

LONG-TERM PROSPECTS, PERSONALITIES, COGNITIVE ABILITIES,
AND LONG-TERM ACHIEVEMENT

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by

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LONG-TERM PROSPECTS, PERSONALITIES, COGNITIVE ABILITIES,
AND LONG-TERM ACHIEVEMENT

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ABSTRACT

Self-referent performance beliefs can influence people's decision making related to and in pursuit of long-term goals. Current measures of such beliefs, however, do not explicitly focus on the long-term aspects of goal achievement. I introduce and evaluate a new construct, Long-Term Prospects (LTP), which is defined as the self-perception that one can maintain the continuous effort needed to achieve long-term goals. In Study 1, 320 incoming college freshmen were administered measures of LTP, conscientiousness, grit, self-esteem, academic self-concept, and intelligence. Standardized achievement scores (ACT) and high school GPA were obtained from the university registrar. Bayesian and standard regression analyses revealed first semester and first year college GPAs were best predicted by LTP, high school GPA, standardized achievement scores, father's education, and gender. Follow-up analyses confirmed that LTP had higher predictive utility than any of the other non-cognitive measures. In study 2, a sample ($n = 200$) of non-college adults was administered the same non-cognitive measures, and they reported their annual income. LTP and conscientiousness emerged as independent predictors of income. The results demonstrate the utility of LTP and highlight the importance of people's explicit beliefs about their ability to maintain effort in the pursuit of long-term goals.

Chapter One: Overview

Identifying the individual difference predictors of success in school and in life has driven research by educators and psychologists for more than a century (e.g., Spearman, 1904; Duckworth & Yeager, 2015). The contribution of cognitive abilities (e.g. intelligence) to academic achievement and to success outside of school has been well documented (Greven, Harlaar, Kovas, Chamorro-Premuzic, & Plomin, 2009; for reviews see Deary, Whalley, Lemmon, Crawford, & Starr, 2000; Geary, 2005). Research has also focused on important personal qualities as predictors of success, including aspects of personality or traits (e.g. Barrick & Mount, 1991; Day, Maltby, Proctor & Wood, 2010; Duckworth, Peterson, Matthews & Kelly, 2007) and aspects of people's self-referent performance beliefs (e.g. Bandura, 1986; Dweck & Molden, 2005; Eccles & Wigfield, 1995; Marsh & Craven, 1997). Self-referent performance beliefs are thought to be important because they can influence the motivational and affective processes that guide people's decision making, engagement and coping in the different stages of pursuing a goal.

However, most self-referent belief studies focus on whether people believe they can accomplish particular goals or short-term objectives, and do not explicitly focus on the long-term aspects of goal achievement, that is, people's self-perceived ability to remain persistent in the pursuit of long-term goals over time. Accordingly, this article introduces and evaluates a new construct and measure that fills this gap. Specifically, Long-Term Prospects (LTP) is the self-perception that one can succeed in achieving long-term goals that require continuous effort. I compared the new construct to both

objective ability measures and to existing performance belief measures to evaluate its incremental validity as a predictor of academic success.

Cognitive Abilities, Personality and Achievement

Intelligence and previous academic performance are two commonly used and powerful cognitive ability measures for predicting later achievement (e.g. Casillas et al., 2012; 1997a; Rhode & Thompson, 2007). Prior standardized test scores and high school GPA are consistent predictors of college academic achievement, even after controlling for intelligence (Coyle & Pillow, 2008; Robbins et al., 2004). Personality also plays a role in achievement. Research on the Big Five personality traits--openness, conscientiousness, extraversion, agreeableness, and neuroticism--has revealed that conscientiousness is a consistent predictor of academic achievement (e.g. Barrick & Mount, 1991; Day, Maltby, Proctor & Wood, 2010). Conscientiousness is the personality trait of being thorough, organized, self-controlled, and careful. The effect of conscientiousness on academic achievement is largely independent of intelligence (see Poropat, 2009, for a meta-analysis). The other dimensions of personality show much less predictive utility than does conscientiousness, with effects that are generally mixed or not significant.

Self-Referent Beliefs and Achievement

An additional aspect of personality is the kind of performance beliefs that humans hold about themselves. As in the well-known “Little Engine that Could” story, those who “think I can, think I can” may hold an advantage over those without such beliefs. One of the first to recognize this was Bandura (1986), who took the post-behavioral perspective that humans are more than the environmental stimuli to which they have been exposed.

People's ability to visualize future success can result in more persistent behaviors in pursuing goals and less anxiety when facing difficulties (Bandura, 1989). Much research effort has been made to measure such self-efficacy beliefs and examine their influence on achievement.

In educational research, self-referent performance beliefs have often been studied under the rubric of "academic self-concept," (e.g. Marsh & Craven, 1997) which assesses perceptions of one's academic ability (i.e., "I am good at learning."). Academic self-efficacy has also been studied in educational research with a focus primarily on people's perceived ability to carry out certain actions (i.e., complete algebra tasks) and performances (Bandura, 1997). Although research results for academic self-efficacy are similar to those for academic self-concept, researchers frame self-efficacy items somewhat differently; they focus more on future outcomes than on a static, here-and-now or in the past self-evaluation, and focus more on the perception of ability without a corresponding affective evaluation (Bong & Skaalvik, 2003). Valentine, Dubois and Cooper's (2004) meta-analysis of longitudinal studies found that self-referent beliefs have a small but consistent effect on later achievement, after controlling for previous achievement, and measures of both academic self-concept and academic self-efficacy are better predictors of achievement than global self-esteem.

Beliefs about Long-term Goals

In the modern work-world with its prolonged educational requirements and evolving professional careers, resisting short-term temptations and maintaining focus on long-term goals has become increasingly important. Achieving and maintaining competitive skills requires continuous effort and repeated practice (Ericsson & Charness,

1994). It is crucial for adolescents and young adults to believe in themselves in the long journey of pursuing success in education or workplace. However, most of the individual differences measured in the existing academic achievement literature have concerned with people's short term behaviors, or their beliefs concerning short term behaviors.

Duckworth, Peterson, Matthews, and Kelly (2007) developed a trait construct they called "grit," which refers to passion and perseverance for long-term goals, as an alternative predictor of academic achievement. In a series of studies, they found evidence that grit was associated with educational success, such as GPA, retention, and educational attainment (Duckworth et al., 2007). In their studies using undergraduate samples, grit was related to self-reported college GPA ($r = .25$, Study 3), but the correlation was attenuated when official GPA was used ($r = .06$, Study 4). The grit concept embodies the importance of persistent effort in predicting achievement, but the published scales do not explicitly ask about people's experiences in a scenario of pursuing long-term goals. Also, it is conceptualized as a personality trait. But self-appraisal measures may serve as better predictors of later behavior than personality trait measures of past behavioral patterns that do not reflect people's conscious intentions regarding their own behaviors. However, research on self-referent beliefs such as self-efficacy is mainly task and situation specific, and does not explicitly measure a long-term focus.

I recognized the gap in measures between the grit and self-efficacy concepts and the void of belief measures in long-term context. Existing measures of personal qualities do not explicitly ask people to evaluate themselves in the context of a long-term goal. To determine if framing these beliefs in the context of such a goal is important, I developed a corresponding construct and measure of efficacy beliefs with respect to long-term goals. I

define *Long-term Prospects (LTP)* as the self-belief that one can succeed in achieving long-term goals that require continuous effort. I developed a new scale called “Long-Term Prospects Scale,” in which each item was explicitly composed of two components; the combination is different from existing scales. The first component is a focus on long-term goals or goals that take continuous effort, and the second is a future oriented wording asking ones’ belief or evaluation about the ability to achieve such goals, such as “I can”, “I am able to” and “I have doubts (R)”. Example items are “I can achieve a goal that takes years of hard work”; “I always have doubts about my ability to achieve long-term goals (R).”

Current Research

The purpose of this research was to examine the validity of LTP in predicting objective academic achievement. I hypothesized that LTP would be a better predictor of college students’ academic performance than either global or academic self-concept, and better than the personality dimensions of grit and conscientiousness. Again, this is because people’s self-referent performance beliefs, particularly concerning long-term performance, should explain unique variance in the prediction of actual long-term behavior (i.e., over the course of a year of college). I tested this longitudinal prediction for college students’ first semester and first year GPAs. For reasons noted above, I included IQ, standardized test scores (i.e., ACT), high school GPA, and parental education as control variables. In a second study, I examined the predictive utility of the LTP measure for adult’s economic success (e.g., income). To compare LTP with alternative predictors, a recently popularized method called Bayes factor analysis (Jeffreys, 1961; Raftery, 1995; Rouder & Morey, 2012) was used. Bayes factor analysis

(below) can select the best set of predictors of achievement and test alternative models, which is useful when comparing the predictive utility of similar and thus correlated constructs.

Chapter Two: Literature Review

Introduction

This chapter is composed of three main parts. The first part reviews previous researchers' effort in identifying factors predicting achievement. Both measures of cognitive abilities and measures of personal qualities are reviewed. The cognitive ability measures that I focus on most are intelligence and previous achievement; the personality measures that I focus on most are conscientiousness and self-referent performance beliefs. The theoretical background of these measures and their relationship with achievement are discussed in this section. Rather than explain these constructs separately, the second part integrates major factors that have been proposed to predict achievement and focuses on reviewing studies that consider both cognitive abilities and personal qualities or both personality and beliefs. This section reviews these effects and discusses the amount of impact of the suggested factor and the interplays between factors. This section ends with a summary of the limitations and gaps in existing literature. The third part reviews previous research on personal qualities in long-term goal contexts and the rationale for developing a measure of long-term prospect. The importance of this measure and how the current study can help fill gaps in the existing literature are also discussed.

Intelligence

Intelligence is one of the most studied predictors of achievement. Intelligence has been defined in different ways. For example, Wechsler (1991) defined intelligence as the "global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his or her environment," (p. 1). Neisser et al. (1996) defined intelligence as "ability to understand complex ideas, to adapt effectively to the environment, to learn

from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought” (p. 77). Gottfredson,(1997) summarized “Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience” (p. 13). Spearman (1904) proposed a conceptual framework of intelligence. He suggested that intelligence has a general factor (the g factor) and a collection of some more specific cognitive abilities (the S factor).

Many measures have been developed to examine the g factor. One of the most famous ones is the Raven’s Progressive Matrices, which was developed by John C. Raven in 1936. This test aims at measuring people’s reasoning ability. In this test, people need to identify the correct missing component to complete a pattern. One of the biggest advantages of this test is its non-verbal feature, so it is claimed to more accurately measure the g factor because it is not influenced by subjects’ literacy level. There are also some other instruments that are often used in educational settings to measure intelligence, such as the Wechsler Intelligence Scale-third edition (WISC-III, Wechsler, 1991) and The Universal Nonverbal Intelligence Test (UNIT, Bracken & McCallum, 1998). These tests must be individually administered, and are much more expensive.

Another alternative for researchers to study or measure intelligence is to use standardized measures of students’ cognitive abilities. Two college entrance exams, the SAT and ACT, have been found to highly correlate with measures of the g factor (e.g., Lewis & Johnson, 1985; Coyle, 2006; Koenig, Frey & Detterman, 2008). And the scores among cognitive ability tests are often highly related. In Koenig, Frey and Detterman’s (2008) study 1, the correlation between ACT scores and the Armed Services Vocational

Aptitude Battery (ASVAB) IQ test scores are .67 (verbal), .74 (math) and .78 (total) and the correlation between SAT subtest scores and the ASVAB IQ test scores are .75 (verbal), .78 (math) and .82 (total). Their Study 2 examined the correlation between Raven's Advanced Progressive Matrices (APM) scores and ACT scores. Results revealed a correlation of .75 between Raven's score and the ACT composite score. In their discussion, they suggested that the ACT can be used as a measure of general intelligence. Similar arguments about using SAT as a measure of intelligence were made by Frey and Detterman (2004) in research that investigated the relationship between SAT and general cognitive ability. Given that these exams are required when applying to college, they are not as hard and expensive as other assessments for researchers or educators to access. Many previous studies on achievement have used students' self-reported or institution-reported standardized test scores as an estimation of general cognitive ability.

There is a rich literature examining the correlation between intelligence and achievement, and a positive relationship has been established (e.g. Gottfredson, 1997; Rhode & Thompson, 2007). For example, Baade and Schoenberg (2004) examined correlations between Wechsler intelligence tests and various group achievement tests, and most of the coefficients ranged from .30 to .60. Besides academic achievement, IQ was also found to be related with social status, occupational status and knowledge outside of the regular curriculum (see Brody, 1997, for a review). Previous research also showed a high correlation between standardized tests (as discussed above, which can be used as a proxy measure of intelligence) and GPA. For example, Stumpf and Stanley (2002) found that students' ACT scores correlated with college GPA from .54 to .63, with a correlation of .70 with graduation rates. In a meta-analysis, Kuncel, Hezlett and Ones (2001) found

that the Graduate Record Examination (GRE) score correlated with graduate GPA from .21 to .31.

Previous achievement

Another cognitive factor that strongly predicts future achievement is previous achievement. For example, in Young, Reynolds and Walberg's longitudinal study (1996), previous achievement was the most dominant student-level factor to predict adolescents' science achievement. Also, McIlroy and Bunting (2002) measured the effect of previous test score, previous course work, self-efficacy, conscientiousness and test anxiety on subsequent test scores. The regression analysis showed that previous tests scores ($\beta = .56$) or previous course work ($\beta = .38$) were the strongest predictors while the second strongest predictor, conscientiousness, ranged from $\beta = .19 \sim .16$ in two models. He found that high school GPA was a stronger predictor than standardized score when admissions were of low selectivity and when predicting minimal to average academic college performance; on the other hand, for more selective schools or to predict high academic performance, standardized score had higher validity than high school GPA. Similar research using SAT and high school GPA predicting college achievement indicated a higher predictive validity of high school GPA than the SAT score, though SAT score provided incremental predictive power (Chissom & Lanier, 1975). Most of the time, the purpose of researchers is to explore factors that can predict achievement above and beyond previous achievement. Therefore, previous achievement is often treated as a control variable when examining the predictive validity of other factors.

Personality

Personality is a broad concept that refers to stable individual differences in pattern of behavior, emotion and cognition. Psychologists have researched what personality traits are and how different traits predict people's behavior and performance outcomes.

One of the most famous personality frameworks is the "Big Five" model (e.g. Costa & McCrae, 1985, 1988; Goldberg, 1990). In the five-dimension personality model, *Openness* represents the tendency to be independent, imaginative and interested in variety vs conforming, practical and interested in routine. *Conscientiousness* represents the tendency to be organized, disciplined and careful vs. disorganized, impulsive and careless. *Extraversion* represents the tendency to be sociable and affectionate vs. retiring and reserved. *Agreeableness* represents the tendency to be compassionate, supportive and trusting vs. ruthless, uncooperative and suspicious. *Neuroticism* represents the tendency to be insecure, anxious and self-pitying vs. secure, calm and self-satisfied (see Goldberg, 1990 for a review) A series of longitudinal studies on those traits has found that the individual differences in personality are highly stable in adults: a retest correlation normally reaches above .70 (see McCrae et al, 2002, for a review).

A number of studies have assessed the relationship between personality and achievement. For example, in a meta-analysis, Tett, Jackson, and Rothstein (1991) reviewed 494 studies and reported corrected correlations between personality and job performance: $r = .18, .33, .27, .15,$ and $-.22$ for conscientiousness, agreeableness, openness, extraversion, and neuroticism, respectively. From this result, it seems like that all five personality traits are associated with achievement at a moderate level, and agreeableness seems to be the strongest predictor of job performance. But these correlations did not control for intelligence. More recently, Poropat (2009) reported a

meta-analysis of 80 research reports on Big-five and academic achievement. He found that Agreeableness (corrected $r = .07$), Openness (corrected $r = .12$) and Conscientiousness (corrected $r = .22$) significantly predicted academic performance. More importantly, after controlling for intelligence, Conscientiousness was the only one that remained significant. A moderation test of academic level showed that the relationship between conscientiousness and academic performance continued to be strong in secondary education and tertiary education while the relationships between academic achievement and the other four personality traits decreased at higher academic levels. In a longitudinal study, Day et al., (2010) found that conscientiousness was the strongest personality predictor of college students' final degree mark after controlling for intelligence (measured by Raven's progressive matrices), previous achievement, and demographics.

Duckworth, Peterson, Matthews and Kelly (1997) suggested that there might be an important personality trait predicting achievement that is not represented by the Big Five factors. They pointed out that conscientiousness emphasizes a short-term organized behavior pattern while there should be a personality trait that refers to long-term stamina. They proposed a new type of personality, *Grit*, which refers to perseverance of effort and passion for long-term goals, and they suggested that it is an important personal quality that is necessary to achieve in every field. Gritty people tend to maintain "effort and interest over years despite failure, adversity, and plateaus in progress," while less gritty people are "more easily discouraged, prone to take 'naps' mid-course, and frequently led off track by new passions." (Duckworth & Eskreis-Winkler, 2013, p. 1). In a series of studies, Duckworth and colleagues (Duckworth, Peterson, Matthews & Kelly, 2007)

found that Grit is associated with educational attainment of adults, undergraduate GPA, retention in Military Academy, and ranking in a National Spelling competition. In their study using undergraduates, they controlled for SAT score (as a measure of intelligence) and found that Grit predicts GPA independent of the influence of intelligence. In their study of a sample of finalists in the National Spelling competition, they further controlled for self-control and measured study time and prior competition experience. The results show that when grit and self-control were both entered as predictors of the record in final round, grit was positively significant while self-control was not. However, when verbal IQ was entered, grit became not statistically significant, though IQ and grit were not strongly correlated. A mediation analysis shows that gritty children worked longer and participated in more competition and subsequently were more successful than less gritty peers. In one of their follow-up studies, they found that longitudinally, gritty children did more deliberate practice and thus they performed better in later spelling activities (Duckworth et al., 2010).

However, there were some issues with those studies and remaining questions. First, none of the studies measured how grit predicts achievement above and beyond IQ, previous achievement and conscientiousness. Second, the results of the predictive validity of Grit controlling for IQ were inconsistent. Third, as stated in their paper, a more important issue is “whether such a thing as personality exists at all” (Duckworth et al, 2007). They viewed the perseverance of effort and passion for long-term goals as a stable trait. But in their study 1, grit shows an increase with age in adulthood (Duckworth et al, 2007), and this monotonic change in adulthood was not found in other personality traits (e.g., McCrae et al, 2002; Roberts & Del Vecchio, 2000). Thus, perseverance and the

passion for long-term goals might be influenced more by life experience and easier to change than traditional personality traits. I will discuss this issue more in the third section.

Self-Referent Beliefs

Humans are not purely a reflection of environmental stimuli. Human agency has an inner force to enact behaviors (Bandura & Cervone, 1983). People are able to visualize success scenarios, and use that to guide their behavior. A strong sense of self-efficacy leads to more motivated behaviors in pursuing the goal and less anxiety when facing difficulties (Bandura, 1989). Because of these forethought capabilities, self-appraisal measures serve as better predictors of later behavior than personality measures. Much effort has been made to measure people's beliefs and examine the influences of beliefs on people's achievement.

Generalized self-referent positive expectancies or positive attitudes, such as self-esteem, have been suggested to improve people's well-being, motivation, and chances of succeeding in a variety of endeavors (Carver, 2003; Lyubomirsky, S., King, L., & Diener, E, 2005; Armor, Massey, & Sackett, 2008). Some other example are measures of optimism, a generalized expectancy that good outcomes will happen (Scheier and Carver, 1985; Armor, Massey, & Sackett, 2008), and hope, a general positive perception composed of efficacy beliefs and optimism (Synder, et al., 2002; Day, Hason, Maltby, Proctor & Wood, 2010). These general beliefs do not specify a goal or a consequence that directly helps people to plan courses of their behavior. They reflect people's attitude toward themselves or their outlook for the future. However, without a cognized goal, these beliefs may not transform into intentional and purposive actions.

An important measure in this area is *self-efficacy*, proposed by Bandura. It is proposed in his Social Cognitive Theory, which explains human functioning with a model of “triadic reciprocity in which behavior, cognitive and other personal factors, and environmental events all operate as interacting determinants of each other” (Bandura, 1986, p.18). He suggested that self-efficacy is one of the important cognitive factors that influence people’s behavior. Bandura (1986) defined perceived self-efficacy as “people’s judgments of their capabilities to organize and execute courses of actions required to attain designated types of performances” (p.391). For example, students’ mathematical self-efficacy measured students perceived abilities in solving mathematical tasks. Perceived efficacy is different from outcome expectancy. Perceived efficacy is an evaluation on one’s ability to accomplish a certain type of behavior (e.g. if I can finish math homework), whereas outcome expectancy is a judgement on the probability that certain behaviors result in some consequences (e.g. the likelihood getting “A” by doing math homework). In this sense, outcome expectancy does not include the self-referent component. A highly rewarding outcome may be not attractive to people who have self-doubt on their ability to master the necessary skills or behaviors for that outcome.

Self-efficacy has been found to influence people’s decision making, persistence of a behavior, and emotional reactions. People who have low appraisal of their abilities will avoid challenges, persist less when meeting obstacles, and feel more stress than people high on self-efficacy (e.g. Bandura, 1977; Bandura & Cervone, 1983; Beck, 1976).

Bandura further suggested that one’s self-efficacy is based on four types of information: first, enactive attainment or success and failure shape self-efficacy; second, vicarious experience, which is seeing similar people’s success or failure, can also influence one’s

self-efficacy; third, verbal persuasion can influence people's self-efficacy; fourth, physiological state can also influence judgment of abilities, that is people are more likely to have low self-efficacy when they are beset by aversive arousal, such as stress and fear (see Bandura, 1997, for a review).

Another relevant construct is self-concept, or one's perception of ones' abilities and worth compared to other people. Self-concept is continually reinforced by evaluative inferences, and interaction with other people (Shavelson, Hubner & Stanton, 1976). When people have a positive self-concept, they show more motivated behaviors and greater perseverance with challenging tasks. Self-concept is a multidimensional, hierarchical construct. It develops early in a child's schooling, with a strong relationship between self-concept and achievement established within two years of starting school (Chapman, Tunmer, & Prochnow, 2000). Adolescents experience an increasing awareness of peers and their relative abilities (Stipek, 1998). Their self-concept is also influenced by uncertainties resulting from school transitions, level of personalized instruction, and perceptions of academic pressures, besides actual ability or performance (Chiu & Klassen, 2010).

Shavelson et al. (1976) posited a hierarchical model of self-concept with general self-concept at the apex, and then a division into academic self-concept and nonacademic self-concepts (social self-concept, emotional self-concept and physical self-concept). Within the academic self-concept, it further splits into 4 sub-areas: English, History, Math and Science self-concept. For the nonacademic self-concept, social self-concept is one's perception of relationships with peers and significant others; emotional self-concepts is

one's perception of particular emotional states; and physical self-concept is one's perception of physical ability and physical appearance.

Academic self-concept received the most attention after Shavelson proposed the hierarchical model. It became one of the well-researched concepts in the education area (Bong & Clark, 1999). Academic self-concept is an evaluative self-perception that refers to one's abilities in academic domains (Marsh & Craven, 1997; Brunner et al., 2009). Decades of research showed that academic self-concepts are associated with many academic outcomes. Motivation is one of the outcomes that are well-studied. For example, Learner and Kruger (1997) examined 150 high-school students in the 11th and 12th grades. They found that that academic self-concept was the best predictor of intrinsic value and self-regulation, whereas social and family self-concept showed much lower relationship with academic motivation. Other studies also found that academic self-concept better predicted academic variables such as academic motivation than non-academic areas of self-concept (Marsh, 1990; Marsh, Byrne, & Shavelson, 1988). The relationship is the strongest between self-concept and the academic outcome in its corresponding domain, like math self-concept with math achievement (Chiu & Klassen, 2010; Dermitzaki, & Efklides, 2000; Dermitzaki, Leondari, & Goudas, 2009), whereas academic self-concept of a specific domain and non-corresponding academic outcomes tends to be small and even negative in a variety of settings across schools and across countries (Marsh & Hau, 2004).

Different models are proposed to explain the relation between academic self-concept and academic achievement (see Marsh & Craven, 2006, for a review). The skill-development model suggests that achievement influences self-concept while self-concept

does not influence achievement. The self-enhancement model suggests the opposite, that self-concept affects achievement whereas achievement is not a strong determinant of self-concept. The reciprocal-effects model proposes that self-concept is built by prior academic achievement, and prior self-concept affects later achievement. Each model has empirical studies supporting it; however, in the Valentine et al., (2004) meta-analysis, they concluded that the reciprocal-effects model had preponderant supports. A recent meta-analysis on the relationship between academic self-concept and achievement showed that the average correlation between prior self-concept and later academic achievement ranges from .20 to .27, and the correlation between previous achievement and subsequent self-concept ranges from .19 to .25 in longitudinal samples (Huang, 2011). Huang also found that the effect of prior academic self-concept on subsequent academic achievement is stronger than the effect of prior global self-concept. This finding supports a reciprocal-effects model, which is that academic self-concept has an effect on achievement while later achievement also helps to adjust students' self-concept.

Academic self-concept and academic self-efficacy has very similar meaning with regarding to the beliefs they aim to measure. These types of beliefs predict achievement better than other types of self-beliefs. For example, Valentine, Dubois and Cooper's (2004) meta-analysis of longitudinal studies found that self-beliefs have a small but consistent effect on later achievement, after controlling for previous achievement, weighted effect size $\beta=.08$. A further moderation analysis shows that the type of self-beliefs (self-esteem, self-concept, and self-efficacy) did not differ from each other after controlling for the level of the measure (global, academic, and subject-specific); however, the level of self-belief exhibited significant differences: academic self-concept had

significantly larger effect size ($\beta=.13$) than global measures of self-belief (e.g. general self-concept, $\beta=.07$), or subject-specific self-belief (e.g math self-concept, $\beta=.06$).

Limitation of previous research

As I reviewed in above sections, many personal qualities seem to predict achievement. There are some gaps and limitations in the current literature: first, there are only a few studies that controlled for IQ or previous achievement as a proxy of basic cognitive abilities when investigating the predictive utility of self-referent beliefs. For example, Pérez, Costa, and Corb í(2012) using structural equating modeling found that general intelligence is the most powerful variable to explain middle school students' achievement, but academic self-concept also had a direct effect on achievement. Catejon and Vera-Muñoz (1996) found that previous achievement and intelligence contributed to later achievement strongly and directly, while academic self-concept had a low but significant effect on later achievement. IQ is one of the strongest predictors to achievement; it may also be a potential confounding factor when investigating the relationship between personality, beliefs, and achievement. Without controlling for IQ or general cognitive abilities, it is unclear whether the ratings on personality and self-perceptions are the byproduct of IQ effects on achievement, or how strong the non-cognitive factor influences achievement above and beyond IQ. The unique contribution of self-beliefs to achievement is unclear without controlling for IQ. Thus it is crucial to include intelligence or other proxy of cognitive abilities in research when evaluating the effect of non-cognitive factors on achievement.

Second, given the different interest of social psychologist and educational psychologist, rare studies included measures of both personality and self-perceptions.

However, it is possible that the people's traits and beliefs are related and influencing each other. Previous research provided evidence of the predictive validity of both, but questions like which is more determinant and whether they contributed to achievement independently remain largely unexplored. It would be theoretically meaningful to compare these long-term traits and short-term beliefs effects on achievement. So far, only a handful of studies controlled for personality when examining the relationship between self-concept and achievement. For example, Marsh et al. (2006) measured the relationship between self-concept and personality (the Big Five) and their construct validation to achievement. They found that in general, self-concept and personality are moderately correlated. The correlations between math and verb self-concept and conscientious is .26 and .10, respectively. More importantly, they found that most of the variance of academic outcomes that predicted by Big Five can also be explained by academic self-concept, and there is a strong support for the incremental validity of academic self-concept. With a longitudinal dataset, Abbott-Chapman et al. (2013) controlled for personality and demographics and still found that self-concept as a learner can significantly predict achieving post-compulsory school education.

Third and most importantly, researchers focused on short term determinants of achievement. There is a void in measuring self-beliefs and traits in long-term contexts, and how those personal qualities contribute to success. For example, measures of conscientiousness and self-control ask participants if they can perform particular behaviors or control impulses under particular circumstances (e.g. Goldberg et al., 2006; Tangney, Baumeister, & Boone, 2004). Measures of mathematical self-efficacy assessed students' perceived ability to solve mathematical problems in the near future, and

researchers have correlated this belief with students' solution rate of arithmetic problems (Schunk & Hanson, 1985). In the modern work-world with its prolonged educational requirements and evolving professional careers, resisting short-term temptations and maintaining focus on long-term goals has become increasingly important.

The grit concept embodies the importance of persistent effort in predicting achievement, but the published scales do not explicitly ask people's experiences in a scenario of pursuing long-term goals. For example, a sample item in the consistency of interest subscale is "I often set a goal but later choose to pursue a different one" (R); and a sample item in the perseverance of effort subscale is "I am a hard worker." Participants could respond to those items based on their recent experiences, thus potentially conflating short-term evaluations with their experiences in long-term contexts. In the 12-item full scale, only two items explicitly ask about people's experience in doing long-term tasks or goals that take long periods of time to complete. In the short grit scale (Grit-S, Duckworth & Quinn, 2009), only one item, "I have difficulty maintaining my focus on projects that take more than a few months to complete," was focused on the long-term context, and no such items were in the perseverance of effort subscale.

Note that grit was conceptualized as a personality trait: "Grit entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress" (Duckworth et al., 2007, p. 1087). Behavioral patterns, as personality trait measures, can be useful in predicting ones' future behavior and later achievement. But, as proposed by Bandura (1987), self-appraisal measures may serve as better predictors of later behavior than personality trait measures of past behavioral patterns that do not reflect people's conscious intentions regarding their own

behaviors. For this reason, a scale measuring not only people's long-term orientations but also their beliefs about future behaviors (rather than just their perceptions of their past behavior) might better predict long-term persistence.

Although Bandura (1989) has suggested that a strong self-efficacy to sustain perseverant effort is important for human attainments, research on self-efficacy is mainly task and situation specific, and does not explicitly measure a long-term focus (Pajares, 2003). Most empirical research on self-efficacy examines relatively short-term contexts. For example, the Teacher's Sense of Efficacy Scale (Tschannen-Moran & Hoy, 2001) has items such as "How much can you do to get through to the most difficult students" and "How much can you do to get students to believe they can do well in schoolwork?" The Perceived Self-Regulatory Efficacy for Writing scale (Zimmerman & Bandura, 1994) has items such as "I can start writing with no difficulty" and "I can adjust my style of writing to suit the needs of any audience." The Academic Efficacy Scale (Midgley et al., 2000) has items such as "I'm certain I can master the skills taught in class this year." One can see that typical efficacy items do not focus on long-term persistence. The lack of a measure of the belief component associated with long-term goal-directed behaviors limits our understanding of factors predicting success.

Development of The Long-Term Prospects scale

I recognized the gap in measures between the grit and self-efficacy concepts and the void of belief measures in long-term context. Existing measures of personal qualities do not explicitly ask people to evaluate themselves in the context of a long-term goal. To determine if framing these beliefs in the context of such a goal is important, I developed a corresponding construct and measure of beliefs with respect to long-term goals. I define

Long-term Prospects (LTP) as the self-belief that one can succeed in achieving long-term goals that require continuous effort. In the definition, LTP has two components. The first component is a focus on long-term goals or goals that take continuous effort, and the second is a future oriented evaluation about the ability to achieve such goals. In this sense, compared with existing self-beliefs, such as self-efficacy, self-concept, and self-esteem, LTP differs with them on the first component. Compared to Duckworth's grit, LTP differs with it on the second component.

To examine if LTP predicts achievement, I created the Long-Term Prospects Scale. As suggested in a review by Worthington and Whittaker (2006), and also in DeVellis (2003), there are several steps to construct a new scale on a concept. (1) Define the construct clearly and concretely, (3) generate a pool of items, and choose a format of response, (2) let experts review the items, (4) include additional scales for validation use, (5) administer the scale to a sample and then evaluate and revise the items. CFA and EFA are the most commonly used methods to test the structure of the new scale. The recommended order is to conduct EFA first then CFA (Worthington and Whittaker, 2006).

By following those suggestions, I first defined LTP as the self-belief that one can succeed in achieving long-term goals that require continuous effort. It is not conceptualized as a task-specific perception, but a capability belief towards long-term goals in general. Based on the definition, and using the scales of similar constructs (e.g. academic self-concept, grit) as reference I drafted 6 items that fit the proposed construct. The first five items included both components of the definition and the last item was a direct statement about one's belief of capability for achieving long-term goals. Three of

the items were reversed items. These items were then revised by experts with regards to face validity and wording accuracy. 30 college students participated in a pilot study to test the scale reliability and provided feedback to improve the scale. The overall alpha was .78. I modified some items based on participants' feedback and psychometric analysis. The revised scale of LTP was then used in this research.

To examine the validity of this measure of LTP, I needed to include additional measures for comparison. Convergent validity is demonstrated with a variable that is supposed to relate to the new concept. In this research, it was grit, the behavior pattern of perseverance for long-term goal. Grit should be correlated with the new concept, LTP. Second, discriminant validity is demonstrated with related constructs that should function differently than the target construct (LTP). This demonstrates the unique facet and function of LTP. In this research, such measures were academic self-concept and self-esteem; they are self-referent thoughts that should function differently than LTP because they are not referring to long-term goals. Third, predictive validity asks for some outcome criterion that the new concept is supposed to predict. In this research, GPA and income can be used as the outcome measures to test the predictive validity of LTP. The validities of the LTP scale were tested in the current studies.

Current Research

I used two studies to examine the predictive ability of LTP and to investigate the set of factors that best explain the variance in achievement. The first study used data of freshmen. All the cognitive and non-cognitive factors were measured at the beginning of the first semester when students came to the college. Their GPA in the first semester and first year were used as outcomes. In the second study, I recruited participants from a

more general population using a public online survey system. I was interested in examining if LTP could predict both academic success (Study 1) and economic success (Study 2).

In Study 1, I collected data from a large sample of freshmen using the psych1000 pool at University of Missouri. There were two research questions: (1) Is the measure of LTP distinct from other similar constructs on factor analysis? (2) Does LTP predictive freshman GPA, and how important it is compared to other similar variables? I hypothesized that all the LTP items would load on one factor, while items measuring other similar constructs would load on other factors. Also, LTP would have incremental predictive ability for freshman first semester and first year GPA above and beyond other variables. In the second study, I collected data from a broader population using Amazon Mturk. I examined the contribution of LTP in predicting people's income. The hypothesis was that people who have higher LTP are more likely to be above the median national annual income than people who have lower LTP after controlling for conscientiousness and grit.

Besides traditional psychometric methods, in Study 1, I also used Bayes factor methodology to test the predictive validity of LTP (Jeffreys, 1961; Raftery, 1995; Rouder & Morey, 2012). Bayes factor is the probability of the observed data under one model relative to another alternative model. With this approach I may compare two models, such as M1 and M2. The resulting Bayes factor is an odds ratio between these two models and is symbolized as B_{12} . The subscript indicates the to-be-compared models, and the one in the numerator is denoted first and then the one in the denominator. For instance, $B_{12}=3$ indicates that M1 fits the data 3 times better than M2. Normally M0 is the

null model and includes no predictors. B_{10} indicates how good M1 is compared with the null model. The bigger the number is the better the model. Bayes factors can help to compare models containing any combination of predictors available and select the optimal model that is comprised of the best set of predictors.

Compared with other traditional methods, one advantage of Bayes factors is that they can provide evidence for the validity of a variable from a different approach. Like multiple regression, Bayes factor can tell how good the model becomes after adding a factor, and also how bad a model becomes after excluding a factor. It also tells whether a factor is necessary to add to a model. For instance, a small Bayes factor (say $1/3$) of a model with a factor and a model without a factor indicates that the model including that factor actually has much less ($1/3$) predictive effect than a model that excludes it. Such a finding provides explicit evidence that some factors do not have a predictive effect on the outcome measure. A second advantage is that Bayes factors may state evidence without the need to make significance decisions, such as whether $p = .056$ is significant or not, and are immediately interpretable as odds. When one model favors another with small odds (e.g., $B_{12} = 2$), the condition may be reported without committing to one model or rejecting the other, and yet the quality of evidence is immediately interpretable. This fact can be used to explain subtle relations between variables than is possible with traditional multivariate regression approaches.

And finally, Bayes factors account for collinearity among variables. In Bayes factor analysis, a parsimonious model is preferred than a model with highly correlated variables. In fact, the Bayes factor is higher for models with one of two highly correlated variables relative to models with both. In the current study, to differentiate LTP from other similar

constructs and test its unique contribution to achievement, Bayes factor analysis can help to deal with the possible multicollinearity issue in the multiple regression models. Due to these advantages, Bayes factor analysis has been increasingly adopted for data analysis in psychological sciences (e.g., Gallistel, 2009; Rouder & Morey, 2011, 2012; Rouder, Speckman, Sun, Morey, & Iverson, 2009; Wagenmakers, 2007). I will follow this approach to identify the best set of predictors of freshman GPA in first semester and first year, and will test whether the model with LTP explains the data better than the model without LTP or models in which LTP has been replaced by other factors.

Chapter Three: Study 1

Method

Participants

The participants were 320 freshmen (224 women, mean age = 18 yrs, $SD = .8$) attending a large public university in the Midwest who were recruited from an introductory psychology course. The sample was predominantly White (77%), with 12% Black, 4% Asian, 2% Hispanic, and the remainder unknown. Participants provided informed consent, including authorization to obtain their high school and college academic records from the university registrar. This sample had higher ACT scores ($M=25.2$, $SD = 3.3$) than the national average ($M=21$) but a bit lower than the school average ($M=25.9$).

Measures

Intelligence. Participants' intelligence was assessed by two measures, the Raven's test and the ACT (formerly, American College Test). Twenty-four of the most difficult items from *Standard Raven's Progressive Matrices* (RPM, Raven, Court, & Raven, 1993), a common measure of intelligence (e.g., Flynn, 2007), were administered to the participants in a timed group setting. ACT scores were obtained from the university registrar. While the ACT was not designed to be a measure of intelligence, research shows it can be used as an intelligence test (Coyle, 2015; Coyle & Pillow, 2008).

Previous Achievement. Participants' official high school GPA was obtained through the college registrar.

College Achievement. As the main outcome variables, participants' official college GPAs for the first semester and for the first year were obtained through the college registrar.

Long-Term Prospects Scale. I developed items that represent beliefs about achieving long-term goals. Each item included two components. The first concerned a focus on long-term goals or goals that take continuous effort, and the second concerned beliefs or evaluations about the ability to achieve such goals. Example items are "I can achieve a goal that takes years of hard work" and "I will give up a valuable goal if it needs continuous effort (R)". Pilot items were administered to 30 students in a pilot study, and several items were modified based on participant feedback and psychometric analysis. The items administered in the main study are shown in the appendix. Exploratory factor analysis using the current sample confirmed the items formed a single factor ($\alpha = .75$), and confirmatory factor analysis showed an acceptable model fit, RMSEA = .075, CFI = .96, TLI=.927.

Conscientiousness. This personality trait was measured using the 10-item conscientiousness subscale from the International Personality Item Pool Representation of the NEO PI-R (IPIP, Goldberg et al., 2006). A sample items is "I pay attention to details," ($\alpha = .83$ for the present sample).

Grit. Grit was measured by *The Short Grit Scale* (Grit-S, Duckworth & Quinn, 2009). This 8-item scale includes four Consistency of Interest items [e.g. "I often set a goal but later choose to pursue a different one(R)] and four Perseverance of Effort items (e.g. "I finish whatever I begin"), ($\alpha = .79$ for the present sample).

Academic Self-concept. Academic self-concept was measured by the 10-item academic subscale of the *Self Description Questionnaire III* (SDQIII, Marsh & O'Neill, 1984). A sample item is “I am good at most academic subjects,” ($\alpha = .79$ for the present sample).

General self-esteem. The 10-item *Rosenberg Self-Esteem Scale* (Rosenberg, 1965) was used in measuring student’ general self-concept. A sample item is “On the whole, I am satisfied with myself,” ($\alpha = .89$ for the present sample).

Demographics. Participants reported sex, family income, and father’s and mother’s education levels.

Procedure

Freshmen participated at the beginning of their first semester in college. In groups of 10 to 25, they first completed the RPM using the standard group testing procedure (Raven et al., 1993), with a 10 min time limit. Then, participants completed the personality measures. Except for the demographics and RPM, participants responded to items on a 1 (Strongly Disagree) to 5 (Strongly Agree) scale. The entire session took about 30 minutes. Their first semester GPAs and end-of-freshman-year GPAs were later obtained through the university registrar, adding a longitudinal element to the study.

Statistical Analyses

First, to examine if LTP was different from other similar constructs on their underlying structure, I conducted EFA on items of LTP scale and items of other personal quality measures. If items of LTP were loaded on a factor and the items of the other measure were loaded on other factor(s), it indicated that LTP items measures a distinct concept that was not captured by the alternative construct.

To prospectively test the predictive validity of LTP for first-semester and first-year GPAs, traditional methods such as bivariate correlations and multiple regressions were used to examine the basic relations between GPAs and LTP and the incremental validity of LTP above and beyond the covariates. Furthermore, I utilized a Bayes factor approach to model comparison based on the setup recommended by Liang, Paulo, Molina, Clyde, and Berger (2008) and imported to psychology by Rouder and Morey (2012). One reason I applied this method is that I expected the predictors to be moderately or highly correlated. Because Bayes factors approach naturally penalizes models for complexity, it can be useful in the presence of correlated predictors to indicate which set of predictors are preferred as well as stating what predictors are effectively interchangeable. With Bayes factors I compared the predictive validity of LTP relative to that of alternative measures. Computations were performed using the regressionBF function in the BayesFactor package for R (Morey & Rouder, 2014).

I denote models for the first semester as MS_m , where m indexes a specific set of predictors. I denote the Bayes factor between model MS_m and MS_n as BS_{mn} . The order of the subscripts denotes the numerator and denominator, respectively, for calculating the ratio. BS_{m0} indicates how much better MS_m is compared to the null model that includes no predictors. The larger the Bayes factor, the better the evidence supporting the model in the numerator, or MS_m with our notation. The same notations were used for first year GPA except Y was substituted for S . Raftery (1995) provides a rule-of-thumb where Bayes factor values of 3 or more are considered suggestive evidence and values of 10 or more are considered substantial evidence for model fit.

In the preliminary analyses, I compared a large set of models comprised of the inclusion and exclusion of several predictors. The best model (the model with largest BS_{m0}) included cognitive ability, high school GPA, fathers' education (exploratory analyses revealed higher explanatory power than mothers' education), sex, and LTP. I denote the model with these predictors as MS1 in Table 2. I then compared this model to the same model without LTP, denoted MS2. If dropping LTP largely worsens the model fit, it provides strong evidence for including it when predicting GPAs. I also added the other non-cognitive predictors, one at a time, to MS2 and compared these models. If these models fit worse than Model MS1, the only model with LTP, then the LTP measure is a stronger predictor of GPA than the alternative non-cognitive measures. Hence, this procedure allows direct comparison of the predictive utility of LTP relative to the utility of the similar non-cognitive predictors.

Results

EFA

First, with only the items from LTP, EFA shows that all the items of LTP loaded on one latent factor. The factor loadings are shown in Table 1.

Table 1. *Exploratory Factor Analysis of LTP Scale in Study1.*

Item	Factor Loading	Item-total correlation
1. I can achieve a goal that takes years of hard work.	0.70	0.48
2. I always have doubts about my ability to achieve long-term goals. (R)	0.62	0.42
3. I am able to finish whatever I started, even if it takes long time.	0.66	0.43
4. I will give up a valuable goal if it needs continuous effort. (R)	0.65	0.45
5. It is hard for me to stay focused on long-term goals. (R)	0.77	0.57

Note: (R) indicates a reversed item.

Then I entered the five items of LTP and items of a similar construct once at a time for exploratory factor analysis with promax rotation. For items of LTP and conscientiousness, three factors were extracted with all the LTP items loaded on the second factor and all the items of conscientiousness loaded on the first or third factor. For items of LTP and academic self-concept, three factors were extracted with all the LTP items loaded on the first factor and all the items of academic self-concept loaded on the second or third factor. For items of LTP and self-esteem, three factors were extracted with all the LTP items loaded on the third factor and all self-esteem items loaded on the first or second factor. Last, for items of LTP and grit, three factors were extracted with all the LTP items loaded on the first factor, most items of the Perseverance of Effort subscale of the Grit scale loaded on the second factor, and items of the Consistency of Interests subscale of the Grit scale loaded on the third factor. The results showed evidence that the LTP scale measured a latent factor distinct from other similar measurements. The factor loadings are shown in Table 2-5.

Table 2 *Exploratory Factor Analysis of LTP and conscientiousness items in Study 1.*

	Items	Factor 1	Factor 2	Factor 3
LTP items	Q1	-0.25718	0.70384	0.12608
	Q3	-0.29964	0.70407	0.03725
	Q2 (R)	-0.33032	0.65904	0.39518
	Q4 (R)	-0.41813	0.67067	0.26421
	Q5 (R)	-0.51708	0.72627	0.31470
Conscientiousness items	Q7	-0.45645	0.17181	0.66935
	Q8	-0.51726	0.23518	0.40198
	Q9	-0.52438	0.12555	0.57899
	Q10	-0.22585	0.27383	0.82790
	Q11	-0.26260	0.23617	0.84216
	Q12	0.71558	-0.33302	-0.37588
	Q13	0.63371	-0.44794	-0.20882
	Q14	0.71970	-0.40394	-0.19211

	Q15	0.76167	-0.32635	-0.21958
	Q16	0.72841	-0.36164	-0.29542

Note: (R) indicates a reversed item.

Table 3 *Exploratory Factor Analysis of LTP and academic self-concept items in Study 1.*

	Items	Factor 1	Factor 2	Factor 3
LTP items	Q1	0.65932	0.20920	0.21649
	Q3	0.67311	0.23203	0.25697
	Q2 (R)	0.69835	0.15366	0.12790
	Q4 (R)	0.67437	0.26739	0.24630
	Q5 (R)	0.77782	0.22911	0.29869
Academic self-concept items	Q17	0.35412	0.79892	0.39955
	Q19	0.22386	0.83559	0.37221
	Q22	0.00282	0.29098	0.70283
	Q23	0.40410	0.23050	0.83727
	Q18 (R)	0.21478	0.78245	0.20398
	Q20 (R)	0.24423	0.80661	0.28411
	Q21 (R)	0.43564	0.37635	0.70357

Note: (R) indicates a reversed item.

Table 4 *Exploratory Factor Analysis of LTP and Self-esteem items in Study 1.*

	Items	Factor 1	Factor 2	Factor 3
LTP items	Q1	0.23964	0.29244	0.66619
	Q3	0.51836	0.16234	0.64333
	Q2 (R)	0.27827	0.26627	0.69408
	Q4 (R)	0.27653	0.26269	0.71461
	Q5 (R)	0.34809	0.23656	0.78847
Self esteem items	Q31	0.66442	0.65984	0.35932
	Q33	0.41663	0.82028	0.28342
	Q34	0.40508	0.76105	0.27936
	Q37	0.28005	0.71992	0.20738
	Q40	0.69860	0.69971	0.33064
	Q32 (R)	0.82609	0.42017	0.34509
	Q35 (R)	0.66032	0.57012	0.37535
	Q36 (R)	0.82092	0.40325	0.34650
	Q38 (R)	0.75468	0.25495	0.24395
	Q39 (R)	0.73950	0.56425	0.32789

Note: (R) indicates a reversed item.

Table 5 *Exploratory Factor Analysis of LTP and Grit items in Study1.*

	Items	Factor 1	Factor 2	Factor 3
LTP items	Q1	0.64453	-0.04813	0.28346
	Q3	0.74175	0.21774	-0.05712
	Q2 (R)	0.51729	0.23325	0.35324
	Q4 (R)	0.60953	0.22856	0.16860
	Q5 (R)	0.67487	0.27726	0.17673
Grit items	Q61	0.30565	0.37205	0.58529
	Q62	0.45800	0.10777	0.27171
	Q63	0.26362	0.11590	0.77170
	Q64	0.11818	0.11824	0.84025
	Q56 (R)	0.21314	0.68915	0.16627
	Q57 (R)	0.05563	0.81840	0.08865
	Q58 (R)	0.18951	0.59912	0.30661
	Q59 (R)	0.22271	0.69117	0.03175

Note: (R) indicates a reversed item.

Bivariate Correlations

As shown in Table 6, first-semester and first-year GPAs were correlated with ACT score ($r=.27$, $r=.29$, respectively), high school GPA ($r=.32$, $r=.38$), and conscientiousness ($r=.17$, $r=.15$). Of the motivational and beliefs variables, GPAs were correlated with LTP ($r=.17$, $r=.15$) and academic self-concept ($r=.11$, $r=.09$).

Table 6. *Descriptive statistics of non-cognitive measures and cognitive measures.*

	M	SD	2	3	4	5	6	7	8	9	10
1. Long-Term Prospects	3.74	0.61	.39***	.49***	.54***	.62***	.03	-.01	.08	.17**	.15**
2. Academic self-concept	3.41	0.64		.34***	.41***	.35***	.09	.17**	.06	.11*	.09
3. Self-esteem	3.92	0.64			.43***	.48***	-.07	.00	.04	.07	.05
4. Conscientiousness	3.68	0.56				.60***	-.05	-.06	.15**	.17**	.15*
5. Grit	3.32	0.59					-.07	-.07	.05	.09	.10
6. Raven's	17.14	3.52						.30***	.00	.07	.05
7. ACT	25.22	3.27							.18**	.27***	.29***
8. High school GPA	3.35	0.53								.32***	.38***
9. 1st term Achievement	3.17	0.64									.88***
10. 1st year Achievement	3.20	0.58									

Note *** $p < .001$; ** $p < .01$; * $p < .05$.

Bayes Factors

As noted, the exploratory analyses compared the fit of all 4095 combinations of the sets of predictors (Rouder & Morey, 2012). The model with largest Bayes factor (BS_{m0} & BY_{m0}) indicates that this combination of variables captures variance in achievement better than the null model and better than alternative combinations of variables. To predict first semester GPA or first year GPA, the best models (MS_1 & MY_1) included the same set of variables: high school GPA, ACT, father's education, sex, and LTP.

First semester GPA. As shown in Table 7, BS_{m1} compared the Bayes factor of other models to that of MS_1 , and BS_{m2} compared the Bayes factor of the other model to that of MS_2 . The BS_{12} indicated the data were 562 times more likely with LTP than without it. Or stated otherwise, as shown by BS_{21} , the data were less than 0.001 times more likely without LTP than with it, providing very strong evidence for its predictive utility (Raftery, 1995). Models MS_3 to MS_6 involved the systematic replacement of LTP with each of the other non-cognitive predictors and evaluation of these models against the model with LTP (MS_1) or the model without LTP (MS_2). The associated Bayes factors revealed that the data were 27 to 1668 times more likely with LTP than with any alternative non-cognitive predictor. The best alternative was conscientiousness, with the data being only 27 times more likely with LTP. I also calculated the adjusted R-square for each model, and the best model selected using the Bayes factors analysis was also the model had explained most variance of first semester GPA among other alternative models.

Table 7. *Comparing model with Long-Term Prospects to models with other factors when predicting first semester GPA.*

Model	BS_{m0}	BS_{m1}	BS_{m2}	Adjusted R-square
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MS ₁	HSGPA +Fedu +Sex + ACT + LTP	5.22 x 10 ¹⁴	1	561.976	.2434
MS ₂	HSGPA +Fedu +Sex + ACT	9.28 x 10 ¹¹	.002	1	.2029
MS ₃	HSGPA +Fedu +Sex + ACT + ASC	3.13 x 10 ¹¹	<.001	.377	.2033
MS ₄	HSGPA +Fedu +Sex + ACT + Cons	1.91 x 10 ¹³	.037	20.75	.2259
MS ₅	HSGPA +Fedu +Sex + ACT + SE	6.08 x 10 ¹¹	.001	.655	.2070
MS ₆	HSGPA +Fedu +Sex + ACT + Grit	9.06 x 10 ¹¹	.002	.976	.2092

Note: HSGPA represents high school GPA; Fedu represents father education level; LTP represent long-term prospects; ASC represents academic self-concept; Cons represents conscientiousness; SE represents self-esteem.

First year GPA. Following the same procedure as used with first semester GPA, the prediction of first year GPA was 16 times more likely with LTP than without it (Table 8). Models MY₃ to MY₆ revealed the data were 10 to 83 times more likely with LTP than with any alternative non-cognitive predictor. Again, the best alternative was conscientiousness, with the data being only 10 times more likely with LTP. This level of evidence is not definitive but highly suggestive that the LTP measure captures non-cognitive contributions to college GPA more effectively than other measures. I also calculated the adjusted R-square for each model, and the best model selected using the Bayes factors analysis was also the model that explained most variance of first semester GPA among other alternative models.

Table 8. *Comparing model with Long-Term Prospects to models with other factors when predicting first year GPA.*

Model		BY _{m0}	BY _{m1}	BY _{m2}	Adjusted R-square
MY ₁	HSGPA +Fedu +Sex + ACT + LTP	2.93 x 10 ¹⁴	1	16.102	.2511
MY ₂	HSGPA +Fedu +Sex + ACT	1.82 x 10 ¹³	.062	1	.2290
MY ₃	HSGPA +Fedu +Sex + ACT + ASC	3.58 x 10 ¹²	.012	.197	.2266
MY ₄	HSGPA +Fedu +Sex + ACT + Cons	3.02 x 10 ¹³	.103	1.661	.2386
MY ₅	HSGPA +Fedu +Sex + ACT + SE	7.12 x 10 ¹²	.024	.391	.2305
MY ₆	HSGPA +Fedu +Sex + ACT + Grit	1.14 x 10 ¹³	.039	.625	.2331

Note. HSGPA represents high school GPA; Fedu represents father education level; LTP represent long-term prospects; ASC represents academic self-concept; Cons represents conscientiousness; SE represents self-esteem.

Regression Models

Multiple regression models with all the potential predictors (the full model) and with only best predictors identified by the Bayes factors (the modified model) are shown in Table 9. Boys had lower GPA in the 1st semester and 1st year than girls. High school GPA and ACT predicted both 1st semester and 1st year GPA, and the estimate suggested that high school GPA is a better predictor of college GPA than ACT, especially for predicting 1st year GPA. The modified model also showed that students whose father had graduated from college had higher GPAs than other students. Conscientiousness significantly predicted 1st semester GPA, but the effect was lower and insignificant for 1st year GPA. LTP emerged as the only significant non-cognitive predictor for both 1st semester and 1st year GPA. The regression weights in the modified models suggest that LTP was almost as important as the cognitive ability measure for predicting college GPAs.

Table 9. *Multiple regression models in Study1.*

Variables	1st semester GPA				1st year GPA			
	Full Model		Modified Model		Full Model		Modified Model	
	Estimates	SE	Estimates	SE	Estimates	SE	Estimates	SE
Intercept	3.11***	.07	3.17***	.05	3.12***	.07	3.17***	.06
Sex (boys)	-.24***	.06	-.23***	.06	-.21**	.06	-.20**	.06
Mother education	.10	.06			.10	.06		
Father education	.10	.07	.17**	.06	.09	.07	.14*	.07

Income	.09	.06			.06	.06		
Raven's	.04	.03	.	.04	.01	.03		.04
ACT	.12***	.03	.13***		.11**	.03	.11***	
High school GPA	.14***	.03	.15***	.03	.19***	.03	.19***	.03
Long-Term Prospects	.13**	.04	.12***	.03	.10*	.04	.09**	.03
Academic self- concept	-.02	.03			-.03	.03		
Self-esteem	.01	.04			-.01	.04		
Conscientiousness	.08*	.04			.05	.04		
Grit	-.06	.04			-.03	.04		

Note: *** $p < .001$; ** $p < .01$; * $p < .05$.

Chapter 4: Study 2

The results for Study 1 provided support for the incremental validity of LTP in predicting college freshmen's GPAs. In study 2 I assessed the retrospective utility of LTP for predicting economic success (income) for a sample of non-college adults.

Method

Participants

I recruited 200 20 to 69 year olds, ($M=33.2$, $SD=10.8$) through MTurk, which is described below. I retained the 188 (102 men) respondents who passed the three fraud items. Fraud items are commonly used for survey measures to ensure participants answer the questionnaire seriously and carefully. An example is "Please choose Strongly Disagree on this item." If a participant answered anything other than "strongly disagree," the participant was dropped. The racial background was diverse: 43% White or Euro-American, 46% South Asian or Indian American, 5% East Asian or Asian American, 2% Black or African American, 2% Latino or Hispanic American and the remaining 2% were some other ethnicity.

Procedure

The survey was conducted through Amazon Mturk. This is a commonly used public online survey system where people voluntarily participate and are paid via deposits into an Amazon account (e.g. Carlson, 2013; Chandler & Kapelner, 2013; Greenwood, Long & Dal Cin, 2013; Kroese, De Ridder, Denise, Evers & Adriaanse, 2014; Miller, Gentile, Wilson & Campbell, 2013). The data obtained through this method have been shown to be of high quality (Buhrmester, Kwang & Gosling, 2011). The survey included the same Long-Term Prospects Scale, conscientiousness, and grit used in Study 1, and all showed

adequate internal consistency for this sample ($\alpha = .74$ to $.83$). Participants also reported their income using a 1 (“Less than \$12,500”) to 9 (“\$100,000 or more”) scale. The survey took about 5 minutes, and participants received \$.15 for completing it.

Results

Bivariate Correlations

The median income level of the sample was between \$12,500 to \$24,999 (rating=2). As shown in Table 5, LTP ($r=.19, p=.0096$) and conscientiousness ($r=.17, p=.0174$) were significantly correlated with reported income, whereas the measure of grit was not. Notably, conscientiousness ($r=.3011, p<.0001$) and grit ($r=.2240, p<.0001$) were positively associated with age, but the relation between age and LTP was smaller ($r=.1385, p=.0580$).

Table 10. *Descriptive statistics of Study2*

Variables	<i>M</i>	<i>SD</i>	2	3	4	5
1.Age	33.19	10.82	.14	.30***	.22**	.11
2.Long-Term Prospects	3.61	0.72		0.61***	0.70***	0.19**
3.Conscientiousness	3.77	0.58			0.72***	0.17*
4.Grit	3.10	0.60				0.00
5. Income	2.28	1.33				

Note: *** $p<.001$; ** $p<.01$; * $p<.05$.

Logistic regressions

Simultaneous logistic regressions were used to predict income above ($n = 46$) or below ($n=142$) the national median personal income for the U.S. (income > \$37,499;

rating > 3)¹. In the prediction of income category, a 1 *SD* increase in LTP was associated with a 2.35 fold increase in the odds of being in the above median income group. Similarly, a 1 *SD* increase in conscientiousness was associated with a 2.55 fold increase in the odds of being in the above median income group. A 1 *SD* increase in grit, however, was associated with a 3.57 decrease in the odds of being in this group, presumably due to collinearity. When the measures were entered separately, a 1 *SD* increase in LTP was associated with a 1.82 fold increase ($p=.0246$) in the odds of being in the above median income group, as compared to 1.86 ($p=.0425$) and 1.02 ($p=.9337$) for conscientiousness and grit, respectively.

Table 11. *Logistic regression model predicting income.*

Variables	Estimates	SE	Odds Ratio	Estimates	<i>p</i>
Intercept	-4.05	1.28			.0016
Gender (male)	.00	.18	1.00		.9903
Age	.02	.02	1.02		.2975
Long-Term Prospects	.86	.36	2.35		.0177
Conscientiousness	.94	.46	2.55		.0419
Grit	-1.26	.45	.28		.0047

¹ If income was treated as a continuous variable, and multiple regression was used for the analysis, Long-Term Prospects was still a significant predictor, $\beta=.43$, $p=.0014$.

Chapter 5: Discussion

The importance of self-referent performance beliefs in the prediction of academic and other important life outcomes is well recognized, and such beliefs have been the focus of considerable research activity (e.g. Marsh & Craven, 1997; Bandura, 1997). The current study contributes to this literature by developing and demonstrating the utility of a measure of Long-Term Prospects (LTP), that is, beliefs about the ability to sustaining effort and maintain focus on long-term goals. The results of study 1 suggest that although LTP are unrelated to cognitive ability, at least for college students, they are positively related to other non-cognitive trait measures, that is, conscientiousness, grit, academic self-concept, and self-esteem. However, the LTP measures differ from these other measures with an explicit focus on people's beliefs about their ability to sustain the effort needed to achieve their long-term goals.

Study 1 used Bayes factor analysis and traditional regression techniques to reveal that LTP better predicts academic GPA than do alternative personality or belief measures. The best of these alternatives was the personality dimension of conscientiousness, which also predicted income status above and beyond the contributions of our LTP measure in Study 2. In contrast, the grit measure was not significantly correlated with GPA or income level. These findings differ in some respects from that of Duckworth et al. (2007), who reported a correlation between grit and college GPA of .25 in one study and .06 in another. I found a correlation closer to the latter figure. Thus, the LTP measure emerged as a better predictor of GPA and income than did grit, even though both measures are conceptually focused on long term persistence.

The implication is that the new LTP measure may be preferable to the short grit measure employed in this study, at least when it comes to predicting academic achievement and income. The Grit Scale measures people's effortful and consistent behaviors, but it is not as predictive as the LTP measure because LTP measured people's belief, and it is future-oriented. It may in fact be the case that many of the behaviors assessed by the grit measure [e.g., being obsessed with a project but then losing interest (reverse coded), working hard, being diligent] are informed by people's beliefs about their ability to persist toward the achievement of long-term goals, and LTP items captured and explicitly embedded these in the LTP scale. As suggested by Bandura (1989), the mechanisms through which LTP influence individual success may be the joint influence of motivational and affective processes. Motivationally, LTP might influence both decision making and later engagement in achieving the sub-goals (e.g., completing a semester of college) needed to ultimately achieve the long-term goal (e.g., college graduation). People low on LTP may correspondingly hold a low expectancy for achieving long-term goals, so they may avoid such goals or lower their priorities on the relevant tasks. If those goals are unavoidable, they may flag in their efforts and work passively. Affectively, LTP may enhance people's coping in the face of obstacles. People who have stronger beliefs may experience less anxiety, think more openly and persist longer when faced with difficulties than people who are beset by self-doubt (Bandura, 1989). Grit items certainly describe effortful behaviors, but LTP may better capture individual differences in motivation that drives these behaviors.

The LTP measure was also a more effective predictor of freshmen GPA than were the global and domain-specific self-concept and self-esteem measures. As noted, global

measures are generally less predictive of specific outcomes than domain-specific measures (Valentine et al., 2004), and this is what I found. As shown in the correlational analyses, self-esteem was rarely correlated with GPA, while the correlation between academic self-concept and GPA was stronger. However, these correlations also showed that academic self-concept was significantly correlated with cognitive ability. Prior studies have found that academic self-concept predicts later achievement, even after controlling for prior achievement (e.g. Huang, 2011, for a meta-analysis), but few of these studies also controlled for cognitive ability. In the current research, academic self-concept had little predictive utility for GPA with cognitive ability controlled. Also, Bayes factor analysis showed that the model with academic self-concept had even less predictive ability than the model with self-esteem. LTP, in contrast, was not related to cognitive ability, but was associated with academic self-concept and self-esteem. This suggests that LTP captures beliefs that overlap with these other non-cognitive measures, but has the advantage of not being confounded by cognitive ability.

Limitations and future directions

I acknowledge the limitations of the current work. First, due to resource constraints, I was not able to create a larger item pool and conduct a full scale development test when developing the new LTP scale, although I did conduct smaller-scale pilot tests. Normally, a fully-developed scale would involve a larger sample ($n > 500$) for the item selection. This might limit the current 5-item scale's generalizability and usefulness, but does not preclude later refinement in larger-scale studies. Nevertheless, my scale showed acceptable reliability and, critically, predictive validity. In general, the current scale would appear to capture explicit beliefs about ability to obtain long-term goals

sufficiently well. I chose the alternative non-cognitive measures based on previous findings; thus these are strong contrasts for assessing the predictive validity of the LTP measure, but it is still possible that some other trait and belief variables might better predict achievement. Future research could compare with measures such as hope, optimism, and academic efficacy, with larger sample sizes, to further examine the validity of LTP measure.

Another limitation is that in Study 2, participants reported their income while they were answering the LTP items. It is possible that participants' ratings on LTP were influenced by their reports on income. In other words, those who had already achieved high incomes might evidence greater confidence in their ability to achieve long-term goals, the opposite causal direction. Prospective studies are needed to address this question. Also, I did not differentiate if respondents came from different countries. Different countries may have different mean incomes, so some individual may be categorized inaccurately using the national median personal income for the U.S. These limitations restrict the inferences to be made from results of Study 2.

Last, the current research did not test *how* LTP might influence achievement. I propose that it may influence people's evaluation of the costs and benefits of pursuing long-term goals and thus their decision making on whether or not to engage in such pursuits. LTP may also, as noted, influence people's sustained engagement in achieving sub-goals needed to attain the desired long-term outcome, and coping strategies when faced with difficulties during the process. Future research that assesses potential achievement-related behaviors or emotions in face of obstacles will be needed to test these hypotheses. Finally, I did not explore how LTP develops and what may modify

them. Despite these limitations, LTP emerged as the most useful and valid non-cognitive predictor of first-year college performance included in this study, and contributed to the prediction of this performance above and beyond the influence of the other well-studied factors of prior GPA, family background, and cognitive ability.

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APPENDICES

Appendix A

Informed consent form

CONSENT INFORMATION, IRB project # 1208928

TITLE: self-concepts and academic achievement

PROJECT BACKGROUND: In this research project, I understand that I will be completing a survey about my self-concept, goals and achievement in school. I am 18 years old, or older. This study is being directed by Yaoran Li under the supervision of David C Geary, Department of Psychological Sciences, at the University of Missouri-Columbia.

PURPOSE OF THE STUDY / DESCRIPTION: The purpose of this study is to learn more about student's self-concepts, goals and how those factors influence students' academic achievement longitudinally.

INTRODUCTION AND BENEFIT: I understand that the survey will take about 30 minutes. I also understand that I am giving permission to the researchers to collect my ACT/SAT scores, high school courses, grades and GPA, as well as later my courses, grades and Term/CUM GPA here at the University of Missouri from the University Registrar, for a period of up to 4 years, ending on or before Summer 2017. Participants will be awarded one credit, for their Psychology 1000 Course requirements. Although you are unlikely to benefit personally from participation, benefits for others and for the research community are likely due to the knowledge gained from your participation.

None of your answers will affect the credit you will earn. You may skip any question that you are uncomfortable with. Your participation is strictly voluntary. You should not feel that you must participate in this study -- your instructor is required to provide you with alternatives to participation in this study that will fulfill the requirements of your introductory psychology course. These alternatives, which might be a research paper, involvement in another project, or something else, are chosen by each individual instructor and should be outlined in the syllabus for your class.

CONFIDENTIALITY: The questionnaire is confidential. We will use your identities to give you credit and to get your ACT/SAT scores, high school courses, grades and GPA, and MU courses, grades and Term/CUM GPA from the University Registrar. After we finish merging data, we will create a code book, and then your identities will be separated from the main data. Thus you will not be identified in the data analysis and results. You will never be identified in any public presentation of this data, and thus your confidentiality will be maintained.

RISK/BENEFIT: There is no deception involved in this study. To participate, you need only read and follow the instructions on the survey as it is presented to you. There is no known risk that associates with this study. Though you are not likely to benefit from the

research personally, the knowledge that we gain from this research will be of aid to educators and others in the general public. It is particularly helpful for educators to create new measurements and interventions to predict or promote students' success in college.

PARTICIPATION: Once you begin the survey, you do not have to complete it. Similarly, if you do not feel comfortable answering any specific question, you can skip that question without penalty.

If you have any questions about this research project, please feel free to contact Yaoran Li at (602)568-3041 or Dr. David Geary, at 882-6268. For additional information regarding human participation in research, please feel free to contact the UMC Campus IRB Office that is located in 483 McReynolds Hall Columbia, MO 65211 or call 573.882.9585/ email umcresearchcirb@missouri.edu. If you experience emotional discomfort while completing the survey that you would like to discuss, you may contact the Psychological Services Clinic at 573-882-4677.

Remember, you may stop your participation at any time without penalty, and you may refuse to answer any question.

Thank you for your participation!

*

If you have read the consent information above, and agree to participate please sign below.

Your participant's number is _____

(print) Last Name _____ (print) First Name _____

Pawprint _____

Student ID _____

Signature _____

Date _____

Appendix B

Questionnaires

Survey items used in Study 1

1. _____ Your participant's number (on your consent form)
2. _____ Your pawprint (5-digit)
3. _____ What's your sex?
 - A. Male
 - B. Female
4. _____ What's your age?
5. _____ Which race or ethnicity best describes you (fill all that apply)?
 - A. American Indian/Alaska Native
 - B. Asian
 - C. Asian (Other)
 - D. Black/African American
 - E. Hispanic/Latino
 - F. Multiple Race/Ethnicity
 - G. Native Hawaiian or Other Pacific Islander
 - H. Non Res International
 - I. Not Specified
 - J. White
6. _____ What your major?
 - A. General (have not chosen a major)
 - B. Art
 - C. Science
 - D. Humanity or Social Science
 - E. Education
 - F. Engineering
 - G. Business
 - H. Other
7. _____ What's your class in MIZZOU?
 - A. Freshman
 - B. Sophomore
 - C. Junior
 - D. Senior
 - E. Other

8. _____ From the list below, please indicate the highest grade your mother completed in school.
- A. Less than high school (grade 12)
 - B. High School (or passed high school equivalency test)
 - C. One to four years of college, but did not graduate
 - D. Graduated from college with B.S., B.A., or equivalent degree
 - E. Postgraduate professional degree (e.g., M.A., M.S.W., D.D.S., L.L.D., Ph.D., M.D.)
9. _____ From the list below, please indicate the highest grade your father completed in school.
- A. Less than high school (grade 12)
 - B. High School (or passed high school equivalency test)
 - C. One to four years of college, but did not graduate
 - D. Graduated from college with B.S., B.A., or equivalent degree
 - E. Postgraduate professional degree (e.g., M.A., M.S.W., D.D.S., L.L.D., Ph.D., M.D.)
10. _____ What is your family's income?
- A. \$0 to \$15,000
 - B. \$15,001 to \$30,000
 - C. \$30,001 to \$45,000
 - D. \$45,001 to \$60,000
 - E. \$60,001 to \$80,000
 - F. \$80,001 to \$100,000
 - G. \$100,000 - \$160,000
 - H. more than \$160,000

- Please rate following statements according to how you agree with those statements:

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

Statements	Answer
I can achieve a goal that takes years of hard work.	
I always have doubts about my ability to achieve long-term goals.	
I am able to finish whatever I started, even if it takes long time.	
I will give up a valuable goal if it needs continuous effort.	
It hard for me to stay focused on long-term goals.	
I am high on perseverance	

I am always prepared	
I pay attention to details.	
I get chores done right away.	
I carry out my plans.	
I make plans and stick to them.	
I waste my time.	
I find it difficult to get down to work.	
I do just enough work to get by.	
I don't see things through.	
I neglect my duties.	

I enjoy doing work for most academic subjects.	
I hate studying for many academic subjects.	
I like most academic subjects.	
I am not particularly interested in most academic subjects.	
I have trouble with most academic subjects.	
I am good at most academic subjects.	
I learn quickly in most academic subjects.	

In general, I find academic subjects in college very interesting	
I enjoy studying academic subjects in college very much	
Making an effort in studying academic subjects in college is worthwhile	
Mastering knowledge and skills in college are very important to me.	
It is very important for me to get good grades in academic subjects in college.	
Studying in college is very useful for what I want to do after I graduate.	
Many things I will learn in college will help me get a job.	

Continued...

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

Statements	Answer
On the whole, I am satisfied with myself.	
At times I think that I am no good at all.	
I feel that I have a number of good qualities.	
I am able to do things as well as most other people.	
I feel I do not have much to be proud of.	
I certainly feel useless at times.	
I feel that I'm a person of worth, at least on an equal plane with others.	
I wish I could have more respect for myself.	
All in all, I am inclined to feel that I am a failure.	
I have a positive attitude toward myself	

- Here are some statements about you, please rate following items according to how you agree with those statements.

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

I often set a goal but later choose to pursue a different one.	
I have been obsessed with a certain idea or project for a short time but later lost interest.	
I have difficulty maintaining my focus on projects that take more than a few months to complete.	
New ideas and projects sometimes distract me from previous ones.	
Please choose strongly agree on this item	
I finish whatever I begin.	
Setbacks don't discourage me.	
I am diligent.	
I am a hard worker.	

Survey items used in Study 2

Part 1

1. _____ What's your sex?
 - A. Male (1)
 - B. Female (2)

2. _____ What's your age?

3. _____ Which race or ethnicity best describes you (fill all that apply)?
 - A. Non-Hispanic White or Euro-American
 - B. Black, Afro-Caribbean, or African American
 - C. Latino or Hispanic American
 - D. East Asian or Asian American
 - E. South Asian or Indian American
 - F. Middle Eastern or Arab American
 - G. Native American or Alaskan Native
 - H. Other

4. From the list below, please indicate where your income locates:
 - A. Less than \$12,500
 - B. \$12,500 - \$24,999
 - C. \$25,000 - \$37,499
 - D. \$37,500 - \$49,999
 - E. \$50,000 - \$62,499
 - F. \$62,500 - \$74,999
 - G. \$75,000 - \$87,499
 - H. \$87,500 - \$99,999
 - I. \$100,000 or more

Part 2

- Please rate following items using the following scale:

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	2	3	4	5

1	I can achieve a goal that takes years of hard work.
2	I always have doubts about my ability to achieve long-term goals.
3	I am able to finish whatever I started, even if it takes long time.
4	I will give up a valuable goal if it needs continuous effort.
5	It hard for me to stay focused on long-term goals.
6	I am high on perseverance

1	I am always prepared
2	I pay attention to details.
3	I get chores done right away.
4	I carry out my plans.
5	I do not sleep every day
6	I make plans and stick to them.
7	I waste my time.
8	I find it difficult to get down to work.
9	I do just enough work to get by.
10	I don't see things through.
11	I shirk my duties.

1	I often set a goal but later choose to pursue a different one.
2	I have been obsessed with a certain idea or project for a short time but later lost interest.
3	I have difficulty maintaining my focus on projects that take more than a few months to complete.
4	New ideas and projects sometimes distract me from previous ones.
5	Please choose Strongly Disagree on this item
6	I finish whatever I begin.
7	Setbacks don't discourage me.
8	I am diligent.
9	I am a hard worker.

VITA

Yaoran Li was born in China on January 23rd, 1988. She received the Bachelor of Science in Psychology from Beijing Normal University. After she finished her bachelor degree in 2010, she came to the U.S studying Educational Psychology and Statistics at the University of Missouri-Columbia. She received a Master's degree in Educational Psychology in 2012 and a master's degree in Statistics in 2016, along with her Ph.D degree. She worked for the statistical research department at ACT in Iowa City, Iowa from 2014 to 2015, and is currently working at the University of San Diego in San Diego, California as a research associate and project lead. Her research has been presented at international conferences such as AERA and APA and published in high-impact peer-reviewed journals such as *Developmental Science*, *Learning and Individual Differences*, and *Plos ONE*.