specific (Bandura, 1997) it may change within relatively short periods of time. We used a longitudinal *subgroup* approach in order to investigate individual differences in the development of self-efficacy and their effects on the development in motivation and performance. This means that students are grouped into categories of certain patterns of *change or stability* in self-efficacy over time. These categories of students are then compared to one another with respect to changes in students' motivation and performance.

The purpose of the present studies was to investigate the effects of changes in self-efficacy over time at two levels: the academic level (Study 1) and the task level (Study 2). We report on the results of two studies, both among students. In the first study, we explore the effects of academic self-efficacy within a field setting and in the second study we investigate the effects of task-related self-efficacy within an experimental setting. Both the field and the experimental study deal with a similar question: Do changes in students' self-efficacy levels over time correspond with similar changes in engagement and performance? By using a field and an experimental study, we cross-validate our findings across a real-life academic setting and a controlled experimental setting.

Theoretical Background

The concept of self-efficacy was drawn from Social Cognitive Theory (SCT; Bandura, 1997), which recognises the influential contribution of self-efficacy to human cognition, motivation, and behavior. In psychology and education, in particular, self-efficacy has proven to be a more consistent predictor of behavioral outcomes than any other motivational construct (Graham & Weiner, 1996). Any external or internal factor influencing students' academic success depends on the core belief of having the power to achieve their personal goals by their own actions. We theorise that students will persevere in the face of difficulties (Salanova, Llorens, & Schaufeli, 2011) because they believe that they can draw upon the necessary cognitive and motivational resources to successfully execute study-related tasks (see also Stajkovic & Luthans, 1998). In the current studies, we specifically look at the effects of self-efficacy on engagement (i.e. cognition, motivation), and performance (i.e. behavior). Several studies have shown that self-efficacy is positively correlated with motivation and performance. These studies are discussed in more detail in the light of the social cognitive perspective.

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Engagement

Engagement is described as a positive and inspiring state of mind that is characterised by vigor, dedication, and absorption (Schaufeli & Bakker, 2004). The concept was initially designed as a work-related well-being measure, but more recently the notion of *study engagement* (or academic engagement) was introduced. It was stated that from a psychological point of view, students' activities can be considered as "work" (Salanova, Schaufeli, Martínez, & Bresó, 2010). Just like employees, students are involved in structured, coercive activities (e.g. attending class) that are directed toward a specific goal (e.g. passing exams). So, analogously to work engagement, study engagement is characterised by feeling vigorous, being dedicated to one's studies, and being absorbed in study-related tasks (Schaufeli et al., 2002a). Students are vigorous when they experience high levels of energy and mental resilience, willingness to invest effort, and persistence in the face of difficulties. Dedicated students feel a sense of significance, enthusiasm, inspiration, pride, and challenge with regard to their studies. Finally, students are absorbed when they are fully focused on their study tasks and feel that time is flying (Bresó, Schaufeli, & Salanova, 2011).

Self-efficacy is positively related to engagement because it leads to a greater willingness to expend additional energy and effort on completing a task or an assignment, and hence to more task involvement and absorption (Ouweneel et al., 2011). Efficacious students are more likely to regulate their motivation by setting goals for themselves (Diseth, 2011), and are therefore more likely to be engaged. Obviously, goal setting and planning may contribute to engagement through goal attainment. Attainment, though, is not a necessary precondition linking goal setting and planning to engagement. Progress towards goals rather than attainment is the key to engagement. Students feel good when they think about achieving desirable future outcomes. Having meaningful goals and plans to pursue those goals is likely to result in higher levels of engagement in study tasks (Howell, 2009; MacLeod, Coates, & Hetherton, 2008; Sansone & Thoman, 2006). Other field research has confirmed the positive relationship between self-efficacy and engagement as well, using correlational designs (e.g. Llorens, Schaufeli, Bakker, & Salanova, 2007; Ouweneel et al., 2011). In fact, manipulated changes in self-efficacy levels are tied to corresponding changes in levels of vigor and dedication, as was shown in an intervention study among students (Bresó et al., 2011). In our field study (Study 1), we will investigate whether natural changes in self-efficacy are tied to changes in engagement as well.

Experimental studies have shown similar results (e.g. Salanova, Llorens, Cifre, Martínez, & Schaufeli, 2003; Salanova et al., 2011; Vera, Le Blanc, Salanova & Taris, in press). In these experimental studies, self-efficacy levels

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were not manipulated; rather, the researchers studied the correlational effects of "natural" levels of self-efficacy on engagement. In the present experimental study (Study 2), we will manipulate changes in self-efficacy, i.e. an increase and decrease in self-efficacy, respectively, and study the effects of this manipulation on the change in engagement levels over time.

Performance

Several factors influence students' study performance (or academic performance), for example, the environment in which they operate (Salanova et al., 2010), past performance (Elias & MacDonald, 2007), actual skills (Brown et al., 2008; Robbins, Lauver, Le, Davis, & Langley, 2004), and health (Trockel, Barnes, & Egget, 2000). Nonetheless, students' self-efficacy levels seem to be one of the strongest predictors of performance (Multon, Brown, & Lent, 1991; Robbins et al., 2004). Efficacious students tend to try other options when they do not achieve their goals at first, they expend high levels of effort in doing so, and deal more effectively with problematic situations by persevering and remaining confident that they will find solutions and be successful in the end. Therefore, generally, they perform well (Bandura, 1997).

Ample correlational research has shown that academic self-efficacy is positively related to grades (Elias & MacDonald, 2007; see for an overview Multon et al., 1991) and task performance (e.g. Bouffard-Bouchard, 1990; Niemivirta & Tapola, 2007). Like the studies on engagement previously discussed, the field studies were correlational in nature. With regard to the experimental studies, Bouffard-Bouchard (1990) compared manipulated levels of self-efficacy as regards their effects on cognitive task performance of the participants, and Niemivirta and Tapola (2007) looked at changes in "natural" levels of self-efficacy and their effects on task performance. In both experimental studies, higher levels of self-efficacy were related to higher levels of performance. Following Bouffard-Bouchard (1990), we manipulated self-efficacy levels and investigated whether different types of change in self-efficacy levels correspond with similar changes in objective task performance.

The Present Studies

Despite the large number of studies on self-efficacy in relation to motivation and performance, most studies have been correlational in nature, neglecting individual differences in changes in self-efficacy levels. These types of studies investigate the *normative stability* (Taris, 2000) of self-efficacy. The present study focuses on the effects of change in and stability of self-efficacy over time. That is, we made a distinction between groups of students who differ in changes of self-efficacy levels over time. This is referred to as *level stability*

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(Taris, 2000). In our studies, we make a distinction between groups of students who differ in changes of self-efficacy levels over time. Further, we compare the group means of these theoretically meaningful subgroups across time rather than examine relationships between variables over time. This subgroup perspective enables us to examine the effects of different types of change and stabilities in self-efficacy levels on the outcome variables. In Study 1, we composed different subgroups on the basis of their natural changes in self-efficacy scores over time. In Study 2, we actually imposed a change in self-efficacy by manipulating the level of self-efficacy differently in subgroups.

STUDY 1: ACADEMIC CONTEXT

Overview and Hypotheses

Study 1 is designed as a "theoretically specified subgroup design" (Taris and Kompier, 2003), or put differently, as a natural experiment. As such, the participants are categorised according to their changes in self-efficacy scores over time, resulting in the following four subgroups: stability-low (low at Time 1 (T1) – low at Time 2 (T2)), increase (lowT1-highT2), decrease (highT1-lowT2), or stability-high (highT1-highT2). In the next section, we explain how these subgroups are constructed. We investigate whether students in these different self-efficacy subgroups differ as regards the changes in their scores on study engagement and study performance over time. We expect interaction effects of time and group on study engagement, and on study performance, respectively. More specifically, we hypothesise that students of the four different subgroups of changes in self-efficacy scores show similar changes in scores on study engagement (Hypothesis 1) and study performance (Hypothesis 2). So, we assumed that (high and low) stable groups have stable levels of engagement and performance over time, and we expect that an increase (low-high)/decrease (high-low) in self-efficacy co-varies with a corresponding increase/decrease in engagement and performance.

Method

Participants and Procedure. This study was conducted among 345 university students. Ten participants were excluded from data analysis because of missing data, leaving a total of 335 participants with a mean age of 20.7 years (*SD* = 2.0). Of the participants, 15 per cent were men. Almost all of the participants were in one of their first three years of college (97%). We recruited the participants via flyers and we invited those who wanted to participate to send an email to the first author (address reported on the flyer).

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We only used the email addresses of the participants to send an invitation to fill in an online questionnaire. In return for their voluntary participation students received course credits. The study consisted of two measurements. Considering that a semester—half of a study year—consists of two time periods ("blocks") of equal size, T1 was at the end of the first block of the semester and T2 was at the end of the second block of the semester. Next to online questionnaire data, we also included the grades obtained by the study participants in those two semester blocks. The first questionnaire started with a written introduction of the study.

Measures

Study-Related Self-Efficacy. We measured self-efficacy with a five-item scale (Midgley et al., 2000). A sample item is: "I believe I can handle even the hardest study tasks". All items were scored on a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree). The scale had a good reliability at both time points ($\alpha_{T1} = .81$ and $\alpha_{T2} = .78$).

Study Engagement. We assessed study engagement by means of the Utrecht Work Engagement Scale - Student survey (UWES-S; Schaufeli et al., 2002a) that consists of 17 items. A sample item is "When I'm doing my work as a student, I feel bursting with energy". All items were scored on a 7-point Likert scale (0 = never, 6 = always). The scale had a good reliability at both time points ($\alpha_{T1} = .92$ and $\alpha_{T2} = .93$).

Study Performance. We calculated the Grade Point Averages (GPAs) per semester block to assess study performance. We conducted this as follows: the GPA at T1 was assessed by computing the mean grade of all tests that were conducted during the first block of the semester and T2 was assessed by computing the mean grade of all tests of the second block of the semester. The grades were acquired from the university register. Although the Dutch grading system ranges from 1 (extremely poor) to 10 (excellent), all grades below 5.5 were lumped together in the university's records and considered "insufficient". For the purpose of the current study we recoded all grades below 5.5 to 5, so that the true range of grades in our study was from 5 (insufficient) to 10 (excellent).

Data Analyses

Creation of Subgroups. First, self-efficacy was dichotomised at both time points in high and low, using a median split procedure (see also De Lange, Taris, Kompier, Houtman, & Bongers, 2002), resulting in four subgroups (low(T1)-low(T2), low(T1)-high(T2), high(T1)-low(T2), and

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TABLE 1
Means, Standard Errors, Number of Participants, Paired-samples *t*-Values (T1–T2), and Cohen's *d* of the Self-Efficacy Subgroups (Study 1)

	T1		*T2*				
	M	SE	M	SE	N	t	*Cohen's* d
Low-low	3.22	0.03	3.23	0.03	136	-0.51^{ns}	–0.04
Low-high	3.40	0.05	3.88	0.05	39	–10.83***	–2.59
High-low	3.97	0.05	3.44	0.05	43	10.21***	2.17
High-high	4.15	0.03	4.11	0.03	117	1.20^{ns}	0.17

Note: *M* = mean, *SE* = standard error, *N* = number of participants, *ns* = not significant, *** $p < .001$.

high(T1)-high(T2)). Thus, self-efficacy was used as a categorical variable to predict the changes in scores (T1–T2) on study engagement and study performance. The outcome variables were continuous variables. The average self-efficacy scores per subgroup and corresponding paired-samples *t*-values and Cohen's *d* to compare the group means over time are presented in Table 1.

Controlling for Demographics. To check for possible effects of age and year of study, we performed an analysis of variance (ANOVA) to test whether the four groups differed with regard to these variables. Further, by means of χ^2 test, we checked for significant gender differences between the four groups. This way, we ensured that the subgroups that were composed differed significantly in levels of self-efficacy over time but not with regard to demographics.

Analyses of Variance and t-Tests. To test our hypotheses, a 2 (time: T1 and T2) × 4 (group: low-low, low-high, high-low, and high-high) multivariate analysis of variance with repeated measures (RM-MANOVA) was carried out with time as a within-subject factor and group as a between-subjects factor. This analysis was followed by two separate univariate RM-ANOVAs with study engagement and study performance as outcome variables. In case of a significant effect of time, we conducted post-hoc paired-samples *t*-tests to see whether the separate group means differed significantly across time. In case of a main effect of group, we then conducted post-hoc independent samples *t*-tests to see whether group means significantly differed within the two time points. Finally, because of the unequal group sizes (see Table 1), we conducted Levene's tests to check for (un)equality of variances across groups.

Results

Preliminary Analyses. Controlling for demographics: ANOVAs revealed that the four self-efficacy subgroups neither differ with regard to age,

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$F(3, 334) = 2.44$, $p = .06$, nor to year of study, $F(3, 334) = 0.54$, $p = .65$. Neither did the groups differ significantly with regard to gender, $\chi^2(3) = 5.50$, $p = .14$. Therefore, we excluded demographics from further analyses.

Testing Hypotheses. We analyzed the data using a RM-MANOVA with a within-subject factor representing time (T1 and T2) and a between-subjects factor of change in self-efficacy scores (low-low, low-high, high-low, and high-high). The RM-MANOVA with study engagement and study performance as dependent variables revealed *no* main effect of time, Wilks' Lambda = .99, $F(2, 329) = 1.58$, $p = .21$, but it did reveal a significant effect of group (i.e. change in self-efficacy), Wilks' Lambda = .84, $F(6, 660) = 9.70$, $p < .001$, $\eta^2 = .08$, as well as a significant interaction effect of time and group, Wilks' Lambda = .94, $F(6, 660) = 3.75$, $p < .001$, $\eta^2 = .03$.

Results of additional univariate RM-ANOVAs showed a significant main effect of group (i.e. change in self-efficacy) on both study engagement, $F(2, 330) = 10.84$, $p < .001$, $\eta^2 = .09$, and study performance, $F(2, 330) = 10.07$, $p < .001$, $\eta^2 = .08$. Moreover, we found a significant interaction effect of time and group on study engagement, $F(2, 330) = 6.69$, $p < .001$, $\eta^2 = .06$, but *not* on performance, $F(2, 330) = 1.06$, $p = .37$. The interaction effect on study engagement was in the assumed direction (see Table 2 and Figure 1), so Hypothesis 1 was confirmed. However, because no interaction effect of time and group was found on performance, Hypothesis 2 was rejected. Figure 1 shows the results of the analyses.

Since the main group effects were significant for study engagement and study performance we conducted post-hoc tests by means of independent samples *t*-tests. In other words, we compared the group means within the two time points. As Table 2 shows, all differences in mean levels are in the expected direction; in all cases, the group means in the "low" categories are actually lower than the group means of the "high" categories and vice versa, at both T1 and T2. Although not all independent samples *t*-tests showed the expected significance levels, 19 of the 24 *t*-tests conducted (79.2%) were in line with our expectations. For reasons of economy, we will not describe the results of these *t*-tests in detail. The results can be obtained upon request from the first author. Finally, Levene's tests indicated no unequal variances for the different groups of change in self-efficacy scores.

Discussion

The results show that changes in self-efficacy scores align with similar changes in study engagement, but not with changes in study performance. We conclude that self-efficacy in an academic setting seems to relate to subjective

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TABLE 2
Means and Standard Errors (in parentheses) of the Outcome Variables as a Function of Time and Group (Study 1)

	Self-efficacy subgroups per time point										
	Low-low (N = *136*)		*Low-high* (N = *39*)		*High-low* (N = *43*)		*High-high* (N = *117*)		*Time*	*Group*	*Time × Group*
	T1	*T2*	*T1*	*T2*	*T1*	*T2*	*T1*	*T2*	*RM-(M) ANOVA* F-*values*		
Variables									$F(2, 329) = 1.58^{ns}$	$F(6, 660) = 9.70$*** $\eta^2 = .08$	$F(6, 660) = 3.75$*** $\eta^2 = .03$
Study engagement	3.08 (.07)	3.04 (.07)	3.18 (.13)	3.45 (.13)	3.40 (.12)	3.12 (.13)	3.60 (.07)	3.60 (.08)		$F(2, 330) = 10.84$*** $\eta^2 = .09$	$F(2, 330) = 6.69$*** $\eta^2 = .06$
Study performance	6.64 (.07)	6.79 (.05)	6.72 (.14)	6.94 (.10)	6.97 (.13)	6.88 (.09)	7.06 (.08)	7.18 (.06)		$F(2, 330) = 10.07$*** $\eta^2 = .08$	$F(2, 330) = 1.06^{ns}$

Note: *** $p < .001$. *ns* = not significant, *N* = total of participants.

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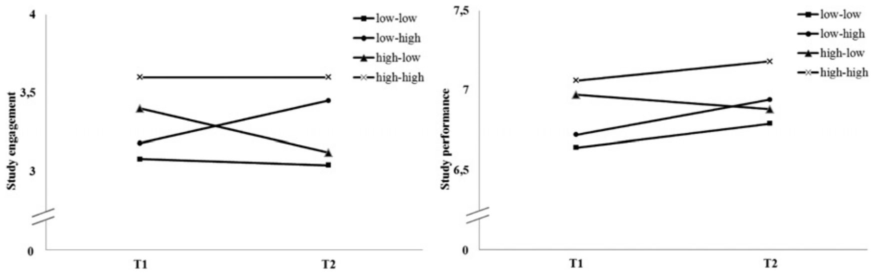

FIGURE 1. The effect of time and group (change in self-efficacy scores) on study engagement and study performance (Study 1).

measures like study engagement, but not to objective measures like GPA. This finding might be in line with the results of some studies demonstrating a negative effect of self-efficacy, i.e. high levels of self-efficacy may lead to overconfidence (e.g. Stone, 1994) or create relaxation (e.g. Vancouver & Kendall, 2006) which could reduce future performance (see General Discussion). A theoretical explanation is that it has to do with proximity: self-efficacy is firstly related to study engagement, after which it will have an impact on performance. Since we found no relationship between changes in self-efficacy and changes in study performance, it could imply that the two measurements were too close together in time to uncover a similar trend of self-efficacy and study performance.

Methodologically speaking, the relationship between self-efficacy and study engagement is partly explained by common method variance because of the use of self-reports for both constructs (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Practically speaking, as can be seen in Figure 1, the overall trend is that GPA scores increase toward the end of the semester. And a final, statistical explanation could be that the sample sizes of the “change groups” were (too) small which caused a loss of power. The grades could also have been positively influenced by external factors (e.g. summer holidays getting closer), thereby undoing the possible effect of self-efficacy.

Although part of the results was unexpected, the findings suggest that something interesting is happening: a change in self-efficacy levels is related to how the level of engagement of students varies across time. However, causality cannot be determined based on the results of Study 1. Therefore, we conducted a study on self-efficacy, engagement, and performance using an experimental design. The advantage of this study is that it takes place in a controlled setting, excluding external factors that could possibly interfere with the performance scores, like in Study 1.

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STUDY 2: EXPERIMENTAL SETTING

Overview and Hypotheses

In the experiment, we assigned the participants to one of three self-efficacy conditions; through positive performance feedback (positive condition), we attempted to increase the level of self-efficacy, through negative performance feedback (negative condition) we attempted to decrease the level of self-efficacy, and finally, in the control condition we gave no feedback at all. Hypothesis 1 predicts that there is an interaction effect of time and group in that the positive condition enhances task engagement, whereas the negative condition reduces task engagement, and the control condition is stable as far as task engagement is concerned. In addition, Hypothesis 2 states that there is an interaction effect of time and group in that the positive condition enhances task performance, whereas the negative condition reduces task performance, and the control condition remains stable in task performance across the two measurements.

Method

Participants, Design, and Procedure. *Participants*: We recruited different participants for the second study via posters and flyers at a university. In return for their voluntary participation students received either course credits or a small payment. Participating students signed a statement upfront in which they gave their informend consent. In the experiment, 91 university students participated (43% men). Their mean age was 20 years (SD = 3.80). Most of the participating students were in one of their first three years of college (82%).

Design: We randomly assigned the participants to one of the three conditions: (a) positive feedback group; (b) a negative feedback group; or (c) a no feedback (control) group.

Procedure: The participants were seated in small cubicles and were verbally instructed by the researcher that they would only need to follow the instructions on the computer screen. The first instruction page showed the cover story to the participants, which was that the study was on potential differences in IQ between the sexes. The experiment consisted of two similar IQ tasks (one existing IQ test split at random in two; http://iq-test-online.co.uk). The tasks consisted of 15 multiple choice questions, the first of which was used as an example question. The questions represented spatial aptitude issues, using two-dimensional geometric symbols. After both IQ tasks, the level of task engagement was measured (T1 and T2). In-between the two IQ tasks, we performed the self-efficacy manipulation. We used the method of providing bogus feedback in order to manipulate the level of self-efficacy.

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This method has proved to be successful in manipulating levels of self-efficacy in previous studies (e.g. Bouffard-Bouchard, 1990; McAuley, Talbot, & Martinez, 1999). In the positive condition, the participants received bogus positive performance feedback ("Congratulations! Your IQ score belongs to the best 10% of the participants so far!"). In the negative condition, the participants received bogus negative performance feedback ("Unfortunately, your IQ score belongs to the worst 10% of the participants so far"). Finally, in the control condition, the participants did not receive any performance feedback. Following the manipulation, the participants had to fill in a Sudoku puzzle, as a filler task to distract them from the manipulation. They were given 3 minutes to get as far as they could. We also assessed the self-efficacy levels of the participants (i.e. manipulation check), and the experiment finished with the second IQ task and the second measurement of task engagement. All participants received bogus positive performance feedback on the second task in order to avoid the students feeling depressed after the experiment. On average, the experiment took the participants 20 to 30 minutes to complete.

Measures

Task-Related Self-Efficacy. The scale consisted of two items which we developed for the specific context of this study. We based the items on those used by Bouffard-Bouchard (1990) and formulated them as follows: "I believe I will perform well on the next IQ task" and "I have confidence in my abilities to do well on the next IQ task". Participants responded using a 9-point scale anchored by 1 (not at all applicable) to 9 (very much applicable). The inter-item correlation of the two self-efficacy items was .71.

Task Engagement. An adjusted version of UWES-S (Schaufeli, Salanova, González-Romá, & Bakker, 2002b; nine-item student version) was used to assess task engagement. The adjustments were twofold: the items were formulated in the past tense and at a task level instead of an academic level. An example of an item is "I felt energetic when I carried out the task". Participants responded using the same 9-point scale anchored by 1 (not at all applicable) to 9 (very much applicable). The task engagement scale had good reliability at both time points ($\alpha_{T1} = .83$ and $\alpha_{T2} = .86$).

Task Performance. Task performance was assessed as the sum of the correct answers on the IQ tasks. The scores on task performance could range from 0 to 14.

Data Analyses

Controlling for Demographic and T1 Variables. In order to establish that participants in the three conditions did not differ with regard to the outcome

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variables before the experiment started, ANOVAs were conducted on task engagement and task performance. Also, to check for the possible effects of age and year of study, we conducted ANOVAs, whereas we used a χ^2 test to check for possible gender differences between the three conditions.

Analyses of Variance and t-Tests. To test the hypotheses, a 2 (time: T1 and T2) $\times$ 3 (group: positive, negative, and control) RM-MANOVA was carried out with time as a within-subject factor, group as a between-subjects factor, and task engagement and task performance as dependent variables. In addition, we performed univariate RM-ANOVAs to test the effects on task engagement and task performance separately. Finally, we conducted post-hoc paired-samples *t*-tests in every case to see whether the separate condition means differed significantly across time. The reason for this is that these tests contain information with regard to changes over time per condition, which is relevant in acquiring more insight into the data of this study. Finally, in case of a main effect of condition, we conducted post-hoc independent samples *t*-tests to see whether the separate condition means significantly differed within time points.

Results

Preliminary Analyses. Controlling for demographic and T1 variables: ANOVAs on the T1 variables revealed that participants in the three conditions did not differ significantly as regards the mean levels of task engagement, $F(2, 90) = 1.01$, $p = .37$, and task performance, $F(2, 90) = 0.29$, $p = .75$. Further, it appeared that participants in the three conditions did not differ with regard to age, $F(2, 83) = 0.98$, $p = .38$, year of study, $F(2, 82) = 0.58$, $p = .56$, and gender, $\chi^2(2) = 2.69$, $p = 26$. So, demographics were excluded from further analyses.

Manipulation check: The manipulation was effective; that is, participants in the positive condition scored higher on self-efficacy ($M = 6.31$, $SD = 1.07$) compared to participants in the negative condition ($M = 4.89$, $SD = 1.32$) and in the control condition ($M = 5.47$, $SD = 1.22$), $F(2, 90) = 10.84$, $p < .001$. Further, Tukey's post-hoc tests confirmed that participants in the positive condition scored significantly higher on self-efficacy than those in the negative condition ($p < .001$) and those in the control condition ($p < .05$). However, participants' self-efficacy scores in the negative condition did not significantly differ from those in the control condition ($p = .16$).

Testing Hypotheses. Analyses of variance and t-tests: We analyzed the data using a RM-MANOVA with time (T1 and T2) as a within-subject factor and group (positive, negative, and control) as a between-subjects factor. The analyses with task engagement and task performance as dependent

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variables, revealed a significant main effect of time, Wilks' Lambda = .86, $F(2, 87) = 6.86$, $p < .01$, $\eta^2 = .14$, but *no* significant main effect of group (i.e. self-efficacy condition), Wilks' Lambda = .93, $F(4, 174) = 1.60$, $p = .18$. Finally, we observed a significant interaction effect of time and group, Wilks' Lambda = .83, $F(4, 174) = 4.21$, $p < .01$, $\eta^2 = .09$.

In addition, univariate RM-ANOVAs revealed a significant main effect of time on task engagement, $F(1, 88) = 13.60$, $p < .001$, $\eta^2 = .13$. However, we did *not* observe a main time effect on task performance, $F(1, 88) = 0.59$, $p = .44$. Finally, we found significant interaction effects of time and group on both task engagement, $F(2, 88) = 4.70$, $p < .05$, $\eta^2 = .10$, and task performance, $F(2, 88) = 3.60$, $p < .05$, $\eta^2 = 08$. Since the interaction effects were both in the assumed direction (see Table 3 and Figure 2), Hypotheses 1 and 2 are confirmed.

Post-hoc paired-samples *t*-tests indicated that, in the positive condition, scores were significantly higher at T2 than at T1 for performance ($t(30) = -3.10$, $p < .01$), but not for task engagement. In the negative condition, the scores on task engagement ($t(30) = 3.38$, $p < .01$) decreased significantly, whereas the performance scores did not. Finally, in the control condition, the scores on performance were stable across time, whereas the scores on task engagement decreased ($t(28) = 3.54$, $p < .001$) over time. See Table 3 for all *t*-values, means, and standard errors of the outcome variables of the separate conditions.

Discussion

The results of the experiment in Study 2 showed that, indeed, manipulated changes in levels of self-efficacy have a significant influence on changes in scores on task engagement and task performance. Students who received positive performance feedback with the aim of boosting their self-efficacy also showed an increase in actual task performance. In a similar vein, task performance decreased when students received negative feedback and it remained stable in the control condition. These findings support the practical explanation that was given in the Discussion section of Study 1: we found no relationship between changes in self-efficacy and study performance, which is likely to do with the fact that external factors influenced the performance of students. This is because the relationship between self-efficacy and performance appeared to exist within a controlled setting (Study 2) in which external factors were excluded.

The effects of changes in self-efficacy on task engagement were slightly different. Although the interaction effect of time and group on task engagement was significant, the level of task engagement was not significantly enhanced following the positive self-efficacy manipulation. Most likely this is

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TABLE 3
Means, Standard Errors (in parentheses), and *t*-Values of the Outcome Variables as a Function of Time and Group (Study 2)

	Self-efficacy conditions per time point											
	Positive (N = *31*)			*Negative* (N = *31*)			*Control* (N = *29*)			*Time*	*Group*	*Time × Group*
	T1	*T2*	*t*	*T1*	*T2*	*t*	*T1*	*T2*	*t*	*RM-(M)ANOVA* F-*values*		
Variables										$F(2, 87) = 6.86^{**}$ $\eta^2 = .14$	$F(4, 174) = 1.60^{ns}$	$F(4, 174) = 4.21^{**}$ $\eta^2 = .09$
Task engagement	4.47 (.16)	4.51 (.17)	-0.35^{ns}	4.33 (.16)	3.96 (.17)	3.38**	4.64 (.16)	4.27 (.17)	3.54***	$F(1, 88) = 13.60^{***}$ $\eta^2 = .13$		$F(2, 88) = 4.70^{*}$ $\eta^2 = .10$
Task performance	9.32 (.41)	10.19 (.40)	−3.10**	8.90 (.41)	8.39 (.40)	3.54***	9.24 (.43)	9.38 (.41)	-0.31^{ns}	$F(1, 88) = 0.59^{ns}$		$F(2, 88) = 3.60^{*}$ $\eta^2 = .08$

Note: * $p < .05$; ** $p < .01$; *** $p < .001$. *ns* = not significant, *N* = total of participants.

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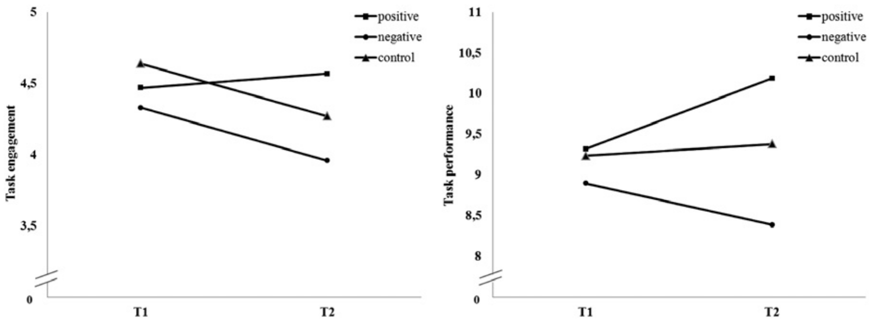

FIGURE 2. The effect of time and group (self-efficacy condition) on task engagement and task performance (Study 2).

caused by the fact that the overall trend indicated that students were getting bored of the task at the end of the experiment (T2). Both the negative and control conditions decreased significantly in engagement at T2 compared to T1. These trends in task engagement were previously found in a controlled setting (Vera et al., in press). Indeed, personal communication with the participants revealed that most participants were getting bored of the task at the end of the experiment. The positive self-efficacy manipulation possibly buffered this effect so that in the positive condition the level of engagement was stable across time.

GENERAL DISCUSSION

Main Findings

In order to explore to what extent stability and change in levels of self-efficacy over time correspond with similar changes in levels of engagement and performance, we performed two studies, one in a field setting and one in a controlled setting. Results showed that our expectations were partly confirmed; changes in self-efficacy corresponded with similar changes in the outcome variables, except for performance in Study 1. So, the effects of changes in self-efficacy on changes in engagement were cross-validated in a field and an experimental setting. However, we found effects of changes in self-efficacy on performance changes in an experimental setting only. We presented possible explanations for this unexpected null-finding in the Discussion of Study 1. As in a controlled setting the relationship between self-efficacy and performance did exist, it is possible to assume that in Study 1 external factors "overruled" the effects of changes in self-efficacy on the changes in study performance over time; at least more so than on changes in

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subjective outcomes such as study engagement. Another theoretical explanation of the inconsistent results with regard to performance could have to do with the fact that the assessment of self-efficacy in Study 1 was not specifically related to courses in which the students acquired their grades. Although the measure was specific for the academic domain, it was not geared to the specific courses. In Study 2 we used a more specific measure of self-efficacy and we indeed found it to be of influence on changes in task performance. Bandura (1997) stated that the more specific the assessment of self-efficacy, the more likely it is to be related to outcomes such as motivation and performance. Finally, it could be that increases in self-efficacy are actually not always beneficial for performance. Hence, Stone (1994) and Whyte, Saks, and Hook (1997) found that high levels of self-efficacy could lead to overconfidence in one's abilities. More recently, studies have shown that high levels of self-efficacy create relaxation and reduce future performance (e.g. Vancouver & Kendall, 2006). In line with this, Vancouver, Thomson, and Williams (2001) found that the more self-efficacy students had with regard to exams, the worse their performance was in examinations at a later time point. Although our results do not show this trend—negative effect of increases in self-efficacy—our results do confirm that the effects of self-efficacy on performance are not as clear-cut as they might seem to be at first glance.

All in all, we found that students with increased self-efficacy also increased in engagement and performance over time, either at academic level (Study 1) or task level (Study 2). On the other hand, students who decreased in self-efficacy are potentially at risk in that they are more likely to feel less engaged and perform less well over time. These results are in line with SCT, in that they confirm that self-efficacy has a significant impact on human cognition and motivation (engagement), and behavior (performance).

Although three out of four interaction effects were significant, not all subgroup differences within time (Study 1) and not all changes over time per condition (Study 2) in the outcome variables were as expected. In Study 2, task engagement was stable over time in the positive condition and decreased significantly in the control condition. An explanation was given in the Discussion of Study 2, namely the overall trend was that students were getting bored of the task at the end of the experiment (see also Vera et al., in press). Nevertheless, our results by and large confirm what was stated in the Introduction, namely, that it is not only important what students *can* do, but also what they *believe* they can do. Although an extensive body of research confirmed this general notion (see for overviews Brown et al., 2008; Multon et al., 1991), our studies using a subgroup approach specifically showed that groups of students, who are classified based on different types of changes in self-efficacy scores over time, exhibit changes in engagement (in both studies) and performance (in Study 2) parallel to the changes in self-efficacy.

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Our study method compared groups of students based on the change in their self-efficacy beliefs. So far, most studies on the effects of self-efficacy have been correlational and thus centered around variables (e.g. Llorens et al., 2007; Ouweneel et al., 2011). Comparing changes in self-efficacy scores across groups has been done mainly in experimental settings (e.g. McAuley et al., 1999; Salanova et al., 2011). To our knowledge, our study is the first in which groups of students were compared in a natural setting, and were classified based on their natural changes in self-efficacy scores (i.e. a natural experiment). As we stated in the Introduction section, this subgroup design does not make the assumption that students are similar in self-efficacy changes over time (Lerner, Lerner, De Stefanis, & Apfel, 2001). Since self-efficacy depends on the domain (e.g. exam or task), it cannot be assumed that self-efficacy will be stable throughout the semester, at least not for all students. A subgroup approach such as the one we adopted acknowledges these differences in self-efficacy changes over time. Moreover, these groups are identifiable in practice, which provides a starting point for intervention on certain groups of students.

Strengths and Limitations

Besides the fact that we compared distinct groups of students with each other—which has rarely been done before in a field setting—our studies have several other strengths. First of all, we made use of actual performance measures, which enabled us to link subjective self-efficacy to objective outcome measures. Second, both studies had designs with two measurements, so that we were able to look at changes over time. Finally, we combined a field study with an experimental study in order to cross-validate findings from the field in a controlled setting.

However, despite these positive points, there is still room for improvement and need for further studies. First, environmental factors such as study resources (e.g. social support) and demands (e.g. time pressure) (Salanova et al., 2010) were not incorporated into our field study. By not including these environmental factors, the origin of the self-efficacy levels in Study 1 is unclear. These factors potentially could have had an influence on the relationships between self-efficacy and the outcome variables too. The studies reported here only give insight into the score changes in self-efficacy across time and the extent to which these score changes correspond with the score changes of the other study variables. Future field studies should include environmental variables in order to give a more detailed look at psychological processes within the academic context.

In Study 1, we measured self-efficacy with respect to the academic domain, though the scale was not course-specific as were the performance measures. Therefore, it would be advisable for researchers to link certain course grades

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to self-efficacy levels regarding those specific courses. Since self-efficacy applies to the level of specific courses or exams, this would lead to even more valuable insights into task-specific self-efficacy in academic settings. Also with regard to Study 1, the two time points were within one academic semester. A longer time lag could have resulted in stronger changes in the research variables and therefore in even more convincing results. Also, Taris and Kompier (2003) state that, strictly speaking, two observations are not adequate for studying intra-individual processes. This information is usually insufficient for a thorough understanding of the process responsible for changes over time. However, clearly, two observations *do* provide information about change over time (Taris & Kompier, 2003). Nonetheless, future studies should contain three measurements or more, and preferably with longer time lags, to conduct for example growth curve modeling (see Niemivirta, 2004).

Another important statistical issue is the way the self-efficacy groups were created in Study 1. At both T1 and T2, the participants were allocated to a group "low" or "high" in self-efficacy, based on a median-split procedure. That way, four groups of (changes in) self-efficacy scores were created (i.e. T1low-T2low, T1low-T2high, T1high-T2low, and T1high-T2high). Although the group means actually changed in the "change groups" and were actually stable in the "stable groups" (see Table 1), it is possible that some of the participants were "accidentally" placed in a particular group because their self-efficacy scores were close to the margin of low versus high self-efficacy (i.e. the median split). However, because our results are based not only on extreme low or high scores, the procedure we used was quite conservative. That is, the results probably would have been more convincing when controlling for the error described here. In any case, we intentionally chose our design because we were interested in engagement and performance levels of groups of individuals that showed increases or decreases in self-efficacy across time. Of course, the relations between intra-individual changes in self-efficacy over time and changes in engagement and performance can also be studied with alternative designs that treat self-efficacy as a continuous variable.

Implications

Both researchers and practitioners are interested in optimising positive change in human beings (Lerner et al., 2001). In that sense, our subgroup approach provides important practical and empirical insights. Our results show that, on the one hand, natural changes of scores in self-efficacy correspond with parallel changes in levels of engagement among students. So, it seems worthwhile to invest in students' self-efficacy in order to increase their levels of engagement. On top of that, our results imply that self-efficacy levels can be manipulated in a controlled setting. Future research could focus on

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increasing students' self-efficacy levels in the field (see for example Bresó et al., 2011). Training programs can help students to set goals to achieve study-related goals. Increased levels of self-efficacy are likely to follow goal setting (Schunk & Ertmer, 1999). Increases in self-efficacy will then lead to increases in, for example, engagement levels which will keep students motivated to put effort into their studies. Moreover, training programs could cause big increases in self-efficacy levels, at least greater than "natural" increases in self-efficacy. This enhances the likelihood that an increased level of self-efficacy has a positive impact on performance.

The results of Study 2 showed that providing positive performance feedback is a suitable method with which to achieve increases in self-efficacy levels among students. University teachers and supervisors can play an important role in changing the self-efficacy beliefs of students in a positive way, e.g. by paying full attention to providing students with positive feedback. Our results showed that bogus feedback works, even without further information. However, others have stated that, in practice, feedback should rather be accurate (Linnenbrink & Pintrich, 2003) and instructive (Schunk, 1983) to enhance self-efficacy levels. In other words, feedback should fit the actual situation and must be shared so that a student can in fact improve his or her situation. So, when a student is not performing very well, teachers might do better by giving true feedback and by setting personal goals with and for the student instead of providing bogus performance feedback. By monitoring the self-efficacy beliefs of students, university teachers and supervisors can act upon decreasing levels of self-efficacy and prevent students from failing their courses or even leaving university. Similar to the way in which we started our article, we conclude that, next to actual capabilities, students' capability beliefs are crucial for academic success. Since self-efficacy beliefs are prone to faulty assessments (Bandura, 1997), making positive changes in these beliefs among students seems to be a worthwhile endeavor.

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