

Moving Beyond Intelligence: Predicting Academic Behaviors and Official GPA in Undergraduate Students with Implicit Theories

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Abstract: People view many attributes, including intelligence, through implicit theories (or mindsets). Entity mindsets position the attribute as unchangeable or static, whereas incremental mindsets see the attribute as malleable or capable of being changed/improved (Dweck & Leggett, 1988). The present studies examined a new questionnaire designed to measure implicit theories of academic success in undergraduate students (the Academic Beliefs Scale, ABS) and its relationship to academic achievement (specifically grade point average, GPA). In Study 1, a negative relationship between the entity theory of academic success and GPA was mediated by poor study habits, procrastination, and self-handicapping while the positive relationship between the incremental theory of academic success and GPA was mediated by poor study habits. In Study 2A and 2B, the validity and reliability of the ABS were evaluated, with generally satisfactory findings. Study 2B also conceptually replicated the findings of Study 1, finding that another unique set of behaviors, good academic habits, mediated the relationship between the incremental theories of academic success and GPA. Future research with undergraduates should continue to examine implicit theories of academic success as a predictor of additional academic outcomes and the psychometric properties of the ABS.

Keywords: implicit theories, academic achievement, undergraduates, academic behaviors, Mindset

Undergraduate students' academic success is of interest to multiple people – students themselves, their parents, professors, administrators, and those financing students' educations. On average, individuals who earned a bachelor's degree had lower unemployment rates and a median weekly income almost \$600 more than those who earned a high school diploma (U.S. Bureau of Labor Statistics, 2023). However, only 64% of first time, full-time undergraduate students (undergraduates) who start at a 4-year-college will earn a bachelor's degree within 6 years (National Center for Education Statistics, 2020). Given that it is important to succeed in, and graduate from, college and not just attend college for some period of time (Giani et al., 2019), it is important to examine predictors of academic success in hopes of developing appropriate interventions aimed at improving key outcomes, such as graduation.

The implicit theories of intelligence are a promising starting point, as research has found they have multiple implications for academic achievement. Dweck and Leggett (1988) refer to implicit theories as core assumptions, or beliefs, that shape the ways in which individuals think about

themselves and the world. These beliefs influence the goals people set, as well as the emotions they experience while working towards those goals. The belief that intelligence is changeable is referred to as having an *incremental* theory of intelligence, or a growth mindset, whereas the belief that intelligence is unchangeable is referred to as an *entity* theory of intelligence, or a fixed mindset (Dweck & Leggett, 1988). These theories are thought to predict student behaviors that, in turn, are predictive of academic achievement. A substantial amount of research has supported these theories, examining the effects of implicit theories of intelligence on academic outcomes, including multiple meta-analyses (e.g., Burnette et al., 2013; Costa & Faria, 2018; Sisk et al., 2018). Research also suggests that the environment or culture around people influences the way in which peoples' implicit theories are displayed and their relationship with relevant outcomes (Murphy & Dweck, 2010). For example, in a study of high school students across 78 countries, the link between growth mindset and academic achievement varied by whether there was a social norm endorsing more fixed or growth mindset (Lou & Li, 2022). In a sample of undergraduate students, both perceived peer implicit theories as well as one's own implicit theories predicted academic experiences and behaviors (Muenks & Yan, 2024). Although the average correlation between the incremental theory of intelligence and academic achievement found in meta-analytic studies is weak overall (between .10 - .12), it varies by age (Costa & Faria, 2018; Sisk et al., 2018). Sisk et al. (2018) found the average correlation between incremental theory of intelligence and academic achievement was only significant for children and adolescents, not adults. Of the studies included in their meta-analysis (including multiple unpublished studies conducted with undergraduates) only 37% found the expected positive relation; six percent found negative correlations between the incremental theory of intelligence and achievement¹. Intervention research with undergraduates has also found mixed results, with interventions having varying impacts based on the outcome variable being measured (Sarrasin et al., 2018; Burnette et al., 2023). For example, Miller and Srougi (2021) found that a growth mindset intervention did improve academic performance, but ironically did not change actual implicit theories of intelligence in a sample of undergraduate biochemistry majors.

One potential explanation for the stronger relationship between the incremental theory of intelligence and academic achievement in children and adolescents compared to undergraduates and adults may lie in the difference between kindergarten – 12th grade (K – 12) education and higher education. For instance, while intelligence may accurately predict success in K – 12 contexts where intelligent children's high test scores alone may lead to good grades, innate ability is frequently insufficient to succeed in undergraduate courses which require students take responsibility for their learning and work (e.g., submitting assignments on time, following guidelines). A meta-analysis conducted by Schneider and Preckel (2017) found that while intelligence did predict achievement in higher education and had the 30th highest ranking in terms of effect size, multiple student strategy variables had stronger associations (e.g., goal setting (rank 5), class attendance (rank 6), persistence/effort (rank 13)).

Given the promising results of research on implicit theories of intelligence in K – 12 but the mixed results in undergraduates, our intention was to add to the literature on implicit theories by evaluating if implicit beliefs about academic success correlate with student behaviors and predict academic achievement. Many researchers have applied Dweck and Leggett's (1988) original framework of incremental and entity implicit theories to additional constructs successfully, including romantic beliefs (Knee, 1998), human character/personality (Hong et al., 2003), and health (Schreiber et al., 2020). Therefore, we created a measure of implicit theories of academic success, the Academic Beliefs Scale (ABS), that reflects the environment of college and undergraduates' expectations (i.e., beliefs about succeeding in class), with the intention of measuring the entity and incremental implicit belief

¹ We also found a negative correlation between the incremental theory of intelligence and GPA in a pilot study.

constructs first delineated by Dweck and Leggett (1988) and subsequently found in other measures of implicit beliefs.

Study 1

In the first study we set out to examine the implicit theories of academic success and determine whether they would significantly predict academic achievement as well as determine their relationships with three behaviors previously found to influence academic achievement in undergraduates: effective study skills and attitudes (Credé & Kuncel, 2008), academic self-handicapping (Schwinger et al., 2014), and procrastination (Kim & Seo, 2015); all are described in more detail in the Methods section. Furthermore, we sought to examine if the relations between the implicit theories of academic success and GPA would be mediated by these self-reported behavioral variables.

Hypotheses

1. Students' implicit theories of academic success will be significantly correlated with GPA, with (a) incremental beliefs positively correlated and (b) entity beliefs negatively correlated with GPA.
2. The incremental theory of academic success will be negatively correlated with procrastination and self-handicapping, and positively correlated with study habits.
3. The entity theory of academic success will be positively correlated with procrastination and self-handicapping, and negatively correlated with study habits.
4. The relationships between the entity theory of academic success and GPA and between the incremental theory of academic success and GPA will be statistically mediated by academic behaviors (procrastination, self-handicapping, and study habits).

See Table 1 for all predicted correlations and summary results for Studies 1, 2A, and 2B.

Table 1. Hypothesized Correlations and Results Across Studies

Variable	Correlated with:	Hypothesized correlation	Study 1 correlation	Study 2A correlation	Study 2B correlation
Entity theory of academic success	Incremental theory of academic success	Negative	-.19**	-.28***	-.22***
	GPA	Negative	-.30***		-.15**
	Self-handicapping	Positive	.25***		
	Procrastination	Positive	.17**		
	Study habits	Negative	-.32***		
	Good academic habits	Negative			-.21***
	Problematic academic behaviors	Positive			.24***
	Incremental theory of intelligence	Negative	-.17**		-.35***
	Entity theory of intelligence	Positive			.42***
	Growth theory of intelligence	Negative			-.23***
Destiny theory of romantic beliefs	Positive			.33***	

Variable	Correlated with:	Hypothesized correlation	Study 1 correlation	Study 2A correlation	Study 2B correlation
	Growth theory of romantic beliefs	Negative		-.21***	
	Academic locus of control ^a	Positive		.33***	
Incremental theory of academic success	GPA	Positive	.06		.22***
	Self-handicapping	Negative	-.06		
	Procrastination	Negative	-.05		
	Study habits	Positive	.29***		
	Good academic habits	Positive			.34***
	Problematic academic behaviors	Negative			-.09
	Incremental theory of intelligence	Positive	.11	.32***	
	Entity theory of intelligence	Negative		-.20***	
	Growth theory of intelligence	Positive		.40***	
	Destiny theory of romantic beliefs	Negative		.16***	
Growth theory of romantic beliefs	Positive		.43***		
Academic locus of control ^a	Negative		-.26***		

^a High scores on academic locus of control indicated external locus of control orientation.
Note. Blank cells indicate variables that were not measured in that study. ** $p < .01$, *** $p < .001$.

Method

Sample

The initial sample was comprised of 268 undergraduates at a large public university in the southern United States who participated for class credit. Eighteen students were removed from analyses: two for failure to follow directions, eight due to computer malfunctions, and eight due to research assistant error.

The final sample ($N = 250$) was comprised primarily of freshmen (74%) and female participants (72%). Participants' ages ranged from 18 to 28 years ($M = 19.18$, $SD = 1.35$), with one participant failing to provide their age. The majority (71.2%) identified as White (not of Hispanic origin), 18.8% identified as African-American, and the remaining students identified as other ethnicities. A small percentage reported being first-generation college students (15.2%).

Measures

Demographics

Participants completed a brief questionnaire to obtain information including their age and ethnic identity.

GPA

Official end-of-the-semester GPAs were obtained from the University Registrar's office. End-of-the-semester GPAs were used to ensure all students' GPAs were based on the same time-period instead of cumulative academic performance over varying lengths of time. GPAs were reported on a 4.0-point scale ranging from 0.00 (*F*) to 4.00 (*A*).

Incremental Theory of Intelligence

Students' implicit theories of intelligence were assessed using the Theories of Intelligence Scale (TIS) – Self Form for Adults (Dweck, 1999). This scale consists of four incremental and four entity theory statements. Scores on the incremental theory statements were reverse-scored and all items were averaged to obtain a score from 1 (*pure entity theory*) to 6 (*pure incremental theory*) (see Rickert et al., 2014).

Study Habits

Students' study habits were assessed with the 24-item Work Habits Subscale from the original Survey of Study Habits and Attitudes (SSHA; Brown & Holtzman, 1955, 1966). This subscale measures behaviors such as being organized, seeking assistance when needed, active engagement in recall while studying, and completing work on time and according to directions. Eight items were reverse-scored and all items were averaged so that higher scores on the 5-point scale reflect better study habits.

Self-handicapping

Students' self-handicapping behaviors were measured using the Patterns of Adaptive Learning Scales 6-item Academic Self-Handicapping Subscale (Midgley et al., 2000). Academic self-handicapping refers to engaging in behaviors that increase the likelihood of doing poorly on academics so that if they do, they have an excuse other than a lack of ability (e.g., staying up late the night before an exam) (Midgley et al., 2000). Items were averaged such that higher scores on the 5-point scale indicate higher levels of self-handicapping behaviors.

Procrastination

Students' procrastination behaviors were measured with the 35-item Tuckman's Procrastination Scale (Tuckman, 1991). Procrastination refers to waiting to engage in, or avoiding, a task under the person's control. Ten items were reverse-scored and all items were summed (range 35 – 140), such that higher scores indicate higher levels of procrastination.

Incremental and Entity Theories of Academic Success

A new measure was created, entitled the Academic Beliefs Scale (ABS), by generating 22 statements reflecting incremental and entity beliefs about academic success that college students are likely to have (see Table 2 for the full list of statements). Participants indicated their agreement with each statement using a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Through consultation with four colleagues familiar with implicit theories and/or higher education pedagogy, we determined the measure had good face validity for assessing academic beliefs in undergraduates.

Table 2. Academic Beliefs Scale Items and Loadings for Study 2A

Factor	Item	Factor Loading
Entity Theory of Academic Success	Someone's GPA is either destined to be above a 3.0 (B-average) or it is not.	1.71
	If someone does not understand class material in the first week, they will inevitably fail the class.	1.53
	Whether someone succeeds or fails in the class is destined from the very beginning.	1.42
	People cannot learn how to learn.	1.32
	To learn a new topic, it must seem easy / effortless from the start.	1.29
	Struggling with class material at the beginning of a semester is a sure sign that someone will have trouble learning other material in the class.	1.27
	People don't have all that much control over their GPA.	1.18
	Someone is either smart or they are not.	1.15
	Early troubles in class signify that the person will not do well in that class.	1.13
	If someone cannot learn something right away, they will never be able to learn it.	1.00
Incremental Theory of Academic Success	Except for required classes, people should only take classes in topics that they are naturally good at.	.79
	Challenges in a class will bring your grade and GPA down.	.63
	Learning requires hard work, challenging oneself, and changing one's approach when needed.	2.56
	Even smart people may struggle learning new material.	2.22
	Doing well in a class requires quality effort.	2.18
	Assignments that challenge people to think deeply are needed to learn that information.	1.96
	It takes both wise use of time and quality effort to cultivate a GPA above a 3.0 (B-average).	1.90
	Challenges / difficulties in a class actually help people learn.	1.71
	Having a GPA above a 3.0 (B-average) is mostly a matter of trying your hardest.	1.64
	With enough effort, anyone can graduate with a 4.0 GPA.	1.24
	If someone is struggling with class material, they just need to make some changes in order to improve.	1.00
	People often fail classes because they do not try hard enough.	.95
Without difficulty from time to time, one can never learn anything new.	.85	
Some people just "get it", while the rest struggle to learn new material.		

Removed items	Getting an “A” or a “B” in class is mostly a matter of finding a professor with a teaching style that is compatible with your learning style.
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Procedure

The study was conducted during in-person lab sessions with approval from the University’s Institutional Review Board (IRB). Participants signed in, reviewed an informed consent letter, and signed a FERPA release granting the researchers permission to later obtain that semester’s GPA from the Registrar’s office. After verifying their student ID number, they were given a study ID number to later match their survey data to their GPA. Participants completed the measures online on Qualtrics. To reduce the possibility of participants rushing to leave, they were informed they were required to stay for the entire thirty minutes and reminded to take their time answering. Participants were given course credit for their participation.

Results

Psychometric Analysis

To check if the dimensions underlying the ABS items were consistent with theory and the intent of the measure, exploratory factor analysis (EFA) was conducted in Mplus v8 (Muthén & Muthén, 1998-2017) using the default Geomin rotation approach. Given both positive and negative skewness observed on most items, we compared the model fit treating all items as continuous and as ordered categorical (i.e., ordinal) variables. There was a better model fit when the ABS items were defined as ordered categorical; therefore, all model results treat the items as ordered categorical.

The results of the EFA were evaluated to determine the best factor fit for the data. The scree plot showed three factors had an eigenvalue over 1.0, and the elbow of the scree plot also indicated the possibility of a third factor. The model fits for a one-, two-, and three-factor model are shown in Table 1 of the supplementary materials. Model fit was evaluated according to the criteria outlined by Byrne (2006). Following these guidelines, the one-factor model demonstrated very poor fit, the two-factor model demonstrated an acceptable fit, and the three-factor model demonstrated a better fit (e.g., CFIs = .76, .90, and .93, respectively). However, examination of the loadings from the three-factor model revealed the loadings on the third factor were low (most of them < .30) and several items demonstrated substantial cross-loadings on the other factors, indicating the third factor did not represent a distinct conceptual factor. Furthermore, a parallel analysis, as recommended by O’Connor (2000) suggested only two factors should be retained. Five items were removed due to cross-loadings and the two factors were labeled the Entity Theory of Academic Success and the Incremental Theory of Academic Success.

Next, a confirmatory factor analysis (CFA) of the two-factor model was conducted to evaluate if it demonstrated acceptable fit, which it did, $\chi^2(188) = 346.44$, $p < .001$, CFI = .92, TLI = .91, RMSEA = .09 (see Table 2 in the supplementary materials for factor loadings of each item). Thus, consistent with the theory of, and existing research on, implicit theories, the ABS measures two unique factors: students’ entity and incremental theories of academic success.

We calculated the raw, summed score of the items for each factor, yielding two total scores, one each for Entity and Incremental Theory of Academic Success (Cronbach’s alphas .84 and .71, respectively).

Hypothesis Testing

To examine Hypotheses 1-3, a series of correlation analyses were conducted. See Table 3 for descriptive statistics and correlations among all study variables for Study 1. As hypothesized, the entity theory of academic success was significantly negatively correlated with GPA and good study habits, and significantly positively correlated with self-handicapping and procrastination. The incremental theory of academic success showed a more mixed pattern. It was significantly and positively correlated with good study habits, as predicted, but was not related to GPA, self-handicapping, or procrastination.

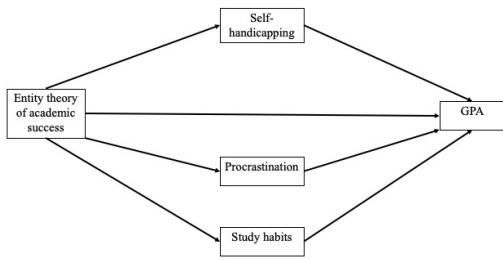
Table 3. Descriptive Statistics and Correlations among Major Study Variables for Study 1

Variable	1	2	3	4	5	6	7
1. GPA	-						
2. Entity theory of academic success	-.30***	-					
3. Incremental theory of academic success	.06	-.19**	-				
4. Self-handicapping	-.28***	.25***	-.06	-			
5. Procrastination	-.18**	.17**	-.05	.43***	-		
6. Study habits	.27***	-.32***	.29***	-.35***	-.58***	-	
7. Incremental theory of intelligence	.03	-.17**	.11	-.05	-.10	.12	-
Mean	3.00	24.81	37.52	2.28	37.52	3.36	4.22
Standard deviation	.74	9.48	6.77	.96	9.38	.40	.88
<i>n</i>	249	250	250	250	250	250	250

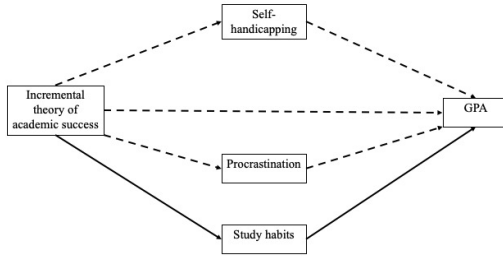
* $p < .05$, ** $p < .01$, *** $p < .001$.

To examine Hypothesis 4, a series of multiple mediation analyses were conducted predicting GPA from each implicit theory of academic success variable with three mediators: self-handicapping, procrastination, and study habits. The multiple mediation analyses were conducted using percentile bootstrap tests (e.g., Fritz et al., 2012) via the PROCESS macro (Hayes, 2018) in SAS 9.4, which have demonstrated the best balance between power and Type I error prevention in sample sizes similar to the current study. The path coefficients for all direct effects are presented in Table 3 of supplemental materials.

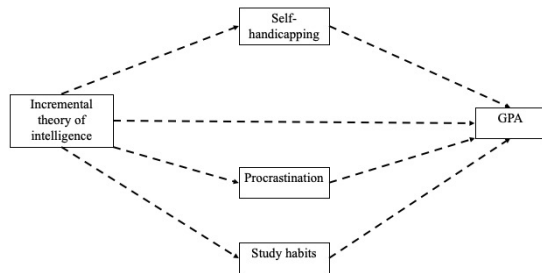
As can be seen in Figure 1, the relationships between the implicit theories of academic success (both incremental and entity) and GPA were statistically mediated by the academic behaviors of procrastination, self-handicapping, and study habits. When the predictor was participant's entity theory of academic success, the indirect paths through self-handicapping, procrastination, and study habits were statistically significant, (95% CIs [.01, .04], [.05, .29], and [-.02, -.01], respectively). The total indirect effect was also significant, 95% CI [-.01, -.003]. When the predictor was participants' incremental theory of academic success, only the indirect path through study habits was statistically significant, 95% CI [.01, .03] whereas the indirect paths through self-handicapping 95% CI [-.03, .01] and procrastination 95% CI [-.25, .10] were not statistically significant. However, the total indirect effect was significant, 95% CI [.003, .02]. Thus, hypothesis 4 was supported for both implicit theories of academic success.



Caption: Relation between entity theory of academic success and GPA is mediated by self-handicapping, procrastination, and study habits, with all indirect paths significant.



Caption: Relation between incremental theory of academic success and GPA is mediated by self-handicapping, procrastination, and study habits, with only the indirect path through study habits significant.



Caption: Relation between incremental theory of intelligence and GPA is not mediated by self-handicapping, procrastination, and study habits.

Figure 1. Mediation Models for Study 1.

Note. Bold lines indicate significant indirect paths through the mediators, dashed lines indicate non-significant indirect paths through the mediators. The total indirect effects for the entity and incremental theories of academic success were significant but the total indirect effect for the incremental theory of intelligence was non-significant.

Finally, we examined the correlations between academic achievement, student behaviors, and the Theories of Intelligence Scale (TIS, Dweck, 1999) given the inconsistent findings seen in previous studies. The incremental theory of intelligence was not significantly correlated with GPA and was only significantly correlated with the entity theory of academic success. Further, self-handicapping, procrastination, and study habits did not significantly mediate the relation between the incremental theory of intelligence and GPA. When participants’ incremental theory of intelligence was the

predictor, none of the indirect paths were significant: 95% CI [-.19, .08] for self-handicapping, 95% CI [-2.22, .44] for procrastination, and 95% CI [-.01, .11] for study habits, nor was the total indirect effect, 95% CI [-.01, .07].

Discussion

Study 1 provides evidence that the link between participants' implicit theories of academic success and GPA were mediated by multiple academic behaviors. These results suggest that to the extent students report higher levels of belief in an entity theory of academic success, they are more likely to report engaging in the problematic academic behaviors of procrastination, self-handicapping, and poor study habits, and these problematic academic behaviors predict lower semester GPAs. By contrast, to the extent that students endorse beliefs in the incremental theory of academic success, they are more likely to engage in better study habits, and these behaviors predict higher semester GPA. These results are consistent with previous work finding various constructs, including incremental theories of intelligence, study skills, self-handicapping, and procrastination, influence academic achievement in undergraduates (e.g., Credé & Kuncel, 2008; Grant & Dweck, 2003; Kim & Seo, 2015; Schwinger et al., 2014; Schwinger et al., 2022) and in K – 12 students (e.g., Blackwell et al., 2007; Rickert et al., 2014; Schwinger et al., 2022). Furthermore, the results of the mediational analyses suggest that while the entity theory of academic success may play a direct role in the prediction of GPA, the incremental theory of academic success only does so through its association with effective study behaviors. By contrast, no academic behaviors significantly mediated the non-significant correlation between the incremental theory of intelligence and GPA.

In sum, Study 1 suggests students' implicit theories of academic success are meaningful predictors of GPA and are associated with relevant academic behaviors. Study 1 also provides preliminary evidence of the psychometric viability of the ABS. The measure demonstrated reasonable internal consistency as well as some predictive validity demonstrated by its correlations with academic behaviors. As such, the aims of Study 2A and 2B were to further explore the psychometric properties of the ABS and replicate and extend the correlational and mediational results.

Study 2A & 2B

Overview

The first goal of Studies 2A and 2B was to evaluate the factor structure of the ABS with a larger sample and assess its reliability and validity. Study 2B had a secondary goal of replicating and extending the mediational analyses conducted in Study 1 with related but slightly different mediating variables. Given that study skills were a strong mediator in Study 1 and study skills can be taught to students (e.g., Wibrowski et al., 2017), we sought to determine if there were unique aspects of study skills that mediate the relationships between the implicit theories of academic success and GPA.

Hypotheses

1. The ABS will be comprised of two factors, one measuring the incremental theory of academic success and the second measuring the entity theory of academic success. (Study 2A)
2. The ABS will demonstrate good validity (e.g., construct, convergent, and divergent). (Study 2A and Study 2B)

3. Incremental and entity theories of academic success will show evidence of reliability. (Study 2A and Study 2B)
4. Students' implicit theories of academic success will be significantly correlated with GPA, with (a) incremental beliefs positively correlated and (b) entity beliefs negatively correlated with GPA. (Study 2B)
5. The negative correlation between the entity theory of academic success and GPA and the positive correlation between the incremental theory of academic success and GPA will be statistically mediated by students' self-reported study skills. (Study 2B)

Method

Procedure

Approved by the university's IRB, Study 2 had two parts. All participants were required to complete a prescreening survey to create an account on the department's online participant management system. The prescreening survey included the measures for Study 2A, which we refer to as "test" data. Students were allowed to skip questions they did not feel comfortable answering. Course credit was given for the pre-screening survey.

After completing the pre-screening, participants signed up for Study 2B during the same semester, allowing us to collect a retest measure for the ABS and additional data from a subsample of Study 2A participants. The procedure was identical to Study 1 (see Section 2.3 for a review) with three minor changes. First, Study 2B was completed in sixty minutes to obtain more measures. Second, to ensure accurate matches for official GPAs, university-provided ID numbers were used instead of study IDs. Third, the IRB required signed consent forms (unlike Study 1's consent letters) due to a new determination that official GPAs were sensitive information.

Samples

Study 2A

The initial sample was comprised of 1,121 undergraduates at a large university in the southern United States who participated for course credit. Of the original sample, 246 (21.94%) were removed for failing the attention check item nested in the survey and one was removed for being below the required age to consent. Thus, data from 874 students were used for analysis purposes. Participants were primarily female (71%) and ranged in age from 18 - 36 ($M = 18.67$, $SD = 1.30$).

Study 2B

All participants signed up to participate in Study 2B after participating in Study 2A during the pre-screening process. There were 414 original participants but 20 (4.83%) were removed from analysis (ten due to lack of survey completion or failure to follow directions and ten due to failing the attention check), resulting in a final sample of 394 participants. Participants ranged in age from 18 to 22 ($M = 18.48$, $SD = .82$) and were primarily female (74.4%).

Measures

All measures included in Study 2A were included in the pre-screening survey and were therefore part of a large pool of measures. Measures in Study 2B were completed in a lab session.

Demographics

Students provided demographic information such as their age and sex.

Incremental and Entity Theories of Academic Success

Students' implicit theories of academic success were measured with a slightly revised version of the ABS used in Study 1. Following Study 1, through consultation with four colleagues regarding the items, half of the items were reworded for clarity and three were added to more fully capture relevant beliefs, for a total of 25 items. Items can be seen in Table 2 and the full measure can be seen in the supplementary materials. Items that loaded on the incremental theory factor and entity theory factor, respectively, were summed to create scores such that the incremental factor score could range from 11 – 77 and scores on the entity factor could range from 12 – 84 with higher scores indicating higher levels of agreement with the theory. See Results section for more information on psychometric properties. Participants completed this measure during Study 2A and 2B.

Construct Validity Measures

Given the fact that the ABS is the first measure we are aware of to measure implicit theories of academic success, there are no measures available to truly establish construct validity. However, we felt it was important to get as close as possible and we adopted three strategies. First, to examine whether the ABS conceptually measured the construct of entity beliefs and incremental beliefs, or the idea that an attribute is fixed or malleable, we correlated the ABS with several other measures of implicit theories. Dweck et al. (1995) noted that some people have a unified implicit theory that applies to multiple attributes while other people have unique implicit theories for different attributes (e.g., intelligence and romantic relationships). Given this, we expected the ABS to be significantly correlated to these alternative measures but with small to medium effect sizes. Further, we expect correlations between the same type of belief (e.g., entity) to be positive while correlations between different types of beliefs (entity and incremental) to be negative. To that end, we used the following measures:

- **Theory of Intelligence.** Students' incremental theory of intelligence was again measured with the TIS (Dweck, 1999) as well as the 14-item Implicit Theory of Intelligence Scale (Abd-El-Fattah & Yates, 2006). The scale results in two factor scores, growth and entity, which are created by averaging the items on each factor such that higher scores (on a 4-point Likert-type scale) indicate higher levels of beliefs in that implicit theory of intelligence. (Study 2A)
- **Implicit Theories of Romantic Beliefs.** Students' implicit theories of romantic beliefs were measured with the 8-item Romantic Beliefs Scale (Knee, 1998). The scale consists of two subscales, with four items each summed to create a destiny and a growth score (such that a score of 28 indicates the highest level of agreement with that implicit theory). (Study 2A)

Second, we sought to establish that our measure was conceptually similar to other measures that assess how people think about academic success (i.e., convergent validity). We turned to the motivation literature and the concept of locus of control – whether outcomes are the result of personal effort (internal) or factors outside of one’s control (external). This connection has been suggested by Dweck and Leggett (1988), who proposed that entity beliefs about intelligence are associated with external locus of control, while incremental beliefs are associated with internal locus of control, and has been partially supported by subsequent research (Bodill & Roberts, 2013). We predicted that incremental beliefs about academic success would be negatively correlated with external locus of control and entity beliefs about academic success would be positively correlated:

- **Academic Locus of Control.** Students’ academic locus of control, whether they view their academic success as due to things in or outside of their control, was measured with the 21-item Revised Academic Locus of Control Scale (Curtis & Trice, 2013). Scores were summed for a total academic locus of control score such that a score of 21 indicates a high external locus of control for academics, indicating they view their academics as outside of their control. (Study 2A).

Third, we wanted to ensure that our measure was conceptually distinct from other measures (i.e., divergent validity). We chose several concepts that have been related to academic outcomes or related to positive outcomes generally:

- **Conscientiousness.** Conscientiousness, a key personality trait involving higher levels of responsibility, reliability, and self-control, was measured with the Ten Item Personality Inventory (Gosling et al., 2003). Higher scores on this factor (range 1 – 7) indicate higher agreement with conscientiousness. (Study 2A)
- **Grit.** To further evaluate divergent validity, students’ grit, how likely they are to persevere in efforts to meet long-term goals as well as passion for those goals, was measured with the 10-item version of the Grit Scale available at <https://angeladuckworth.com/grit-scale> (Duckworth, n.d.) and scored like the 8-item short grit scale (Duckworth & Quinn, 2009). The global score was computed and higher scores (range 1 – 5) indicate higher levels of grittiness. (Study 2B)
- **Self-esteem.** Students’ self-esteem, the way they view and value themselves, was measured with Rosenberg’s 10-item Self-Esteem Scale (Rosenberg, 1965). Higher scores (range 10 – 40) indicate higher self-esteem, meaning viewing and valuing themselves positively. (Study 2A)
- **Socially Desirable Responding.** Students’ socially desirable responding, responding in a manner that they believe portrays them in a socially desirable way, was measured with version six of the Balanced Inventory of Socially Desirable Responding (Paulhus, 1991). The total score was calculated by summing all items such that higher scores indicate more socially-desirable responding (range 40 – 280). (Study 2A)

Outcome Measures

GPA

Official end-of-the-semester GPAs from the semester in which students participated in the study were obtained from the University Registrar's office. GPAs were reported on a 4.0-point scale ranging from 0.00 (*F*) to 4.00 (*A*). (Study 2B)

Good Academic Habits and Problematic Academic Behaviors

Students' study habits were assessed with the 100-item Survey of Study Habits and Attitudes (SSHA; Brown & Holtzman, 1966). This scale has demonstrated strong internal consistency and construct validity (Brown & Holtzman, 1955; Cerasoli & Ford, 2014) and is recommended by Credé and Kuncel (2008) for use as a strong measure of study habits predicting collegiate GPAs. However, due to evidence in the literature that the original four-factor solution for the SSHA is not accurate (Bray et al., 1980), we conducted a factor analysis, which resulted in five meaningful factors. We used the two factor scores that most closely aligned with study skills, which we labeled Good Academic Habits and Problematic Academic Behaviors, both of which were scored by finding the mean of the items that loaded on the factor (range 1 – 5), with higher scores indicating higher levels of agreement that they engage in those behaviors. Good Academic Habits (Cronbach's alpha = .82) measured behaviors such as working hard even if they do not like a subject, organizing work, and using time effectively. Problematic Academic Behaviors (Cronbach's alpha = .89) measured behaviors such as procrastination, failure to persist, engaging in other activities more than school-work, and inefficient studying behavior. (Study 2B)

Results (Study 2A)

Factor Structure (Hypothesis 1)

To confirm the dimensions underlying the revised ABS were the same as in Study 1, EFA and CFA were again conducted via Mplus v8. Similar to Study 1, the revised ABS items were defined as ordered categorical because there was a better model fit than when they were defined as continuous.

Replicating the analyses of Study 1, the dimensionality of the items was examined via EFA, and the results were identical to those of Study 1. The scree plot indicated the possibility of up to three factors, so model fit was evaluated according to the criteria outlined by Byrne (2006). As can be seen in Table 4, the one-factor model demonstrated very poor fit, the two-factor model indicated an acceptable fit, and the three-factor model demonstrated better fit (e.g., CFIs = .76, .93, and .95, respectively). However, the loadings from the three-factor model also demonstrated the same problematic features as Study 1 (i.e., low loadings and cross-loadings), and the parallel analysis also demonstrated that the 2nd eigenvalue from our data was greater than the eigenvalue from the random data. Therefore, based on these combined results, we again determined the two-factor model was the best fit to the data. Two items were removed due to cross-loading in the two-factor EFA, see Table 2 for factor loadings. The CFA of the two-factor model demonstrated acceptable fit², $\chi^2(229) = 1595.61$,

² Note. χ^2 = Chi-square test of model fit, *DF* = degrees of freedom, CFI = comparative fit index, LI = Tucker-Lewis index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.

$p < .001$, CFI = .93, TLI = .92, RMSEA = .08. Therefore, our first hypothesis that the ABS will be comprised of the same two factors as in Study 1 was supported. As in Study 1, the raw summed scores of the items from the two factors were computed as the total scores.

Table 4. Model Fit of EFA for Different Factor Models for Study 2A

Model\Index	χ^2	DF	p -value	CFI	TLI	RMSEA	SRMR
1-factor	4841.523	299	.000	.760	.739	.132	.117
2-factor	1595.430	274	.000	.930	.917	.074	.051
3-factor	1284.862	250	.000	.945	.929	.069	.045

Validity (Hypothesis 2)

To examine the validity of the ABS, we conducted a series of correlation analyses between the ABS and the various measures described above (see Table 1). First, we examined whether the ABS was related to other implicit theories measures. With one exception (a positive correlation between incremental beliefs toward academic success and destiny beliefs in romantic relationships), the incremental beliefs of the ABS were positively correlated with the incremental beliefs of other measures of implicit theories and negatively correlated with the entity beliefs of the other measures of implicit theories, as predicted. Consistent with predictions, the opposite pattern was found with the entity beliefs of the ABS. All correlations were small to moderate in size (absolute magnitude $\leq .43$), indicating that the ABS is measuring a construct that is related to, but distinct from, other implicit theory constructs, which is consistent with the literature suggesting some people hold a generalized implicit theory while others hold different implicit theories for different attributes (Dweck et al., 1995). (See Table 4 of supplemental materials for descriptive statistics and correlations among the implicit theory measures.)

Next, we examined whether the ABS was significantly correlated with the Academic Locus of Control measure, given their marginal degree of conceptual similarity. As predicted, endorsing an external academic locus of control was positively correlated with entity beliefs ($r = .33, p < .001$) and negatively correlated with incremental beliefs ($r = -.26, p < .001$).

Finally, we examined whether the ABS was conceptually distinct from other measures (i.e., divergent validity). As can be seen in Tables 5 and 6, all correlations between the ABS factor scores and the measures of divergent validity were in the expected directions but small to moderate in size (absolute magnitude $\leq .34$), indicating the ABS factors are measuring unique constructs from the divergent measures given in Studies 2A and 2B.

Table 5. Descriptive Statistics and Correlations among Divergent Validity Measures for Study 2A

Variable	1	2	3	4	5
1. Entity theory of academic success	-				
2. Incremental theory of academic success	-.28***	-			
3. Socially desirable responding	-.14***	.07	-		
4. Conscientiousness	-.24***	.22***	.29***	-	
5. Self-esteem	-.26***	.21***	.46***	.35***	-
Mean	31.32	58.90	161.10	5.29	30.44
Standard deviation	11.56	8.63	21.11	1.20	5.47
n	837	860	735	835	815

*** $p < .001$.

Table 6. Descriptive Statistics and Correlations among Measures for Study 2B

Variable	1	2	3	4	5	6	7
1. GPA	-						
2. Entity theory of academic success	-.15**	-					
3. Incremental theory of academic success	.22***	-.22***	-				
4. Grit	.09	-.19***	.20***	-			
5. Good academic habits	.36**	-.21***	.34***	.47***	-		
6. Problematic academic behaviors	-.11*	.24***	-.09	-.58***	.45***	-	
7. Incremental theory of intelligence	-.01	-.25***	.23***	.17**	.16**	.18***	-
Mean	3.26	26.56	60.37	3.47	4.00	2.94	3.99
Standard deviation	.64	9.10	8.20	.62	.50	.67	.84
<i>n</i>	390	394	393	394	394	394	386

Note. All measures completed at re-test time point except for the TIS (Incremental theory of intelligence).

* $p < .05$, ** $p < .01$, *** $p < .001$.

In sum, as can be seen in Table 1, the correlations across all three studies were in the expected direction with one exception as previously noted; additionally, 79% of the hypothesized correlations were statistically significant and in the expected direction, with 17% non-significant but in the expected direction. Therefore, our second hypothesis, that participants' implicit theories of academic success would show evidence of convergent and divergent validity is also supported with the caveat that it is not truly possible to assess the construct validity of the ABS given its novelty.

Reliability (Hypothesis 3)

Students could take the pre-screening measure at any point in the semester and we ran Study 2B (when they took the retest) throughout the semester as well, so the number of days between test and retest ranged between 1 and 101 days ($M = 44.02$, $SD = 25.78$). Therefore, to examine the test-retest reliability (how closely participants' scores matched each other the first and second time they completed the measure) of the ABS factor scores, the correlations between test and retest of the entity and incremental theories of academic success were computed with and without partialling out length of time between test and retest. Test-retest correlations for the entity and incremental theories of academic success were similar with and without partialling out length of time between test and retest ($.32$, $p < .001$ and $.41$, $p < .001$, respectively). Thus, our hypothesis that the ABS would show evidence of test-retest reliability is only partially supported. The correlations are statistically significant but lower than desirable.

Two measures of internal reliability were computed to examine the measure's reliability in Study 2A and 2B: Cronbach's alphas, which measure how well the items in the measure relate to one another as a group, and Spearman-Brown split-half reliabilities, which measures consistency between two halves of the measure to determine if they are measuring the same construct. In Study 2A, Cronbach's alphas were .88 and .78 and Spearman-Brown split-half reliabilities were .88 and .71 for participants' entity and incremental theories of academic success respectively. These results indicate good internal consistency and split-half reliability for both factors. In Study 2B, reliabilities of the ABS

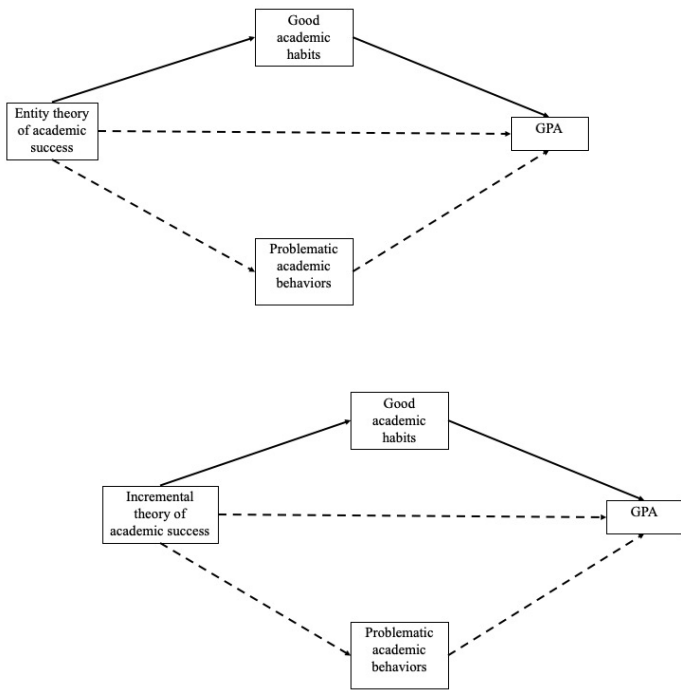
factors were examined again using the retest scores. Cronbach's alphas were .83 and .77 and Spearman-Brown coefficients were .81 and .73 for the entity and incremental theories of academic success respectively, again indicating good internal consistency for both factors.

Predicting Academic Outcomes (Hypotheses 4 and 5)

Correlation analyses were conducted to examine Hypothesis 4. Consistent with predictions, incremental beliefs about academic success were positively and significantly correlated with GPA and entity beliefs were negatively and significantly correlated with GPA (see Table 1).

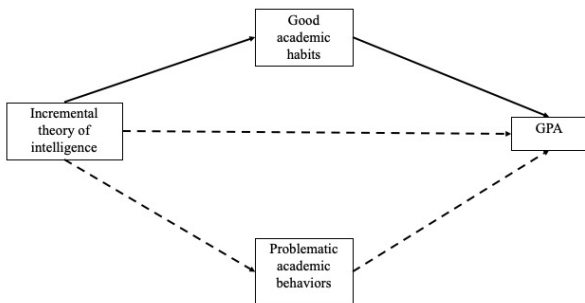
To test Hypothesis 5, the multiple mediation analysis conducted in Study 1 was repeated using Study 2B data and the same percentile bootstrap method. Participants' retest ABS factor scores were used as the predictors and good academic habits and problematic academic behaviors were used as the mediators to determine whether these factors would mediate the correlations between participants' entity and incremental theories of academic success and GPA. The direct path coefficients are presented in Table 5 of the supplementary materials.

As can be seen in Figure 2, the relationships between the entity and incremental theories of academic success and GPA were mediated by good academic habits, as predicted by Hypothesis 5. When the entity theory of academic success was the predictor, the total indirect effect of the model was significant, 95% CI [-.008, -.001], and the indirect path through good academic habits was significant, 95% CI [-.009, -.003], but the indirect path through problematic academic behaviors was not significant, 95% CI [-.000, .004]. When the incremental theory of academic success was the predictor, the total indirect effect of the model was significant, 95% CI [.005, .014], and the indirect path through good academic habits was significant, 95% CI [.006, .014], but the indirect path through problematic academic behaviors was not significant, 95% CI [-.002, .000]. These results provide additional support for the theory that students' implicit theories are associated with behaviors, and those behaviors, especially engaging in good academic habits, predict academic outcomes (in this case, GPA).



Caption: Relation between entity theory of academic success and GPA is mediated by good academic habits and problematic academic behaviors, with only the indirect path through good academic habits significant.

Caption: Relation between incremental theory of academic success and GPA is mediated by good academic behaviors, with only the indirect path through good academic habits significant.



Caption: Relation between incremental theory of intelligence and GPA is mediated by good academic habits and problematic academic behaviors, with only the indirect path through good academic habits significant.

Note. Bold lines indicate significant indirect paths through the mediators, dashed lines indicate non-significant indirect paths through the mediators. The total indirect effects for all models were significant.

Figure 2. Mediation Models for Study 2A & B

A secondary mediational analysis was done using the incremental theory of intelligence to re-examine the nonsignificant mediation found in Study 1. This analysis was secondary because the incremental theory of intelligence was measured as part of Study 2A whereas the mediators were measured as part of Study 2B. As can be seen in Figure 2, when the incremental theory of intelligence was the predictor and good academic habits and problematic academic behaviors were the mediators, the total indirect effect was significant, 95% CI [.01, .08], and the indirect path through good academic habits was significant, 95% CI [.02, .09], but the indirect path through problematic academic behaviors was not significant, 95% CI [-.03, .01]. Therefore, in this study, the relationship between the incremental theory of intelligence and GPA was mediated by good academic habits, providing further support for the theory that implicit beliefs are associated with behaviors and these behaviors predict academic outcomes.

Discussion

Replicating the findings of Study 1, the entity theory and incremental theory of academic success both predicted GPA through their relationship with positive study habits. Of note, the pathway through problematic academic behaviors was not significant.

Taken together, the results of Study 2 provide further support for the ABS as a useful measure. Study 2A suggests that the ABS measure is conceptually strong, again demonstrating a two-factor solution representing incremental and entity factors, and consistently related to similar constructs. However, the results of Study 2B provide some evidence that improvements to the ABS could be made at an item-level. The test-retest reliability is discussed further below. Internal reliability analyses suggested some degree of redundancy.

General Discussion

Given the mixed findings regarding implicit theories of intelligence's prediction of academic achievement in adults (Sisk et al., 2018) it is important to determine if implicit theories of a construct other than intelligence may predict this important outcome. The results of Studies 1 and 2 provide evidence that implicit theories of academic success may be just such a construct.

The results suggest that the measurement of this construct, the ABS, possesses acceptable psychometric properties for use in an undergraduate context. The factors derived with two separate samples are consistent with the literature on implicit theories, with one factor measuring the entity theory and the other measuring the incremental theory (Dweck & Leggett, 1988). The ABS is unique in that it is the only measure of which we are aware that measures implicit theories related to academic success in an undergraduate context. Both factors of the ABS (the entity and incremental theories of academic success) possess important predictive validity for studies examining the impact of implicit theories on academic success in undergraduates. The entity theory of academic success was significantly correlated with GPA and five academic behavior variables (e.g., self-handicapping and good academic habits) in two samples, with all correlations in the small to moderate range. Further, there was a significant indirect effect on GPA in two mediation models predicting GPA from the entity theory of academic success with different relevant academic behaviors as mediators. These mediational models indicate the entity factor is measuring a belief structure that is associated with students' behaviors and, through these behaviors, ultimately their academic achievement.

The incremental theory of academic success was not as consistently predictive of outcomes, but nevertheless has good predictive validity. The incremental factor was significantly correlated with GPA in only one of the two samples and was significantly correlated with two of the five academic behavior variables (study habits and good academic habits). Thus, it appears students who endorse

incremental theories of academic success are more likely to engage in desirable studying behaviors but not significantly less likely to avoid engaging in behaviors that might negatively impact their academic success; perhaps because the beliefs they endorse do not preclude behaviors like procrastinating but working hard right before a deadline. It may also be the case that students who endorse the incremental theory of academic success are more likely to engage in behaviors that foster academic success but were not measured in this study. For example, they may be more likely to ask questions and less likely to make internal attributions. When the incremental theory of academic success was the predictor in the mediation models predicting GPA with different relevant academic behaviors as mediators, there was a significant indirect effect on GPA in both studies. Like the entity theory, it appears the incremental theory is measuring a belief structure that has meaningful relations to students' studying behaviors and ultimately their academic achievement. However, it may also be the case that holding an entity theory of academic success may have a more significant association with students' behaviors and success than holding an incremental theory of academic success. In other words, the undesired impacts of an entity theory of academic success may be larger than the desired impacts of an incremental theory of academic success.

Taken together our results suggest students' implicit theories of academic success play a small, but important, role in students' academic success that likely functions by influencing relevant academic behaviors. Although the coefficients of the entity and incremental theories of academic success were relatively small, these relatively small effect sizes are consistent with the literature which finds the incremental theory of intelligence and academic achievement are significantly correlated but the effect size is small to moderate depending on age of the participants (Sisk et al., 2018).

Although we did not set out to evaluate the TIS, our results are consistent with research showing inconsistent findings when predicting academic achievement from the TIS in undergraduates, in which incremental theories of intelligence have been found to either be negatively related to measures of academic achievement (Aronson et al., 2002; Kornilova et al., n.d.) or not significantly related (Kornilova et al., 2009; Stump et al., 2014). However, our results are inconsistent with the results found in K–12 populations (e.g., Blackwell et al., 2007; Romero et al., 2014) and one study with Chinese undergraduates (Chen & Wong, 2015). When examining the correlations between the incremental theory of intelligence and the outcome variables, the correlations were in the expected directions, but the incremental theory of intelligence was not significantly correlated with GPA in either sample and was only significantly correlated with the two academic behavior variables measured in Study 2A. When the incremental theory of intelligence was the predictor in the mediational models, there was not a significant mediation in Study 1 but there was a significant indirect effect on GPA for Study 2. Thus, our results call into question whether the inconsistent findings in undergraduates may be due, at least in part, to the measurement of implicit theories being used. Future research exploring the impact of implicit theories on academic achievement in undergraduates should examine the validity of the TIS for use with undergraduates and consider using the ABS in addition to, or in place of, the TIS.

In addition to promising predictive validity, the results suggest the ABS has acceptable levels of construct validity. With only one exception, the ABS factors correlate in expected directions with related measures of implicit theories and related constructs (e.g., grit), but not so highly that the factors appear to be measuring the same underlying constructs. As noted previously, it is important to keep in mind that the ABS is the only measure we are aware of that evaluates this exact type of implicit theory, so it is impossible to establish true convergent validity with other measures of academic beliefs. Even though only some people hold a generalized implicit theory that applies across attributes (Dweck et al., 1995), we found evidence that the ABS is measuring similar, but unique, constructs. The convergent and divergent correlation coefficients found for the ABS are similar to, or higher than, those found for related measures such as the Romantic Beliefs Scale (Knee, 1998).

The ABS factors displayed good internal consistency all three times the ABS was administered. However, given the high split-half reliability for the entity theory of academic success, future research with the ABS should explore whether some items on the ABS entity factor may be redundant, and thus can be removed.

One significant concern regarding the ABS is its potential for unreliability, given the moderate correlations found for test-retest reliability. The moderate correlations found in this study are much lower than the two-week test-retest reliability of .80 found for a shorter version of the TIS (Dweck et al., 1995) but like those found for the RBS, which were .52 and .40 (Knee, 1998). As Knee discusses, it is possible that undergraduates' beliefs are flexible and responsive to experiences over time. This would be consistent with more recent research by Murphy and colleagues (e.g., LaCosse et al., 2021; Muenks et al., 2020; Murphy & Dweck, 2010) which indicates that people's implicit theories are influenced by the implicit theory of the organization or classroom they are currently a part of. Furthermore, as DeVellis (2003) discusses, test-retest correlations can be caused by at least four different reasons, only one of which is unreliability of the measurement in question. It is therefore unknown if these moderate correlations are caused by unreliability, or some other reason. For example, they may be due to true temporal changes in scores over time, with some students decreasing their beliefs in the entity theory and increasing their beliefs in the incremental theory of academic success over the course of a semester. This would be consistent with the means of the two scales at each time point and research showing changes in the incremental theories across time (e.g., Costa & Faria, 2022; Gutentag et al., 2022). There are also two methodological reasons that cannot be ruled out as complicating interpretation of these correlations. First, the order of the items varied at test and retest, which may have influenced participants' response sets. Second, participants completed the measure in different settings at test and retest so situational factors may be at play. Future research should further examine the test-retest of the ABS, discerning whether it was an artifact of the current study, an aspect of the ABS measure, or the construct itself.

Strengths, Limitations, and Future Directions

There are multiple strengths of the current set of studies. First, the ability to replicate our major results in two samples with different measures suggests these results are robust. Second, by using official end-of-the-semester GPAs we ensured having a consistent and accurate measure of academic achievement across participants regardless of length of time in school or socially desirable responding, that is an externally valid measure because GPAs are influenced by multiple factors. Third, we collected data across the entire semester to ensure we captured the full range of students on our constructs of interest (e.g., procrastination). Fourth, students completed the measures in a laboratory setting in Study 1 and 2B and were required to stay the duration of the study to increase chances they took their time and focused on the items. Finally, the ability to measure undergraduates' implicit theories of academic success with a measure that predicts relevant behaviors and outcomes is an important contribution to the field that will allow researchers across disciplines to further explore predictors of academic success in undergraduates and potentially assist with intervention targets.

However, the following limitations should be kept in mind when interpreting our results. First, both studies were conducted at the same university, which is a large, research-focused university in the southern United States. Therefore, it will be important to replicate the results in other university and college settings. Second, by using different methodology for Studies 2A and 2B and having variable measurement times, we were unable to obtain an ideal measurement of test-retest reliability. Thus, it is possible the ABS has low test-retest reliability. Future research using the ABS should consider this and attempt to determine test-retest reliability using consistent methodology across time points. Third, all of our variables are based on students' self-reports, with the exception of GPA. Self-

report measures, although useful and common, may suffer from several notable limitations, especially in the realm of education (Duckworth & Yeager, 2015). Future research should include behavioral measures, such as the likelihood of students' choosing to engage in challenging optional work. Finally, research has found multiple necessary-but-not-sufficient conditions for academic success (Tynan, et al., 2020), and the present studies evaluated a small subset of those variables. Future research should continue to explore the relative importance of variables in the prediction of academic achievement so that research may focus on the constructs that are found to be the most highly predictive of this important outcome. Additionally, this research should continue to explore the mechanisms through which these variables, including the implicit theories of academic success, predict relevant behaviors and outcomes.

We recommend future research on implicit theories related to academic success in undergraduates use the ABS in addition to, or perhaps in place of, the TIS. Future research should also continue to explore the psychometric properties of the ABS. Based on the work of De Castella and Byrne (2015) who found revising the wording of items on the TIS to become self- rather than other-referential predicted greater outcome variance on dependent measures, future research should explore whether the same would hold true for the ABS. Finally, if our results are replicated in other settings, future research could explore the possibility of interventions related to the implicit theories of academic success to determine whether an intervention could reduce the negative impact of the entity theory of academic success on behavioral mediators and ultimately academic achievement outcomes.

Conclusion

Understanding factors that can promote college success is important for a variety of reasons. Given the promise of implicit theories to understanding people's behavior but the inconsistent finding of existing measures, the ABS is a promising new measure for evaluating relevant entity and incremental theories of academic success in undergraduates which is easy to administer and has promising psychometric properties. The ABS significantly predicted GPA and was correlated with relevant academic behaviors in two samples. Further, we found academic behaviors mediated the relationship between the implicit theories of academic success and GPA, adding to the literature and supporting the theory that implicit beliefs influence relevant behaviors and, through these behaviors, ultimately influence academic success. We encourage researchers interested in implicit beliefs related to academic achievement in undergraduates to include the ABS in their measurements.

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