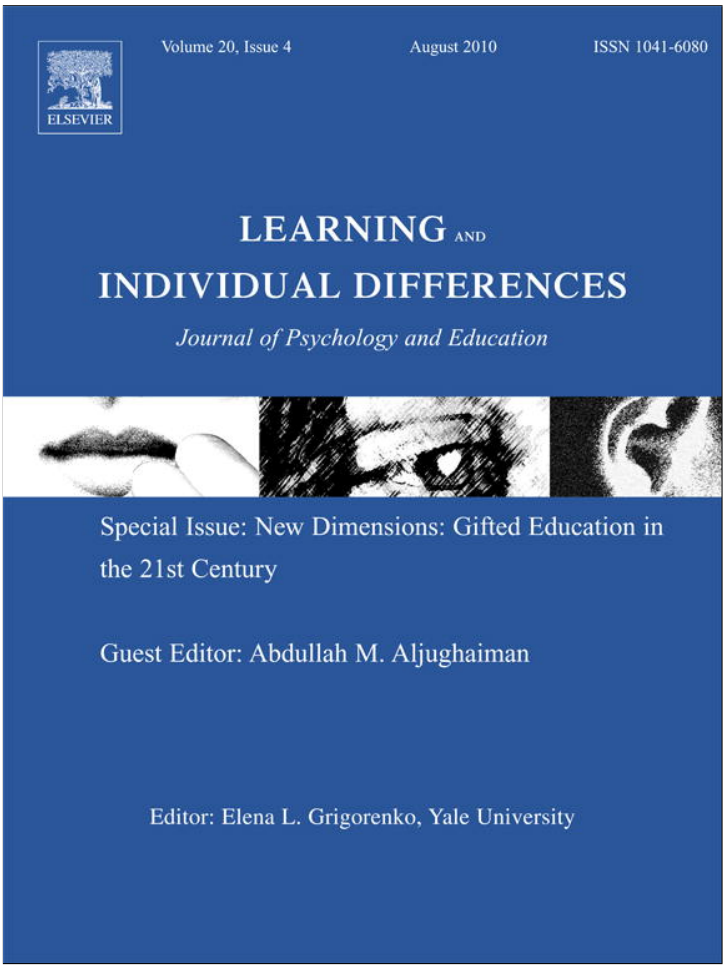

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Research on a modified framework of implicit personality theories

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ABSTRACT

There is ample evidence that labeled gifted students exhibit maladaptive behavior patterns. According to Carol Dweck those students who subscribe to a fixed view of their abilities are particularly at risk. In this contribution we extended Dweck's framework and distinguished two aspects of the implicit theory of one's own abilities. We hypothesized that the negative consequences of a fixed view are limited to the belief that one's own deficits are stable. In contrast, we assumed that the belief in the stability of existing abilities as well as the belief in the modifiability of ability deficits is adaptive. In two longitudinal studies with students from grades 7 to 10 we found supportive evidence for the proposed distinction.

1. Introduction

Many authors have warned that labeling students into a single "gifted and talented" category can have unintentionally negative consequences for them (e.g. Brettingham, 2007; Freeman, 2006a,b). For example, children admitted to talent programs, enrolled in schools for the gifted, or children skipping classes in most cases are frequently assigned one or more labels such as "gifted", "talented", "highly able" or "extremely intelligent".

A substantial proportion of gifted pupils reject using the label "gifted" in reference to themselves. Hershey and Oliver (1988) found that, in their sample of 600 schoolchildren, 39% voiced a preference for not being referred to as gifted while 30% indicated that they were not troubled by it. In a study conducted by Robinson (1990) 30% stated that they were not comfortable with the label. Kaplan and Geoffrey (1993) found indications that rejections of such labels could be correlated with assumptions among gifted persons that too much is expected of them. Among the approximately 1500 gifted schoolchildren in the sample examined by Cross, Coleman and Stewart (1993), more than half played down their academic success in order to protect themselves from peers potentially using it against them. In fact, students who label themselves gifted are well aware of being different (Wright & Leroux, 1997).

Not only gifted persons themselves, but also their social environment associates negative meanings with labels such as "gifted" and "talented". Sternberg (1996) identified a "constellation of emotions about the gifted, namely distrust, envy, anxiety and fear" (p. 170). Roeper (1996) wrote that "there is also a current tendency to believe that gifted children are prone to having learning difficulties" (p. 225). Wingert (1997) compared mothers who use the label "gifted" for their talented children with mothers who do not. The mothers, who did use labels, valued intelligence highly, but did not place a high degree of importance on the significance of hard work and were also less satisfied with the academic performances of their children.

The most significant study on the effects caused by labels such as "gifted" was conducted by Freeman (1991, 2006a,b). This longitudinal study investigated carefully matched triads of children, initially aged 5–14. The target group of 70 gifted children was compared with a second group of 70 children of their same school class who were unlabeled, but of equal measured ability. A third group of 70 pupils was randomly selected from the same classrooms. All students were interviewed and tested in their homes, and their families and teachers were questioned as well. The main finding, relevant to our purposes, was that those who had been labeled "gifted" had significantly more behavioral and emotional problems than the non-labeled children in the other groups. Most important, Freeman did not find conclusive evidence that the higher level of emotional and behavioral problems among the children labeled gifted had been caused by pressure exerted on them by their parents.

This study and others led Heller (2000, 2004) in his literature review to include labeling among the most serious problems in the identification of the gifted. Some of the risks he explicitly mentioned include "social isolation, development of egocentric attitudes and behaviors, endangering or disturbing the personality development and self-concept through extreme achievement pressures or too much responsibility" (p. 308). His recommendation was not merely to inform gifted students and their social learning environment when giftedness has been identified, but rather to impart this information in combination with professional counseling in order to minimize the negative consequences of labeling (Heller, Reimann, & Senfter, 2005).

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If counseling is to provide any sort of tangible impact, two premises plainly need to be met. First, the negative effects of labeling must be sufficiently understood. The mechanisms at the base of the negative effects have not yet been subjected to thorough research. For example, in some studies no consistent effect or conflicting evidence concerning the consequences of labeling have been found (e.g., Cole & Cilia, 1990; Shore, Cornell, Robinson, & Ward, 1991), and the reasons for this have not been clarified. Second, we must be absolutely certain that counseling does not exacerbate the negative effects of labeling. After all, counseling of the gifted is an activity which is explicitly practiced with students already associated with some sort of label, and over the course of counseling the label often becomes highly salient (Mendaglio & Peterson, 2007).

2. Theoretical considerations

There is no doubt that the label *gifted* can have negative effects. However, the reasons for these effects have not yet been fully understood. In our studies we want to investigate a hypothesis suggested by Carol Dweck (1999). She distinguishes between two personality theories of intelligence (Dweck, 1999, 2006; Dweck, Chiu, & Hong, 1995). Those who have a "fixed mindset" or an "entity theory" believe that intelligence is a stable entity that will not change and cannot be controlled by the individual. Those who believe their success is based on hard work and learning are said to have a "growth mindset" or an "incremental theory" of intelligence. Dweck relates this differentiation to other concepts related to intelligence such as giftedness, talents, or high abilities (cf. Dweck, 1999).

In numerous studies, Dweck has been able to demonstrate that a growth mindset in achievement contexts is more adaptive than a fixed mindset (for a review see Dweck, 2006, refer also to Heller, Finsterwald & Ziegler, 2001). Students who hold an incremental theory are oriented towards learning goals, have more confidence in their abilities, show less helplessness and higher control convictions, and mediated through these variables they reach higher achievements. Students holding an entity theory are primarily oriented towards performance goals and show more maladaptive learning and achievement behavior. For example, facing a setback, growth mindset individuals still believe that their performance can be improved. Indeed, they often react with increased effort. Fixed mindset individuals, however, dread failure because it is a negative message referencing their basic abilities. In a highly interesting series of studies, Mueller and Dweck (1998) found that praising children with statements such as "good job, you're very smart" is much more likely to develop a fixed mindset, whereas if compliments like "good job, you worked very hard" are given, they are more likely to develop a growth mindset. In these experiments, children with a fixed mindset who had been praised for their intelligence were less persistent after failure and their performances deteriorated. What these experiments clearly show is that, although people generally value being intelligent, believing oneself to be intelligent can have detrimental effects when this belief is framed by a fixed mindset.

Although Dweck's theory offers a sound explanation for the detrimental effects of being labeled with terms such as *intelligent*, *gifted* or *high achieving*, we were not fully satisfied with one aspect of her theory: Dweck (1999) assumes that a "fixed mindset" or an "entity theory" should generally be seen as maladaptive and a "growth mindset" or "incremental theory" should generally be seen as maladaptive. In contrast, we consider it necessary to go one step beyond the distinction between an entity theory and an incremental theory of one's own abilities. In particular, we hypothesize that a fixed mindset or an entity theory of one´s own abilities does not generally lead to negative consequences. Compared to Dweck we assume that an entity theory only shows negative consequences if a person shows ability deficits. It should however show positive consequences if a person shows high abilities. These assumptions are supported by early theories concerning identity (e.g. Erikson, 1959; Marcia, 1980) that postulated a positive relationship between a firmly integrated identity and several positive outcomes. A brief glance through the rich assortment of literature on self-theories reveals that many influential theories share the view that it can be advantageous to retain the stability of positively assessed aspects of one's self. This applies to, among others, self-esteem (Brown, 1993; Harter, 1993; Leary, 1998), self-concept (Baumeister, 1986), self-regard (Rogers, 1977, 1980), self-definition (Wicklund & Gollwitzer, 1982), and even to impressions of the self in the eyes of the others (Goffman, 1959; Schlenker, 2003). Furthermore, there seems to be a behavioral tendency to preserve the stability of one's own self-concept (Swann, Rentfrow, & Guinn, 2003, for a review). People tend to seek verification of self-views that they consider to be important and central to the self (Chen, Chen, & Shaw, 2004). In this process it is important to point out two aspects. Firstly, such behavior is adaptive and by no means the consequence of tenacious beliefs (Swann et al., 2003). Secondly, the self-verification of the functionality aims to serve one's self-view, and is in no way geared towards insuring a simple self-enhancement (Swann, Chang-Schneider, & McClarty, 2008).

A significant intention of our studies is, therefore, to investigate whether a more precise specification of Dweck's personality theory may possibly offer a more suitable starting point towards understanding the negative effects associated with labels such as "gifted" or "highly able" in comparison to the original approach developed by Dweck. We hypothesized that an entity theory does not show negative effects when applied to positive aspects of one's own talent and one's own learning. The maladaptive consequences postulated by Dweck should in our view be limited to cases where the negative aspects of one's own talent and learning are considered to be stable entities. Furthermore, we hypothesized that an incremental theory and therewith the firm belief that aspects of one's own self can be modified is of particular importance when dealing with deficiencies related to one's own talents and learning. In two longitudinal studies we tried to find first evidences for this more differentiated view. In study we examined whether the original or the extended Dweck framework could lead to better predictions of adaptive and maladaptive learning behavior. In Study 2 we tried to replicate and expand the findings of Study 1.

3. Study 1

The starting point for our considerations was research findings which indicated that gifted and high ability labeling can be associated with negative consequences for the persons being labeled. In Study 1 we wanted to use a longitudinal design to investigate whether Dweck's differentiation between a fixed mindset and a growth mindset would be able to properly differentiate between maladaptive and adaptive achievement behavior among high achieving schoolchildren. Furthermore, we wanted to determine whether proposed extensions to the Dweck framework would prove capable of improving its predictive power. It was assumed that it is advantageous for persons when they believe in the stability of their abilities and in the modifiability of their ability deficits. To test these assumptions we analyzed the predictive power of the Dweck framework compared to the extended Dweck framework on the most common variables investigated by researchers in the field of implicit personality theories, such as motivational orientations or confidence in own abilities (for an overview refer to Dweck, 1999).

3.1. Method

3.1.1. Participants

The participants in the study were 245 pupils (127 boys and 108 girls) enrolled in the eighth (88 students), ninth (73 students) and tenth (84 students) grades of German Gymnasiums (public schools

which prepare students for university studies).[1] As none of the students was ill or missing during one of the two classroom instruction periods in which the data were collected there was no attrition rate. The pupils can be considered as the typical population of this type of school in Germany. The mean age of the pupils came to 15.77 years (SD = 1.15, range 14–19).

3.1.2. Procedure

The pupils completed two questionnaires. Both questionnaire sessions were held during normal classroom instruction periods. The sessions were conducted by a research assistant in the presence of the class teacher. The first questionnaire was completed shortly before mid-year grades were issued (end of January), and the second was filled out about six months later (end of June). The first questionnaire collected information through–in addition to several scales which are not reported in this study–three scales pertaining to implicit personality theories (a scale adapted from Dweck and new scales to assess the stability of existing abilities and the modifiability of ability deficits). The second questionnaire was comprised of all of the scales described below. In each instance, the pupils needed about one full class period to complete the scales.

3.1.3. Measures

Unless specified otherwise in the following, all items on the respective measurements were presented along a 6-point Likert type scale, ranging from 1 (*I disagree completely*) to 6 (*I agree completely*). Furthermore, all items were formulated to pertain to the domain of mathematics. The reliabilities of all scales used were satisfactory (see Table 1).

3.1.3.1. Implicit Personality Theory (adapted from Dweck). To assess implicit theories on talent for mathematics, the items suggested for use by Dweck, Chiu and Hong (1995) were translated into German and formulated to pertain specifically to the scholastic subject of mathematics. The three item scale supplies insight regarding the degree to which a student utilizes an entity or a modification theory of his/her own talent in this area (i.e. whether the pupils perceive their talents to be fixed characteristics or ones which can be augmented). (Sample item: *Everyone has certain ability for mathematics and there is not much that can be done to really change that*). The scaled value increases with the assumed modifiability of talent for mathematics. In several studies the validity of the translated scale was shown (for more information, refer to Ziegler, 2001).

3.1.3.2. Stability of existing abilities. In order to assess the beliefs in stability of one's existing abilities, a six item scale published by Ziegler, Dresel, Schober and Stoeger (2005) was applied. (Sample item: *After I have learned something in mathematics, I don't forget how to apply it*). A higher scale value indicates a higher stability of existing abilities.

3.1.3.3. Modifiability of ability deficits. In order to measure the beliefs in modifiability of ability deficits, a six item scale, developed by Ziegler et al. (2005), was utilized. (Sample item: *In math class, I can compensate for knowledge deficits by studying more*). A higher value on this scale indicates that the respondent believes that ability deficits are more susceptible to modification.

[1] Although the students of our sample were not officially labeled "gifted" one can assume that Dweck's implicit personality theories can be applied. Dweck (1999) relates her differentiation of implicit theories not only to giftedness but also to high abilities. The students of our sample all were labeled as "high ability learners" because they attended a German Gymnasium. Only students who show high achievement levels (about the top 20 to 25%) are allowed to attend this type of school in Germany (Bavaria). Students attending the Gymnasium are generally estimated as more "gifted" and are officially labeled as "high achievers".

Table 1
Means (*M*), standard deviations (SD), *T*-tests and internal consistencies (Cronbach's α) for all measures.

	Gender					
		Boys		Girls		
	α	*M*	SD	*M*	SD	*T*-tests
Implicit personality theory (Dweck adapted)	0.68	3.25	0.95	3.07	0.86	$T(1236) = -0.03$, $p > 0.10$
Stability of existing abilities	0.81	3.62	0.86	3.53	0.71	$T(1236) = 0.90$, $p > 0.10$
Modifiability of ability deficits	0.76	4.63	0.67	4.38	0.65	$T(1236) = 2.94$, $p < 0.01$
Effort expenditure	0.83	4.29	0.76	4.04	0.75	$T(1236) = 2.50$, $p < 0.05$
Learning goal orientation	0.87	4.31	0.91	4.09	0.82	$T(1236) = 1.90$, $p < 0.10$
Performance approach goal orientation	0.88	3.51	0.80	3.32	0.81	$T(1236) = 1.76$, $p < 0.10$
Performance avoidance goal orientation	0.89	3.29	0.90	3.19	0.96	$T(1236) = 0.83$, $p > 0.10$
Confidence in own abilities	0.86	3.99	1.15	3.53	1.18	$T(1236) = 3.00$, $p < 0.01$
Helplessness	0.86	2.68	1.06	2.91	0.99	$T(1236) = -1.68$, $p < 0.10$
Academic elective behavior	0.97	3.49	1.47	2.92	1.28	$T(1236) = 2.90$, $p < 0.01$
Class grade Mathematics	–	3.25	1.37	3.35	1.20	$T(1234) = -0.54$, $p > 0.10$
Aspiration	–	3.45	0.84	3.65	0.63	$T(1230) = -2.10$, $p < 0.05$

3.1.3.4. Effort expenditure. Effort expenditure was measured with a twelve item scale (Ziegler, Dresel, & Stoeger, 2008). The scale offers insight into the amount of effort students apply to their learning (Sample item: *I spend a lot of time at home doing homework assignments*).

3.1.3.5. Motivational orientations (adapted from Dweck). Motivational orientations were assessed with a domain-specific version of a choice task developed by Dweck and Leggett (1988), by which one of four statements is to be chosen. Only one choice represents a learning goal orientation (Sample item: *I like math exercises where I can learn something, even if they are so difficult that I may make mistakes*) whereas the other three items refer to a performance goal orientation (Sample item: *I like math exercises which are not very difficult because I do not make as many mistakes*).

3.1.3.6. Motivational orientation. In order to assess which goals the pupils were attempting to attain in achievement contexts, 30 items from a scale by Ziegler et al. (2008) (see also Ziegler & Stoeger, 2002) were put to use. All items begin with the phrase "In mathematics I want above all to..." Six of the 30 items measure learning goal orientation. The remaining 24 items refer to performance goal orientation, whereby 12 of the items assess performance approach goal orientation and 12 items assess performance avoidance goal orientation (Sample items — Learning goal orientation: *In school I want above all to work through tricky exercises which can teach me something new*; sample item — Performance approach goal orientation: *In school I want above all to insure that my teachers notice how good I am*; sample item — Performance avoidance goal orientation: *In school I want above all not to get bad grades*).

Confidence in ability was assessed with the scale "Confidence in one's own competence" (Dweck & Henderson, 1988). This scale consists of four item pairs containing two statements corresponding to a positive self-evaluation and a negative self-evaluation. The two poles of a six-point answer scale are formulated as statements (Sample item: *I am not sure that I am good enough to be successful in math*).

3.1.3.7. Helplessness. The degree of helplessness was assessed with four items taken from the Helplessness Scale (HiS) advanced by Breitkopf (1985). This scale appraises anxiety (Sample item: *I cannot think clearly in math*) as well as the self-perceived non-contingency of one's own actions and the consequences of these actions (Sample item: *Even when I study a lot, I still won´t be good in math*).

3.1.3.8. Academic elective behavior. The students' academic elective behavior was assessed with four items taken from a scale developed by Ziegler and Stoeger (2008). The study's participants were to indicate how well they could picture themselves choosing mathematics as a university course of study, attending a discussion and a class in mathematics and pursuing a career in this field. All items begin with the phrase "I can picture myself..." (Sample items: *I can picture myself majoring in a subject related to the field of mathematics*, *I can picture myself attending a public discussion on a topic in the field of mathematics*).

3.1.3.9. Achievement. As measurements of individual achievement, the most recent report card grade results for the subject of mathematics were made available. Because grades in Germany are scaled inversely, the lower the grade, the better. The highest grade possible is 1, and the poorest is 6, with a grade of 5 indicating that the classroom goal was not reached.

3.1.3.10. Aspiration level for the subject of mathematics. Aspiration level for the subject of mathematics was measured with the question "What is the lowest grade with which you would be satisfied on the next exam in math class?"

3.2. Results

The following section first offers a review of the descriptive statistics calculated for the variables. This review will be followed by a presentation of the intercorrelations among these variables and the results of a stepwise regression analysis.

3.2.1. Descriptive statistics and intercorrelations

Means (M), standard deviations (SD), T-tests to check for gender differences and internal consistencies (Cronbach's α) for all measures are presented in Table 1. The reliabilities computed for all of the scales (see Table 1) were satisfactory. Regarding the three measures used to assess implicit theories of personality, the only gender difference which could be isolated was for the belief in the modifiability of one's own abilities, which favored the boys. In addition, for the remaining measures of adaptive achievement behavior, a more positive impression is left by the results obtained by the boys in our sample. They demonstrated higher success expectations, more confidence in their own abilities, lower levels of helplessness, and a higher degree of academic elective behavior for mathematics and proved to hold higher aspirations with respect to the domain of mathematics. Furthermore, their motivation was marginally, but significantly, higher than that found among the girls. This was demonstrated by both the scale developed by Ziegler et al. (2008) to measure learning goal and performance approach goal orientation and the forced-choice scale for motivational orientation as suggested by Dweck ($\chi^2(1, N = 245) = 2.51$, $p < 0.10$), on which boys more frequently opted for a learning goal orientation (see Table 2).

Table 3 contains the correlations among the various individual variables. The correlations calculated between each of the three measures applied to assess implicit theories of personality and the other variables representing adaptive achievement behavior ranged from 0.24 to 0.59. The intercorrelations among the remaining measures of adaptive achievement behavior ranged from −0.79 to 0.74. An examination of the multicollinearity of the three variables (learning goal orientation, time management and self-efficacy) provided satisfactory results. The absolute values of the correlations between each of the three variables were less than 0.34. Tolerance (Implicit Personality Theory — adapted from Dweck: 0.91, Stability of existing abilities: 0.86, and Modifiability of ability deficits: 0.79) and the variance inflation factor (Implicit Personality Theory — adapted from Dweck: 1.10, Stability of existing abilities: 1.16, Modifiability of ability deficits: 1.27) also fulfilled the guidelines for acceptable scores, namely close to 1 and under 4.

3.2.2. Regression analysis

In the next step, a stepwise regression analysis was calculated. The measures used to assess implicit theories of personality (Implicit Personality Theory — adapted from Dweck, Stability of existing abilities and Modifiability of ability deficits), as well as their interaction terms, were set as predictors in the regression model. In order to determine the individual interaction terms, the variables were centered on the group mean (that is, for each individual on his or her mean) and the scales were then multiplied with each other. The indicators of adaptive achievement behavior presented above formed the criteria. The results of the regression analyses for all dependent variables are presented in Table 4.

The adapted version of Dweck's Implicit Personality Theory scale was only able to predict the aspiration levels of the pupils. However modifiability of ability deficits proved to be the better predictor. The adapted version of Dweck's Implicit Personality Theory scale was not able to serve as a predictor for any other dependent variable, either alone or as part of an interaction. The belief in the modifiability of ability deficits predicted four of the dependent variables. Higher levels of beliefs in the modifiability of ability deficits were linked to better school grades, higher expectations of success and higher levels of

Table 2
Intercorrelations among all measures.

	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)
1) Implicit personality theory (Dweck adapted)	0.04	0.29***	0.11	0.09	0.06	0.02	0.11	−0.13*	0.14*	−0.02	0.10
2) Stability of existing abilities		0.34***	0.31***	0.36***	0.09	0.05	0.32***	−0.33***	0.25***	−0.10	−0.29***
3) Modifiability of ability deficits			0.59***	0.47***	0.01	−0.11	0.55***	−0.56***	0.41***	−0.25***	−0.36***
4) Effort expenditure				0.49***	0.10	−0.03	0.74***	−0.79***	0.58***	−0.48***	−0.45***
5) Learning goal orientation					0.18**	0.07	0.44***	−0.43***	0.40***	−0.25***	−0.38***
6) Performance approach goal orientation						0.76***	0.01	0.08	−0.01	0.14*	0.11
7) Performance avoidance goal orientation							−0.04	0.18**	0.01	0.15*	0.10
8) Confidence in own abilities								−0.75***	0.73***	−0.54***	−0.52***
9) Helplessness									−0.55***	0.52***	0.42***
10) Academic elective behavior										−0.44***	−0.53***
11) Class grade Mathematics											0.55***
13) Aspiration level Mathematics											

Note. Sample size was 237 for all variables with the exception of grade and aspiration level, for which it was 235 and 231. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 3
Frequencies of choosing performance goals and learning goals associated with the forced-choice scale on motivational orientations as suggested by Dweck.

	Performance goal orientation	Learning goal orientation
Boys	66.4%	33.6%
Girls	75.7%	24.3%

elective activities in mathematics. A high expression on the scales measuring the beliefs in the modifiability of ability deficits and the stability of existing abilities predicted high confidence in abilities and low helplessness. A high expression on either of these two variables, as well as the interaction term between these two variables, furthermore, predicted high learning goal orientation. A high performance avoidance goal orientation, on the other hand, was predicted by a high expression of beliefs in the modifiability of ability deficits as well as the interaction term consisting of stability and modifiability. A high expression of the interaction term combining modifiability and stability was also able to predict a low performance avoidance goal orientation.

Lastly, we considered the forced-choice scale on motivational orientations developed by Dweck. The scale was dichotomized for our purposes, whereby a performance goal orientation was awarded the value 1 and a learning goal orientation the value 2. Next, a logistic regression analysis was calculated (method: forward Wald, P_{in}: 0.05, P_{out}: 0.10). The dichotomous dependent variable was whether the subject had a performance goal orientation or learning goal orientation. The scales to measure implicit personality theories (adapted version of Dweck's Implicit Personality Theory scale, scale to measure beliefs in stability of existing abilities and modifiability of ability deficits as well as the interaction terms between these variables) served as predictor variables in the regression equation. Here again the variables were centered on the group mean and afterwards the scales were multiplied with each other. Statistically significant predictors were the stability of existing abilities ($\beta = 0.57$, Wald = 7.48, $p < 0.01$) and the modifiability of ability deficits ($\beta = 0.56$, Wald = 4.59, $p < 0.05$).

The proportion of variance explained by the model produced a *Nagelkerke* coefficient of $R^2 = 0.13$ and 72.1% of the participants in the investigation could be allocated to the correct group on the basis of these two variables. The model fit was, according to the Hosmer Lemeshow test, satisfactory ($\chi^2(8) = 10.13$, $p = 0.26$), and the Wald coefficient for the constants was 23.03.

3.3. Discussion of Study 1

Study 1 had two objectives. First, we were interested whether Dweck's differentiation between a fixed mindset and a growth mindset might be able to predict maladaptive and adaptive achievement behavior. The indicators for adaptive and maladaptive achievement behavior used were precisely those suggested by Dweck (1999, 2006; Dweck et al., 1995).

The second objective of Study 1 was to examine whether an extended Dweck framework could lead to improved predictive capabilities. In other words we surveyed whether the individual believe that positive aspects of one's own talent and one's own learning are stable qualities proofs to be adaptive; and whether negative consequences of a fixed mindset are limited to cases where the negative aspects of one's own talent and learning are considered to be stable entities. This was, in fact, the case for all indicators of adaptive and maladaptive achievement behavior. One such finding can, however, certainly not be considered a repudiation of a theory which enjoys the wide empirical support accorded Dweck's. In such a case the results must be, above all, subject to replication. This replication is one of the objectives of Study 2.

Table 4
Results of the regression analysis: Relationships among Dweck defined IPT's, new IPT stability of existing abilities, new IPT modifiability of ability deficits as well as their interaction terms[a] and the indicators of adaptive achievement behavior.

	Classroom grades ($R^2 = 0.06$)				Expectation of success ($R^2 = 0.35$)				Learning goal orientation ($R^2 = 0.29$)				Performance approach goal orientation ($R^2 = 0.03$)				Performance avoidance goal orientation($R^2 = 0.04$)				Confidence ($R^2 = 0.32$)				Helplessness ($R^2 = 0.34$)				Elective behavior ($R^2 = 0.17$)				Aspiration ($R^2 = 0.20$)			
	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p
Implicit personality theory																																				
IPT Dweck (adapted)																																		0.04	−0.20	3.17	**
Stability									0.04	0.21	3.55	***									0.02	0.14	2.40	*	0.02	−0.14	−2.47	*						0.03	−0.17	−2.59	*
Modifiability	0.06	−0.25	−3.87	***	0.35	0.59	11.28	***	0.22	0.42	6.99	***					0.02	−0.13	−1.98	*	0.30	0.50	8.62	***	0.32	−0.51	−8.96	***	0.17	0.41	6.92	***		0.13	−0.36	−5.36	***
Interaction term																																				
Stability × Modifiability									0.03	0.15	2.75	**	0.03	−0.16	−2.52	*	0.02	−0.16	−2.38	*																

Note. Only those predictors with an explained variance of $p < 0.05$ were included in the regression model. Depicted in the table are the regression coefficients and significance levels for the final regression model (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$).

[a] Since the interaction term computed between the adapted Dweck scale and the two new scales, stability and modifiability, did not show a significant level of predictive power, this interaction term was not included in the table.

4. Study 2

Study 2 investigated whether the good predictive performance found when using the extended Dweck framework, as demonstrated by Study 1, could be replicated and extended to further variables investigated in Dweck's studies (for an overview refer to Dweck, 1999, 2006). However, in comparison to the first study, three modifications were made. First, we decided not to utilize Dweck's original scales in assessing implicit theories of own abilities in the new census. Second, the study was conducted in a different scholastic subject: Instead of mathematics, the investigators examined an area of the natural sciences, physics. Third, an intelligence test was utilized to isolate possible interactions with the beliefs in the stability of existing abilities and the modifiability of ability deficits.

4.1. Method

4.1.1. Participants

The participants in the study were 351 pupils (176 boys and 175 girls) enrolled in the eighth (88 students), ninth (87 students), tenth (105 students) and eleventh (71 students) grades of three German Gymnasiums (public schools which prepare students for university studies). During measuring point 2 two students were ill. These two students filled out the questionnaire one week later, after returning to school. For this reason there was no attrition rate. The mean age of the pupils was 16.54 years (SD = 1.69, range 14–19).

4.1.2. Procedure

The pupils completed two questionnaires and an intelligence test. Both of the questionnaire sessions and the intelligence test were all conducted during normal class instruction periods. The sessions were administered by a research assistant in the presence of the class teacher. The first questionnaire and the intelligence test were completed shortly before the start of the school year (mid-September), the second questionnaire was filled out about six months later, shortly after mid-year report cards were issued (end of February). The first questionnaire collected information through, in addition to several scales which are not reported in this study, the two scales pertaining to the beliefs in the stability of existing abilities and the modifiability of ability deficits. The second questionnaire consisted of all of the scales described below. The pupils needed about one full class period to complete each of the two questionnaires. The intelligence test required approximately one hour to complete.

Table 5
Means (M), standard deviations (SD), T-tests and internal consistencies (Cronbach's α) for all measures.

	Gender					
		Boys		Girls		
	α	*M*	SD	*M*	SD	*T*-tests
Stability of existing abilities	0.84	3.24	0.86	2.99	0.76	$T(1350) = 3.07$, $p < 0.01$
Modifiability of ability deficits	0.76	4.41	0.76	4.27	0.69	$T(1350) = 1.95$, $p < 0.10$
Confidence in own abilities	0.86	3.98	0.99	3.02	1.00	$T(1347) = 9.044$, $p < 0.001$
Control belief	0.83	4.36	0.88	4.19	0.77	$T(1350) = 1.90$, $p < 0.10$
Learning goal orientation	0.83	4.08	0.96	3.89	0.81	$T(1350) = 1.93$, $p < 0.10$
Performance approach goal orientation	0.87	3.63	0.85	3.63	0.71	$T(1350) = -0.02$, $p > 0.10$
Performance avoidance goal orientation	0.84	3.41	0.86	3.40	0.77	$T(1350) = .08$, $p > 0.10$
Academic elective behavior	0.89	3.13	1.23	2.34	1.06	$T(1350) = 6.44$, $p < 0.001$
Class grades	–	2.40	0.83	2.76	0.93	$T(1347) = -3.55$, $p < 0.001$
Aspiration	–	2.99	0.63	3.25	0.58	$T(1350) = -3.93$, $p < 0.001$

4.1.3. Measures

Stability of existing abilities, modifiability of ability deficits, motivational orientations (in accord with Ziegler et al., 2008), confidence in abilities, and academic elective behavior scales were applied exactly as in Study 1 (for a detailed description refer to the Method section of Study 1). All scales were reformulated to apply to the domain of physics. In order to assess individual achievement, the researchers were granted access to the grades awarded the pupils in this study on their mid-year report cards for the subject of physics. Furthermore, aspiration for physics was also measured (see also Study 1).

4.1.3.1. Control beliefs. In addition to the measurements described above, a six item scale to assess control beliefs among the pupils was administered (Ziegler & Stoeger, 2002). The scale measures the degree to which pupils believe they themselves can exert an influence over the successes (and/or failures) experienced in physics class (Sample item: *I can make sure that I learn a lot of new things in physics class*). The items were presented along a 6-point Likert type scale, ranging from 1 (*I disagree completely*) to 6 (*I agree completely*). The reliabilities calculated for all of the scales (see Table 5) were satisfactory.

4.1.3.2. Cognitive abilities. Cognitive abilities were measured with the Kognitive Fähigkeitstest (KFT 4–12 + *R*) [Cognitive Abilities Test for children between grades 4 and 12] developed by Heller and Perleth (2000). This test is a revised version of the Cognitive Abilities Test (CAT) by Thorndike and Hagen (1971), which was translated into German. The unabridged version of the KFT 4–12 + *R* consists of three test sections (verbal, quantitative, and nonverbal) each of which is further divided into three subtests. In the current study an abridged format was utilized, which consisted of two subtests from the quantitative section (set comparisons and numeric series). The individual items were presented in a multiple-choice format with between 2 and 5 distractors. The completion of the test took approximately 1 h.

4.2. Results

Here we will once again present the descriptive statistics and correlations, followed by the results of the stepwise regression analyses. The predictors used in the regression model were the implicit theories of personality (stability of existing abilities and modifiability of ability deficits), IQ, and their interactive terms. The indicators of adaptive achievement behavior formed the criteria.

4.2.1. Descriptives and intercorrelations

Means (M), standard deviations (SD), T-tests to check for gender differences and internal consistencies (Cronbach's α) are presented in Table 5. The reliabilities computed for all of the scales were satisfactory (see Table 5). Again in the second study, boys proved to demonstrate more favorable scores than girls. The boys estimated their existing abilities to be more stable than the girls in the sample did, had more confidence in their abilities, showed more positive academic elective behavior, received higher classroom grades and displayed higher levels of aspiration. Marginally significant differences were uncovered for the modifiability of ability deficits, control beliefs and learning goal orientation. Boys here again showed more advantageous ratings.

Table 6 contains the correlations calculated. The correlations between each of the two measures applied to assess implicit theories of personality and the remaining measures of adaptive achievement behavior ranged from 0.12 to 0.48. The intercorrelations calculated for the remaining measures of adaptive achievement behavior ranged

Table 6
Intercorrelations among all measures.

	2)	3)	4)	5)	6)	7)	8)	9)	10)
1) Stability of existing abilities	0.32***	0.39***	0.12*	0.25***	0.14*	0.11	0.32***	−0.19**	−0.21***
2) Modifiability of ability deficits		0.46***	0.48***	0.40***	0.20**	0.01	0.43***	−0.32***	−0.32
3) Confidence in own ability			0.40***	0.36***	0.13*	−0.08	0.59***	−0.48***	−0.43***
4) Control belief				0.46***	0.39***	0.19***	0.36***	−0.25***	−0.22***
5) Learning goal orientation					0.46***	0.28***	0.53***	−0.21***	−0.23***
6) Performance approach goal orientation						0.72***	0.19***	0.01	−0.11*
7) Performance avoidance goal orientation							0.04	0.11	0.01
8) Academic elective behavior								−0.32***	−0.35***
9) Class grades in Mathematics									0.52***
10) Aspiration level Mathematics									

Note. Sample size was 251 for all variables with the exception of grade, for which it was 248 $^{*}p<0.05$, $^{**}p<0.01$, ***.

from −0.48 to 0.53. An examination of the multicollinearity for the scales stability of existing abilities and modifiability of ability deficits provided satisfactory results. The absolute value of the correlation between the two variables was 0.32, tolerance (stability of existing abilities: 0.94 and modifiability of ability deficits: 0.94) and the variance inflation factors (stability of existing abilities: 1.1, modifiability of ability deficits: 1.1) also fulfilled the guidelines for acceptable scores, namely close to 1 and under 4.

4.2.2. Regression analysis

In the next phase stepwise regressions were calculated. The predictors used in the regression model were the two measures used to assess implicit theories of personality (stability of existing abilities and the modifiability of ability deficits), IQ as determined on the intelligence test, and the interaction terms formed among these variables. In determining the interaction terms, variables were again centered on the group mean and then the scales were multiplied with each other. The criteria were formed by the indicators of adaptive achievement behavior depicted above. The results obtained with the regression analyses for all dependent variables are presented in Table 7.

With the exception of performance avoidance goal orientation, all criterion variables could be predicted by various combinations of the predictors. Confidence in one's own abilities could be predicted by stability, modifiability, IQ and the interaction term of modifiability and IQ, with modifiability being the strongest predictor. These same predictors, as well as the interaction term of modifiability and stability, predicted control beliefs among the pupils. Stability, modifiability and their interaction term were able to predict a learning goal orientation as well as academic elective behavior. Modifiability and the interaction term of modifiability and stability were able to predict the performance approach goal orientation among the pupils. Report card grades were predicted by the modifiability of ability deficits, IQ and the interaction term of stability, modifiability, and IQ. The modifiability of ability deficits and IQ were able to predict the aspiration levels of the pupils.

4.3. Discussion of Study 2

In Study 2 the prognostic powers of the extended Dweck framework on indicators of adaptive and maladaptive achievement behavior already found in Study 1 could generally be confirmed. With the one exception of performance avoidance goal orientation, all criterion variables could be prognosticated through various combinations of the predictors examined. In those cases where the modifiability of ability deficits and the stability of existing abilities interacted, high expressions of both variables were the most effective. In those cases where IQ interacted with these variables, high IQ values paired with high expressions of each of the two scales predicted adaptive achievement behavior. In summary it must be clearly stated that, also in Study 2, boys reported generally higher expressions of adaptive achievement behavior on the questionnaires than did girls and also received better grades in their physics classes.

5. General discussion

Sufficient empirical evidence has been submitted to confirm that negative consequences can be expected when children are categorized into a “gifted and talented” category (Freeman, 2006a,b). One intriguing explanation for the negative consequences has been suggested by Dweck (1999, 2006; Dweck et al., 1995). She proposes that labels such as gifted, talented, highly able, highly intelligent etc. stimulate mindsets. About one half of all children tend towards a “fixed mindset”, in which intelligence is perceived as a stable, non-changing entity. Likewise, one half of all children have a “growth mindset”. They believe that intelligence is a quality which is subject to modification and growth. As Dweck has been able to demonstrate, a fixed mindset is closely associated with a number of maladaptive consequences. When gifted children with a fixed mindset are labeled as gifted, this labeling could lead to the negative consequences delineated earlier.

One problem with Dweck's theory is made evident by research studies which show that the stability of aspects concerning one's self are normally adaptive (e.g., Baumeister, 1986; Harter, 1993, Swann et al., 2008). We, therefore, considered the possibility that stability beliefs might show negative consequences only if related to deficits in one´s own abilities. Furthermore modification beliefs might not be adaptive when individuals fear that their existing abilities might be lost. However they might be adaptive if they refer to ability deficits.

In Study 1 we compared the predictive power of Dweck's original scales with two new scales which took into consideration different adaptations concerning stability beliefs and modifiability beliefs. In fact, in a longitudinal study, only the extended Dweck framework proved to be effective for predicting adaptive achievement behavior in the scholastic subject of mathematics. In Study 2 the predictive power of the extended Dweck framework could also be confirmed in a second longitudinal study in the scholastic subject of physics.

In a comparison of the two scales, the modifiability of deficits and the stability of existing abilities, the first clearly proved to possess stronger predictive power. It was, with only one exception, a significant predictor in all regression models. This relative strength may also explain why, previously, modifiability was associated with such good predictions following failure. In fact, a high percentage of individuals interpret failure as an indication that their own abilities are insufficient (Dweck, 1999, 2006).

A further indicator for the need to expand on Dweck's original framework is the finding that the scale “stability of existing abilities” opens wider predictive capabilities. In Study 1 it predicted confidence in ability, helplessness and learning goal orientation with regard to mathematics. In Study 2, for the subject of physics, the scale once again predicted confidence in ability and the newly assessed variables of control beliefs and elective behavior. A third indicator for the need

Table 7
Results of the regression analyses: Relationships among the stability of existing abilities, modifiability of ability deficits, IQ as well as their interaction terms and the indicators of adaptive learning behavior.

	Confidence ($R^2=0.31$)				Control belief ($R^2=0.27$)				Learning goal orientation ($R^2=0.35$)			
	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p
Implicit personality theory												
Stability	0.07	0.26	5.22	***	0.02	0.14	2.65	**	0.04	0.18	3.68	***
Modifiability	0.22	0.37	7.44	***	0.22	0.39	7.49	***	0.29	0.49	10.30	***
IQ	0.01	0.10	2.18	*	0.01	0.11	2.19	*				
Interaction term												
Stability × Modifiability					0.01	−0.17	−3.41	**	0.02	0.12	2.65	***
Stability × IQ												
Modifiability × IQ	0.01	0.10	2.10	*	0.01	0.10	2.03	*				
Stability × Modifiability × IQ												

	Performance approach goal orientation ($R^2=0.09$)				Elective behavior ($R^2=0.34$)				Class grades ($R^2=0.20$)				Aspiration ($R^2=.$)			
	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p	ΔR^2	β	t	p
Implicit personality theory																
Stability					0.07	0.26	5.39	***								
Modifiability	0.06	0.26	4.86	***	0.25	0.43	8.96	***	0.13	−0.33	−5.90	***	0.10	−0.30	−5.10	***
IQ									0.03	−0.17	−3.00	**	0.02	−0.13	−2.22	*
Interaction term																
Stability × Modifiability	0.03	0.15	2.77	**	0.02	0.16	3.45	**								
Stability × IQ																
Modifiability × IQ									0.04	−0.18	−3.00	**				
Stability × Modifiability × IQ																

Note. Only those predictors with an explained variance of $p<0.05$ were included in the regression model. Depicted in the table are the regression coefficients and significance levels for the final regression model (***$p<0.001$, **$p<0.01$, *$p<0.05$).

to expand on Dweck's original framework is the finding that the interaction between beliefs concerning the modifiability of ability deficits and the stability of existing abilities in Study 1 was able to predict all three of the motivational orientations, although in Study 2 this finding could be replicated only for learning goal orientation and performance approach goal orientation. In addition, the interaction term predicted control beliefs and elective behavior. In accordance with expectations, high values for both scales were bound to adaptive achievement behavior (measured by the dependent variables in Studies 1 and 2).

In Study 2, IQ predicted confidence in abilities for the subject of physics, control beliefs, scholastic achievement and aspiration level. These findings are in accordance with other findings in relevant research literature (Ziegler, 2008). However, IQ proved to be a significantly less capable predictor than the implicit personality theories were. Interestingly enough, the interaction between modifiability of ability deficits and IQ could predict confidence in abilities, control beliefs and scholastic achievement. More precise analyses of the interactions revealed that highly intelligent pupils who had a deeper belief in the modifiability of their own ability deficits proved to have more confidence and more deeply instilled control beliefs as well as higher scholastic achievement levels. In future studies it would certainly be worthwhile to examine whether the reports made by several researchers that gifted pupils demonstrate better self-concept profiles and mental health (Heller, 2000; Rost, 2000) can be attributed to more advantageous theories concerning the modification of their own ability deficits.

Taken as a whole, the findings reported here show that an extension of the original Dweck framework could be advantageous in understanding the effect of implicit personality theories of one's own abilities. Both, the belief in the modifiability of ability deficits and a strong belief in the stability of one's own abilities, as well as their interactions, contributed to improvements in predictions in two studies exploring the indicators of adaptive learning behavior. The next logical steps in a research program should, therefore, consist of determining the personality theories of children who have been labeled gifted and investigating whether these theories exercise a moderating effect on adaptive achievement behavior as well as further variables of interest.

5.1. Limitations

In closing we would like to address a few of the limitations associated with the present study. The first is that this research was conducted with questionnaires. In contrast, Dweck's assumptions are supported by a wide array of datasets which have been collected through a broad range of methods (Dweck, 1999, 2006). A second limitation is that no consideration was made of possible inter-cultural aspects. However, there exists clear evidence of cultural differences in the implicit personality theories in Dweck's framework (Hong, Chiu, Yeung, & Tong, 1999) as well as in the usage of gifted labels (Colangelo & Assouline, 1995; Kolesaric & Koren, 1992; Shahal, 1995). A third limitation is the narrow focus on mathematics and physics of our study. Generalizing our findings to alternative cultures and other subjects is therefore, of course, problematic.

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