Learning and Individual Differences 21 (2011) 747–752

Contents lists available at SciVerse ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

Dangerous mindsets: How beliefs about intelligence predict motivational change

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ARTICLE INFO

Article history:
Received 10 November 2010
Received in revised form 25 August 2011
Accepted 3 September 2011

Keywords:
Intelligence beliefs
Intrinsic motivation
Mediation
Academic achievement
Achievement goals

ABSTRACT

The present study examined how beliefs about intelligence, as mediated by ability-validation goals, predicted whether students lost or maintained levels of intrinsic motivation over the course of a single academic year. 978 third- through eighth-grade students were surveyed in the fall about their theories concerning the malleability of intelligence, need to validate their academic ability through schoolwork, and intrinsic motivation. At the end of the school year, they were surveyed again about their intrinsic motivation and subsequently characterized as either *decliners* (those who lost intrinsic motivation over the year) or *maintainers* (those who maintained or gained intrinsic motivation over the year). As predicted, decliners were more likely to endorse an entity theory of intelligence than maintainers and this relationship was fully mediated by the adoption of ability-validation goals. Implications for intervention efforts and future research are discussed.

1. Introduction

A long tradition of research has shown that intrinsic motivation (i.e., learning for learning's sake) is associated with a host of adaptive classroom behaviors, including persistence, cognitive flexibility, preference for challenge, use of adaptive coping strategies, and engagement in deep conceptual learning (Boggiano, 1998; Meece, Blumenfeld & Hoyle, 1988; Miller, Behrens & Greene, 1993; Otis, Grouzet & Pelletier, 2005; Pintrich & Garcia, 1991; Ryan & Connell, 1989). Intrinsic motivation also predicts strong academic performance (Boggiano, 1998; Gottfried, 1985; Lepper, Corpus & Iyengar, 2005) and may be particularly beneficial for students with lower ability (Lau & Chan, 2003; Logan, Medford & Hughes, 2011).

In light of these benefits, it is alarming that levels of intrinsic motivation tend to dissipate as students progress through the school years (Corpus, McClintic-Gilbert & Hayenga, 2009; Gottfried, Fleming & Gottfried, 2001; Harter, 1981; Lepper et al., 2005; Otis et al., 2005; Tzuriel, 1989). Of course, not all students follow this same path of decline — some maintain intrinsic motivation and adaptive attitudes toward the learning process. The majority of research documenting motivational declines, however, has examined the *average* trajectory of change across an entire sample (cf. Harter, Whitesell & Kowalski, 1992). In order to identify distinct trajectories of change the current study distinguished students who maintained intrinsic motivation (*maintainers*) from those who lost motivation (*decliners*) over the course of an academic year. We studied these groups at the late elementary and middle school level because it is a period of marked decline in adaptive motivational beliefs (e.g., Harter, 1981; Lepper et al., 2005) and could ultimately serve as an important point for motivational intervention.

1.1. Explaining motivational change

Assuming such distinct motivational trajectories exist, what factors might predict whether students lose or maintain motivation over time? An array of motivational theories have cited contextual factors as sources of motivational change, from parental socialization and involvement (Grolnick, Kurowski & Gurland, 1999; Pomerantz & Dong, 2006) and the detrimental effects of extrinsic rewards on intrinsic motivation (Deci, Koestner & Ryan, 1999; Lepper, Greene & Nisbett, 1973) to the provision of structure and social support in the learning environment (Ryan & Deci, 2000). Much of the research on motivational change in educational contexts has examined the transition to middle school. Indeed, intrinsic motivation may dissipate around this time as schools increasingly focus on normative grading standards and performance outcomes while decreasing their support for autonomy, cognitive challenge, personal applicability of coursework, and mastery goal structures (e.g., Eccles, Midgley, Wigfield, Buchanan, Revman, Flanagan & Mac Iver, 1993; Elliot & Harackiewicz, 1994; Harackiewicz, Barron, Carter, Lehto & Elliot, 1997; Lepper & Henderlong, 2000; Midgley, Anderman & Hicks, 1995; Stipek & Mac Iver, 1989).

While these contextual factors are undoubtedly important, it is equally crucial to investigate personally controllable individual characteristics. For example, numerous studies highlight how individuals' beliefs about their competence (e.g., Marsh, Trautwein, Ludtke, Koller

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doi:10.1016/j.lindif.2011.09.002

& Baumert, 2005), self-efficacy (e.g., Bandura, 1982), and expectations for future performance (e.g., Wigfield & Eccles, 2000) have important consequences for motivation. Such personal beliefs may not only be more malleable than contextual variables but also serve as a buffer against negative environmental influences (Elliot & Thrash, 2002; Roeser, Midgley & Urdan, 2001; Walker, Greene & Mansell, 2006). In the present study, we expanded this tradition of research on personal characteristics to examine students' beliefs about the malleability of intelligence and their need to validate their own ability through schoolwork as predictors of motivational decline versus maintenance. As elaborated below, we focused on these particular constructs because they represent a powerful, predictive framework that has not yet been tested as a source of intrinsic motivational trajectories over the elementary and middle school years.

1.1.1. Intelligence beliefs

Dweck's social-cognitive theory of motivation posits that individuals experience achievement situations differently depending upon the implicit theories they hold about the malleability of intelligence (Dweck, 2006). Students who hold an entity theory of intelligence believe that intelligence is a fixed trait and cannot be altered through effort. Conversely, students with an incremental theory believe that intelligence may be gained over time through effort and learning. When individuals with an incremental theory of intelligence encounter academic difficulties, they are likely to redouble their efforts, attempt new strategies, and improve performance; those with an entity theory of intelligence, in contrast, are preoccupied with protecting perceptions of competence and accordingly reduce effort, use ineffective strategies, and report negative emotions (for a review, see Dweck, Chiu & Hong, 1995a; Dweck & Leggett, 1988). These preoccupations are likely incompatible with the curiosity-driven engagement characteristic of intrinsic motivation. Indeed, experimentally induced entity theories have been shown to dampen intrinsic motivation in laboratory contexts (Aronson, Fried & Good, 2002; Cury, Elliot, Da Fonseca & Moller, 2006, Study 2). It is important to extend this line of investigation beyond the laboratory to study longer-term changes in intrinsic motivation as they occur in everyday classroom environments over the course of elementary and middle school.

Implicit theories of intelligence can, in fact, predict trajectories of change across extended periods of time (Blackwell, Trzesniewski & Dweck, 2007; Robins & Pals, 2002). For example, Blackwell and colleagues (2007) implemented an intervention to increase middle school students' incremental beliefs of intelligence and found that these increases led to positive growth in mathematics performance over the course of one year. However, the intervention did not evaluate intrinsic motivation or the mechanisms by which theories of intelligence may affect motivational change. Thus, Dweck's model is a powerful explanatory framework that has not yet been linked to trajectories of intrinsic motivation but has the potential to account for such distinct patterns of change over time. The current study sought to address this gap in the literature by examining whether intelligence beliefs may explain students' status as motivational decliners versus maintainers. We hypothesized that entity beliefs would erode intrinsic motivation over the course of an academic year.

1.1.2. Ability-validation goals

Entity beliefs presumably detract from intrinsic motivation precisely because they encourage a preoccupation with protecting or validating the limited intelligence that one possesses. This focus on verifying intellectual ability through school work has been termed an *ability-validation goal* (Grant & Dweck, 2003), and is highly correlated with a sense of self-worth contingent on success in the achievement domain (Crocker & Park, 2004). While students who possess ability-validation goals persist and perform well under successful circumstances, they tend to perform poorly when faced with a difficult situation (Grant & Dweck, 2003). Because these students are preoccupied with presentational concerns and distracted by fears of incompetence, they may have difficulty maintaining intrinsic motivation.

We hypothesized that endorsing such ability-validation goals would mediate the proposed relationship between entity beliefs and losses to intrinsic motivation. Dweck's theoretical model has long proposed that goals are the mechanism through which intelligence beliefs shape behavioral outcomes (e.g., Dweck, 1999; Dweck & Leggett, 1988) and subsequent empirical work using a variety of achievement-related outcome variables supports this mediational model (Corrion, D'Arripe-Longueville, Chalabaev, Schiano-Lomoriello, Roussel & Cury, 2010; Cury et al., 2006; Howell & Buro, 2009; Roedel & Schraw, 1995; Stevenson & Lochbaum, 2008; Stipek & Gralinski, 1996; Wang & Biddle, 2003).[3] In particular, entity theories tend to produce goals focused on gaining positive judgments or avoiding negative judgments of competence, often referred to as *performance goals*. Nearly all of the mediational work to date, however, defines such performance goals in normative terms (i.e., focused on demonstrating one's ability relative to other students) — a practice that may lack external validity and have questionable predictive value (Brophy, 2005). Building from a recent tradition that differentiates various forms of performance goals (e.g., Grant & Dweck, 2003; Hulleman, Schrager, Bodmann & Harackiewicz, 2010), we chose to focus on ability-validation goals because they arguably reflect the original meaning of Dweck and Leggett's (1988) mediational model more precisely than normative performance goals (see Grant & Dweck, 2003) yet have been largely ignored in research on goal mediation.

In the present study we expected that decliners would endorse ability-validation goals to a greater extent than maintainers, and that such goals would fully mediate the anticipated effect of entity theories discussed above. Finally, we expected that decliners would be less academically successful than maintainers given the previously documented relationship between academic achievement and both theories of intelligence (Blackwell et al., 2007) and intrinsic motivation (e.g., Gottfried, 1985; Lepper et al., 2005).

2. Method

2.1. Participants and procedure

Data for this study were collected in 2005–2006 as part of a larger longitudinal project examining contextual and academic correlates of intrinsic and extrinsic motivations (see Corpus et al., 2009; Hayenga & Corpus, 2010). Participants were 978 3rd- through 8th-grade students (54% female; 14% to 17% of students at each grade) drawn from 83 classrooms in eight schools (five public, three parochial) in Portland, Oregon. While the private schools were located in largely middle-class neighborhoods, the public schools were more socioeconomically diverse, with between 21% and 74% of students eligible for free or reduced price lunch. Most participants self-identified as Caucasian (79%) with smaller but sizable percentages also identifying as Hispanic (11%) and Asian (12%). In the fall (i.e., October or November), students completed a survey that assessed their intrinsic motivation, beliefs about the malleability of intelligence, and ability-validation goals as well as other measures unrelated to the present study. In the spring (i.e., April or May), they once again completed a survey that assessed their intrinsic motivation.

[3] Dweck's original model also proposed that perceived competence may moderate the relationship between achievement goals and motivational outcomes after individuals encounter challenges or failure. In the present study, we chose to focus only on implicit theories and achievement goals because they are the more central aspects of the theory (see Dweck, Chiu & Hong, 1995b). Although perceived competence may indeed play a role in predicting intrinsic motivation (e.g., Deci & Ryan, 1985; Marsh et al., 2005; White, 1959), this aspect of Dweck's model is less important in answering our question of how implicit beliefs affect motivation over time, given that most children will experience some sort of challenge or setback that affects their perceived competence during the course of a school year.

Table 1
Correlations and descriptive statistics.

	1.	2.	3.	4.	5.	6.	7.	8.
1. Grade level	–	−.25**	−.29**	−.02	−.18**	−.20**	.03	−.14**
2. Fall intrinsic motivation		–	.66**	−.37**	−.01	.20**	.17**	.19**
3. Spring intrinsic motivation			–	.39**	−.02	−.13**	.17**	.24**
4. Decliner vs. maintainer status[a]				–	−.07	−.15**	.08*	.14**
5. Fall entity theory					–	.24**	−.21**	−.16**
6. Fall ability-validation Goals						–	−.17**	−.13**
7. Fall GPA							–	.79**
8. Spring GPA								–
Mean	–	3.44	3.33	–	3.14	2.81	3.00	3.05
SD	–	.74	.74	–	1.35	1.37	.83	.90

Note: GPA = Grade Point Average, *SD* = Standard Deviation. Intrinsic motivation and ability-validation goals measured on a 5-point scale. Entity theory measured on a 6-point scale. Grade point average measured on a 4-point scale.
[a] Decliners were coded as 0; Maintainers were coded as 1.
* $p<.05$.
** $p<.01$.

2.2. Measures

Students responded to all items using five-point Likert-type scales, except for entity theory, which was assessed on a six-point scale.

2.2.1. Intrinsic motivation

We used the intrinsic motivation scale from Lepper et al. (2005), which included 17 items focusing on the dimensions of challenge-seeking (e.g., "I like hard work because it's a challenge"), independent mastery (e.g., "I like to do my schoolwork without help"), and curiosity-driven engagement (e.g., "I ask questions in class because I want to learn new things;" fall $\alpha = .90$; spring $\alpha = .90$).

2.2.2. Entity theory

For 6th- through 8th-grade students, entity theory was measured using the standard three-item measure from Dweck (1999) (e.g., "Your intelligence is something about you that you can't change very much"; $\alpha = .86$). For 3rd- through 5th-grade students, we used Cain and Dweck's (1995) adaptation of the standard measure, which substitutes the term "smart" for "intelligent" (e.g., "How smart you are is something about you that you can't change very much"; $\alpha = .83$).

Table 2
Hierarchical logistic regression predicting decliner versus maintainer status.

Predictor variables	Decliner versus maintainer status[a]				
	B	*SE B*	Wald χ^2	df	Odds ratio
Step 1					
Fall intrinsic motivation	−1.18***	.13	84.51	1	.31
Grade level	−.17**	.06	9.24	1	.84
Step 2					
Fall entity theory	−.12*	.06	3.98	1	.88

Note: N = 705. A third step was initially included to test a grade level × entity theory interaction; it was not significant and therefore was dropped from the final model.
[a] Decliners were coded as 0; Maintainers were coded as 1. (Decliners: $\Delta IM \geq .37$; Maintainers: $\Delta IM \leq 0$)
* $p<.05$.
** $p<.01$.
*** $p<.001$.

2.2.3. Ability-validation goals

Ability-validation goals were measured using two items inspired by Grant and Dweck's (2003) ability-validation goal items (e.g., "I need to do well in school to know that I'm smart; I want to do a good job in school so that I can know for sure that I'm smart"; $\alpha = .88$). A portion of participants in this sample ($n = 176$) completed an alternate version of the survey that did not include these items.

2.2.4. Academic achievement

Academic achievement was measured by report card grades collected in both the fall and spring from all but a relatively small portion of participants ($n = 81$) whose parents did not grant access to school records. Students' grades were transformed to a standard four-point numerical scale and grade point averages (GPAs) were then computed by averaging scores for language arts, math, social studies, and science.

3. Results

Because preliminary analyses of variance (ANOVAs) revealed no gender differences for any of the outcome variables, gender was excluded from further analyses, all $Fs < 2.5$, *ns*. Descriptive statistics and correlations among variables are displayed in Table 1.

3.1. Creating groups

The difference between fall and spring levels of intrinsic motivation was used to form two groups of students: *decliners* and *maintainers*. Decliners ($n = 277$) were those students who lost more than one-half of the sample standard deviation of fall intrinsic motivation (raw score $\Delta \geq .37$). Maintainers ($n = 428$) were those students who stayed at a constant level or reported increases in intrinsic motivation from fall to spring (raw score $\Delta \leq 0$). Those students who did not fit in either group ($n = 273$) were dropped from subsequent analyses (final $n = 705$). While these groups were somewhat arbitrarily defined and a sizable portion of the sample had to be sacrificed, we selected this approach in order to create distinct groups that represented conceptually clear cases of motivational decline and motivational maintenance.[4]

3.2. Predicting motivational change

As shown in Table 2, a hierarchical logistic regression revealed that entity theory was a significant predictor of decliner versus maintainer status ($\beta = -.12$, $p<.05$), even after controlling for students' grade level ($\beta = -.17$, $p<.005$) and initial level of intrinsic motivation ($\beta = -1.18$, $p<.001$). Decliners ($M = 3.31$, $SD = 1.44$) endorsed an entity theory to a greater extent than did maintainers ($M = 3.09$, $SD = 1.33$), as shown in Fig. 1.[5] A third step in the regression was initially included to test if grade level interacted with entity theory; it was not significant ($\beta = -.01$, *ns*) and therefore was dropped from the final model.

[4] Analyses conducted with the excluded group of participants ($n = 273$) revealed a pattern of results similar to that reported below. A series of one way ANCOVAs controlling for grade level and fall intrinsic motivation confirmed that the three groups differed significantly in their endorsement of both entity theory, $F(2, 978) = 3.99$, $p<.05$, $\eta^2 = .01$, and ability-validation goals, $F(2, 802) = 3.95$, $p<.05$, $\eta^2 = .01$. Post-hoc comparisons indicated that decliners endorsed entity theory and ability-validation goals to a greater extent than did maintainers, and the ambiguous middle group fell in between but did not differ significantly from maintainers.

[5] Repeating this analysis using change in motivation as a continuous index rather than a dichotomous classification showed a parallel albeit weaker set of findings. A hierarchical linear regression with all participants ($N = 978$), controlling for grade and initial level of intrinsic motivation, indicated a marginally significant effect of entity theory on motivational change as indexed by difference scores, ($\beta = -.05$, $p<.10$).

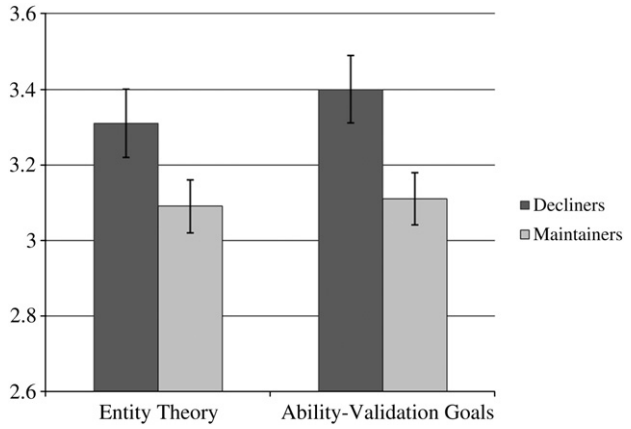

Fig. 1. Levels of entity theory and ability-validation goals endorsed in the fall by decliners and maintainers.

3.3. Mediation analysis

To assess if endorsement of ability-validation goals mediated the relationship between entity theory and decliner versus maintainer status, a simple mediation analysis was conducted, as shown in Fig. 2. In line with the requirements of a full mediation (Baron & Kenny, 1986), entity beliefs predicted both decliner versus maintainer status ($\beta = -.12$, $p < .05$) and ability-validation goals ($\beta = .21$, $p < .001$). Ability-validation goals were also significantly related to decliner versus maintainer status ($\beta = -.24$, $p < .005$). Finally, after controlling for students' endorsement of ability-validation goals, the direct effect of entity beliefs on decliner versus maintainer status was no longer significant ($\beta = -.08$, *ns.*), indicating a full mediation. Sobel's (1982) test verified that this reduction was significant, $Z = -2.74$, $p < .01$, and a bootstrapping model (Preacher & Hayes, 2004) further confirmed this effect (95% confidence interval of −.09 to −.02).

3.4. Academic achievement

Finally, in order to examine the relationship between decliner versus maintainer status and achievement, we conducted a one way analysis of covariance (ANCOVA) with change status as the predictor variable and spring GPA as the outcome variable, controlling for fall intrinsic motivation and fall GPA. As expected, decliners ($M = 2.93$, $SD = .94$) were significantly less academically successful than maintainers ($M = 3.16$, $SD = .83$), $F(1, 645) = 20.91$, $p < .001$, $\eta_p^2 = .03$. The same pattern of results was found when not controlling for initial level of intrinsic motivation, $F(1, 645) = 10.43$, $p < .001$, $\eta_p^2 = .02$.

4. Discussion

The present study begins to address an essential question for both researchers and practitioners: What differentiates those who lose intrinsic motivation from those who are able to maintain it? It appears that two key factors are children's beliefs about the malleability of intelligence and their tendency seek personal validation through schoolwork. Indeed, students who experienced motivational declines were more likely to have previously endorsed an entity theory of intelligence and approached their schoolwork as a means for validating their ability than were those who maintained levels of intrinsic motivation over the course of a school year. These findings are in line with previous literature demonstrating that the beliefs students hold about intelligence affect their classroom motivation (Cury et al., 2006; Dweck, 1999; Stipek & Gralinski, 1996) but go one step beyond by documenting such beliefs as sources of longer-term trajectories of intrinsic motivation. This approach, of course, required the identification of distinct groups of students representing different patterns of change, which is an important complement to the dominant approach of averaging levels of intrinsic motivation across grade levels within a sample (e.g., Corpus et al., 2009; Gottfried et al., 2001; Harter, 1981; Lepper et al., 2005; Otis et al., 2005).

In addition to identifying a link between entity beliefs and a loss to intrinsic motivation, this study tested the central components of Dweck's original model by documenting the mediating role of ability-validation goals. Most studies have neglected the study of ability-validation goals in favor of examining mastery and performance goal orientations as mediators of the relationship between entity theory and academic outcomes (Corrion, D'Arripe-Longueville, Chalabaev, Schiano-Lomoriello, Roussel & Cury, 2010; Howell & Buro, 2009; Roedel & Schraw, 1995; Stevenson & Lochbaum, 2008; Stipek & Gralinski, 1996). Yet ability-validation goals are conceptually similar to Dweck's original model of achievement goals and may hold unique predictive value (see Dweck & Elliott, 1983; Grant & Dweck, 2003). Future research should move beyond an examination of normatively defined performance goals to include the study of ability-validation goals more widely in research on motivational processes.

An additional contribution of the present study comes from the inclusion of students from middle childhood through early adolescence. Researchers have posited that the detrimental effects of an entity theory on motivation may not manifest until early adolescence (Blackwell et al., 2007; Dweck, 2002; but see Cain & Dweck, 1995). Contrary to these claims, the present study found no interaction between grade level and entity beliefs in predicting motivational change. Indeed, an entity theory of intelligence predicted decliner versus maintainer status for elementary and middle school participants alike, suggesting that students as young as third grade are susceptible to the maladaptive effects of endorsing entity beliefs. Given that theories of intelligence become more crystallized as children age (see Dweck, 2002; Pomerantz & Ruble, 1997), future interventions might benefit from addressing development of these beliefs in even younger students.

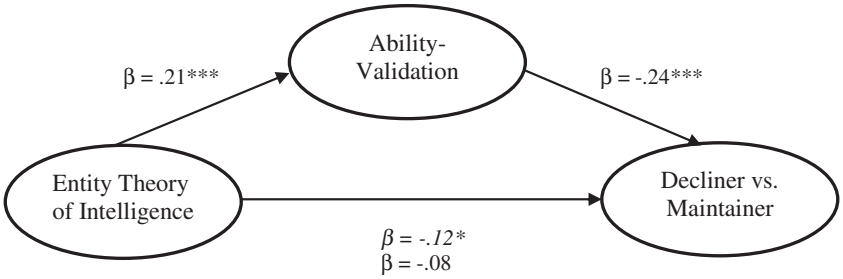

Fig. 2. Test for mediation of fall entity theory on students' status as a decliner or maintainer by endorsement of fall ability-validation goals.

Such intervention efforts might target these individual differences in conjunction with contextual factors; while changing an entire classroom or school structure may be very difficult, relatively brief and simple psychological interventions to affect personal mindsets may have long lasting effects on student achievement (e.g., Blackwell et al., 2007; Good, Aronson & Inzlicht, 2003; Yeager & Walton, 2011). A focus on decreasing endorsement of ability-validation goals, found to play an important role in mediating the relationship between intelligence beliefs and motivation, also merits attention by both researchers and educators. Conducting experimental interventions that incorporate both theories of intelligence and ability-validation goals could not only have meaningful practical benefits, but also extend findings from the present study by testing for causal links.

While intervention efforts are an important future step, it may be more immediately useful to identify the meaningful outcomes associated with different motivational trajectories. The present study showed significant differences in student achievement such that decliners received lower grades than did maintainers, regardless of their initial level of achievement or motivation. This pattern of results raises the interesting question of whether students would be better off maintaining a modest level of intrinsic motivation across the school year or beginning the year with high intrinsic motivation and subsequently losing that motivation. Future longitudinal research should pay particular attention to the interaction of absolute levels of motivation and subsequent patterns of change over time. Similarly, while this study addressed the important question of what differentiates students who decline in motivation versus those who do not, others might expand on this issue to examine how beliefs and goals relate to the degree of change in motivation.

There are several limitations to the current study that merit discussion. Because the results presented here are correlational, they cannot speak to causality. Experimental efforts manipulating theories of intelligence and goals could better address the causal relationship between endorsing entity theory or ability-validation goals and maintaining or losing intrinsic motivation. We also focused solely on ability-validation goals, while most research in this vein has examined the more traditional conceptualizations of performance goals as the desire to outperform others or to avoid being outperformed by others. Future research could include mastery goals and normative performance goals in conjunction with ability-validation goals to more fully explore the relationship between theories of intelligence and intrinsic motivation (Grant & Dweck, 2003; Hulleman, Schrager, Bodmann & Harackiewicz, 2010; but see Brophy, 2005). Despite these limitations, the present study holds an important and hopeful message: encouraging a malleable mindset may help to sustain children's intrinsic motivation, thereby enhancing both academic success and life-long learning.

Acknowledgments

Funding for this research was provided by a grant from the Spencer Foundation to the third author. We thank the team of undergraduate research assistants who helped to collect the data, the students who participated in this research, Kris Anderson for statistical guidance, and Amynta Hayenga for her work on an earlier version of this project which was presented at the 2009 meeting of the Society for Research in Child Development.

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