To improve or to compete

Implicit theories of ability and parental behavior as determinants of achievement goals in sport

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Chapter 3

The effects of implicit theories of ability on achievement goals, motivation, and performance of athletes

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Abstract

The purpose of this study was to examine the effects of implicit theories of ability on achievement goals, motivation to practice, and performance of advanced athletes. In three computer guided experiments (N_1 = 49, N_2 = 71, N_3 = 62) we assigned athletes to an incremental condition, an entity condition or a control condition, and manipulated their implicit theories through the reading of a text. We assessed their achievement goals before and after failure, as well as their motivation to practice, and their performance. A manipulation check showed that our manipulation was largely successful, but experimental condition hardly affected achievement goals. However, Study 1 showed an effect of implicit theories on motivation to practice, Study 2 showed an effect of implicit theories on performance-avoidance goals and motivation to practice, and Study 3 showed effects of implicit theories on performance. Our findings suggest that implicit theories affect psychological factors in the sports domain. The fact that only some of our hypotheses were supported, may be partly due to the experimental paradigm we used. A priority for future studies is to develop an experiment that elicits consistent effects of implicit theories in experienced athletes from different sports.

Introduction

Implicit theories are lay beliefs about the malleability of personal attributes like intelligence, athletic ability, or morality (Biddle et al., 2003; Dweck, Chiu, & Hong, 1995). Two implicit theories can be distinguished: an incremental view is the belief that an attribute can be developed and improved through effort and practice, and an entity view is the belief that an attribute is innate and largely unchangeable (Dweck & Leggett, 1988).

Early theorizing and empirical research on implicit theories of intelligence focused on the effects of incremental and entity beliefs in the academic domain and demonstrated that the two implicit theories cause two distinct response patterns after failure: the mastery and the helpless pattern (Diener & Dweck, 1978; Dweck & Leggett, 1988). An incremental view causes a mastery response pattern to failure, which is characterized by a focus on mastery goals (i.e., the goal to learn and to improve one's ability; Elliot & McGregor, 2001), the intention to learn from the experience, sustained motivation, and no changes in affect or performance. An entity view causes a helpless pattern after failure, which is characterized by a focus on performance goals (i.e., the goal to perform better than others; Elliot & McGregor, 2001), the belief that failure indicates a lack of ability, loss of motivation and task interest, negative affect, and a decline in performance. Support for these effects of implicit theories has been found in the context of intelligence (Cury, Elliot, Da Fonseca, & Moller, 2006; Dweck, 1999). Correlational support for the associations of implicit theories with goals, motivation, and performance in sport settings has also been found, but experimental studies are relatively scarce (Vella et al., 2016), and their findings do not always align with theory.

Several correlational studies evidenced a link between implicit theories and achievement goals in sport (e.g., Biddle et al., 2003; Wang, Liu, Lochbaum & Stevenson, 2009), but to our knowledge, only one experimental study in the sports domain has supported a causal relation between implicit theories and achievement goals (Spray et al., 2006). Compared to findings in the school setting, this study showed relatively small effects of implicit theories, which were stronger for performance goals than for mastery goals and only became fully significant after a failure experience.

Regarding the effects of implicit theories on motivation, experiments have revealed ambiguous results. Some studies found that incremental beliefs resulted in higher motivation as compared to entity beliefs (Kasimatis et al., 1996; Moreno et al., 2010), but other experimental studies did not find an effect of implicit theories on intrinsic motivation (Li, Lee, & Solmon, 2008), or on motivation to

practice (Spray et al., 2006). However, Li et al. (2008) showed that pre-existing implicit theories predicted intrinsic motivation.

Furthermore, some experimental studies found that implicit theories affected motor performance (Chiviacowsky, & Drews, 2014; Drews, Chiviacowsky, & Wulf, 2013), but other studies found no main effects of implicit theories on performance (Li et al., 2008) or -contrary to expectations- even found that entity beliefs, rather than incremental beliefs, resulted in better performance (Moreno et al., 2010).

Taken together, these findings show that it is not clear if implicit theories have similar effects in sport as in the academic setting. Also, research on the effects of implicit theories in sport shows some limitations. First, there is only one experimental study that tested whether the manipulation of implicit theories affects the formation of achievement goals (i.e., Spray et al., 2006). Second, some of the studies that revealed effects of implicit theories on performance did not include psychological factors that may underlie these effects (Chiviacowsky & Drews, 2014; Drews et al., 2013). Third, experimental studies on implicit theories about sport or physical activity mostly sampled students who were tested at their school or university, in a task that was not related to a sport they were experienced in (e.g., Li et al., 2008; Moreno et al., 2010). Hence, we are unsure whether existing findings on implicit theories can be generalized to experienced athletes in a competitive sport context.

The goal of this study therefore is to investigate the effects of implicit theories of ability in a competitive sports setting, using tasks that are relevant to participants' sports. Examining implicit theories of ability in this specific context is important because previous findings suggest that effects of implicit theories of intelligence and school performance may not generalize to the sports domain (Sarrazin et al., 1996; see also Chapter 2 of this dissertation). This could indicate that implicit theories operate psychologically differently when referring to intelligence and school performance than to talent for sport and sport performance. For example, most people believe sports ability is more malleable than intelligence (Chapter 2 of this dissertation). Furthermore, competitive sport is different in many aspects from physical exercise and physical education, which are the contexts in which implicit theories of ability in sport have previously been studied. In three studies, we will therefore examine the effects of implicit theories on achievement goals, motivation, and performance among advanced athletes, using an experimental design in which athletes are tested at their sports facility, with a task that is framed in the context of their sport.

Implicit Theories and Achievement Goals

Implicit theories are predicted to impact an individual's cognition such that they lead to the pursuit of specific types of achievement goals (Dweck, 1999; Dweck & Leggett, 1988; Elliot & McGregor, 2001). The goals people set for themselves, either explicitly or implicitly, reflect how they define competence and affect psychological processes related to achievement behavior (Latham & Locke, 2007). A theoretical framework for goal-setting that has received much attention in sport is the 2x2 achievement goal framework (Elliot & McGregor, 2001). This framework categorizes goals based on the distinction between mastery and performance goals and on the distinction between approach and avoidance goals. The combination of these two dichotomies results in four types of goals: mastery-approach goals that concern the desire to improve one's skill level or learn something, mastery-avoidance goals that concern the wish to avoid learning less than possible or missing out on opportunities to develop oneself, performance-approach goals that concern the desire to win or to perform better than others, and performance-avoidance goals that concern the wish to avoid losing or performing worse than others.

Incremental beliefs refer to the idea that ability can be developed and that mastery follows from practice and training. According to Dweck (1999), incremental beliefs make people pursue mastery goals because they want to assess their current performance, focus on their own development, and monitor their progress, since they believe that achievement is ultimately a matter of self-actualization. Entity beliefs refer to the belief that ability is innate and mostly fixed (Dweck, 1999). Entity beliefs make people pursue performance goals, because they believe that a comparison with others will reveal how much of an ability they possess. Because they believe the ability is fixed, the more favorable they compare to others, the more of an innate ability they apparently have. In sport, a game, match, or competition is therefore a moment of truth to athletes with strong entity beliefs, because they believe that if they do not have an ability now, it will be very difficult to develop it.

Thus, incremental beliefs should result in stronger endorsement of mastery-approach goals and mastery-avoidance goals than entity beliefs. Support for a relation between incremental beliefs and mastery goals in sport has been found in correlational studies among middle school pupils (Biddle et al., 2003) and university students (Wang et al., 2009). Experimental support for this relation in the context of sport or physical activity is rare, but has been found by Spray et al. (2006). Conversely, entity beliefs should result in stronger endorsement of performance-approach goals and performance-avoidance goals than incremental

beliefs. Support for a relation between entity beliefs and performance goals in the context of sport has been found in correlational studies among middle school pupils (Biddle et al., 2003) and university students (Wang et al., 2009), although in the latter study the relation between entity beliefs and performance-avoidance goals only emerged for students with low perceived competence. As far as we know there is only one experiment that found support for the relation between entity beliefs and performance goals in sport (Spray et al., 2006).

In the current studies, we will experimentally manipulate an incremental or entity belief among the study participants. Based on implicit theories literature and correlational research, we expect the following:

> *Hypothesis 1*: Participants in the incremental condition will endorse (a) more mastery-approach goals, (b) more mastery-avoidance goals, (c) less performance-approach goals and (d) less performance-avoidance goals than participants in the entity condition.

Implicit Theories and Motivation

Implicit theories are predicted to affect individuals' expectations for improvement such that they impact their motivation to practice (Dweck, 1999; Dweck & Leggett, 1988; Elliot & McGregor, 2001). Within an incremental view of ability, setbacks and failures are viewed as a normal part of the developmental process, and interpreted as opportunities to learn (Dweck, 1999). Therefore, people with incremental beliefs are less discouraged by adversity, and respond to it by trying to find a solution or better approach. They will be more emotionally stable, focus on the best approach to a problem, and stay motivated to practice, or learn what is needed to overcome the obstacle. They believe that such a mindset is the way to grow as a person, which -to them- is the underlying goal of achievement.

Within an entity view of ability, setbacks and failures are interpreted as a sign of incompetence and a signal to stop trying, because more exposure of incompetence might otherwise follow. Therefore, people holding entity beliefs will try to avoid failure and looking incompetent. This may -for example- take the form of self-handicapping (Ommundsen, 2001b), cheating (Ring & Kavussanu, 2018b), or task avoidance (Mueller & Dweck, 1998). When faced with adversity, people holding entity beliefs will fear that failure might follow, which could expose their lack of ability. However, because they see ability as something fixed, they will believe they cannot improve it, and therefore will not be motivated to practice.

Based on this reasoning, we expect incremental beliefs to lead to higher motivation to practice than entity beliefs. Empirical support for this expectation

has been found in an experiment where middle school pupils (aged 12-16 years) performed a physical task and reported more intrinsic motivation in the incremental condition than in the entity condition (Moreno et al., 2010). But another study with middle-school pupils (11-15 years) found no difference between the incremental and entity condition in motivation to practice (Spray et al., 2006). Nevertheless, based on the underlying theory we expect that incremental beliefs will result in higher motivation to practice than entity beliefs (cf. Biddle et al., 2003).

> *Hypothesis 2*: Participants in the incremental condition will be more motivated to practice after the experiment than participants in the entity condition.

Implicit Theories and Performance

Because of the psychologically adaptive processes elicited by incremental beliefs like setting mastery goals, maintaining motivation, and focusing on the task, incremental beliefs are thought to facilitate performance (Dweck, 1999; Mueller & Dweck, 1998). In contrast, because of the maladaptive psychological processes elicited by entity beliefs like setting performance-avoidance goals, losing motivation, and losing focus due to fear of failure and negative thinking, entity beliefs are proposed to be less beneficial for performance (Dweck, 1999; Mueller & Dweck, 1998). Indeed, research suggests that incremental beliefs facilitate performance whereas entity beliefs hinder performance (Burnette et al., 2013; Chiviacowsky & Drews, 2014; Wulf, Lewthwaite, & Hooyman, 2013). Therefore:

> *Hypothesis 3*: Participants in the incremental condition will perform better than participants in the entity condition.

To test these hypotheses, we conducted three experimental studies among competitive soccer players who were assigned to one of three conditions (incremental, entity, and control). All participants read a text that stressed the importance of the ability that was going to be assessed. Participants then read that the ability was either malleable (incremental condition), fixed (entity condition), or they just read a short reminder that it was important (control condition). In Study 1, participants performed a reaction speed test, and in Studies 2 and 3 participants performed a game insight test. Because the effects of implicit theories typically show up after failure (Burnette et al., 2013; Mueller & Dweck, 1998), we created a failure experience after the first round of the task, after which we assessed participants' achievement goals and motivation. Specifically, participants were told they had performed poorly after the first round, and were then asked what

their achievement goal was for the second round, and how much they wanted to practice the skill. In Studies 2 and 3 we added an assessment of pre-test implicit theories and self-efficacy as control variables, as well as a measure of achievement goals that was administered prior to the first attempt on the task.

Study 1: Method

In the first study we focused on the effects of implicit theories in sport on achievement goals and motivation, using a reaction speed test.

Participants

The sample consisted of 61 soccer players, who were contacted through their coaches. The soccer players were informed about the study at the beginning of their practice and invited to participate. We removed five participants because they had guessed the aim of the study, and four participants because a reading check showed that they had not understood the manipulation correctly. We screened the data for univariate outliers, using the criterion of more than three standard deviations and also using the outlier labeling method (Hoaglin & Iglewicz, 1987), which led to the removal of three participants. One was an outlier on both incremental and entity beliefs (manipulation check) and two were outliers in both age and educational level.

The remaining sample consisted of 49 soccer players (24 female, 25 male; M_{age} = 23.78, SD_{age} = 3.40). This sample provides us with a power of 68% to find large effects and 31% to find medium effects at an alpha level of .05. The participants spent between 2 and 14 hours a week on their sport (M = 6.16 hours, SD = 2.43 hours), and were all members of competitive teams. Participants were sequentially assigned to one of the three conditions (i.e., 1-2-3-1…). There were 19 participants in the incremental condition, 15 in the entity condition, and 15 in the control condition.

Procedure, Experimental Manipulations, and Task

Procedures were approved beforehand by the Ethics Review Board of the University of Amsterdam. Participants provided their informed consent at the start of the experiment. They were seated behind a computer in a quiet room. The first screen of the experiment welcomed the participants to the 'Experiment about reaction speed and sport'. Then they read that research had shown that reaction speed is an important predictor of performance in a broad variety of sports and that athletes with a slow reaction speed had almost no chance of success in their sport. Next, they read that the aim of the study they were taking part in was to

investigate the reaction speed of Dutch athletes and compare it to athletes from around the world.

Subsequently, depending on the condition they were assigned to, participants read a text which served to manipulate their implicit theory of ability. The texts were based on Dweck's (1999) definition of incremental and entity beliefs, and adapted from earlier studies of implicit theories about intelligence (Cury et al., 2006) and about sports ability (Spray et al., 2006). Participants in the incremental condition read:

> Everyone can become better at sports
>
> Research on reaction speed and sports talent has demonstrated that reaction speed strongly determines the performance level athletes can achieve. The faster their reaction speed, the better their performance, because reaction speed is an indicator of how fast their nerve system transmits impulses.
>
> A large number of studies has demonstrated that there are many ways to significantly improve reaction speed. Everyone who is willing to work for it, can improve their reaction speed and thus their possibilities in sport. This means that reaction speed is a personal attribute that is highly malleable.
>
> Over the last few years, the Institute of Sport Intelligence has developed a training program that improves athletes' reaction speed. It involves exercises that have to be done on a daily basis. All athletes who completed the program showed large improvements in their reaction speed as well as in their sport performance.

This message was supported by a graph of reaction times with an orange line representing the group that practiced their reaction speed, showing a strong downward trend over time, and a black line representing the group that did not practice, which stayed approximately equal over time.

Participants in the entity condition read:

> Sports talent determined at birth
>
> Research on reaction speed and sports talent has demonstrated that reaction speed strongly determines the performance level athletes can achieve. The faster their reaction speed, the better their performance, because reaction speed is an indicator of how fast their nerve system transmits impulses.
>
> A large number of studies demonstrated that reaction speed basically is a fixed human quality that cannot be changed. Someone's reaction speed at an adult age turns out to be largely determined at birth, because it depends on the brain's anatomy. Even if people try hard to change their reaction speed, this hardly leads to improvement. This means reaction speed is a personal attribute that is not malleable.
>
> Over the last few years the Institute of Sport Intelligence has tried to develop a training program that improves athletes' reaction speed. None of the training programs produced any significant results. After each three-month trial, the reaction speed of athletes in the training program was comparable to that of the athletes who did not practice.

This message was supported by a graph with two lines, representing the two groups, which both stayed approximately horizontal over time.

Participants in the control condition read:

> High performance means: reacting quickly
>
> A series of studies at the Institute of Sport Intelligence in California (US), has shown that athletes who can react quickly, often do very well in all kinds of sports. Athletes who react slowly are generally not successful. This means that reaction speed is a good indicator of an athletes' abilities. The institute reached this conclusion after intensive studies of more than 300 athletes of different performance levels, who completed a reaction time task.
>
> Although researchers did not know which of the athletes practiced their sport at a high level, their reaction time was a very reliable predictor. This was found for very diverse sports, such as track and field, martial arts, soccer, field hockey, volleyball, baseball and other ball sports.
>
> These results seem plausible, because many sports are about reacting fast, leaving enough time to plan and finish movements, but the strength of the results exceeded the expectations. Based on their reaction speed, researchers could make an accurate prediction of the performance level of 85% of the athletes.

After the experimental manipulation, participants completed a reading check and an assessment of their implicit theories of ability. Subsequently they performed the reaction speed test. We used an adapted version of the Simon task (Notebaert, Soetens, & Melis, 2001; Winkel et al., 2012) as a measure of reaction speed. Other studies in the sports domain have used tasks like golf-putting (Spray et al., 2006), stabilometer performance (Wulf & Lewthwaite, 2009), bean-bag throwing, and a wall-soccer task (Chiviacowsky and Drews, 2014). We chose the Simon task because it can be integrated in a computer-guided assessment and it is a credible talent test for reaction speed in different types of sport. However, we did not analyze this assessment as a performance measure because a reliable assessment would require several hundreds of trials and more rigorous control of testing conditions and sequencing of trials (cf. Notebaert et al., 2001; Winkel et al., 2012).

In the Simon task, a colored shape appears randomly on one of four horizontal positions against a black background (two left and two right of the middle). Participants have to press a button with their left hand when a red or yellow shape appears and with their right hand when a green or blue shape appears. We adapted it to sport by using t-shirts as shapes and telling participants that the test mimicked reacting to teammates and opponents. The appearance of a shape and the pressing of a button comprise one trial. After each trial a score appears, which we fixed to be mostly negative in order to make participants feel like they were failing. Participants were allowed three practice trials, followed by

the 'real' test consisting of 60 trials. After 30 trials all participants read that their intermediate score was 348 milliseconds, and were told that it was not good. After another 30 trials they read that their final score was 356 milliseconds, and that their performance was among the slowest 11% of all athletes. A thermometer-like graph showed their performance was in the lowest area, which was colored red, and had the caption 'slow'.

After the failure feedback, we assessed participants' motivation to practice to improve their reaction speed, and their achievement goals for the second attempt. In the second round of the reaction speed test (of another 2 x 30 trials) we manipulated the scores to be mostly positive, to make participants leave the experiment with a feeling of success. After this round participants read that they had done well, and had achieved a score among the highest 85%. Then they were informed about the true goal of the experiment and carefully debriefed.

Measures

Manipulation checks. To assess incremental beliefs after the manipulation, we adapted three items that measure incremental beliefs of ability in sport (Biddle et al., 2003; Chapter 2; e.g., "I think I could quite easily improve my reaction speed."; α = .85). Answers were provided on a Likert scale from 1 (*completely disagree*) to 7 (*completely agree*). To assess entity beliefs after the manipulation, we adapted three items that measure implicit theories of intelligence (Dweck, 1999) to apply to reaction speed (e.g., "To be honest, I don't think you can really change your reaction speed."; α = .89). Answers were provided on a Likert scale from 1 (*completely disagree*) to 6 (*completely agree*).

Achievement goals. We assessed participants' dominant achievement goals before the second round of the reaction time task with Van Yperen's (2006) round robin, forced-choice measure. Such a forced-choice measure of achievement goals is similar to the assessment used in early studies of implicit theories of ability (e.g., Dweck & Leggett, 1988; Mueller & Dweck, 1998), where participants were forced to select one achievement goal out of four. The item stem in our measure was adapted to fit the present study as follows: "In the reaction time test I am about to take, I find it important to… ". This was followed by six contrasts of two goal statements, with each goal statement representing one of the four achievement goals (i.e., mastery-approach: "…do better than in the first round."; mastery-avoidance: "…not do worse than in the first round."; performance approach: "…do better than others."; performance-avoidance: "…not do worse than others."). If participants consistently prefer one type of goal over other types, they have a dominant achievement goal, which is generally the

case for about 80% of respondents (Van Yperen, 2006). In our sample, 90% of the participants had a dominant goal (see Table 3.1).

Motivation to practice. Similar to other research (e.g., Elliot & Church, 1997; Spray et al., 2006) we measured motivation to practice with six items adapted to the specific task context by asking if participants were motivated to train their reaction speed (e.g., "I would like to train this week, to improve my reaction speed."; α = .83). Answers were provided on a scale from 1 (*completely disagree*) to 6 (*completely agree*).

Study 1: Results

Means, standard deviations, reliabilities and correlations between the study variables are presented in Table 3.1.

Measures

Manipulation check. A one-way ANOVA demonstrated that there were significant differences in incremental beliefs between the three experimental conditions, $F(2, 46) = 17.84$, $p < .001$, $\eta^2 = .44$. Planned contrasts showed that incremental beliefs of participants in the incremental condition ($M = 5.07$, $SD = 0.73$) were significantly higher than those of participants in the entity condition ($M = 3.38$, $SD = 1.04$), $t(46) = 5.21$, $p < .001$, $d = 1.88$ (large effect). The difference between the incremental condition and the control condition ($M = 5.18$, $SD = 1.07$) was not significant, $t(46) = -0.33$, $p = .74$, but the difference between the control condition and the entity condition was, $t(46) = 5.24$, $p < .001$, $d = 1.71$ (large effect).

In addition, a one-way ANOVA demonstrated that there were significant differences between the three conditions in entity beliefs, Welch's $F(2, 26.90) = 12.76$, $p < .001$, est. $\omega^2 = .51$ (Arciszewska, 2019). Planned contrasts showed that entity beliefs of participants in the entity condition ($M = 3.55$, $SD = 1.13$) were significantly higher than those of participants in the incremental condition ($M = 1.99$, $SD = 0.62$), $t(20.59) = -4.83$, $p < .001$, $d = 1.71$ (large effect), and the control condition ($M = 1.97$, $SD = 0.77$), $t(24.68) = 4.50$, $p < .001$, $d = 1.63$ (large effect). The difference between the incremental condition and the control condition was not significant, $t(26.68) = .08$, $p = .94$.

Table 3.1

Means, Standard Deviations, Correlations, and Internal Consistencies (Cronbach's alphas) for the Variables in Study 1

	Incremental		Entity		Control		Total										
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Sex	0.58		0.47		0.47		0.51		-								
2. Age	22.79	2.57	25.27	2.69	23.53	4.50	23.78	3.41	-.03	-							
3. Hrs train p/w	6.74	2.40	4.67	1.76	6.93	2.49	6.16	2.43	.12	-.52**	-						
4. Mcheck Inc	5.07	0.73	3.38	1.04	5.18	1.07	4.59	1.23	-.05	-.27	.42**	(.85)					
5. Mcheck Ent	1.99	0.62	3.55	1.13	1.97	0.77	2.46	1.11	.00	.26	-.37**	-.78**	(.89)				
6. Motivation	4.49	0.70	3.61	0.94	3.93	1.07	4.05	0.96	.00	-.16	.37**	.39**	-.36*	(.83)			
7. Dummy Inc	19[a]								.11	-.23	.19	.32*	-.34*	.37**	-		
8. Dummy Ent			15[a]						-.06	.29*	-.41**	-.66**	.66**	-.31*	-.53**	-	
9. Dummy Con					15[a]				-.06	-.05	.21	.32*	-.30*	-.08	-.53**	-.44**	-
10. Dom AG - MAP[b]	12		11		8		31										
11. Dom AG - MAV[b]	0		0		0		0										
12. Dom AG - PAP[b]	5		2		5		12										
13. Dom AG - PAV[b]	1		0		0		1										
14. Dom AG - No goal[b]	1		2		2		5										

Note. *N*= 49. Sex categories include 1 = male, 0 = female. Figures on the diagonal are Cronbach's alpha reliabilities. Hours train p/w = hours of training per week, Mcheck Inc = manipulation check incremental beliefs, Mcheck Ent = manipulation check entity beliefs, Motivation = motivation to practice, Dummy Ent = dummy for the entity condition, Dummy Inc = dummy for the incremental condition, Dummy Con = dummy for the control condition, Dom AG - MAP = dominant mastery-approach goal, Dom AG MAV = dominant mastery-avoidance goal, Dom AG PAP = dominant performance-approach goal, Dom AG PAV = dominant performance-avoidance goal, Dom AG - No goal = no dominant achievement goal.

[a] Number of participants in this experimental condition. [b] Number of participants that had this type of goal as their dominant achievement goal.

*$p < .05$, two-tailed **$p < .01$, two-tailed.

Achievement goals. The distribution of dominant achievement goals is presented in Table 3.1. Of the 49 participants, 44 (90%) had a dominant achievement goal. However, Fisher's exact test showed that there was no relation between experimental condition and dominant achievement goals, $\chi^2(6) = 4.26$, $p = .70$ (Hypothesis 1 not supported).

Motivation to practice. A one-way ANOVA showed significant differences between the three conditions in motivation to practice, $F(2, 46) = 4.21$, $p = .02$, $\eta^2 = .16$. Planned contrasts showed that participants in the incremental condition ($M = 4.49$, $SD = 0.70$) were significantly more motivated to practice than participants in the entity condition ($M = 3.61$, $SD = 0.94$), $t(46) = -2.84$, $p = .01$, $d = 1.06$ (large effect, Hypothesis 2 supported). There was no significant difference between the incremental condition and the control condition ($M = 3.93$, $SD = 1.07$), $t(46) = -1.80$, $p = .08$, and no significant difference between the control condition and the entity condition, $t(46) = 0.98$, $p = .33$.

Because our experimental manipulation may not have affected all participants to the same extent, we regressed motivation to practice on post-manipulation incremental- and entity beliefs. Despite significant correlations of incremental and entity beliefs with motivation to practice ($r = .39$, $p = .005$, and $r = -.36$ $p = .01$ respectively) and a significant overall regression model, $F(2, 46) = 4.49$, $p = .02$, $R^2 = .16$, the separate implicit theories were no significant predictor of motivation to practice ($\beta_{incremental\ beliefs} = .29$, $p = .19$, $\beta_{entity\ beliefs} = -.14$, $p = .53$).

Study 1: Discussion

Our first study showed that the manipulation of incremental beliefs was not entirely successful, as it led to a significant difference in incremental beliefs between the incremental condition and the entity condition, but not between the incremental condition and the control condition. A possible explanation may be that participants already held strong incremental beliefs when they entered the experiment, and that our manipulation could not increase these beliefs enough to create a significant difference with the control condition. The manipulation of entity beliefs was successful. It raised the entity beliefs in the entity condition as compared to both the incremental and the control condition.

There was no effect of implicit theories on the adoption of achievement goals after failure. A possible explanation may be the forced-choice format of our achievement goal measure, which may not be sufficiently sensitive. In our second study we therefore added a scale measure of achievement goals based on Elliot and Murayama (2008). In line with our hypothesis, there was a significant effect of

implicit theories on motivation, showing that participants in the incremental condition were more motivated to practice than those in the entity condition.

Study 2

As in Study 1, the aim was to test the hypotheses that implicit theories of ability affect achievement goals and motivation. Additionally, we sought to examine the effects of implicit theories on performance. We changed the task to the Design Fluency test (Delis, Kaplan, & Kramer, 2001a, 2001b), because it provides a reliable performance measure, which predicts success in soccer (Vestberg, Gustafson, Maurex, Ingvar, & Petrovic, 2012). In the explanation to the participants the task was presented as an assessment of game insight. Furthermore, we added an additional measure of achievement goals and measures of self-efficacy and pretest implicit theories as control variables. Self-efficacy has been shown to be an important predictor of achievement goals (Cury et al., 2006). Because the effect of our experimental manipulation could depend on participants' pre-test implicit theories, we included these as a second control variable.

Study 2: Method

Participants

The sample consisted of 71 soccer players (all male; M_{age} = 17.10 years; *SD* = 1.00; age range 15-20 years) who spent between 2 and 39 hours a week on their sport (*M* = 8.45 hours, *SD* = 7.70 hours) and were playing in the four highest youth-soccer leagues in the Netherlands. We screened the data for univariate outliers by using the criterion of more than three standard deviations, and the outlier labeling method (Hoaglin & Iglewicz, 1987). No indications were found for removing participants. Participants were sequentially assigned to the incremental condition (*n* = 24), the entity condition (*n* = 24), and the control condition (*n* = 23). The sample provides us with a power of 85% to find large effects and 44% to find medium effects at an alpha level of .05.

Procedure, Experimental Manipulations, and Task

The experiment was approved beforehand by the Ethics Review Board of the University of Amsterdam. We contacted soccer players through their coaches. The soccer players were informed at the beginning of a training about the study and invited to partake. Their parents received an information letter about the study, with a passive informed consent clause. No parents withheld their child from the study. Participants provided their informed consent at the beginning of the experiment. The procedure was largely identical to the procedure in Study 1,

but the wording was adapted to match the game insight task, and measures of pretest implicit theories and self-efficacy were added, as well as a second measure of achievement goals that participants filled out before the first round on the task.

Game insight test

We programmed a digital adaptation of the Design Fluency test that was presented as a test of game insight for soccer players. Participants were shown a matrix of 7 x 5 squares with five black dots (Round 1), or five black and five white dots (Round 2 and 3) in each square. They were asked to draw as many different patterns of four lines as possible within one minute, using the computer mouse. In three rounds, three variations of the task were presented: (1) connect black dots, (2) connect white dots, while ignoring black dots, (3) switch between black and white dots. To demonstrate the relevance for soccer, we told participants the drawing of lines represented the passing of a football between team members.

All participants received failure feedback after completion of a first test trial (regardless of their true performance), visually supported by a thermometer-like graph showing they had done poorly. Participants then read they would get a second attempt and were asked to fill out the forced-choice measure of their achievement goals for this second round. However, after completion of the measure, they read that the experiment was over and that they would be taken to the concluding information. Participants were then informed about the true goal of the experiment and carefully debriefed.

Measures

Pre-test entity beliefs. To assess implicit theories of ability before the experimental manipulation, we adapted three entity beliefs items from an existing measure (Biddle et al., 2003; Chapter 2; e.g., "You have certain abilities in soccer and there is not much you can do to change that."; α = .58). Answers were provided on a Likert scale from 1 (*completely disagree*) to 5 (*completely agree*).

Self-efficacy. To assess self-efficacy beliefs about game insight before the experimental manipulation, we adapted three self-efficacy items to apply to game insight in soccer (Riggs & Knight, 1994; e.g., "I have good game insight." α = .71). Answers were provided on a Likert scale from 1 (*completely disagree*) to 6 (*completely agree*).

Manipulation check entity beliefs. To check if the manipulation had been successful we used the three-item entity measure from Study 1 (based on the items in Dweck, 1999) that we adapted for game insight (e.g., "To be honest, I don't think you can really change your game insight."; α = .86). Answers were provided on a Likert scale from 1 (*completely disagree*) to 6 (*completely agree*).

Achievement goals-1. We used the revised version of the Achievement goals Questionnaire (AGQ-R; Elliot & Murayama, 2008) to assess achievement goals after the experimental manipulation but before the first round of the test. We adapted the stem to match the present study setting as follows: "In the game insight test that I am going to take, I want to…", which was followed by twelve items, measuring the four achievement goals with three items each: mastery approach (e.g., "…fully master all necessary skills.", α = .81), mastery avoidance (e.g., "…avoid performing worse than I actually can." , α = .75), performance approach (e.g., "…do well compared to other soccer players." , α = .90), performance avoidance (e.g., "…avoid performing worse than other athletes." , α = .86). Answers were given on a 5-point Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*).

Achievement goals-2. As in Study 1, after participants learned that they had failed, we assessed their dominant achievement goals for the second round with the forced-choice measure (Van Yperen, 2006), which was adapted to apply to the game insight test.

Motivation to practice. To assess how motivated participants were, we told them they could practice their game insight in the week following the experiment on a website. Then we asked them to indicate beforehand how long they wanted to practice (in minutes, with a maximum of 120 minutes). The requested amount of practice time served as an indicator of their motivation. Similar procedures have been employed in previous experiments of implicit theories (Li et al., 2008; Li, Lee & Solmon, 2005; Spray et al., 2006)

Performance. Our performance measure was the sum of the number of correct patterns in each of the three variations of the game insight task (excluding repetitions of the same pattern; cf. Delis et al., 2001a, 2001b).

Study 2: Results

Means and standard deviations, and correlations between the study variables are presented in Table 3.2.

Manipulation check entity beliefs. A one-way ANOVA showed significant differences between conditions in entity beliefs after the experimental manipulation, $F(2, 68) = 6.06$, $p = .004$, $\eta^2 = .15$ (medium to large effect). Planned contrasts showed that participants in the entity condition ($M = 3.67$, $SD = 1.26$)

Table 3.2

Means, Standard Deviations, Correlations, and Internal Consistencies (Cronbach's alphas) for the Variables in Study 2

	Incremental		Entity		Control		Total				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	1	2	3
1. Age	17.00	0.98	16.96	0.75	17.35	1.23	17.10	1.00			
2. Hrs train p/w	9.42	9.80	8.77	7.87	7.11	4.55	8.45	7.71	.19		
3. Pre-test Ent	2.33	0.94	2.26	.80	2.38	0.88	2.32	0.86	-.10	-.05	(.58)
4. Self-efficacy	4.56	0.72	4.35	0.71	4.59	0.64	4.50	0.69	.19	-.02	-.10
5. Mcheck Ent	2.51	1.06	3.67	1.26	3.28	1.19	3.15	1.25	-.09	-.14	.22
6. MAP	4.24	0.69	4.29	0.70	4.19	0.64	4.24	0.67	.12	.28*	-.02
7. MAV	3.89	0.80	4.22	0.76	4.22	0.73	4.11	0.77	.21	.04	-.02
8. PAP	3.97	0.81	4.07	0.86	3.70	0.84	3.92	0.84	.02	.13	.10
9. PAV	3.68	0.89	4.13	0.85	3.78	0.81	3.86	0.86	.23	.19	-.01
10. Motivation	14.21	27.10	13.38	33.55	13.00	26.79	13.54	28.93	.11	.53**	-.20
11. Performance	28.13	9.46	29.42	6.79	31.00	6.51	29.49	7.70	.03	.01	-.27*
12. Dummy Inc	24[a]								-.07	.09	.01
13. Dummy Ent			24[a]						-.10	.03	-.05
14. Dummy Con					23[a]				.17	-.12	.04
15. Dom AG - MAP[b]	10		10		10		30				
16. Dom AG - MAV[b]	3		2		3		8				
17. Dom AG - PAP[b]	2		6		4		12				
18. Dom AG - PAV[b]	0		0		0		0				
19. Dom AG - No goal[b]	9		6		6		21				

Note. $N = 71$. Participants were all male. Figures on the diagonal are Cronbach's alpha reliabilities. Hours train p/w = hours of training per week; Pre-test Ent = pre-test entity beliefs; Mcheck Ent = manipulation check entity beliefs; MAP = mastery-approach goals; MAV = mastery-avoidance goals; PAP = performance-approach goals; PAV = performance-avoidance goals; Motivation = intended home-practice time in minutes (0-120); Performance = number of correct patterns drawn; Dummy Inc = dummy for the incremental condition; Dum Ent = dummy for the entity condition; Dum Con = dummy for the control condition; Dom AG - MAP = dominant mastery-approach goal; Dom AG MAV = dominant mastery-avoidance goal; Dom AG PAP = dominant performance-approach goal; Dom AG PAV = dominant performance-avoidance goal; Dom AG - No goal = no dominant achievement goal.

[a] Number of participants in this experimental condition. [b] Number of participants that had this type of goal as their dominant achievement goal.

*$p < .05$, two-tailed **$p < .01$, two-tailed.

Table 3.2 (continued)

	4	5	6	7	8	9	10	11	12	13	14
1. Age											
2. Hrs train p/w											
3. Pre-test Ent											
4. Self-efficacy	(.71)										
5. Mcheck Ent	.00	(.86)									
6. MAP	.18	.12	(.81)								
7. MAV	.21	.17	.64**	(.75)							
8. PAP	.33**	.13	.58**	.50**	(.90)						
9. PAV	.39**	.13	.50**	.65**	.76**	(.86)					
10. Motivation	.10	-.31**	.26*	.15	.19	.12	-				
11. Performance	-.13	-.24*	-.02	.00	.05	-.11	.28*	-			
12. Dummy Inc	.06	-.37**	.00	-.21	.05	-.15	.02	-.13	-		
13. Dummy Ent	-.16	.30*	.06	.11	.13	.22	.00	-.01	-.51**	-	
14. Dummy Con	.10	.07	-.05	.10	-.18	-.07	-.01	.14	-.49**	-.49**	-
15. Dom AG - MAPb											
16. Dom AG - MAVb											
17. Dom AG - PAPb											
18. Dom AG - PAVb											
19. Dom AG - No goal[b]											

were significantly higher in entity beliefs than participants in the incremental condition (M = 2.51, SD = 1.06), $t(68)$ = -3.42, p = .003, d = 1.00 (large effect). Contrasts showed no significant difference between the entity condition and the control condition (M = 3.28, SD = 1.19), $t(68)$ = -1.12, p = .27, but the difference between the control condition and the incremental condition was significant, $t(68)$ = 2.26, p = .03, d = 0.68 (medium to large effect).

Achievement goals-1. We first tested the effects of the experimental manipulation on achievement goals before the first attempt on the test. An ANCOVA with pre-test entity beliefs and self-efficacy as control variables, showed no significant differences between conditions on mastery-approach goals, $F(2, 66)$ = 0.29, p = .75, η^2 = .01, or mastery-avoidance goals, $F(2, 66)$ = 1.78, p = .18, η^2 = .05 (Hypotheses 1a and 1b not supported).

The difference between conditions on performance-approach goals, with pre-test entity beliefs and self-efficacy as control variables, was only significant at α = .10, $F(2, 66)$ = 2.40, p = .098, η^2 = .07 (small to medium effect), but contrary to Hypothesis 1c, planned contrasts showed no difference between the entity condition (M = 4.07, SD = 0.86) and the incremental condition (M = 3.97, SD = 0.81), $t(66)$ = 0.89, p = .38. There was, however, a significant difference between the entity condition and the control condition (M = 3.70, SD = 0.84), $t(66)$ = 2.18, p = .03, d = 0.44 (medium effect), indicating that participants in the entity condition more strongly endorsed performance-approach goals than those in the control condition. Contrasts showed no significant difference between the incremental condition and the control condition, $t(66)$ = 1.32, p = .19.

The difference between conditions on performance-avoidance goals, with pre-test entity beliefs and self-efficacy as control variables, was significant, $F(2, 68)$ = 3.54, p = .04, η^2 = .10 (small to medium effect). In support of Hypothesis 1d, planned contrasts showed that participants in the entity condition (M = 4.13, SD = 0.85) set more performance-avoidance goals than participants in the incremental condition (M = 3.68, SD = 0.89), $t(66)$ = 2.47, p = .02, d = 0.52 (medium effect). Also the difference between participants in the entity and control condition (M = 3.78, SD = 0.81) was significant, $t(66)$ = -2.10, p = .04, d = 0.42 (small to medium effect). Contrasts showed no significant difference between the incremental condition and the control condition, $t(66)$ = -0.35, p = .73.

To examine whether the effect of our experimental manipulation was different depending on participants' pre-test implicit theories or their pre-test self-efficacy, we regressed achievement goals on experimental condition (using dummies), with pre-test implicit theories, self-efficacy, the interaction between

condition and pre-test implicit theories, and the interaction between condition and self-efficacy as additional predictors. There was an interaction of pre-test implicit theories with the difference between the entity and control condition on mastery-approach goals, that was significant at an adjusted significance level of α = .10 (β = -.32, p = .07). This indicates that the stronger the pre-test entity beliefs of participants in the entity condition were as compared to the control condition, the less likely they were to select mastery-approach goals. None of the remaining interactions were statistically significant.

The interaction of pre-test entity beliefs with experimental condition shows that our manipulation did not affect the beliefs of all participants to the same extent. Therefore we also regressed achievement goals on post-manipulation entity beliefs, with pre-test entity beliefs and self-efficacy as control variables. This showed that post-manipulation entity beliefs were no significant predictor of any of the achievement goals (all β's < .18, all p's > .14).

Achievement goals-2. Second, we tested the effects of the manipulation on the selection of dominant achievement goals for the second round of the test. The distribution of achievement goals is presented in Table 3.2. Of the 71 participants, 50 (70%) had a dominant achievement goal, but Fisher's exact test showed there was no relation between experimental condition and dominant achievement goal, $\chi^2(6) = 3.16$, p = .82 (Hypothesis 1 not supported).

Motivation to practice. An ANCOVA with pre-test implicit theories and self-efficacy as control variables, showed no significant differences in motivation to practice between conditions, $F(2, 66) = 0.01$, p = .99, η^2 = .00 (Hypothesis 2 not supported).

To examine whether the effect of our experimental manipulation was different depending on participants' pre-test implicit theories or their pre-test self-efficacy, we regressed motivation to practice on experimental condition (using dummies), with pre-test implicit theories, self-efficacy, the interaction between condition and pre-test implicit theories, and the interaction between condition and self-efficacy as additional predictors. None of the interactions was a significant predictor of motivation to practice (all β's < |.21|, all p's > .24).

Because our experimental manipulation may not have affected all participants to the same extent, we regressed motivation on post-manipulation entity beliefs, with pre-test entity beliefs and self-efficacy as control variables. This showed that entity beliefs after manipulation were a significant negative predictor of motivation to practice, β = -.28, $t(67) = -2.41$, p = .02, indicating that participants who report stronger entity beliefs were less motivated to practice. Thus, self-

reported implicit theories after the manipulation were a predictor of motivation to practice, while the experimental condition itself was not.

Performance. An ANCOVA with pre-test implicit theories and self-efficacy as control variables, showed no significant differences in performance between conditions, $F(2, 68) = 1.08$, $p = .35$, $\eta^2 = .03$ (Hypothesis 3 not supported).

To examine whether the effect of our experimental manipulation was different depending on participants' pre-test implicit theories or their pre-test self-efficacy, we regressed performance on experimental condition (using dummies), with pre-test implicit theories, self-efficacy, the interaction between condition and pre-test implicit theories, and the interaction between condition and self-efficacy as additional predictors. None of these interactions was a significant predictor of motivation to practice (all β's < |.15|, all p's > .39).

Because our experimental manipulation may not have affected all participants to the same extent, we also regressed performance on post-manipulation entity beliefs with pre-test implicit theories and self-efficacy as control variables. This showed that post-manipulation entity beliefs were no significant predictor of performance, $\beta = -.19$, $p = .11$.

Study 2: Discussion

In Study 2, our manipulation of implicit theories was partially successful, as it led to a significant difference in entity beliefs between the entity condition and the incremental condition, but not between the entity condition and the control condition. This suggests that the incremental manipulation lowered the entity beliefs of participants in the incremental condition compared to the control condition (i.e., baseline level), rather than that the entity manipulation heightened the entity beliefs of participants.

There was no difference in the adoption of mastery-approach goals or mastery-avoidance goals between conditions. There was a difference in the adoption of performance-approach goals, but only at the .10 significance level, and the entity condition was higher in performance-approach goals than the control condition, but not higher than the incremental condition, which is not in line with expectations. In line with our hypothesis there was a difference in the adoption of performance-avoidance goals between conditions. As expected, the entity condition scored highest on performance-avoidance goals and the incremental condition scored the lowest. There were no differences between conditions in the selection of achievement goals on the forced-choice measure that was administered after failure.

There were no differences in motivation to practice between conditions, but at an adjusted alpha of .10, the post-manipulation entity beliefs measure was a significant predictor of motivation to practice, suggesting again that our experimental manipulation may not have affected all participants sufficiently or in the same way. The absence of a difference in performance between conditions, may be explained by the fact that the failure feedback followed performance, so participants did not feel like they were failing during their performance. This was addressed in Study 3. This study was identical to Study 2, except for the inclusion of a second attempt on the game-insight task, which was added to investigate if the effect of failure on performance would be different, depending on the experimental condition the athlete was in.

Study 3: Method

Participants

The original sample consisted of 63 soccer players. We removed one participant who gave the same answer on almost all Likert items, which resulted in a final sample of 62 participants (all male; M_{age} = 17.17 years; *SD* = 2.31; age range 15 – 26 years) who spent between 3 and 20 hours a week on their sport (*M* = 10.40 hours, *SD* = 2.69 hours) and were playing in the highest youth-soccer leagues in the Netherlands. Participants were sequentially assigned to the incremental (*n*= 21), entity (*n*= 22) and control condition (*n* = 19).

This sample provides us with a power of 80% to find large effects and 39% to find medium effects at an alpha level of .05. We screened the data for univariate outliers of more than three standard deviations, and also using the outlier labeling method (Hoaglin & Iglewicz, 1987), but no further participants were removed.

Procedure, Experimental Manipulations, and Task

The experiment was approved beforehand by the Ethics Review Board of the University of Amsterdam. We contacted soccer players through their coaches. The soccer players were informed at the beginning of a training about the study and invited to partake. When required, due to age, their parents received an information letter about the study with a passive informed consent clause. No parents withheld their child from the study. Participants provided their informed consent at the beginning of the experiment.

The first part of the experimental procedure was identical to the procedure in Study 2, but after filling out the second achievement goals measure, participants performed a second round of the game-insight task. This attempt was added as a second performance measure which enabled us to investigate

whether the experimental condition affected performance after failure differently. After completion of the second round, participants read that they had done well and had achieved a score among the highest 85% to make them leave the experiment with a feeling of success. Then they were informed about the true goal of the experiment and carefully debriefed.

Measures

The measures in Study 3 were identical to those in Study 2. Reliabilities were α = .64 for the pre-test entity beliefs scale, α = .65 for the self-efficacy scale, α = .83 for the manipulation check entity beliefs scale, α = .85 for the mastery-approach scale, α = .80 for the mastery-avoidance scale, α = .90 for the for the performance-approach scale and α = .79 for the performance-avoidance scale. Calculation of the performance score on the game-insight test in Study 3 was performed in the same way as in Study 2.

Study 3: Results

Means, standard deviations, reliabilities and correlations between the study variables are presented in Table 3.3.

Measures

Manipulation check entity beliefs. A one-way ANOVA showed significant differences between conditions in post-manipulation entity beliefs, F (2, 59) = 6.00, p = .004, η^2 = .17 (medium to large effect). Planned contrasts showed participants in the entity condition (M = 3.39, SD = 1.14) were significantly higher in post-manipulation entity beliefs than participants in the incremental condition (M = 2.37, SD = 0.80), t(66) = 3.36, p = .001, d = 1.04 (large effect). Contrasts showed no significant difference between the entity condition and the control condition (M = 3.12, SD = 1.01), t(66) = 0.86, p = .39, but the difference between the control condition and the incremental condition was significant, t(66) = 2.39, p = .02, d = .82 (large effect).

Achievement goals-1. We first tested the effects of the experimental manipulation on achievement goals before the first attempt on the test. An ANCOVA with pre-test entity beliefs and self-efficacy as control variables, showed no significant differences between conditions on mastery-approach goals, F (2, 57) = 0.95, p = .39, η^2 = .03, mastery-avoidance goals, F (2, 57) = 1.19, p = .31, η^2 = .04, performance-approach goals, F (2, 57) = 0.65, p = .53, η^2 = .02, or performance-avoidance goals, F (2, 57) = 1.21, p = .31, η^2 = .04.

To examine whether the effect of our experimental manipulation was different depending on participants' pre-test entity beliefs or their pre-test self-

efficacy, we regressed achievement goals on experimental condition (using dummies), with pre-test implicit theories, self-efficacy, the interaction between condition and pre-test implicit theories, and the interaction between condition and self-efficacy as additional predictors. This showed that there were no significant interactions of pre-test entity beliefs or self-efficacy with experimental condition, on achievement goals (all β's < |.34|, all p's > .16).

Because our experimental manipulation may not have affected all participants to the same extent, we also regressed achievement goals on post-manipulation entity beliefs, with pre-test implicit theories and self-efficacy as control variables. This showed that post-manipulation entity beliefs were no significant predictor of any of the achievement goals (all β's < .17, all p's > .20).

Achievement goals-2. Second, we tested the effects of the manipulation on the selection of dominant achievement goals for the second round of the test. The distribution of achievement goals is presented in Table 3.3. Of the 62 participants, 56 (90%) had a dominant achievement goal, but Fisher's exact test showed there was no relation between experimental condition and dominant achievement goal, $\chi^2(6) = 5.57$, $p = .48$ (Hypotheses 1 and 2 not supported).

Motivation to practice. A one-way ANCOVA with pre-test entity beliefs and self-efficacy as control variables, showed no significant differences in motivation to practice between conditions F (2, 56) = 0.09, $p = .91$, $\eta^2 = .00$ (Hypothesis 2 not supported).

To examine whether the effect of our experimental manipulation was different depending on participants' pre-test entity beliefs or their pre-test self-efficacy, we regressed motivation to practice on experimental condition (using dummies), with pre-test implicit theories, self-efficacy, the interaction between condition and pre-test implicit theories, and the interaction between condition and self-efficacy as additional predictors. This showed that there were no significant interaction-effects of pre-test entity beliefs or self-efficacy with experimental condition, on motivation to practice (all β's < .39, all p's > .10).

Because our experimental manipulation may not have affected all participants to the same extent, we also regressed motivation to practice on post-manipulation entity beliefs, with pre-test implicit theories and self-efficacy as control variables. This showed that post-manipulation entity beliefs were no significant predictor of motivation to practice ($\beta = -.08$, $p = .54$).

Performance in Round 1. In support of Hypothesis 3, an ANCOVA with pre-test entity beliefs and self-efficacy as covariates, showed significant differences in performance between conditions, $F(2, 55) = 3.56$, $p = .04$, $\eta^2 = .12$

Table 3.3
Means, Standard Deviations, Correlations, and Internal Consistencies (Cronbach's alphas) for the Variables in Study 3

	Incremental		Entity		Control		Total				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	1	2	3
1. Age	17.14	2.13	17.23	2.64	17.11	2.23	17.16	2.31			
2. Hrs train p/w	10.05	2.37	9.91	2.43	11.34	3.17	10.40	2.69	-.48**		
3. Pre-test Ent	2.46	0.95	2.61	0.62	2.72	0.88	2.59	0.82	.28*	-.11	(.64)
4. Self-efficacy	4.57	0.70	4.23	0.81	4.67	0.47	4.48	0.70	-.03	.21	-.03
5. Mcheck Ent	2.37	0.80	3.39	1.14	3.12	1.01	2.96	1.07	.16	-.07	.17
6. MAP	4.43	0.46	4.11	0.98	4.42	0.46	4.31	0.70	-.31*	.28*	.02
7. MAV	4.03	0.81	3.50	1.11	3.72	0.92	3.75	0.97	-.10	.09	-.09
8. PAP	4.14	0.68	3.80	1.00	4.18	0.66	4.03	0.81	-.21	.24	.02
9. PAV	3.87	1.00	3.33	0.89	3.74	0.75	3.64	0.91	-.19	.23	.03
10. Motivation	25.48	21.79	18.95	32.97	21.32	28.72	21.93	27.85	.01	-.07	-.21
11. Perf Round 1	28.90	6.41	24.05	8.09	26.88	5.48	26.55	7.05	-.03	.10	.03
12. Perf Round 2	34.10	6.70	29.14	11.34	33.88	6.06	32.19	8.78	.08	.19	.09
13. Dummy Inc	21[a]								-.01	-.09	-.12
14. Dummy Ent			22[a]						.02	-.14	.01
15. Dummy Con					19[a]				-.02	.24	.10
16. Dom AG - MAP[b]	13		14		14		41				
17. Dom AG - MAV[b]	1		4		0		5				
18. Dom AG - PAP[b]	5		2		3		10				
19. Dom AG - PAV[b]	0		0		0		0				
20. Dom AG - No goal[b]	2		2		2		6				

Note. *N*= 62. Participants were all male. Figures on the diagonal are Cronbach's alpha reliabilities. Hours train p/w = hours of training per week, Pre-test Ent = pre-test entity beliefs, Mcheck. Ent = manipulation check entity beliefs, MAP = mastery-approach goals, MAV = mastery-avoidance goals, PAP = performance-approach goals, PAV = performance-avoidance goals, Motivation = requested home-practice time in minutes (0-120), Performance = number of correct patterns drawn, Dummy Inc = dummy for the incremental condition, Dum Ent = dummy for the entity condition, Dum Con = dummy for the control condition, Dom AG - MAP = dominant mastery-approach goal, Dom AG MAV = dominant mastery-avoidance goal, Dom AG PAP = dominant performance-approach goal, Dom AG PAV = dominant performance-avoidance goal, Dom AG - No goal = no dominant achievement goal.

[a] Number of participants in this experimental condition.

[b] Number of participants that had this type of goal as their dominant achievement goal.

$^{*}p < .05$, two-tailed $^{**}p < .01$, two-tailed

Table 3.3 (continued)

	4	5	6	7	8	9	10	11	12	13	14	15
1. Age												
2. Hrs train p/w												
3. Pre-test Ent.												
4. Self-efficacy	(.65)											
5. Mcheck Ent	.07	(.83)										
6. MAP	.19	.06	(.85)									
7. MAV	.18	.16	.53**	(.80)								
8. PAP	.28*	.05	.73**	.42**	(.90)							
9. PAV	.33**	.02	.55**	.73**	.65**	(.79)						
10. Motivation	.23	-.08	-.03	.16	.08	.21	-					
11. Perf. Round 1	-.12	.05	.21	.25	.12	.10	.06	-				
12. Perf. Round 2	-.02	.08	.16	.20	.05	.02	.10	.69**	-			
13. Dummy Inc	.10	-.40**	.12	.21	.10	.19	.09	.25	.16	-		
14. Dummy Ent	-.27*	.30*	-.22	-.19	-.21	-.25*	-.08	-.27*	-.27*	-.53**	-	
15. Dummy Con	.18	.10	.11	-.02	.12	.07	-.02	.03	.12	-.48**	-.49**	-
16. Dom AG - MAP[b]												
17. Dom AG - MAV[b]												
18. Dom AG - PAP[b]												
19. Dom AG - PAV[b]												
20. Dom AG - No goal[b]												

(medium effect). Planned contrasts showed that participants in the incremental condition (M = 28.90, SD = 6.41) performed better than participants in the entity condition (M = 24.05, SD = 8.09), $t(57)$ = -2.64, p = .01, d = 0.66 (medium effect, Hypothesis 3 supported). Contrasts showed no significant difference between the incremental condition and the control condition (M = 26.88, SD = 5.48), $t(57)$ = -.80, p = .43, and no significant difference between the entity condition and the control condition $t(57)$ = -1.65, p = .10.

To examine whether the effect of our experimental manipulation was different depending on participants' pre-test entity beliefs or their pre-test self-efficacy, we regressed performance on Round 1 on experimental condition (using dummies), with pre-test implicit theories, self-efficacy, the interaction between

condition and pre-test implicit theories, and the interaction between condition and self-efficacy as additional predictors. None of these interactions was a significant predictor of performance on Round 1 (all β's < |.28|, all p's > .20).

Because our experimental manipulation may not have affected all participants to the same extent, we also regressed performance on Round 1 on post-manipulation entity beliefs, with pre-test implicit theories and self-efficacy as control variables. This showed that post-manipulation entity beliefs were no significant predictor of performance on Round 1 (β = .06, p = .66).

Performance in Round 2. An ANCOVA with pre-test entity beliefs and self-efficacy as control variables, showed that the difference between conditions in performance on Round 2 was only significant at an adjusted alpha of .10, $F(2, 57) = 2.52$, p = .09, η^2 = .09 (small to medium effect). Planned contrasts showed that participants in the incremental condition (M = 34.10, SD = 6.70) performed better than participants in the entity condition (M = 29.14, SD = 11.37), $t(57) = -2.04$, p = .046, d = 0.53 (medium effect, Hypothesis 3 supported), but not better than participants in the control condition (M = 33.88, SD = 6.06), $t(57) = -0.14$, p = .89. Planned contrasts showed that the difference between the entity condition and the control condition was only significant at α = .10, $t(57) = 1.78$, p = .08, d = 0.52 (small to medium effect).

To examine whether the effect of our experimental manipulation was different depending on participants' pre-test entity beliefs or their pre-test self-efficacy, we regressed performance on Round 2 on experimental condition (using dummies), with pre-test implicit theories, self-efficacy, the interaction between condition and pre-test implicit theories, and the interaction between condition and self-efficacy as additional predictors. None of the interactions was a significant predictor of performance on Round 2 (all β's < .23, all p's > .29).

Because our experimental manipulation may not have affected all participants to the same extent, we also regressed performance in Round 2 on post-manipulation entity beliefs, with pre-test implicit theories and self-efficacy as control variables. This showed that post-manipulation entity beliefs were no significant predictor of performance on Round 2, β = .07, p = .61.

Finally, to examine if there was an interaction between experimental condition and time, we performed a repeated measures analyses of the two performance scores. A repeated measures ANCOVA, with pre-test entity beliefs and self-efficacy as control variables, showed that there was no significant interaction between condition and time, $F(2, 54) = 0.47$, p = .62, η^2 = .02, indicating

the effects of condition on performance did not differ significantly between Round 1 and 2.

Study 3: Discussion

In Study 3, the manipulation of entity beliefs was partially successful, as it led to a significant difference in entity beliefs between the entity condition and the incremental condition, but not between the entity condition and the control condition. As in Study 2, this suggests that the incremental manipulation lowered the entity beliefs of participants in the incremental condition compared to the control condition (i.e., baseline level), rather than that the entity manipulation heightened the entity beliefs of participants in the entity condition.

There was no difference between the experimental conditions in the adoption of the achievement goals before or after failure. Also, there were no differences in motivation to practice between conditions. In support of our hypothesis, we did find a difference in performance on Round 1 and a difference at the .10 significance level in performance on Round 2, with the incremental condition performing significantly better than the entity condition. These results show that entity beliefs have measurable effects on performance in line with our hypothesis.

General Discussion

In this study we investigated the effects of implicit theories of ability on achievement goals, motivation, and performance in sport. In all three studies we found an effect of our manipulation on athletes' implicit theories, and we found some support for effects of implicit theories on performance-approach and performance-avoidance goals (Study 2). We also found some support for an effect on motivation to practice (Study 1 and 2) and for an effect on performance (Study 3).

Theoretical Implications

We did not find support for our hypotheses about the effect of implicit theories on mastery-approach goals or mastery-avoidance goals. This raises the question to what extent mastery goals in sport are caused by incremental beliefs and if there are other predictors. The effect of implicit theories on performance-approach goals in Study 2 was significant but the pattern of findings was not fully in line with our hypotheses. However, the effect of implicit theories on performance-avoidance goals in Study 2 supports theoretical predictions. These findings are consistent with outcomes of meta-analyses that found weak relations

between implicit theories and achievement goals in a variety of settings (Burnette et al., 2013; Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018; Vella et al., 2016).

Implicit theories had a clear effect on motivation to practice in Study 1, supporting the theoretical prediction that entity beliefs lead to a decrease in motivation to practice (Dweck, 1999). In Study 2 and 3 we tried to replicate this effect using a measure that was closer to actual behavior. We did not find an effect of experimental condition on motivation to practice, but in Study 2 entity beliefs after manipulation (instead of experimental condition) were a significant predictor of motivation to practice. This may suggest that the manipulation only worked for the participants who were receptive to the message, as another study of implicit theories also found (Burnette & Finkel, 2012).

Lastly, implicit theories affected performance in Study 3, such that participants in the incremental condition performed better than participants in the entity condition. This is in line with theoretical predictions and with the outcomes of previous studies using physical performance tasks (Chiviacowsky & Drews, 2014; Drews et al., 2013). It is somewhat surprising that we found an effect of our experimental manipulation on performance while we did not find effects on the psychological factors. It may be that implicit theories exert their effect through other psychological processes than proposed in the literature, or that the influence is caused by subconscious processes. One possible process is fear of failure (cf. Wulf et al., 2013), which may take up self-regulatory and attentional resources, thus obstructing performance.

Taken together, our findings suggest that implicit theories may affect achievement goals, motivation to practice, and performance in sport settings, but that these effects are not as strong and consistent as we expected.

Limitations and Future Directions

A first limitation of our study is that the experimental manipulation did not always result in significant differences in implicit theories between all three conditions. More specifically, we think that participants with extensive experience in their sport, may need a longer or more convincing manipulation to override their pre-existing implicit theories, as was also concluded from a previous experiment (Li et al., 2008).

Second, not all participants believed that the tests in our studies were valid assessments of their ability for their sport. In educational settings such doubts have not been reported, possibly because these studies used tests that participants were familiar with, and are accepted as valid assessments of intelligence. In our studies we used tests that participants had never seen before,

and that may not have had sufficient face validity as tests of sport abilities. Greater confidence in the validity of a test may increase both the importance of performing well, and the impact of the outcomes.

Third, we used Van Yperen's (2006) forced-choice measure after the failure experience, because it most closely resembles the measure used by Mueller and Dweck (1998). Probably, to maximize the chance of finding effects, it would have been better to administer the -more sensitive- scale measure of achievement goals (the AGQ-R) after the failure experience in the experiment, because the effects of implicit theories are strongest after failure.

A consideration for future studies is that nowadays many athletes have learned about implicit theories and the benefits of mastery goals as opposed to performance goals in sport. The fact that we found effects of implicit theories on performance, while we did not find effects on the achievement goal questionnaires, may be caused by socially-desirable responding. Therefore, it is advisable for future studies to check if athletes are familiar with these topics or to recruit athletes who are not.

Conclusion

Our findings partially support theoretical predictions of the effects of implicit theories on performance goals, motivation to practice, and performance. The pattern of differences between conditions suggests that the influence of implicit theories could be captured in a carefully designed and controlled experiment with a large enough sample size. Therefore, the first concern for future studies seems to be to develop an experiment that elicits consistent effects of implicit theories in competitive athletes from different sports. Recommendations would be to make sure that the manipulation of implicit theories is powerful enough, to use a test of sport ability with sufficient face validity, to assess dependent variables after a failure experience, and to check if participants have been informed about entity and incremental beliefs in sport.

Further investigation of implicit theories in competitive sport still appears to be promising because of the negative effects of entity beliefs as opposed to the inspirational and motivational effects incremental beliefs can have.