

The Situational Adaptiveness of Implicit Theories of Intelligence and Achievement Goal

Orientations

by

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Date: July 30, 2009

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
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ABSTRACT

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Abstract

Previous research has largely highlighted the maladaptive consequences of holding an entity theory of intelligence and the adaptive consequences of holding an incremental theory (for reviews, see Dweck, 1999; Dweck & Leggett, 1988). This research, however, has largely ignored the role of the achievement context and how it may conflict with the goals that naturally arise from implicit theories of intelligence. The present research demonstrates that the adaptiveness of theories of intelligence may depend on the demands of the situation. Across two studies, the most adaptive motivation, affect, and use of self-regulatory resources was observed when entity theorists pursued performance goals and when incremental theorists pursued learning goals (*fit*). Conversely, maladaptive outcomes were observed when entity theorists pursued learning goals and when incremental theorists pursued performance goals (*nonfit*). For several achievement-related outcomes, however, this pattern of results was moderated by perceived competence, suggesting that fit may be most adaptive when confidence in abilities is high, and nonfit may be most adaptive when it is low. Implications for achievement motivation and goal pursuit are discussed.

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1. Introduction

Schemas play essential roles in human functioning. They are cognitive structures that contain information about events, concepts, other people, and the self, that help to organize and direct the processing of information about the world (Bartlett, 1932; Dunning & Hayes, 1996; Markus, 1977). In the absence of sufficient information, schemas function to fill in the blanks. Although they are highly adaptive, they are not failsafe. In part, they operate based on assumptions, which may or may not be correct. Consequently, they can be inappropriately applied to situations, resulting in deleterious outcomes. The present research takes a person-by-situation perspective in examining the self-schemas, or implicit self-theories, people hold regarding the nature of intelligence and the consequences of their situationally appropriate and inappropriate uses.

Research has found that individuals differ with respect to their beliefs regarding the malleability of intelligence. *Entity theorists* believe intelligence is limited and fixed, whereas *incremental theorists* believe it can be improved (Dweck, 1999; Dweck & Leggett, 1988). These beliefs create meaning systems that shape the way individuals construe their world (Ames, 1981; Dweck, 1999; Molden & Dweck, 2006). They result in differential expectations regarding the acquisition of competencies and the adoption of different goals. Believing that abilities are fixed, entity theorists do not expect their efforts to yield significant improvements. Consequently, they adopt *performance goals*, which focus on demonstrating their abilities when positive judgments are expected and

avoiding situations that may expose their incompetence. Incremental theorists, however, believe that effort fosters competence. Consequently, they adopt *learning goals*, which focus on learning and improvement (Dweck, 1999; Dweck & Leggett, 1988).

Our everyday pursuits, however, do not always permit us to pursue goals in the manner we prefer. Indeed, incremental theorists may find themselves in situations for which learning goals are not possible, and entity theorists may find themselves in situations best served by learning goals. Consider an assistant professor working toward tenure. He or she will likely be concerned with making a good impression on senior faculty members and will also be eager to demonstrate his or her intellectual abilities. Despite holding an incremental theory, the assistant professor may find it necessary to frequently engage in these performance goals. Conversely, the success of a researcher is largely contingent on his or her ability to be innovative. Innovation requires a desire for learning and improvement, and self-referential standards of success. An assistant professor endorsing an entity theory may find him- or herself at odds with these learning goals.

The purpose of this dissertation is to extend previous work on implicit theories of intelligence and achievement goals by examining the consequences of *theory of intelligence fit* (ToI fit). I define ToI fit as the degree of congruence between the endorsed implicit theory of intelligence and the achievement goal being pursued in a particular context. *Fit* refers to the engagement in an achievement goal that naturally arises from

the endorsed theory of intelligence (i.e., entity theorists pursuing a performance goal, and incremental theorists pursuing a learning goal), and *nonfit* results from engaging in an achievement goal that naturally arises from the theory of intelligence not endorsed (i.e., entity theorists pursuing a learning goal, and incremental theorists pursuing a performance goal).

The present research examines the motivational, affective, and self-regulatory consequences of ToI fit. The studies were designed to illuminate the situations that optimize motivation, affect, and self-regulatory resources for different people. In contrast to past research that has highlighted the general benefits of endorsing an incremental theory and the deleterious outcomes associated with holding an entity theory, the present research addresses the strengths and weaknesses of each implicit theory of intelligence for coping with different situations. This research has implications for optimizing motivation, affect, and self-regulation in educational, business, sports, and health settings.

2. Theoretical Background

2.1 Beliefs about Intelligence

Dweck and her colleagues (Dweck, 1999; Dweck & Leggett, 1988) have identified two major self-theories people tend to hold regarding the nature of intelligence. Within an entity theory, intelligence is perceived to be unchanging and cannot be improved much. Individuals with this theory endorse statements such as “You have a certain amount of intelligence and there is nothing you can do about it.” In contrast, those with an incremental theory believe in the plasticity of intelligence and believe that effort fosters competence. These individuals endorse statements such as “No matter who you are, you can significantly change your intelligence level.” These beliefs can vary from domain to domain (Dweck, Chiu, & Hong, 1995), and each has distinct consequences including how competence is construed, the goals that are adopted, and the attributions made for success and failure. These differences result in disparities in motivation, achievement, and emotional well-being (Dweck, 1999; Dweck & Leggett, 1988).

At the core of the entity-incremental distinction is the belief in the potential to change (Dweck, 1999). Indeed, incremental theorists embrace this notion, whereas entity theorists generally do not. Consequently, incremental theorists tend to demonstrate relatively more adaptive patterns of goal pursuit, including higher levels of persistence and achievement, as well as better strategies for coping with negative events (Henderson & Dweck, 1990; Sorich & Dweck, 1999). For example, academic settings are

often highly evaluative and can elicit different responses from entity and incremental theorists. When receiving a low grade, entity theorists may perceive that it reflects on their intelligence, and because they believe their intelligence to be fixed, there is no use in studying harder for the next exam. For incremental theorists, the low grade may simply indicate that they did not study enough or used the wrong studying strategies, and they will thus commit more time and effort in preparing for the next exam.

2.2 Endogenous Determinates of Achievement Goals

Due to their distinctly different beliefs about the nature of intelligence and the potential to change, entity and incremental theorists value and pursue very different achievement goals. Believing that their intelligence is fixed, entity theorists are motivated to pursue achievement goals that allow them to demonstrate their abilities when positive judgments are expected and to avoid demonstrating incompetence when they are not (Dweck & Leggett, 1988). They are motivated to either self-protect or to validate their competence (Y.-y. Hong, Chiu, Dweck, Lin, & Wan, 1999; Nussbaum & Dweck, 2008). Consequently, entity theorists are chiefly concerned with how they perform compared to others (Butler, 2000a, 2000b). In comparison, incremental theorists tend to pursue goals that allow them to develop competencies due to their belief that intelligence is malleable, and they seek challenges that foster this goal (Dweck & Leggett, 1988). Thus, entity theorists tend to adopt performance goals, and incremental theorists tend to adopt learning goals (Dweck, 1986, 1999; Dweck & Leggett, 1988).

Performance and learning goals also invoke different *goal orientations* (Dweck, 1986; Dweck & Leggett, 1988; Pintrich, 2000b), which refer to the mental frameworks people use to interpret and react to achievement situations (Dweck & Leggett, 1988; Pintrich, 2000a). Consequently, these goal orientations result in adaptive and maladaptive responses to setbacks (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 1999). A performance goal is largely focused on assessing ability. When individuals endorsing this goal perform poorly, they interpret their failure as an indictment of their intelligence, and they may be quick to give up. In other words, they may demonstrate a helpless response (Dweck, 1975, 1986; Dweck & Reppucci, 1973). A learning goal, on the other hand, is focused on the development and improvement of competencies. For individuals endorsing this goal, failure may not be interpreted as a reflection their intellect. Instead, it may mean that they have not yet discovered the appropriate strategies or expended sufficient effort. Therefore, they tend to exhibit a mastery-oriented response to failure (Dweck, 1986; Licht & Dweck, 1984). For these reasons, clear disparities have been found between incremental and entity theorists in how they persist on tasks and cope with failure.

The causal relation between achievement goals and responses to failure (i.e., learned helplessness and mastery-orientation), as well as the moderating role of perceived competence, has been empirically demonstrated in a study by Elliott and Dweck (1988). Before participants engaged in a pattern recognition task, the researcher

manipulated their goal. Half of the participants were told that their ability would be evaluated by how well they performed on the task (performance goal). The other half were told that the task would provide them with an opportunity to learn (learning goal). Furthermore, participants were induced to believe that their task-relevant ability was either high or low. After presenting them with several easy items, which ensured initial success, the researcher gave participants a few difficult problems in order to examine how each group coped with failure. When participants had adopted a performance goal and their perceived competence was low, they evinced a helpless pattern; that is, they attributed their mistakes to a lack of ability, experienced negative affect, and withdrew effort. When perceived competence was high, however, they evinced a mastery-orientated pattern with one exception. Similar to those with low perceived ability, they declined opportunities to learn when their mistakes would be made public. Finally, participants who adopted a learning goal demonstrated a mastery-orientation regardless of their perceived ability level. They strived to improve their skills, even when their mistakes would be public, and they used their failures as an opportunity to learn better strategies for solving the problems.

In a reformulation of the framework set forth by Dweck, Elliot and his colleagues (e.g., Elliot & Church, 1997) proposed that perceived competence, among other individual difference variables, was an antecedent to the adoption of achievement goals rather than a moderator of achievement goal outcomes. Specifically, Elliot and Church

(1997) demonstrated that learning goals are largely driven by high levels of achievement motivation and perceived competence. Distinguishing between *performance-approach goals* (goals focused on attaining normative competence) and *performance-avoidance goals* (goals focused on avoiding normative incompetence) (see Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001), different patterns of predictors emerged. Performance-approach goals were predicted by high achievement motivation, fear of failure, and perceived competence. In contrast, performance-avoidance goals were predicted by fear of failure and low perceived competence. Therefore, empirical evidence suggests that achievement goals and goal orientations arise from lay theories of intelligence, but they may also be influenced by several other achievement-related individual differences. It is also clear that perceived competence plays an important role in individuals' engagement and withdrawal from achievement situations.

2.3 Exogenous Determinates of Achievement Goals

Thus far, I have discussed how entity and incremental theories create different meaning systems, which influence the goals individuals adopt. In the real world, however, people cannot always choose what goals they pursue or the manner in which they pursue those goals. Some pursuits require performance goals and others require learning goals. For example, a performance goal may best serve professional track runners, as their success is defined in terms of how they perform compared to others. In contrast, an environmental scientist working to develop new technologies that minimize

carbon emissions would likely benefit most from endorsing a learning goal. In each case, the nature of the goal determines what achievement goal is most appropriate.

The *goal structure* of the context may also invoke particular goals (e.g., Ames, 1992b; Anderman, Maehr, & Midgley, 1999; Anderman & Midgley, 1997; Church, Elliot, & Gable, 2001; Linnenbrink, 2004; Maehr & Midgley, 1991; Urdan & Midgley, 2003), regardless of their efficacy. Goal structures refer to the routines, rules, tasks, and evaluation systems established by the achievement context that make particular achievement goals salient (Ames, 1992a, 1992b). For instance, educational settings should ideally promote learning goals, which facilitate the acquisition and development of academic competencies. In practice, however, this is often not the case. Educational settings can be highly evaluative and often define success in terms of normative standards such as grading curves. As such, they often promote performance goals. In turn, these classroom contexts can influence the particular goals adopted by those within it (Ames, 1992b; Church et al., 2001; Linnenbrink, 2004).

Demonstrating the influence of goal structures on situational goal adoption, Church, Elliot, and Gable (2001) found that when students perceive their courses to have an evaluative focus, they tend to adopt performance goals. Conversely, when students find the instructor's lectures engaging, and when they perceive an absence of an evaluative focus and harsh evaluation, they tend to adopt learning goals. Furthermore, students' perceptions of the goals promoted by the classroom were indirectly related to

achievement and intrinsic motivation. That is, the goals perceived to be supported by the instructor predicted goal adoption which, in turn, predicted achievement and intrinsic motivation. Indeed, perceptions of the achievement context are important predictors of goal adoption (Ames, 1992b; Church et al., 2001; Maehr & Anderman, 1993; Roeser, Midgley, & Urdan, 1996; Urdan, 2001, 2004; Urdan, Midgley, & Anderman, 1998).

Theories of intelligence, however, represent relatively stable thinking styles (Dweck et al., 1995; Robins & Pals, 2002), and as such, individuals apply these beliefs across myriad contexts. Given their relative inflexibility, these implicit theories may lead to different types of nonfit. First, perceptions of achievement contexts may be colored by one's endorsed theory of intelligence. Because the effectiveness of an achievement goal may vary from one achievement context to the next, theories of intelligence may lead to a preference to pursue situationally inappropriate achievement goals. In other words, although the goal pursued may arise naturally from the endorsed theory of intelligence, it may not be the optimal achievement goal for the particular situation. This type of nonfit could also be caused by subjective perceptions of the goal context that are influenced by the endorsed theory of intelligence. Second, achievement contexts may objectively promote particular goals and goal orientations. Some businesses, for example, implement incentives for salespeople who sell more products than their colleagues, thereby clearly promoting a performance goal structure. These objective goal

structures may conflict with the goals preferred by individuals based on their theory of intelligence.

This second type of nonfit is assessed in the present research. Pursuing goals with an incongruent implicit theory may create conflicts in behavioral responses and expectations, and may also focus attention on less important or irrelevant aspects of the pursuit. Furthermore, nonfitting motivational orientations may lead to frustration and disengagement in an achievement goal (Linnenbrink, 2004). Ultimately, these conflicts may lead to decreases in motivation, achievement, and positive affect (Higgins, 2000, 2005).

2.4 Considering the Consequences of Fit and Nonfit

Within the achievement motivation literature, fit has been conceptualized and examined in a number of ways, with the underlying assumption that goal pursuits are most adaptive when environments (or tasks) match the individuals' needs or goals (Eccles et al., 1993; Hunt, 1975). This research has focused on the fit between goals at various levels of analysis: target goals, achievement goal orientations, and achievement goal structures. For example, Harackiewicz and Elliot (1998) examined the interaction of target goals (i.e., task-specific goals with particular behavioral referents) and goal orientations. They assigned participants target goals for a pinball game (i.e., scoring a particular amount of points for the first game, and an increased number of points for the second) and framed its purpose as to either outperform others (performance goal

orientation) or to develop skills (learning goal orientation). They found that competence valuation and engagement in the game was optimized when the type of target goal fit with the goal's purpose. That is, the most beneficial outcomes were observed for individuals assigned a learning goal orientation and a learning target goal, and for those assigned a performance goal orientation and a performance target goal. Furthermore, competence valuation and task engagement suffered when the invoked goal orientation did not fit the target goal.

In another conceptualization of fit, Barron and Harackiewicz (2001, Study 1) examined fit between goal structures and situational goal orientations. They proposed that, because performance-approach and learning goals are both associated with unique beneficial outcomes (see also Elliot & Harackiewicz, 1994; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Harackiewicz & Elliot, 1993), an achievement context that emphasized both goals, rather than one or the other, would be most beneficial. Indeed, the multiple goal context allowed individuals to engage in the goal that was most situationally advantageous. In other words, individuals were able to situationally fit their goal orientation to the situational needs of the goal context.¹

¹It should be noted that the fit effects described above are not completely consistent in the literature. For example, Murayama and Elliot (2009) tested direct, indirect, and interactive models of personal achievement goals and goal structure. Although they found that personal performance-approach goals positively predicted academic self-concept and intrinsic motivation, particularly in classrooms with a strong performance goal structure, which is consistent with the notion of fit, they also found positive achievement outcomes related to nonfit. Intrinsic motivation was positively related to personal performance-approach goals in classrooms with weak, but not strong, learning goal structures. Other studies have also found

This previous research demonstrates the importance of fit when pursuing goals, particularly with regard to situational needs. That is, motivational orientations are often situational such that they can shift depending on the immediate needs of the individual and environmental affordances. Some motivational orientations, however, are less subject to situational influences; they are stable across situations. Indeed, Linnenbrink and Pintrich (2001) suggested that a fit (or match) between goal structures and the goal orientations individuals bring to the context may lead to the most beneficial outcomes. The present research attempts to extend prior work in this area by examining these more stable motivational orientations, particularly with reference to the goal orientations invoked by implicit theories of intelligence.

In an attempt to begin exploring fit and the role of stable motivational orientations, O'Keefe, Messersmith, and Linnenbrink-Garcia (in preparation) conducted a longitudinal study examining the interactive effects of stable achievement goal orientations (see Van Yperen, 2006) and classroom goal structures on several achievement outcomes. As predicted, classroom goal structure moderated the relation between stable goal orientations and domain-specific interest, career aspirations, and academic performance. Relative to classrooms with learning goal structures, ratings on

inconsistent findings regarding fit and nonfit, and have highlighted the complexity of this issue (e.g., see Lau & Nie, 2008; Linnenbrink, 2005).

each dependent variable were higher for performance-oriented students when in a class with a performance goal structure. Conversely, learning-oriented students' reports on each dependent variable were higher when in a class with a learning goal structure relative to classrooms with a performance goal structure. These results lend preliminary support to the notion that a fit between stable achievement goal orientations and achievement contexts may facilitate multiple beneficial outcomes, whereas nonfit may disrupt them.

Research in self-regulation also supports the notion that goals are best pursued when they fit one's own stable motivational orientation (Higgins, 2000). According to regulatory focus theory (Higgins, 1997), goals can be pursued with two different motivational orientations. A promotion focus is primarily concerned with ideals and achievement, and a prevention focus is primarily concerned with safety, obligations, and the avoidance of losses. For example, a health goal may be construed as either attaining a high level of well-being (promotion focus) or preventing future heart failure (prevention focus). In research conducted by Cesario, Grant, and Higgins (2004), participants who pursued a goal that was framed to match their chronic regulatory focus evinced stronger engagement in the goal and felt better about its outcome than those who pursued goals that were at odds with their chronic focus. Subsequent research has also suggested that regulatory fit increases motivation during goal pursuit (Forster, Higgins, & Idson, 1998; Shah, Higgins, & Friedman, 1998).

Regulatory fit has also been demonstrated to influence the value and experience of goal engagement. In a series of studies, Freitas and Higgins (2002) had participants anticipate goal engagement or actually take part in an experimental task, for which the strategies for goal attainment were framed as either promotion- or prevention-focused. When the regulatory focus of the task fit that of the participants, they reported higher levels of anticipated or actual enjoyment of the task than those in nonfit conditions. Regulatory fit made participants 'feel right' about the pursuit, which, in turn, made them feel good about it. Subsequent research has also shown that regulatory fit intensifies positive and negative feelings (Idson, Liberman, & Higgins, 2004). Thus, the congruence of motivational orientations can influence task valuation and affect.

Furthermore, research in this area has also examined the effects of fit and nonfit on self-regulatory depletion. Baumeister and his colleagues (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven & Baumeister, 2000) have proposed that the exertion of self-control—which is often done when pursuing challenging goals—draws from a finite pool of self-regulatory resources that, when depleted, temporarily impairs subsequent efforts to effectively exert self-control. Extending this work, Hong and Lee (2008) found that regulatory fit restored self-regulatory resources, whereas regulatory nonfit depleted them. Perhaps most surprisingly, participants in the regulatory fit conditions experienced increases in self-regulatory strength even when they had previously been experimentally depleted. Their research suggests not only that self-regulatory resources

are used most effectively when motivational orientations are congruent but also that fit may also increase those resources.

Very little research, however, has examined ToI fit in relation to achievement-related outcomes, which is the focus of the present research. Plaks and Stecher (2007) conducted a preliminary investigation of fit between theories of intelligence and performance feedback from a prediction confidence perspective. That is, entity and incremental theorists have different expectations regarding their performance trajectories over multiple trials, which may or may not indicate improvement. Their research suggested that when feedback indicates improvement, both entity and incremental theorists exhibit positive affect, but entity theorists—due to their belief in unchanging ability—are more anxious and expend greater effort to restore confidence in their performance prediction. When feedback indicated a decline in performance, entity theorists were, again, more anxious, and engaged in more compensatory effort. When feedback indicated unchanging performance, however, incremental theorists exhibited relatively more anxiety and engaged in more compensatory efforts. Thus, people appear to experience anxiety and increased compensatory effort when feedback violates their implicit theory of intelligence.

3. The Present Research

Previous research has largely focused on the downstream consequences that result from endorsing one theory of intelligence or the other. Although theories of intelligence influence the adoption of particular achievement goals (Dweck, 1999; Dweck & Leggett, 1988), those goals may or may not be appropriate for the pursuit at hand; that is, the required or optimal theory of intelligence may or may not compliment the requirements of a particular task or situation. The purpose of the present research is to extend prior work by examining the consequences of theories of intelligence when they are congruent vs. incongruent with the achievement goal context. Although research has primarily illuminated the benefits of an incremental theory (see Dweck, 1999), the proposed studies are intended to shed considerable light on the situational adaptiveness of each implicit theory, resulting in a better understanding of their utility across different domains.

Across two studies, participants' theories of intelligence were either measured or manipulated. They also engaged in tasks for which the achievement context was manipulated, thereby invoking either a performance or learning goal orientation. This design allowed for the examination of the consequences of entity and incremental theories of intelligence when they fit the achievement context and when they do not (see Figure 1 for a graphical depiction of the general design). Within this framework, I

assessed motivation, changes in affect, and task value. Additionally, self-regulatory depletion was examined after the main experimental task in Study 2.

		Theory of Intelligence	
		Entity	Incremental
Achievement Goal Orientation	Performance	Fit	Nonfit
	Learning	Nonfit	Fit

Figure 1. A visual representation of theory of intelligence fit and nonfit.

In general, it was expected that the invoked goal orientation would moderate the relation between theories of intelligence and achievement-related outcomes. Conditions of fit should result in more adaptive goal pursuit as compared to conditions of nonfit, demonstrated by relatively higher levels of motivation, positive affect, task value, and self-regulatory resources. First, based on research examining the consequences of fit between motivational orientations (Barron & Harackiewicz, 2001; Forster et al., 1998; Harackiewicz & Elliot, 1998; Shah et al., 1998), it was predicted that motivation—as measured by task performance and persistence—should be relatively stronger when theories of intelligence are congruent with the goal orientations invoked by the context,

as compared to when they are not. It was also expected that task value would be relatively higher in conditions of fit. This prediction was based on research suggesting that value is bolstered when motivational orientations are congruent with the goals of a task (Freitas & Higgins, 2002). Other work suggests that, under conditions of fit, positive feelings can intensify (Idson et al., 2004), and people evaluate their experience of goal pursuit more positively (Freitas & Higgins, 2002). Thus, fit should result in relatively higher levels of positive affect than conditions of nonfit. Finally, congruent motivational orientations have been demonstrated to restore, and even increase, self-regulatory resources (J. Hong & Lee, 2008). Therefore, it was expected that fit would lead to relatively less self-regulatory depletion than nonfit conditions. Table 1 summarizes these predicted outcomes.

Table 1. Shows the predicted effects of ToI fit on each dependent variable.

Condition	ToI Fit	Motivation (performance and persistence)	Post-Task Affect	Task Value	Self-Regulatory Resources
Entity Theory/ Performance Goal Orientation	Fit	High	Positive	High	Minimal or no depletion
Incremental Theory/ Performance Goal Orientation	Nonfit	Low	Negative	Low	Significant Depletion
Incremental Theory/ Learning Goal Orientation	Fit	High	Positive	High	Minimal or no depletion
Entity Theory/ Learning Goal Orientation	Nonfit	Low	Negative	Low	Significant Depletion

An alternative to this pattern of predictions was proposed by Linnenbrink and Pintrich (2001). From the perspective that learning goals are adaptive and performance goals are largely maladaptive (for a review, see Midgley, Kaplan, & Middleton, 2001), the most beneficial motivational outcomes should be observed when learning-oriented individuals engage in a context with a learning goal structure. Conversely, individuals endorsing a performance goal orientation would evince the worst outcomes when engaging in a context with a performance goal structure. They proposed, however, that personal learning goal orientations and learning goal structures may “buffer” against the negative effects of engaging in performance goal contexts or endorsing a performance goal orientation, respectively. The present research, though, assumed that the stable meaning systems created by theories of intelligence would not result in this buffering pattern. Believing that they cannot improve their abilities, entity theorists would not be expected to benefit from an opportunity to learn and improve. Similarly, incremental theorists are concerned with competency development, so they would not be expected to benefit from the opportunity to merely demonstrate their abilities. As such, the most adaptive outcomes should be observed when individuals are permitted to pursue goals in the manner that is congruent with their theory of intelligence.

4. Study 1

The purpose of this study was to conduct an initial test of ToI fit. Theories of intelligence were induced, and participants engaged in a task that invoked either a performance or learning goal orientation. The 2 (theories of intelligence: entity vs. incremental) \times 2 (achievement goal orientation: performance vs. learning) design created conditions of fit and nonfit for participants. Performance, persistence, task value, and changes in affect were assessed as a function of ToI fit.

4.1 Method

4.1.1 Participants

Ninety-seven (62 females) Duke University undergraduate and graduate students were recruited via an online participant pool. In return for their participation, they were remunerated \$6 for the 30 minute experimental session. Eight participants did not complete the theory of intelligence induction, and six others did not properly follow directions for the main experimental task. Consequently, they were excluded from all analyses. The remaining sample of 83 participants (58 females) ranged in age from 18 to 33 ($M = 20.61$, $SD = 2.16$). It was also ethnically diverse, comprising Caucasians (59.0%), Asians (19.3%), African-Americans (10.8%), and Latinos (3.6%). Several of the participants had also reported that they were of mixed ethnicity (7.2%) or preferred to not report their ethnicity (3.6%).

4.1.2 Measures

Remote Associates Test. The Remote Associates Test (RAT) (Mednick, 1962) was employed as the main experimental task. The task requires participants to provide a single word that links three others. For example, the word *party* is the common link among SURPRISE-LINE-BIRTHDAY (i.e., surprise party, party line, and birthday party). Participants completed three practice items and then twelve experimental items. Each grouping of three words was presented one-at-a-time and participants provided their response in a text box. They were permitted to work on each problem for as long as they wished and could advance to the next problem at anytime.

Affect. Current affect was assessed immediately before and after the main experimental task using the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988). On a 5-point Likert-type scale anchored at 1 (*very slightly or not at all*) and 5 (*extremely*), participants were asked to report the degree to which they were currently experiencing 10 positively valenced emotions (e.g., inspired, proud) and 10 negatively valenced emotions (e.g., afraid, distressed). Thus, separate scales for positive and negative affect were created by summing ratings of the appropriate items, both having a possible range of 10 to 50. The PANAS was chosen because of its high degree of internal and external (convergent and discriminant) validity, and because of its stability over multiple durations of time, including reports at a particular moment, which was

done in the present study. One additional item assessed current overall mood on an 11-point scale anchored at -5 (*very negative*) and +5 (*very positive*).

Perceived competence. Perceived competence on the RAT ($M = 3.97$, $SD = 1.09$) was assessed by asking participants “How well do you think you will perform on the task?” They responded on a 7-point scale anchored at 1 (*very poorly*) to 7 (*very well*).

Value. A single item assessed participants’ value for the main experimental task. On a 7-point scale anchored at 1 (*Not at all effectively*) and 7 (*Very effectively*), participants responded to an item that read “How valuable was the associative reasoning test?” which was similarly anchored at 1 (*Not at all valuable*) and 7 (*Very valuable*).

Implicit theories of intelligence manipulation check. Participants were assessed for their entity and incremental theories of intelligence using Dweck’s (1999) 8-item theories of intelligence scale at the end of the study. Participants responded to questions such as “No matter how much intelligence you have, you can always change it quite a bit,” (incremental item) and “You have a certain amount of intelligence, and you cannot really do much to change it,” (entity item) on a 6-point scale anchored at 1 (*strongly agree*) and 6 (*strongly disagree*). After reverse scoring, lower scores corresponded to incremental beliefs, whereas higher scores corresponded to entity beliefs. Thus, the theories of intelligence scale was employed as a continuous variable ($M = 3.33$, $SD = 1.02$).

Achievement goal orientation manipulation check. On a 7-point scale anchored at 1 (*very little or not at all*) and 7 (*extremely*), participants reported the extent to which they adopted learning and performance goals for the main experimental task. In particular, they were asked “While working on the puzzles earlier, to what extent was it your goal to DEMONSTRATE your associative reasoning abilities?” and “While working on the puzzles earlier, to what extent was it your goal to IMPROVE your associative reasoning abilities?”

Demographics. Participants provided their age, sex, year in school, major, grade point average (GPA), and ethnicity.

4.1.3 Procedure

After providing informed consent, participants were seated at a computer station. After their current affect was assessed, they were told that they would be working on several reading comprehension and associative reasoning problems taken from the Graduate Record Examination (GRE). This cover story was used in order to invoke an achievement context relevant to implicit theories of intelligence, a cover story that has been successfully implemented in previous research (e.g., Niiya, Crocker, & Bartmess, 2004). The first part, which was framed as the reading comprehension section, was, in fact, designed to induce theories of intelligence. Participants read an ostensibly true research article that either espoused an entity or incremental theory. The text for the entity theory condition portrayed intelligence as hereditary and unchanging throughout

the lifespan. Those in the incremental theory condition read text portraying intelligence as something influenced more by environmental factors that can be significantly improved. Similar inductions of theories of intelligence have been successfully used in previous research (e.g., McConnell, 2001; Niiya et al., 2004; Plaks, Stroessner, Dweck, & Sherman, 2001). After reading the article, participants were asked to write a summary of its main points under the guise of assessing their reading comprehension, but this task served as a manipulation check for the induction. (Because prior research largely shows benefits for incremental beliefs, as compared to entity beliefs (see Dweck, 1999), participants were thoroughly debriefed about the induction after the study. These debriefings emphasized the importance of effort over a focus on ability.)

Participants then engaged in the RAT (Mednick, 1962), which was presented as the “associative reasoning” section of the GRE. They were provided with instructions for the task and completed three practice items. Afterward, they were asked to rate their perceived competence for the task. Participants were then randomly assigned to one of two goal orientation conditions. In the performance goal orientation condition, participants were told that “Working on these problems will give you an opportunity to *demonstrate* your associative reasoning abilities.” Those in the learning goal orientation condition were told that “Working on these problems will give you an opportunity to *improve* your associative reasoning abilities.” Similar achievement goal manipulations have been used in prior research (e.g., Elliott & Dweck, 1988). After the goal orientation

induction, participants engaged in the twelve experimental trials of the RAT, which ranged from moderately difficult to difficult.¹

After completing the RAT, participants indicated how much they valued the task, and completed the manipulation check for goal orientation, post-task affect, and the theories of intelligence scale, in addition to providing demographic information. They were subsequently debriefed, given an opportunity to ask questions regarding their participation, and then excused. The entire experimental session lasted 30 minutes or less.

4.2 Results

Manipulation check. Two inductions occurred in the present study, the first of which attempted to manipulate theories of intelligence. An analysis of implicit theory condition and self-reports of entity and incremental theory endorsement, revealed that they were, indeed, significantly different, $t(81) = 3.93, p < .001$. Those who read an article in support of entity theory reported greater endorsement of an entity theory at the end of the study ($M = 3.75, SD = 0.96$), whereas those whose article supported an incremental theory reported greater endorsement of an incremental theory ($M = 2.94, SD = 0.93$).

The second manipulation was intended to lead participants to adopt either a performance or learning goal orientation. Participants in the performance goal condition

¹ RAT items were chosen based on normed data collected by Bowden and Jung-Beeman (2003). The twelve selected items were solvable for 34 to 42 percent of individuals who were allotted 15 seconds to solve each item. The three selected practice items were solvable for 80 to 92 percent of participants allotted 15 seconds to solve each item.

should have reported a stronger performance goal relative to a learning goal.

Conversely, those in the leaning goal condition should have reported a stronger learning goal relative to a performance goal. A mixed model ANOVA including achievement goal orientation condition and self-reports of goal preference assessed the efficacy of the manipulation, with repeated measures on the second factor. The analysis yielded a significant main effect for goal preference, $F(1, 81) = 20.049, p < .001, M_{\text{performance}} = 4.71, SD_{\text{performance}} = 1.48; M_{\text{learning}} = 3.81, SD_{\text{learning}} = 1.43$). The predicted interaction, however, was not obtained, $F(1, 81) < 1$, suggesting that the manipulation check did not detect relative differences in performance goal orientation ($M_{\text{performance}} = 4.82, SD_{\text{performance}} = 1.19; M_{\text{learning}} = 4.61, SD_{\text{learning}} = 1.70$) or learning goal orientation ($M_{\text{performance}} = 4.08, SD_{\text{performance}} = 1.40; M_{\text{learning}} = 3.57, SD_{\text{learning}} = 1.42$) as a function of the induction.

One possibility is that participants adopted a goal orientation that corresponded to their manipulated theory of intelligence. A mixed model ANOVA including theory of intelligence condition and self-reports of goal preference was run to assess this possibility, with repeated measures on the second factor. The analysis yielded a significant main effect for goal endorsement ($F(1, 81) = 20.505, p < .001, M_{\text{performance}} = 4.71, SD_{\text{performance}} = 1.48; M_{\text{learning}} = 3.81, SD_{\text{learning}} = 1.48$). It did not, however, yield a significant interaction ($F(1, 81) < 1$), suggesting that the manipulation check did not detect relative differences in performance goal orientation ($M_{\text{entity}} = 4.70, SD_{\text{entity}} = 1.57; M_{\text{incremental}} = 4.72,$

$SD_{\text{incremental}} = 1.40$) or learning goal orientation ($M_{\text{entity}} = 3.73$, $SD_{\text{entity}} = 1.52$; $M_{\text{incremental}} = 3.88$, $SD_{\text{incremental}} = 1.35$) as a function of the theory of intelligence induction.

Taken together, results suggest that the theory of intelligence induction worked, but the goal orientation induction may have been too subtle to be detected by the manipulation check. That said, there is no evidence to suggest that participants adopted goals as a function of their induced theory of intelligence.

Performance. For all analyses reported in this study, ToI fit was assessed using multiple regression analyses, with a particular interest in the interaction of theories of intelligence and achievement goal orientation. All continuous variables were standardized, and all interaction terms were calculated using the standardized continuous variables.

Performance on the RAT was quantified by summing the number of correct responses across the 12 experimental items ($M = 6.02$, $SD = 2.78$). Performance on the practice items were calculated the same way ($M = 2.74$, $SD = 0.54$). In order to assess performance as a function of ToI fit, performance on the experimental items were regressed onto theory of intelligence condition, achievement goal orientation condition, their interaction, with practice performance, GPA, task enjoyment, age, and sex added to the model as covariates. The analysis yielded marginally significant main effects for practice performance ($\beta = .171$, $t(73) = 1.79$, $p < .08$) and GPA ($\beta = .175$, $t(73) = 1.91$, $p = .06$), suggesting that increases in both variables are associated with better RAT

performance. Significant main effects were also found for task enjoyment ($\beta = .463, t(73) = 5.04, p < .01$) and age ($\beta = -.231, t(73) = -2.44, p < .05$), suggesting that higher task enjoyment was associated with higher performance, and older age was associated with worse performance.

The analysis also yielded the predicted interaction between theories of intelligence and achievement goal orientation, which was marginally statistically significant, $\beta = .256, t(73) = 1.94, p < .06$. The interaction suggests that theories of intelligence moderated the effects of participants' relative preference for performance or learning goals. As seen in Figure 2, compared to incremental theorists, entity theorists performed better when induced with a performance goal orientation than a learning goal orientation. In contrast, incremental theorists showed a greater preference for learning goals over performance goals than did entity theorists).

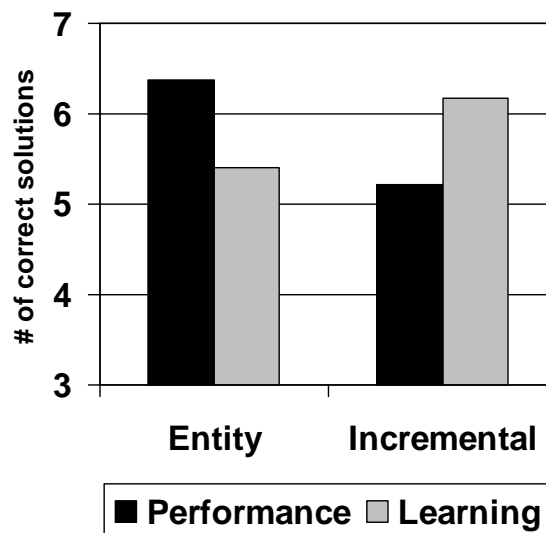


Figure 2.

Figure 2 (continued). Predicted values of task performance for entity and incremental theorists induced with either a performance or learning goal orientation.

A follow-up analysis was conducted to examine the possibility that ToI fit was moderated by perceived competence. RAT performance was regressed onto theory of intelligence condition, achievement goal orientation condition, self-reported perceived competence, all possible 2-way interactions, and their 3-way interaction, with GPA, task enjoyment, age, and sex added to the model as covariates.² The analysis did not yield a significant 3-way interaction ($\beta = -.19$, $t(70) = -1.05$, $p > .10$), however the interaction between theories of intelligence and goal orientation remained marginally significant ($\beta = .28$, $t(70) = 1.72$, $p = .09$).

Persistence. Persistence on the main experimental task was quantified by summing the time in seconds spent on all twelve problems ($M = 218.84$, $SD = 107.90$). Total time spent on the practice items was quantified in the same way ($M = 24.34$, $SD = 17.05$). To examine the affect of ToI fit on task persistence, the total time spent on the experimental items was regressed onto theory of intelligence condition, achievement goal orientation condition, and their interaction, with total time spent on the practice problems, perceived competence, and sex added to the model as covariates. The analysis did not yield a significant interaction ($\beta = -.15$, $t(76) = -.81$, $p > .10$).

² Performance on the practice items was excluded as a covariate in this analysis due to its significant correlation with perceived competence ($r(83) = .453$, $p < .01$).

A subsequent analysis examined the possibility that ToI fit was moderated by perceived competence. Therefore, the total time spent on the experimental items was regressed onto theory of intelligence condition, achievement goal orientation condition, self-reported perceived competence, all possible 2-way interactions, and their 3-way interaction, with total time spent on the practice problems and sex added to the model as covariates. The analysis yielded main effects for perceived competence ($\beta = .24, t(73) = 2.39, p < .05$) and practice persistence ($\beta = .37, t(73) = 3.81, p < .001$), suggesting that increases in each variable is associated with an increase in persistence on the RAT. A marginally significant main effect also emerged for theories of intelligence ($\beta = -.19, t(73) = -1.88, p < .07$), suggesting that, regardless of goal orientation condition, those who adopted an entity theory spent longer working on the problems. There was also a significant interaction between theories of intelligence and perceived competence ($\beta = -.22, t(73) = -2.23, p < .05$), suggesting that, compared those who adopted an incremental theory, those who adopted an entity theory persisted longer when perceived competence was high.

Most interestingly, however, was the significant 3-way interaction ($\beta = .28, t(73) = 2.87, p < .01$), showing that the relation between the interaction of theories of intelligence and goal orientation, and task persistence was moderated by perceived competence. To understand the nature of the interaction and to examine how ToI fit may vary as a function of perceived competence, simple interaction tests were performed. Following

the guidelines set forth by Dawson and Richter (2006), ToI fit was assessed at high (+1 *SD*) and low (-1 *SD*) perceived competence. A marginally significant interaction emerged for those high in perceived competence ($t(73) = 1.62, p = .11$), suggesting that, compared to those who adopted an incremental theory, entity theorists persisted longer when a performance goal orientation was invoked. Conversely, relative to those induced with an entity theory, incremental theorists persisted longer when a learning goal orientation was invoked (see Figure 3a). The opposite pattern emerged for the simple interaction test for those low in perceived competence ($t(73) = -2.43, p < .05$) (see Figure 3b). As compared to those who adopted an incremental theory, adoption of an entity theory resulted in longer persistence when combined with a learning goal orientation. The opposite was true for participants who were led to adopt an incremental theory. Interestingly, these results suggest that fit may be most beneficial when perceived competence is high, and nonfit may be most beneficial when perceived competence is low.

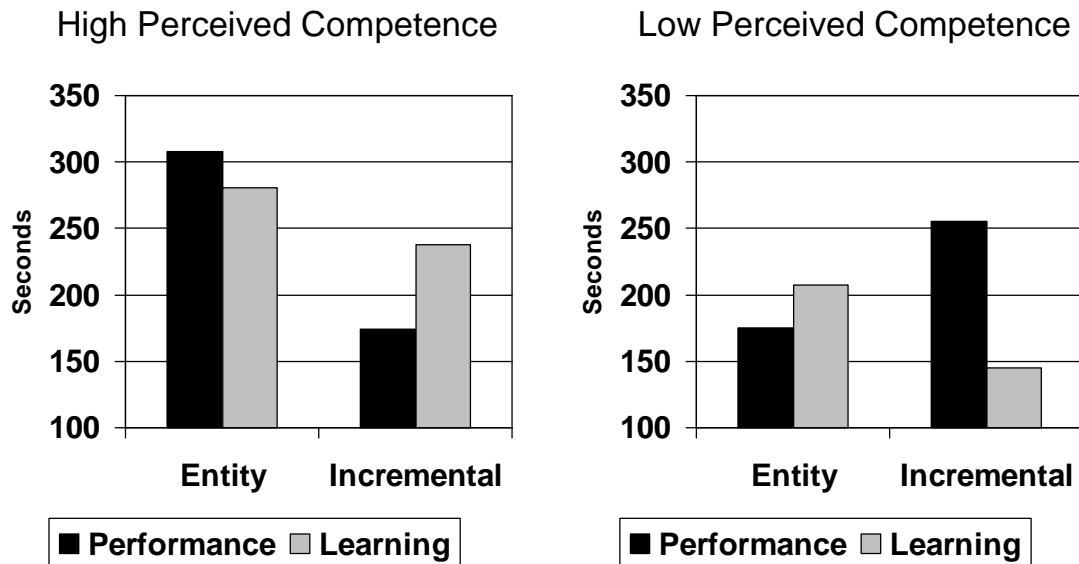


Figure 3. A: Predicted values of task persistence for those induced with an entity or incremental theory of intelligence and induced with a performance or learning goal orientation when perceived competence is high (+1 *SD*). B: Predicted values of task persistence for those induced with an entity or incremental theory of intelligence and induced with a performance or learning goal orientation when perceived competence is low (-1 *SD*).

Affect. A series of analyses were conducted to assess the prediction that affect would change as a function of ToI fit. The first analysis assessed positive affect, using the positive affect subscale from the PANAS (Watson et al., 1988) ($M_{pre} = 25.77$, $SD_{pre} = 6.69$; $M_{post} = 24.45$, $SD_{post} = 6.95$). Post-task positive affect was regressed onto theories of intelligence condition, achievement goal orientation condition, their interaction, controlling for pre-task positive affect, RAT performance, and sex, which yielded a nonsignificant interaction ($\beta = -.01$, $t(76) = -.13$, $p > .10$). A subsequent analysis examined the possibility that the interaction between theories of intelligence and goal orientation was moderated by perceived competence, regressing post-task positive affect onto

theories of intelligence condition, achievement goal orientation condition, perceived competence, all possible 2-way interactions, and their 3-way interaction, controlling for pre-task positive affect, and sex.³ The 3-way interaction was not significant ($\beta = .20, t(73) = 1.13, p > .10$).

Changes in negative affect were then analyzed as a function of ToI fit. Three participants reported particularly high pre-task negative affect (greater than 3 *SDs* from the mean), and they were excluded from the following analyses. Post-task negative affect was regressed onto theories of intelligence, achievement goal orientation, and their interaction, controlling for pre-task positive affect, task performance, and sex. This analysis yielded a main effect for pre-task negative affect ($\beta = .71, t(73) = 9.00, p < .001$), showing that pre-task and post-task affect were correlated as one would expect. A marginally significant main effect for task performance also emerged ($\beta = -.15, t(73) = -1.88, p < .07$), suggesting that increases in performance were related to lower post-task negative affect.

Most interestingly, however, the predicted interaction of theories of intelligence and goal orientation emerged ($\beta = -.17, t(73) = -2.11, p < .05$) (see Figure 4).

³ RAT performance was excluded from the model as a covariate due to its significant correlation with perceived competence ($r(83) = .22, p < .05$).

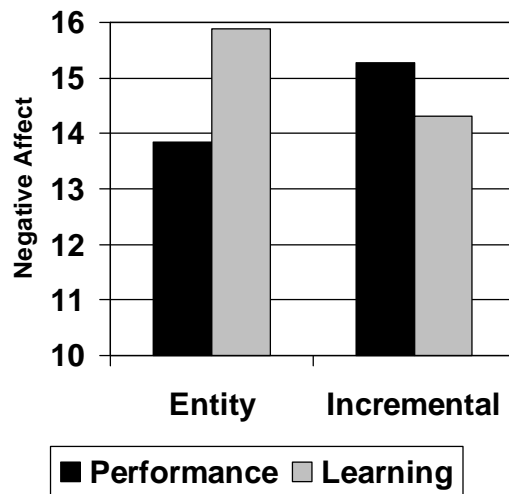


Figure 4. Predicted values of post-task negative affect as a function of theories of intelligence and achievement goal orientation.

This interaction shows that, compared to participants who were led to adopt an incremental theory, those induced with an entity theory felt more negatively when the task invoked a learning goal orientation (as compared to a performance goal orientation). Furthermore, compared to those who adopted an entity theory, those who adopted an incremental theory felt more negatively when the task invoked a performance goal orientation (as compared to a learning goal orientation). Therefore, negative affect was lower when theories of intelligence fit with the invoked goal orientation.

A follow-up analysis examined the moderating influence of perceived competence on ToI fit, regressing post-task negative affect onto theories of intelligence condition, achievement goal orientation condition, perceived competence, all possible 2-

way interactions, and their 3-way interaction, controlling for pre-task negative affect, and sex.⁴ The analysis showed that the 3-way interaction was not significant ($\beta = -.16$, $t(70) = -1.03$, $p > .10$) but that the interaction between theories of intelligence and goal orientation remained significant ($\beta = -.305$, $t(70) = -2.093$, $p < .05$).

Value. In order to test the hypothesis that self-reported task value would vary as a function of ToI fit, task value was regressed onto theories of intelligence, achievement goal orientation, their interaction, with RAT performance and sex included in the model as covariates, yielding a nonsignificant interaction ($\beta = -.10$, $t(77) = -.93$, $p > .10$). A follow-up analysis tested the possibility that perceived competence moderated the interaction between theories of intelligence and achievement goal orientation. Task value was regressed onto theories of intelligence, achievement goal orientation, perceived competence, all possible 2-way interactions, and their 3-way interaction, with sex included in the model as a covariate, yielding a nonsignificant 3-way interaction ($\beta = -.062$, $t(74) = -.528$, $p > .10$).

4.3 Discussion

Across multiple dependent variables, the results of Study 1 lend strong initial support for the notion that motivation and positive affect are higher when theories of intelligence are aligned with their corresponding achievement goal orientations.

⁴ As with the positive affect 3-way analysis, RAT performance was excluded as a covariate from this model due to its significant correlation with perceived competence.

Motivation was assessed behaviorally by measuring performance and persistence on a problem-solving task, which was presented to participants as actual GRE items. This cover story was intended to activate the manipulated theory of intelligence. Results for performance were congruent with predictions, such that, relative to each theory of intelligence, participants who were led to adopt an entity or incremental theory performed best when the corresponding achievement goal orientation was also induced. For entity theorists, this meant having a performance goal orientation induced, and for incremental theorists, this meant having a learning goal orientation induced.

An interesting pattern emerged for task persistence. When perceived competence was high, participants persisted longest when their theory of intelligence was aligned with its corresponding goal orientation. When perceived competence was low, however, participants persisted relatively longer when their theory of intelligence was incongruent with the invoked goal orientation. The latter result is compelling because it suggests that, when people believe their competence is low, they may avoid the very goals that are elicited by their theory of intelligence. Because goals that fit one's theory of intelligence are preferred under optimal circumstances, they may be threatening when circumstances are not optimal. When entity theorists do not believe they will perform well on a task, a performance goal orientation—which makes concerns about evaluation salient—is particularly threatening. A learning goal orientation, on the other hand, is much less threatening because it minimizes evaluative concerns and may result

in less anxiety. Incremental theorists, however, may benefit from nonfit for a different reason. A performance goal orientation generally involves the pursuit of more specific goals (e.g., scoring in the 90th percentile) than those associated with a learning goal orientation (e.g., improving upon past performance), and are consequently perceived to be more difficult (Senko & Harackiewicz, 2005). This perceived difficulty may be preferred by incremental theorists, who seek challenges, and they may also benefit from the greater specificity of performance goals.

It was also predicted that participants' mood would be more positive when the goal orientation fit their theory of intelligence. Although no significant results emerged for positive affect, a compelling interaction emerged for negative affect. Participants' mood was less negative when the goal orientation fit their induced theory of intelligence. Put another way, participants' mood was relatively more negative when the goal orientation did not fit their theory of intelligence.

Contrary to predictions, participants' reports of task value did not vary as a function of the interaction between theories of intelligence and goal orientation. Although it was predicted that fit would result in higher task value than nonfit, no such relation was found. This may have resulted from the way in which value was assessed. After completing the RAT, which was framed as an assessment of associative reasoning ability, participants reported the extent to which they believed the *test* to be valuable. The item may have implied that, regardless of the goal orientation manipulation, the

RAT was an assessment rather than an opportunity to improve associative reasoning abilities. Performance-oriented participants may have been particularly sensitive to the way in which the item was framed, especially depending on their level of perceived competence. Learning-orientated participants, on the other hand, may have considered it irrelevant to their task goals.

Although the manipulation check did not detect differences in self-reported goal orientation endorsement, the analyses demonstrated that the goal orientation manipulation was, at least in part, successful. It would be highly unlikely to obtain the consistent pattern of results demonstrating differences on the dependent variables based on goal endorsement if the manipulation had not worked. The failure of the manipulation check to detect the effects of the manipulation could have occurred either because participants were unable to accurately report the goal orientation they applied to the experimental task, or because the manipulation check items should have, instead, asked them to recall the purpose of the task (i.e., the invoked goal orientation) as presented to them earlier in the study.

5. Study 2

This study was designed to replicate and extend the findings from Study 1 in a number of ways. In Study 1, theories of intelligence were induced, which may have created an inauthentic experience for participants, such that they may not have naturally applied those beliefs to the achievement context. In Study 2, theories of intelligence were measured instead. Goal orientations, however, were invoked in the same manner as Study 1, permitting the assessment of ToI fit. Study 2 also differs from the first in that it assessed self-regulatory depletion after engagement in the experimental task, permitting an examination of how ToI fit may affect self-regulatory resources. As discussed earlier, it was predicted that individuals who engage in a task with an achievement goal orientation that fits their implicit theory of intelligence would evince relatively less self-regulatory depletion than those in the nonfit conditions. This prediction was based on previous research suggesting that goal pursuit is depleting when the manner in which one engages a goal does not sustain the goal orientation, and that depletion should be minimized or strengthened when it does (J. Hong & Lee, 2008).

5.1 Method

5.1.1 Participants

Across two semesters, 86 (59 females) Duke University undergraduate students were recruited from the psychology participant pool. Their recruitment was based on their completion of the theory of intelligence scale (Dweck, 1999), which was

administrated at the beginning of each semester in group testing. For their participation, students received credit toward their course research requirement. The sample was ethnically diverse, comprising Caucasians (47.7%), Asians (33.7%), African-Americans (8.1%), Latinos (8.1%), a Native Hawaiian (1.2%), and a Native American (1.2%). Several of the participants had also reported that they were of mixed ethnicity (5.8%).

5.1.2 Measures

Implicit theories of intelligence. During mass testing at the beginning of each semester, students were pretested for their entity and incremental theories of intelligence using Dweck's (1999) 8-item theories of intelligence scale ($M = 3.43$, $SD = 1.01$), which was described in Study 1. Recruitment was limited to those students who had completed all eight items.

Affect. Pre- and post-task positive and negative affect was assessed in the same manner as described in Study 1, using the Positive and Negative Affect Schedule scales (PANAS) (Watson et al., 1988).

Word Prospector. In a task adapted from Burson, Larrick, and Klayman (2006), participants were asked to create as many words as possible from a 10-letter word presented to them. These 10-letter words included one practice item (TYPEWRITER) and five experimental items (TROGLODYTE, PETROGLYPH, GOGONZOLA, CUMMERBUND, GARGANTUAN, presented in this order). They were also given several rules to follow. First, possible solutions could only be 4-, 5-, or 6-letters long.

Second, when forming words, they could use each letter in the 10-letter word only once. Third, only real English words were permitted. Fourth, different forms of the same word derivations were permissible (e.g., given DISTRACTED, *race*, *raced*, and *races* would all count as correct responses). Finally, misspelled or repeated words were not acceptable.

Participants worked on one word at a time and typed their responses in the text box provided, one at a time. When they could no longer produce solutions, they were instructed to press the Esc button, which advanced them to the next item (or ended the task after the fifth item). The dependent variables of interest were their task persistence (i.e., the total amount of time they spent on the task) and task performance (i.e., the total number of correct responses provided).

Self-regulatory depletion. The Stroop task (Stroop, 1935) was employed as a measure of self-regulatory depletion. Myriad studies have demonstrated it to be a reliable assessment of self-regulatory resources (e.g., Muraven, Shmueli, & Burkley, 2006; Richeson & Shelton, 2003; Richeson, Trawalter, & Shelton, 2005; Wallace & Baumeister, 2002). On a computer, participants were presented with color words or a series of X's (i.e., XXXX) presented in one of four colors (blue, green, red, yellow), one at a time, for a maximum of 2000-ms. Each was preceded by a fixation point (i.e., +), and the inter-trial interval was 1500-ms. Two types of color words were presented: incompatible and compatible. Incompatible items were those printed in a color different than the word presented (e.g., RED printed in the color blue). Compatible items were

those printed in the same color as the word presented (e.g., RED printed in the color red). The participant's task was to determine the color in which the item was printed as accurately as possible, using a color-coded response box on the keyboard. There were 48 practice trials to orient participants to the task, and then 6 blocks of 12 trials, for a total of 72 experimental trials. This task yielded response latencies for each of the experimental trials that were used in the analyses.

The rationale for this task is that, when presented with incompatible items, one must exert self-control in order to inhibit the automatic response to report the color relating to the word rather than the color in which it is printed. Thus, the more self-regulatory resources an individual has, the more quickly he or she will correctly identify the printed color.

Value. A single item assessed participants' value for the main experimental task. On a 7-point scale anchored at 1 (*Not at all effectively*) and 7 (*Very effectively*), participants responded an item that read "How valuable was this test?" which was anchored at 1 (*Not at all valuable*) and 7 (*Very valuable*).

Enjoyment. A single item assessed enjoyment, asking participants, "How much did you enjoy working on the puzzles?" anchored at 1 (*Not at all enjoyable*) and 7 (*Very enjoyable*).

Perceived competence. Perceived competence on the Word Prospector task ($M = 3.94$, $SD = 1.07$) was assessed by asking participants "How well do you think you will

perform on the actual puzzles?" They responded on a 7-point scale anchored at 1 (*very poorly*) to 7 (*very well*).

Manipulation check. On a 7-point scale anchored at 1 (*very little or not at all*) and 7 (*extremely*), participants reported the extent to which they adopted learning and performance goals while working on the Word Prospector task. In particular, they were asked "While working on the puzzles earlier, to what extent was it your goal to DEMONSTRATE your Integrative Orientation?" and "While working on the puzzles earlier, to what extent was it your goal to IMPROVE your Integrative Orientation?"

Demographics. Participants provided their age, sex, year in school, major, GPA, and ethnicity.

5.1.3 Procedure

Upon arrival to the laboratory, participants were seated at a computer station and provided informed consent. They were then randomly assigned to one of two goal orientation conditions and began the study, which was entirely computer-administrated. First, participants completed the PANAS (Watson et al., 1988) as a measure of baseline positive and negative mood, and then engaged in Word Prospector, which was the main experimental task. They read through the instructions and then worked on one sample problem. Afterward, they reported their predicted performance for the actual test items.

Participants were then presented with a screen containing two statements. The first read "These puzzles are taken from the Yale Integrative Orientation Test (YIOT),

which measures an important type of intelligence (Watson and Fuller, 2004).” This cover story was used in order to invoke participants’ theories of intelligence for the experimental task. The second statement was designed to manipulate the achievement context in order to induce a particular achievement goal orientation. Those in the performance goal orientation condition read “Your level of Integrative Orientation will be assessed by your performance on the puzzles.” Those in the learning goal orientation condition read “Working on these puzzles will give you an opportunity to improve your level of Integrative Orientation.”

Participants then worked on the five actual items for as long as they wished. Afterward, they reported the extent to which they found the task valuable and enjoyable. Subsequently, participants completed the Stroop task (Stroop, 1935) and provided demographic information. Finally, they were debriefed, assigned credit for their participation, and excused. The entire experimental session lasted 30 minutes or less.

5.2 Results

Manipulation check. The experimental manipulation in this study was intended to induce either a performance or learning goal orientation for the experimental task. A mixed model ANOVA, including achievement goal orientation condition and self-reports of goal preference was run to assess the efficacy of the manipulation, with repeated measures on the second factor. A significant main effect emerged for goal endorsement such that participants reported greater learning goal endorsement, ($F(1, 84)$

= 15.86, $p < .001$; $M_{\text{performance}} = 3.49$, $SD_{\text{performance}} = 1.45$; $M_{\text{learning}} = 3.81$, $SD_{\text{learning}} = 1.43$). It did not, however, yield the predicted interaction ($F(1, 81) = 1.13$, $p > .10$), suggesting that the manipulation check did not detect relative differences in performance goal orientation ($M_{\text{performance}} = 4.24$, $SD_{\text{performance}} = 1.64$; $M_{\text{learning}} = 4.00$, $SD_{\text{learning}} = 1.52$) or learning goal orientation ($M_{\text{performance}} = 3.44$, $SD_{\text{performance}} = 1.62$; $M_{\text{learning}} = 3.54$, $SD_{\text{learning}} = 1.27$) as a function of the induction. The means for goal endorsement, however, are in the correct direction.

One possible reason for the null interaction might be that individuals adopted the goals that naturally arise from lay theories of intelligence; that is, entity theorists may have adopted performance goals and incremental theorists may have adopted learning goals (see Dweck, 1999; Dweck & Leggett, 1988). A correlational analysis revealed, however, that self-reported theories of intelligence were not related to self-reports of having adopted a performance goal, $r(86) = .03$, $p > .10$, or a learning goal, $r(86) = .01$, $p > .10$). These results suggest that, although the goal orientation induction did not detect differences in goal orientation endorsement, there is also no evidence to suggest that goal orientation endorsement was related to participants' theories of intelligence.

Performance. For all analyses, ToI fit was assessed using multiple regression. Therefore, the interaction of theories of intelligence and achievement goal orientation was of particular theoretical interest. Performance and learning goal orientation

conditions were coded 0 and 1, respectively, all continuous variables were standardized, and all interaction terms were calculated using the standardized continuous variables.

Performance on the Word Prospector task was quantified by summing the correct responses across all five experimental items ($M = 26.13$, $SD = 16.01$). In order to examine ToI fit, task performance was regressed onto theories of intelligence, achievement goal condition, their interaction, with GPA, task enjoyment, and sex included in the model as covariates, which did not yield the predicted interaction ($\beta = -.06$, $t(74) = -.40$, $p > .10$).

A subsequent analysis explored the possibility that the predicted interaction was moderated by perceived competence. Task performance was regressed on theories of intelligence, achievement goal condition, perceived competence, all possible 2-way interactions, and the 3-way interaction, with GPA and task enjoyment included as covariates. The analysis yielded main effects for GPA ($\beta = .23$, $t(74) = 2.34$, $p < .05$) and task enjoyment ($\beta = .50$, $t(74) = 4.88$, $p < .01$), suggesting that increases in both variables were associated with increases in task performance. The analysis also yielded a significant 3-way interaction, ($\beta = -.38$, $t(74) = -2.14$, $p < .05$), suggesting that the relation between the interaction of theories of intelligence and achievement goal orientation, and task performance was moderated by participants' perceived competence.¹ As shown in

¹ When sex was included in the model as a covariate, the 3-way interaction was marginally significant, ($\beta = -.35$, $t(73) = -1.92$, $p < .06$). The main effect for sex, however, was not significant ($\beta = -.13$, $t(73) = -1.31$, $p > .10$).

Figure 5, those high in perceived competence (+1 *SD*) demonstrated a pattern of performance resembling fit, and those low in perceived competence (-1 *SD*) demonstrated a pattern of performance resembling nonfit.

Following the guidelines proposed by Dawson and Richter (2006), simple interaction tests examined whether entity and incremental theorists performed differently in performance and learning goal contexts as a function of their perceived competence. Although a significant simple interaction was not present when perceived competence was low ($t(74) = 1.46, p > .10$) (see Figure 5b), a marginally significant simple interaction was present when perceived competence was high ($t(74) = -1.67, p < .10$). Thus, relative to incremental theorists, entity theorists performed better when a performance goal orientation as opposed to a learning goal orientation was induced. Conversely, incremental theorists performed better when a learning goal orientation than a performance goal orientation was induced, relative to entity theorists (see Figure 5a). Taken together, these results suggest that fit may lead to better performance when perceived competence is high. The other observed pattern, however, suggests that nonfit could possibly be beneficial when perceived competence is low. The simple interaction for that effect, however, was nonsignificant.

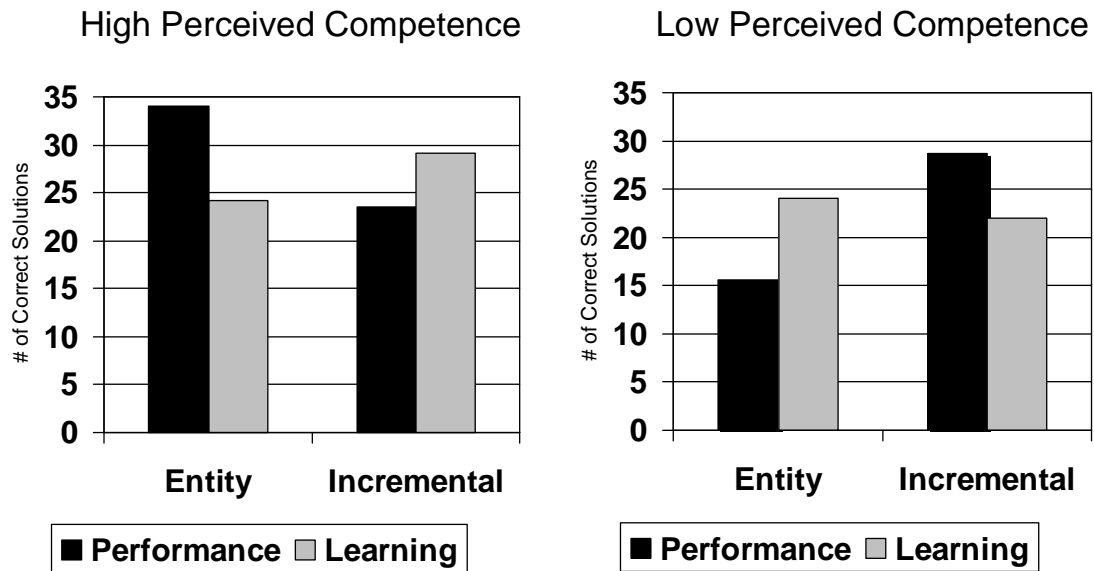


Figure 5. A: Predicted values of task performance for entity (+1 *SD*) and incremental theorists (-1 *SD*) pursuing either a performance or learning goal when perceived competence is high (+1 *SD*). B: Predicted values of task performance for entity (+1 *SD*) and incremental (-1 *SD*) theorists pursuing either a performance or learning goal when perceived competence is low (-1 *SD*).

Persistence. Persistence was quantified as the total time in seconds that participants spent working on all five Word Prospector items ($M = 499.99$, $SD = 252.08$). In order to examine ToI fit, persistence was regressed onto theories of intelligence, achievement goal orientation, and their interaction, with GPA, total time spent on the practice item, and sex added as covariates, which yielded a null result for the predicted interaction ($\beta = -.15$, $t(65) = -1.04$, $p > .10$).

Considering that some of the data were collected at the end of one semester, and the majority were collected at the beginning of the next, a subsequent analysis was conducted that included only those who participated during the latter semester.

Students who rushed to finish their research participation requirement at the end of the semester may have come from a different population than those who planned ahead and completed at least some of their hours early in the semester. Running the same regression model with this subset of participants yielded main effects for persistence on the practice item ($\beta = .74, t(49) = 8.39, p < .01$), and GPA ($\beta = .35, t(49) = 3.67, p < .01$), suggesting that increases in both variables were related to increases in persistence. There was also a significant interaction between theories of intelligence and achievement goal ($\beta = -.27, t(49) = -1.98, p = .05$), suggesting that persistence varied for entity and incremental theorists as a function of the invoked achievement goal orientation (see Figure 6). Relative to incremental theorists, entity theorists persisted longer when a performance goal orientation was induced as compared to a learning goal orientation. The opposite was true for incremental theorists. Relative to entity theorists, they persisted longer when a learning goal orientation as compared to a performance goal orientation was induced.

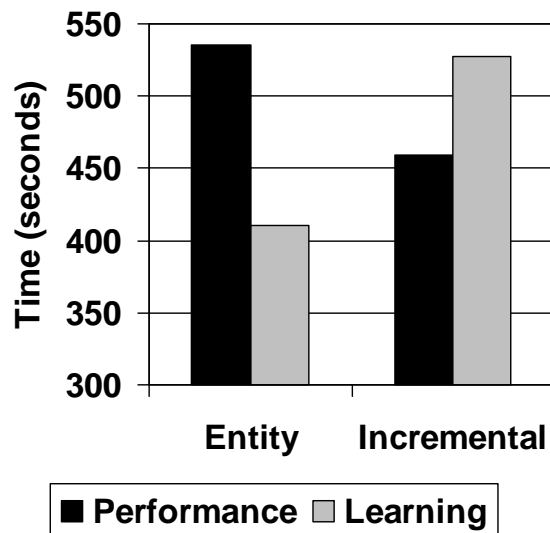


Figure 6. Predicted values of persistence on the experimental task for entity (+1 *SD*) and incremental (-1 *SD*) theorists induced with either a performance or learning goal orientation.

A follow-up analysis tested the possibility that ToI fit was moderated by perceived competence on the same subset of participants. Persistence was regressed on theories of intelligence, achievement goal orientation, perceived competence, all possible 2-way interactions, and the 3-way interaction, with GPA, time spent on the practice item, and sex added as covariates, which yielded a nonsignificant 3-way interaction, ($\beta = -.17$, $t(45) = -.85$, $p > .10$).

Affect. Mood was also predicted to change as a function of ToI fit. To address this prediction, two analyses were conducted. The first analysis assessed positive affect, using the positive scale from the PANAS (Watson et al., 1988) ($M_{pre} = 24.28$, $SD_{pre} = 6.46$; $M_{post} = 22.67$, $SD_{post} = 7.64$). Post-task positive affect was regressed onto theories of

intelligence, achievement goal orientation condition, and their interaction, controlling for pre-task positive affect, task performance, and sex, which yielded a nonsignificant interaction ($\beta = .83, t(77) = 1.66, p > .10$).

A subsequent analysis assessed the possibility that perceived competence moderated ToI fit. Post-task positive affect was regressed onto theories of intelligence, achievement goal orientation condition, perceived competence, all possible 2-way interactions, and the 3-way interaction, controlling for pre-task positive affect, task performance, and sex. Again, this analysis yielded a null result for the 3-way interaction ($\beta = .07, t(73) = .50, p > .10$).

Changes in negative mood were then assessed using the PANAS (Watson et al., 1988) negative affect scale ($M_{pre} = 13.69, SD_{pre} = 4.27; M_{post} = 13.11, SD_{post} = 3.36$). Post-task negative affect was regressed on theories of intelligence, achievement goal orientation, and their interaction, with pre-task negative affect, task performance, and sex included in the model as covariates, yielding a nonsignificant interaction effect ($\beta = -.06, t(77) = -.59, p > .10$).

A follow-up analysis assessed the possibility that perceived competence moderated ToI fit. Thus, post-task negative affect was regressed onto theories of intelligence, achievement goal orientation condition, perceived competence, all possible 2-way interactions, and the 3-way interaction, with pre-task negative affect, task performance, and sex, included in the model as covariates, yielding main effects for pre-

task negative affect ($\beta = .75, t(73) = 10.60, p < .01$) and perceived competence ($\beta = .27, t(73) = 2.27, p < .05$), suggesting that increases in both variables are associated with increases in post-task negative affect. A significant interaction between theories of intelligence and perceived competence also emerged ($\beta = .38, t(73) = 3.06, p < .01$), suggesting that, relative to incremental theorists, entity theorists felt more negatively when their perceived competence was high as compared to when it was low.

The analysis also yielded a 3-way interaction among theories of intelligence, goal orientation, and perceived competence ($\beta = -.34, t(73) = -2.26, p = .01$), showing that the relation between the interaction of theories of intelligence and goal orientation, and post-task negative affect varied as a function of perceived competence. Following the guidelines set forth by Dawson and Richter (2006), simple interaction tests were performed to examine the theories of intelligence x goal orientation simple interaction separately for those high and low in perceived competence. A significant simple interaction was found for those high in perceived competence (+1 *SD*) ($t(73) = -2.22, p < .05$), suggesting that, compared to incremental theorists, entity theorists differ in their ratings of post-task negative affect depending on the goal orientation invoked. This simple interaction, which does not conform to the ToI fit predictions, appears to be driven largely by entity theorists' negative reaction to the performance goal context. A marginally significant simple interaction also emerged for those low in perceived competence (-1 *SD*) ($t(73) = 1.70, p < .10$), suggesting that, relative to incremental

theorists, entity theorists experienced greater negative affect when induced with a learning goal orientation as compared to a performance goal orientation. The opposite pattern emerged for incremental theorists.

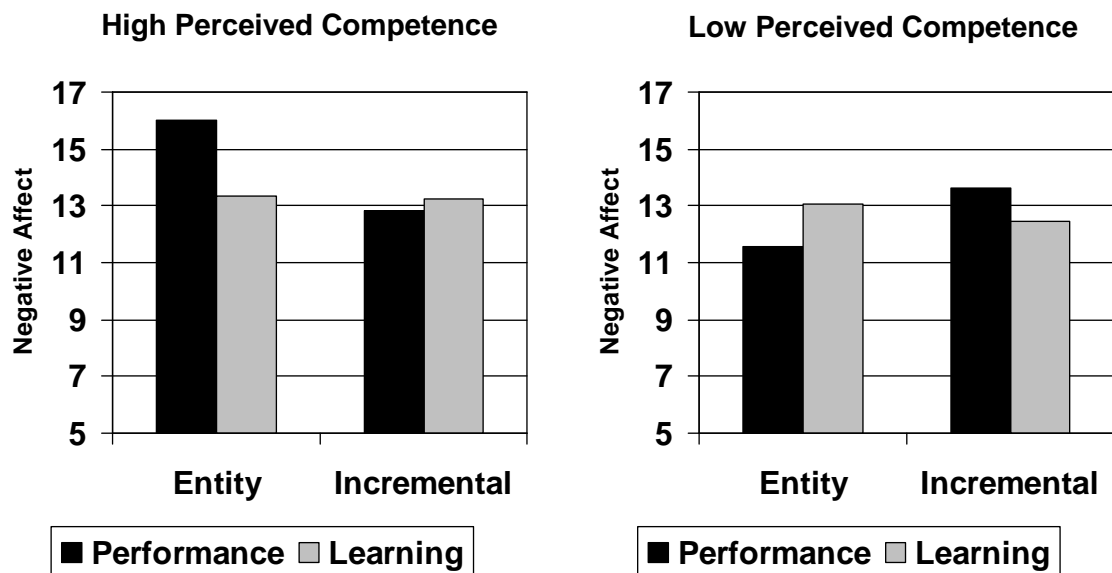


Figure 7. A: Predicted values for post-task negative affect for entity (+1 *SD*) and incremental theorists (-1 *SD*) invoked with either a performance or learning goal orientation when perceived competence is high (+1 *SD*). B: Predicted values for post-task negative affect for entity (+1 *SD*) and incremental theorists (-1 *SD*) invoked with either a performance or learning goal orientation when perceived competence is low (-1 *SD*).

Value. To assess the prediction that fit would lead to greater value of the experimental task, self-reported task value was regressed on theories of intelligence, achievement goal orientation condition, and their interaction, with task performance, enjoyment, and sex added to the model as covariates. The analysis yielded a marginally significant main effect for theories of intelligence ($\beta = -.27, t(77) = -1.76, p < .09$),

suggesting that incremental theorists valued the task more than entity theorists regardless of the goal orientation that was elicited. A marginally significant main effect also emerged for task performance ($\beta = .19, t(77) = 1.68, p < .10$), suggesting that the better participants performed, the more they valued the task. Another main effect emerged for task enjoyment ($\beta = .37, t(77) = 3.28, p < .01$), suggesting that greater enjoyment was associated with greater task value. Finally, the analysis yielded a significant interaction ($\beta = .30, t(77) = 1.98, p = .05$), suggesting that entity and incremental theorists' ratings of task value differed depending on which achievement goal orientation had been elicited (see Figure 8). The nature of the interaction did not conform to the ToI fit prediction. Instead, relative to incremental theorists, entity theorists valued the task more when it had elicited a learning goal orientation as compared to a performance goal orientation. The opposite pattern emerged for incremental theorists.

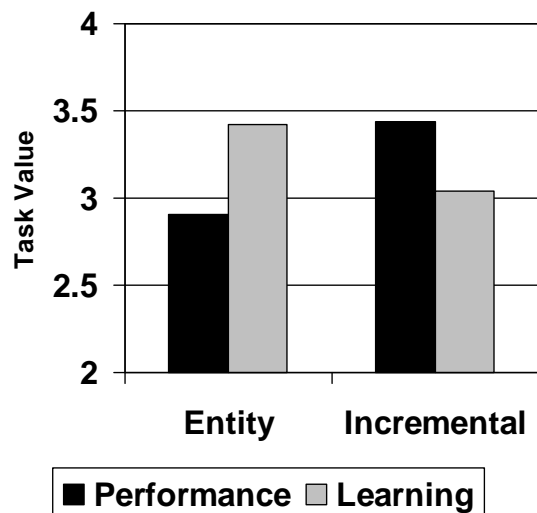


Figure 8.

Figure 8 (continued). Predicted values of self-reported task value for entity (+1 *SD*) and incremental (-1 *SD*) theorists who were invoked with either a performance or learning goal orientation.

To assess the possibility that ToI fit would be moderated by perceived competence, self-reported task value was regressed onto theories of intelligence, achievement goal condition, perceived competence, all possible 2-way interactions, and the 3-way interaction, with task performance, enjoyment, and sex included as covariates. This yielded a null result for the 3-way interaction ($\beta = .08, t(73) = .40, p > .10$).

Self-regulatory depletion. Response latencies for incompatible Stroop items were employed as a measure of self-regulatory depletion, and compatible Stroop items were used as controls (i.e., baseline response latencies). In order to normalize the positively skewed distributions, the response latencies were log transformed in accordance with recommendations by Fazio (1990), and mean composites were created ($M_{\text{incompatible}} = 6.65, SD_{\text{incompatible}} = 0.20; M_{\text{compatible}} = 6.49, SD_{\text{compatible}} = .20$). To examine the extent to which ToI fit influenced self-regulatory resources, mean response latencies for incompatible Stroop items were regressed onto theories of intelligence, achievement goal orientation, and their interaction, with mean response latencies for compatible Stroop items, overall post-task mood, task performance, and sex included in the model as covariates. The analysis yielded a null interaction ($\beta = .11, t(75) = 1.08, p > .10$).

A subsequent analysis was conducted on participants who had participated during the second semester of data collection, using the same model, sans the sex

variable.² The analysis yielded a main effect for control response latencies ($\beta = .83, t(57) = 11.23, p < .01$), suggesting that compatible response latencies were positively related to incompatible response latencies. Another main effect emerged for overall post-task mood ($\beta = -.18, t(57) = -2.31, p < .05$). More positive moods were associated with shorter response latencies for incompatible Stroop items. This finding is consistent with previous research demonstrating that positive mood can restore self-regulatory resources (Tice, Baumeister, Shmueli, & Muraven, 2007), which also provides the rationale for its inclusion as a covariate. The analysis also yielded the predicted interaction ($\beta = .22, t(57) = -1.96, p < .06$), which was marginally significant. Relative to each other, entity and incremental theorists experienced less self-regulatory depletion when the achievement context fit their theory of intelligence (see Figure 9).

² When the analysis examined only the subset of participants and sex was included, its main effect was nonsignificant ($\beta = .07, t(56) = .93, p > .10$). Given that it was not uniquely related to the dependent variable, yet attenuated the significance of the interaction ($\beta = .21, t(56) = 1.81, p < .08$), it was excluded from the model.

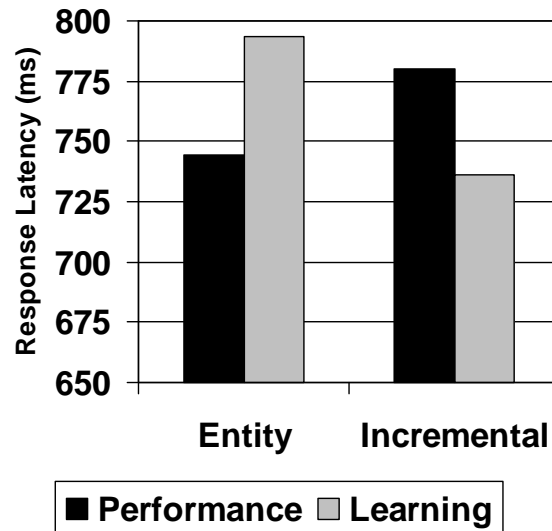


Figure 9. Predicted values of self-regulatory depletion for entity (+1 *SD*) and incremental (-1 *SD*) theorists who were invoked with either a performance or learning goal orientation.

5.3 Discussion

Study 2 was designed to replicate the findings from Study 1 and to extend its results in two important ways. First, theories of intelligence were measured rather than induced. This modification was intended to assess the interaction of chronic (as opposed to situationally induced) theories of intelligence with the invoked goal orientation. Second, self-regulatory resources were assessed after engagement in the main experimental task in order to test the prediction that fit would conserve self-regulatory resources, relative to nonfit.

The first analysis examined performance on the Word Prospector task as a function of the interaction between theories of intelligence and achievement goal

orientation. It was predicted that fit would optimize performance, relative to nonfit. Interestingly, the interaction was moderated by perceived competence. Simple interaction analyses revealed that fit resulted in relatively better performance when perceived competence was high, whereas nonfit resulted in relatively better performance when perceived competence was low. This pattern of results mirrored those for persistence in Study 1, and may have occurred for similar reasons. That is, when expected performance is high, individuals may prefer to pursue goals that naturally arise from their endorsed theory of intelligence. When expected performance is low, however, individuals may be motivated to avoid pursuing those goals. Consequently, nonfit may protect against the negative effects of low perceived competence.

Support was also obtained for the prediction that task persistence would be greatest when participants' theory of intelligence fit with the invoked goal orientation, as compared to when it did not fit. This result, however, appears to be independent of perceived competence, suggesting that fit resulted in relatively greater persistence regardless of how well participants believed they would perform.

A noteworthy difference between Study 1 and Study 2 is the moderating role of perceived competence for performance and persistence. In Study 1, an interaction between theories of intelligence and goal orientation was obtained, whereas in Study 2, the interaction was moderated by perceived competence. Conversely, in the analyses of

persistence, ToI fit was moderated by perceived competence in Study 1 but not in Study 2. These differences may be attributable to the cover story for the experimental tasks employed in the studies, as well as the tasks themselves. Study 1 presented participants with problems that were ostensibly taken from the GRE—a well validated exam with important implications for intelligence and graduate school admission. Given the high academic accomplishment and aspirations of Duke students, the tasks may have been particularly valuable to them, and they may have been reluctant to avoid their preferred achievement goals, regardless of their perceived competence. In contrast, Study 2 employed a task that was presented as being related to an important type of intelligence (i.e., integrative orientation). The obscurity of the type of intelligence assessed by the task may have made it less believable and valuable to participants, permitting them to avoid goals that fit their theory of intelligence when perceived competence was low.³

Differences in the moderating role of perceived competence for task persistence may have been caused by different reasons. In Study 1, participants engaged in the RAT, for which participants cannot be certain that they had provided a correct answer. Study 2, however, employed the Word Prospector task, for which correct responses were unambiguous. Participants could simply refer to the 10-letter word provided to check

³ Although task value was assessed in both studies, ratings of value relative to each task were not. It is, therefore, not possible to test whether one task was more valuable than the other.

the accuracy of their response. Thus, perceived competence may have been a relevant moderating variable for persistence on the RAT but not the Word Prospector task.

Fit was also predicted to be associated with adaptive levels of positive and negative affect relative to nonfit. Similar to Study 1, no significant findings were obtained for positive affect. Both experimental tasks were presented to participants as valid assessments of important intellectual abilities, which may have created an overall negative experience for them. Thus, it may be more likely that results would be obtained for changes in negative affect as opposed to positive affect. Indeed, the present study yielded significant results such that the interaction of theories of intelligence and achievement goal orientation was moderated by perceived competence. Inconsistent with expectations, however, negative affect was greatest under fit when perceived competence was high. This effect was particularly pronounced for entity theorists when a performance goal orientation was induced. Because entity theorists often seek to validate their abilities when perceived competence is high (Grant & Dweck, 2003), the task may have been interpreted as a high-stakes situation. That is, performing poorly would be an indictment of their intelligence, and the experimental condition may have been experienced particularly negatively. When perceived competence was low, however, negative affect was greater under nonfit. Although this analysis suggests that nonfit is more beneficial, its interpretation may relate to the results for task performance (Study 2) and persistence (Study 1). When perceived competence is low, individuals

may avoid pursuing goals that fit their theory of intelligence, and the negative reinforcement resulting from this avoidance may attenuate negative affect. These results differ from those obtained in Study 1 in that the interaction of theories of intelligence and achievement goal orientation were moderated by perceived competence. Furthermore, the results in Study 1 conformed to predictions, whereas the findings from Study 2 did not. Again, the differences may be attributable to the believability of the cover stories employed.

Contrary to predictions, fit also did not result in relatively higher task value. In fact, relatively higher task value was related to nonfit. This result may have been related to the believability of the task as a valid measure of an intellectual ability. Low believability may have attenuated task value. This low value may lead individuals to avoid goals corresponding to their endorsed theory of intelligence. Instead, they may be buffered by pursuing nonfitting goals, such that entity theorists value the task when pursuing the goal of improvement—a non-evaluative goal—relative to incremental theorists. Conversely, relative to entity theorists, incremental theorists may value the task more when the goal is perceived to be more challenging (see Senko & Harackiewicz, 2005).

It was also expected that self-regulatory resources would be relatively optimized under ToI fit, and the analysis yielded results congruent with these predictions. When comparing entity and incremental theorists, the experience of pursuing goals that do not

fit the endorsed theory of intelligence appears to deplete self-regulatory resources relative when they fit.

In addition, as in Study 1, the manipulation check did not detect differences in participants' reports of their endorsement of achievement goal orientations during the experimental task. The pattern of results observed in Study 2, however, suggest that the manipulation was successful, and that the manipulation check may have been problematic for the reasons previously discussed.

6. General Discussion

Implicit theories of intelligence represent stable styles of thinking (Robins & Pals, 2002), and people use these beliefs to organize and make sense of their cognitions. In other words, these beliefs represent “meaning systems” regarding competence and achievement (Dweck, 1999; Dweck & Molden, 2005). These meaning systems, however, are often at odds with the dynamics of everyday pursuits. They may cause conflicts between the goals people prefer to pursue and those that are situationally optimal, resulting in inefficient or counterproductive goal engagement. The purpose of the presented studies was to examine the predicted disruptive effects of adopting achievement goal orientations (and pursuing achievement goals) that do not fit with one’s held theory of intelligence, and how such effects differs from the predicted facilitative effects of when they fit.

This research provides an important extension to current theory by revealing an important variable that may explain why, even under seemingly ideal circumstances, goal pursuits may go awry, and how motivation, affect, and self-regulation can be optimized across domains. Previous research has largely highlighted the maladaptive consequences of an entity theory and the adaptive consequences of an incremental theory (for reviews, see Dweck, 1999; Dweck & Leggett, 1988). This research, however, has largely ignored the role of the achievement context, and how it may conflict with the goals that naturally arise from theories of intelligence. The present research

demonstrates that the adaptiveness of theories of intelligence may depend on how well they correspond to the demands of the achievement context. In general, the current research suggests that achievement goals are pursued most adaptively when they fit a person's endorsed theory of intelligence. Specifically, the most adaptive motivation, affect (Study 1), and use of self-regulatory resources were observed when entity theorists engaged in a performance goal context, and when incremental theorists engaged in learning goal contexts (i.e., fit). Conversely, relatively maladaptive outcomes were generally observed when entity theorists engaged in learning goal contexts and when incremental theorists engaged in performance goal contexts (i.e., nonfit).

Interestingly, this pattern of results was moderated by perceived competence for several achievement-related outcomes. Of particular interest, the analyses for performance (Study 2) and persistence (Study 1) demonstrated that, when perceived competence is high, the most beneficial outcomes were associated with fit. When perceived competence is low, however, the opposite pattern was true. That is, the most beneficial outcomes were associated with nonfit. These results suggest that, when individuals have confidence in their abilities, they may prefer to pursue achievement goals that naturally arise from their theory of intelligence. When confidence in abilities is low, however, individuals may avoid the achievement goals that fit their endorsed theory of intelligence. In this case, nonfitting goals may buffer against the negative effects of an avoidance orientation. Entity theorists tend to adopt performance goals,

which emphasize the importance of normative competence. When competence is believed to be low, entity theorists may prefer learning goals because they lack an evaluative component and are, therefore, less threatening. Incremental theorists, on the other hand, may benefit more from performance goals when confidence in their abilities is low because those goals tend to be perceived as more challenging and specific (Senko & Harackiewicz, 2005), which may facilitate improvement (see Locke & Latham, 2002).

This notion of buffering, however, is different than that proposed in the achievement goal literature. In particular, Linnenbrink and Pintrich (2001) suggested that learning goal structures may buffer against the negative effects associated with performance goal orientations, and that learning goal orientations may buffer against the negative effects of performance goal structures. In both cases, the mere presence of either a learning goal structure or learning goal orientation presumably results in more beneficial achievement-related outcomes than when they are not present. Furthermore, they proposed that the most beneficial outcomes should result from the endorsement of a learning goal orientation in a context with a learning goal structure, whereas the worst outcomes should result from endorsing a performance goal orientation when engaging in a context with a performance goal structure. Several of the current findings, however, suggest that the most beneficial outcomes are associated with a fit between theories of intelligence and achievement goal orientation, and that buffering occurs when perceived competence is low and nonfitting goals are pursued.

6.1 Future Directions

The current research had a few potential limitations that could be addressed in future research. First, the studies were able to examine only the *relative* adaptiveness of fit and nonfit. It is still not understood whether fit (or nonfit when perceived competence is low) facilitates goal pursuit or whether nonfit (or fit when perceived competence is low) disrupts it. For example, it is unclear from the data whether fit strengthens self-regulatory resources or nonfit depletes them. It can only be said that there is a relative difference. Indeed, Hong and Lee (2008) demonstrated this pattern within the regulatory fit framework. In order to address this issue within the present framework, a neutral control group must be added to the experimental design. Its addition would permit analyses of slope differences with the neutral condition and conclusions regarding the unique adaptiveness of fit and nonfit.

Another limitation involved low statistical power. The analyses and predictions of interest in the present work involved the interaction of theories of intelligence and achievement goal orientation. Interactions, in particular, usually account for a very small percentage of the variance explained in a dependent variable above and beyond the main effects (Cohen, Cohen, West, & Aiken, 2003). The analyses, therefore, should need enough power to detect a small to moderate effect size, which correspond to .02 and .13, respectively, according to Cohen (1988). For example, to detect a moderate effect ($f^2 = .13$) for an interaction in a model with two covariates (for a total of five predictors), at $\alpha =$

.05 and a desirable level of power ($1-\beta = .80$), 104 participants would be required. For a small effect size ($f^2 = .02$), the required number of participants increases to 643.

Considering that 83 participants were assessed in Study 1, and 86 were assessed in Study 2, even a conservative estimate suggests that too few participants were recruited for each study. Insufficient power may have resulted in an inability to detect an interaction of theories of intelligence and achievement goal orientation for task value in Study 1, and perhaps more importantly, additional 3-way interactions of theories of intelligence, achievement goal orientation, and perceived competence for several dependent variables across both studies.

Furthermore, the assessment of task value may need to be revised. The question in both studies retrospectively framed the task as an assessment of intellectual ability. Although this framing was congruent with how the performance goal orientations were induced, it was not congruent with the induction of learning goal orientations. For learning-oriented participants, the purpose of the task was to improve their abilities, as opposed to demonstrating them. It may have been more appropriate for the assessment of task value to retrospectively frame each of the experimental tasks as a “task” rather than a “test.” This would leave the nature of the task open to retrospective interpretation for both groups.

Furthermore, the reported studies were intended to provide a foundation on which to conduct further research on ToI fit, several of which are worth noting. One

direction involves the examination of fit with other constructs that arise from implicit theories of intelligence. For example, theories of intelligence give rise to particular preferences regarding the diagnosis of performance (Butler, 2000b), and those preferences may or may not be supported by the achievement context. Performance goals are largely focused on documenting ability rather than developing it (Dweck & Leggett, 1988). Therefore, individuals who endorse this goal largely measure success in terms of how they perform relative to others, and they are most attuned to normative feedback (Butler, 1993, 1995). In contrast, those with learning goals are most concerned with developing abilities and improving upon them (Dweck & Leggett, 1988). Because they measure success by the degree to which they are learning and improving, they are most attuned to feedback that assesses these concerns (Butler, 1993, 1995). Therefore, entity and incremental theorists may suffer decrements in motivation, emotional well-being, and self-regulatory resources when they do not receive performance feedback that is congruent with their endorsed theory of intelligence.

Future work should also consider the boundary conditions of ToI fit. As previously mentioned, evidence suggests that performance and engagement are higher when motivational orientations fit the goals invoked by the situation, as compared to when they do not (e.g., Cesario et al., 2004; Higgins, Shah, & Friedman, 1997; O'Keefe, Messersmith et al., in preparation). The present research is conceptually similar in that it examined fit at a more abstract level of implicit self-theories. In contrast, other research

has demonstrated that personal achievement goals can change as a function of the context (e.g., Church et al., 2001; O'Keefe, Ben-Eliyahu, & Linnenbrink-Garcia, in preparation). These conflicting results expose lacunae in the achievement goal literature, such that we do not yet understand the conditions under which theories of intelligence (or stable goal orientations) will prevail over situational influences, and *visa versa*. One mechanism worthy of examination may be the strength with which theories of intelligence are held. When an entity or incremental theory is strongly endorsed, the resulting perceptual biases may trump situational influences. Conversely, the situation may determine goal adoption when theories of intelligence are weakly endorsed.

Future research should also consider the mechanisms for the cognitive, affective, and behavioral consequences of ToI fit. The current studies reveal a compelling pattern of findings, but the mechanisms that drive these effects are unclear. One possibility is that entity and incremental theorists construe the importance and difficulty of performance and learning goals differently. Because entity theorists do not believe that their level of intelligence can be improved, they may perceive learning goals to be unimportant due to their irrelevance, and they may have low expectations for success. Similarly, performance goals may be relatively irrelevant to incremental theorists. Their belief in the malleability of intelligence, as well as their concern for learning and improvement, may lead them to devalue the mere demonstration or validation of their abilities.

Subsequent research should also compare theoretical models of achievement goal adoption from a ToI fit perspective. The present research applied the model proposed by Dweck and her colleagues (Dweck, 1986, 1999; Dweck & Leggett, 1988). As discussed earlier, however, Elliot and his colleagues (e.g., Elliot & Church, 1997) explained the adoption of achievement goals as a function of achievement motivation, fear of failure, and perceived competence. From this perspective, achievement motivation and perceived competence are positively related to the adoption of learning goals. In comparison, performance-approach goals are positively related to achievement motivation, fear of failure, and perceived competence, and performance-avoidance goals are positively related to fear of failure and negatively related to perceived competence. These three formulations represent a fit between sets of antecedent factors and achievement goal adoption. Nonfit, however, could be assessed by imposing incongruent achievement goals on individuals who are characterized by a particular set of antecedent factors. Comparing theoretical models such as these would highlight areas of theoretical convergence, and may also expose lacunae in our understanding of the complex dynamics of goal pursuit.

7. Conclusion

The majority of research on theories of intelligence has largely focused on individual differences in achievement strivings. The current research, however, was designed to consider the influence of the achievement context. Real-life goal pursuits are varied and dynamic, and the appropriateness of an achievement goal may depend on the situation or the nature of the pursuit. This implies that both entity and incremental theories may be situationally adaptive, resulting in beneficial and harmful consequences. Research that examines theories of intelligence from a person-by-situation perspective promises to yield a more complete understanding of entity and incremental theories and their utility for adaptive goal pursuit.

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Biography

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