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What Do We Really Know About Grit? A Multivariate Statistical Investigation on the Construct Validity of Grit

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WHAT DO WE REALLY KNOW ABOUT GRIT? A MULTIVARIATE STATISTICAL ANALYSIS INVESTIGATION ON THE CONSTRUCT VALIDITY OF GRIT

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Dissertation Abstract

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The primary purpose of this study was to collect evidence on the construct validity of grit using convergent, discriminant, and predictive validity principles. To accomplish this purpose and extend previous research on grit, college students from two schools completed an instrument comprised of a cognitive ability test, and a questionnaire. The questionnaire was comprised of existing and multiple measures of grit, interest, self-efficacy, locus of control, and conscientiousness along with a number of college success measures. Structural equation modeling was used as the primary statistical analysis technique. Factor analysis, correlation analysis, and path analysis were also used.

First, the results from a series of exploratory factor analyses based on four sources of evidence revealed four different factor structures of grit: (a) two-factor structure comprised of perseverance of effort and consistency of interest, (b) three-factor structure comprised of goal attainment, focus, and perseverance, (c) four-factor structure comprised of perseverance of effort, consistency of interest, harmonious passion and obsessive passion, and (d) two-factor structure comprised of grit and passion. Second, the results based on four different path analysis models found conscientiousness to be the sole predictor of both GPA and long-term college goals. Conscientiousness was an even better predictor of college success than cognitive ability – not grit. Third, a series of

correlation analyses based on different measures of grit and conscientiousness found a statistically significant strong positive relationship between grit and conscientiousness. Fourth, the resulting confirmatory factor analysis' Pearson correlation coefficients revealed a statistically significant "strong" to "very strong" positive relationship among all five latent constructs: interest, self-efficacy, locus of control, conscientiousness, and grit. Finally, results from the structural equation model found interest to be a predictor of subjective college success and conscientiousness to be the dominant predictor of both subjective college success and objective college success.

Overall, the results from this study indicate that grit was not only hardly distinguishable from conscientiousness and other motivational constructs, it disappeared altogether. The dominant predictor of college success was conscientiousness. The popularity around grit may just be in its name.

SIGNATURE PAGE

This dissertation, written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the Faculty of the School of Education in partial fulfillment of the requirements for the degree of Doctor of Education. The content and research methodologies presented in this work represent the work of the candidate alone.

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"If it wasn't hard, everyone would do it. It's the hard that makes it great."
Tom Hanks, A League of Their Own.

There have been quite a few days, not discounting today, that I felt discouraged. Testing, analyzing, making additions, modifications … checking and re-checking my work – until finally, all I needed to do was complete the necessary paperwork. Yes, it was hard! I kept reminding myself that "it's the hard that makes it great." I was determined to finish what I started. Go ahead, call it "GRIT!"

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CHAPTER I

STATEMENT OF THE PROBLEM

"As much as talent counts, effort counts twice." – Angela Duckworth, Grit

What contributes to a student's college success? We know that intellectual talent contributes to a student's college success, but are there other factors that could possibly play a larger role? Growing research has suggested that non-cognitive variables are related to college success (Andretta, Worrell, & Mello, 2014; Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011; Dumfart & Neubauer, 2016). The growing interest in these non-cognitive variables makes sense, given that there is the possibility these variables might be more sensitive to intervention and training programs. These programs include character-building education (Soutter & Seider, 2013), resiliency programs (Perkins-Gough, 2013) and growth mindset (Dweck, 2010). One such variable that is sensitive to these intervention and training programs is grit (Duckworth, 2016; Fitzgerald & Lauren-Fitzgerald, 2016; Hochanadel & Finamore, 2015).

Duckworth, Peterson, Matthews, and Kelly (2007) introduced the construct of grit, which is defined as "perseverance and passion for long-term goals" that "entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress" (pp. 1087-1088). In other words, grittier individuals remain focused and stay the course toward their goals even when they encounter setbacks. Duckworth and her colleagues found that grit demonstrated incremental predictive validity of success measures over and beyond IQ and conscientiousness. Although their findings have received widespread attention, prompting additional studies and with a few of those studies, some criticism, there still

remains much to be discovered about grit and its underlying psychological mechanisms. So what do we really know about grit?

Much of the existing literature has recognized grit as a two-factor structure comprised of perseverance of effort and consistency of interest (Abuhassàn & Bates, 2015; Credé, Tynan, & Harms, 2016; Duckworth & Gross, 2014; Duckworth et al., 2007; Duckworth & Quinn, 2009; Ivcevic & Brackett, 2014). These studies have focused on the predictive validity of grit and/or the two dimensions of grit separately. Although Duckworth and her colleagues (2007) have indicated that the two dimensions of grit together were more predictive than either alone, research has revealed that the perseverance of effort dimension appears to be the dominant predictor of success (Abuhassàn & Bates, 2015; Bowman, Hill, Denson, Bronkema, 2015; Kelly, Matthews, & Bartone, 2014). For example, Abuhassàn and Bates found that higher perseverance was the most important factor in predicting long-term achievements. They indicated that it is the effortful persistence or "elbow grease" that is unique to grit.

In their seminal work, Duckworth and her colleagues (2007) conducted six studies with high-achieving individuals and found that grit was positively related to (a) educational attainment among two samples of adults, (b) higher GPA among students attending an elite university, (c) success in summer training for West Point cadets, (d) higher rounds of advancement among participants in the Scripps National Spelling Bee, and (e) career stability. Results from these studies revealed that grit accounted for an average of 4% of the variance in success outcomes. Duckworth and her colleagues also reported strong to moderate correlations between grit and Big Five conscientiousness

(r = .77) and neuroticism (r = -.38), along with statistically significant relations with agreeableness (r = .24), extraversion (r =.22), and openness to experience (r =.14), suggesting significant construct overlap, especially for conscientiousness.

In fact, grit has been criticized as hardly being distinguishable from conscientiousness (Credé et al., 2016). Conscientiousness is the Big Five personality trait that includes a number of lower-level traits, such as self-control and perseverance (MacCann, Duckworth, & Roberts, 2009; Roberts, Chernyshenko, Stark, & Goldberg, 2005), and has been found to be a significant predictor of performance (Furnham, Chamorro-Premuzic, & McDougall, 2003; Wolfe & Johnson, 1995), academic achievement (Digman & Takemoto-Chock, 1981), and academic course grades (Poropat, 2009). In response to the criticism, Duckworth stated that perseverance of effort, or determination is not enough. It is consistency of interest, or "the passion piece" that is just as important (Dahl, 2016). However, studies investigating grit with conscientiousness found that grit did not explain any additional variance in academic success (Abuhassàn & Bates, 2015; Dumfart & Neubauer, 2016; Ivcevic & Brackett, 2014).

Some researchers suggest that grit is a more fine-grained measure of conscientiousness (Duckworth et al., 2007; Ivceciv & Brackett, 2014; MacCann et al., 2009). However, grit as a measure of conscientiousness has drawn criticism in the promotion of grit in education. Conscientiousness is a personality trait, not a skill, and usually thought not amendable by direct instruction – "nor should it be" (Credé et al., 2016). Nevertheless, a major implication of grit and the educational programs that have sprung up in the past few years is that it is a malleable skill (Duckworth, 2016).

Other researchers have taken a different perspective and linked grit with motivation (Almeida, 2016; Duckworth & Gross, 2014; Siegling & Petrides, 2016). For example, Almeida indicated that the theory of motivational intensity (Brehm & Self, 1989) is useful in connecting grit with motivation (Silvia, Eddington, Beaty, Nusbaum, & Kwapil, 2013). According to this theory, two factors – the perceived importance and difficulty of the goal - contribute to the amount and type of effort that a person exerts (Almeida, 2016, p. 571). Almeida indicated that the importance of the goal and the degree of effort the person is willing to exert towards that goal, mediated by external influences, may help determine one's level of grit. Duckworth and Gross (2014) added that the individual's goal must be of compelling and significant interest for the individual to be inspired and driven towards this lifelong allegiance, despite setbacks, mistakes, obstacles, and alternatives. Duckworth and Gross indicated that grit is "as much motivation as volition" (p. 323).

Is grit part-motivation? Is it the motivation aspect of grit that differentiates it from conscientiousness? There are ultimately two fundamental questions concerning motivation in the context of individual differences and psychological assessment (Siegling & Petrides, 2016). They are "why?" and "how much, or to what extent?" The "why" are the specific reasons for one's behavior, whereas the "how much, or to what extent" is the propensity to pursue goals, motives, needs, etc. (Cattell & Kline, 1977). If grit is part-motivation, the perseverance of effort dimension of grit would be linked to the propensity or "how much, or to what extent" individuals act on personal motivators, and the personal motivators would be linked to the consistency of interest dimension of grit. The personal motivators, or specific reasons for "how much effort is put forth," is what

propels the propensity. The question that remains to the researcher is: "What are the personal motivators?"

A considerable amount of the current research on grit has been on its construct and predictive validity (Abuhassàn & Bates, 2015; Bowman et al., 2015; Credé et al., 2016; Duckworth & Gross, 2014; Duckworth et al. 2007; Duckworth & Quinn, 2009; Kelly et al., 2014; Ivcevic & Brackett, 2014). Other than the links between growth mindset (Dweck, 2010), and deliberate practice (Duckworth et al., 2011; Duckworth et al., 2007), the antecedents of grit are less explored. Only within the last three years have researchers decided to investigate the plausible antecedents of grit. The problem is that researchers have not focused on what initiates grit.

Duckworth (2016) wrote that individuals would first need to find their interest in order to develop and increase their grit. Is it possible that "interest" is the telling factor that differentiates grit from conscientiousness? Are the conflicting results with the predictive power of grit and success due to a lack of interest? Could there possibly be other variables that are mediating factors and have an effect on success via grit? This study intends to answer these questions. More specifically, this study seeks to shed light on what initiates grit, what differentiates grit from conscientiousness, and what could be the reason for the conflicting results with the predictive power of grit.

Purpose of the Study

Duckworth and her colleagues (2007) argue that non-cognitive skills like grit can be developed, and grit is at least as important as IQ in predicting success. Decisions are being made to assess this construct as part of students' evaluations (Zernike, 2016), and government agencies are advocating programs and schools to help students develop grit

(U.S. Department of Education, 2013). Yet, the research examining grit's relations to conscientiousness, and its predictive validity with college success are sparse and/or contains conflicting results. Furthermore, grit researchers have yet to investigate what initiates grit. Therefore, the purpose of this study is to (a) examine the factor structure of grit, (b) determine whether grit is a better predictor of college success than cognitive ability and conscientiousness, (c) examine the relationship between grit, its two dimensions, and measures of conscientiousness, (d) examine grit's relation to interest, self-efficacy, locus of control, and conscientiousness, and (e) investigate their predictive validity with college success.

To accomplish this purpose and extend previous research on grit, college students from a private university and junior college located in Central Valley of Northern California completed an instrument comprised of a cognitive ability test and a questionnaire. The questionnaire was comprised of existing and multiple measures of grit, interest, self-efficacy, locus of control, and conscientiousness along with a number of college success measures. Structural equation modeling (SEM) was used as the primary statistical analysis technique. The primary antecedent (interest) was examined as an exogenous variable. Grit, self-efficacy, locus of control, conscientiousness, and college success were examined as endogenous variables. Factor analysis, correlation analysis, and path analysis were also used.

Significance of the Study

This study is significant and justified for several reasons. First, an important methodological issue that has theoretical ramifications is whether the two subscales of grit are part of a single latent construct called grit or are different enough to be distinct

constructs (Muenks, Wigfield, Yang, & O'Neal, 2016). Both perseverance of effort and consistency of interest are thought to contribute to success; however, a review of literature reveals that the perseverance of effort dimension is the primary utility of grit (Abuhassàn & Bates, 2015; Credé et al., 2016). Given that government agencies are making recommendations for how educators might work with children to help them develop the "non-cognitive" skills they need to succeed in school (U.S. Department of Education, 2013), it is critical to understand where the focus should be in developing the "non-cognitive" skills' curriculum. The findings of this study will enhance educators' and government agencies' understanding of grit and its two dimensions, and provide direction for them to take in developing their "non-cognitive" skills' curriculum.

Second, this study will contribute to the knowledge base on grit by examining the overlap and distinctiveness of grit with different measures of conscientiousness among college students. It will extend previous research on the construct validity of grit by taking into account different measures of conscientiousness, and by using ostensibly comparable measures of grit. Educators can use the findings from this study to develop or modify curriculum programs that are targeted to promote grit and/or related "non-cognitive" skills. At the same time, researchers can use the findings from this study to continue the "ongoing process of discovery" and "can engage in increasingly informative evaluations of theories and measures that accompany them" (Smith, 2005, p. 406).

Third, a major contribution from this study is the examination of potential antecedents of grit. The research on grit has primarily been on the construct and predictive validity of grit and its two dimensions. It is just as important to focus on the factors that initiate the effortful persistence and commitment to one's goals. In other

words, the academic research on what initiates and cultivates grit is very much in its infancy. The findings of this study will shed light on additional antecedents of grit and provide educators, government agencies, and interested parties with direction on what can be done to initiate, promote, and sustain grit.

Finally, the findings of this study will provide educators and researchers with greater understanding of factors that contribute to success. Greater understanding of factors that contribute to college success can help educators develop better educational curriculum. Success in college has been, for the most part, measured by GPA. Including additional measures of college success in examining grit and its closely-related construct will provide educators and researchers alike with a more global measure of college success. After all, success after college is not measured by GPA, or just one factor.

Theoretical Framework

The theoretical framework for this study incorporates Deci and Ryan's (1985) self-determination theory, the self-efficacy component of Albert Bandura's (1986) social cognitive theory, and Rotter's (1966) locus of control theory. The three theories have been researched extensively. Deci and Ryan's self-determination theory provides a framework for the study of human motivation and personality. Self-efficacy theory recognizes the diversity of human capabilities (Bandura, 1997), and locus of control serves as a motivation determinant (Rotter, 1966). A comprehensive review of each theory follows, starting with Deci and Ryan's (1985) self-determination theory.

Self-Determination Theory. According to the self-determination theory, the central assumption is that all individuals are born with the basic psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 1985; Ryan & Deci, 2000), and

that individuals are motivated to engage in activities to the extent that the activities are associated with the satisfaction of these needs (Deci & Ryan, 1985; Sansone & Thoman, 2005). Autonomy refers to "an inner endorsement of one's action" (Reeve & Jang, 2006, p. 209). That is, the individual's motivation emerges from within, and there is perception of choice and freedom. White (1959) defined competence as "the ability to interact effectively with the environment" (p. 297). He considered it necessary to treat competence as having a motivational aspect. Competence serves to enhance the abilities of the individual. He indicated that individuals will engage in activities simply to experience competence, and characterized this experience as "a feeling of efficacy" (p. 329). Deci and Flaste (1995) indicated that the feeling of competence (i.e., being able to succeed at the activity or goal) is an important aspect of intrinsic satisfaction. They wrote that "for a positive close relationship to exist between the individual's competence and intrinsic motivation, the activity must be interesting and challenging for the individual" (p. 58). Relatedness refers to the development and maintenance of close personal relationships (Deci & Ryan, 1985). Hrbackova and Suchankova (2016) described relatedness as "the individual perceiving a sense of security, confidence, and satisfaction in interpersonal relationships" (p. 690).

Self-determination theory distinguishes three types of motivation based on the interaction of individuals' needs and their environment: amotivation, intrinsic, and external (Deci & Ryan, 1985; Ryan & Deci, 2000). Amotivation is a form of non-regulation, in which individuals have no interest in the activity, whereas intrinsic motivation is a form of self-regulation, in which individuals demonstrate their own interest in the activity (Hrbackova & Suchankova, 2016). Amotivated individuals do not

see any value in an activity (Ryan, 1995) or do not feel competent to do it (Deci & Ryan, 1985, p. 71). Individuals who are intrinsically motivated engage in an activity because the activity is enjoyable and gratifying by itself (Ryan & Deci, 2000).

Between amotivation and intrinsic motivation is extrinsic motivation. Extrinsic motivation refers to doing an activity for its instrumental value (Ryan & Deci, 2000, p. 60). These individuals engage in an activity because it leads to a reward or outcome separable from the activity itself.

There are four types of extrinsic motivation that differ based on their regulation processes: external, introjected, identified, and integrated (Deci & Ryan, 1985). Ryan and Deci (2000) described each of the four types of extrinsic motivation. External regulation represents the least autonomous form of extrinsic motivation. These individuals engage in an activity to satisfy an external demand or obtain an externally imposed reward. Introjected regulation is a type of internal regulation that is still quite controlling. These individuals engage in an activity to avoid guilt or anxiety, or to enhance their egos. Identified regulation is a more autonomous or self-determined form of extrinsic motivation. These individuals have identified some personal importance associated with an activity or behavior and have thus accepted its regulation as their own. For example, a girl who learns how to create a website because she sees it as relevant to enhancing her communication skills, which she considers important for her career, has identified with the value of this learning activity. Ryan and Deci wrote that the most autonomous form of extrinsic motivation is integrated regulation, and "occurs when identified regulations have been fully assimilated to the self" (p. 62). The more individuals internalize the reasons for a behavior or action and assimilates them to the

self, the more their actions become self-determined. Furthermore, they indicated that the level of motivation also varies, and in some cases, the nature and focus of motivation varies.

Intrinsic motivation is closely connected with the concepts of conation (Huitt & Cain, 2005) and drive (Siegling & Petrides, 2016). Deci and Ryan (1985) defined intrinsic motivation as "based in the innate, organismic needs for competence and self-determination" that "energizes a variety of behaviors and psychological processes for which the primary rewards are the experience of effectance and autonomy" (p. 32). They added that the intrinsic need for competence and self-determination motivates the individual to continuously seek and conquer optimal challenges, and "they do so persistently" (p. 33). A wide variety of knowledge, attitudes, and skills comprise the conative domain, such as defining one's purpose, having an achievement orientation, setting goals, regulating behavior, and persevering (Huitt & Cain, 2005). The construct drive would be concerned with the extent to which a person acts on personal motivators, whatever these may be (Siegling & Petrides, 2016, p. 1). On the other hand, personal motivators - such as interest - reflect what a person wants to attain, or reasons for one's behavior.

Based on the self-determination theory, interest is analyzed in relation between a person and an activity (Deci, 2014). Deci wrote that "the self-determination analysis is concerned with the match between a person's needs, desires, and capacities, on the one hand, and the affordances of an activity, on the other hand" (p. 46). Specifically, he indicated that the individual experiences interest only when his or her needs and desires mesh with the activity, and it is not until the individual identifies with the importance of

the activity that interest develops. He stated that as the individual's regulation becomes integrated, he or she will experience greater interest in doing it, though he believed that the concept of "importance" is more central than interest even to self-determined extrinsic motivation (p. 55).

Therefore, based on Deci and Ryan's (1985) self-determination theory, for individuals to remain committed and driven towards their long-term goals, they must first develop an interest - something that they "intrinsically enjoy doing" (Duckworth, 2016, p. 91). Interest is what initially inspires individuals to be driven towards their lifelong allegiance, despite setbacks, mistakes, obstacles, and alternatives. Interest is what initiates grit. But is interest, on its own, enough to propel individuals to become "grittier" and successful?

Self-Efficacy Theory. In *Social Foundations of Thought and Action*, Albert Bandura (1986) wrote that theories that seek to explain human behavior solely as the product of external rewards and punishment present a truncated view of human nature because people possess a self system that enables them to exercise a measure of control over their thoughts, feelings, and actions (p. 335). The self system includes abilities to symbolize, exercise forethought, learn from others, regulate one's own behavior, and engage in self-reflection. It is comprised of cognitive and affective structures; whereas, individuals are able to regulate their behavior through internal standards and self-evaluation of their own behavior (Bandura, 1986, p. 390). In all, Bandura presents a portrait of human behavior and motivation, and in this portrait it is "the beliefs that people have about themselves that are key elements in the exercise of control and personal agency" (Pajares, 1996, p. 543). In other words, it is the individuals'

conceptions of their personal efficacy that is considered to be most influential in people's lives (Bandura, 1986, p. 390).

Wood and Bandura (1989) defined self-efficacy as "beliefs in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (p. 408). Individuals with high self-efficacy exert greater effort and persevere when obstacles are encountered (Bandura, 1977). These individuals see "difficult tasks as challenges to be mastered, are more interested in achieving goals, sustain higher effort at difficult times, and attribute failure to lack of effort or insufficient knowledge and skill" (Becker & Gable, 2009, p. 6).

Pajares (1996) wrote that perceived efficacy beliefs help facilitate how much effort individuals will exert, how long they will persevere when confronted with obstacles, and how resilient they will prove in the face of adversities. In other words, "the higher the sense of efficacy, the greater the effort, persistence, and resilience" (p. 544). Individuals with high self-efficacy choose to perform more challenging tasks. These individuals have greater confidence in these tasks, and they exert greater effort and persist longer than those low in self-efficacy (Pajares, 1996). It is their belief in their personal competence that enables them to deal with all kinds of demands (Luszczynska, Gutiérrez-Doña, & Schwarzer, 2005).

Self-efficacy is not only considered to be an important component of an individual's self-concept, but draws close parallels with other expectancy beliefs (Pajares, 1996). Some researchers have even used the terms (self-efficacy and self-concept) synonymously (Reyes, 1984); the difference resides in the contextual framework. In other words, self-efficacy is context-specific, and "self-concept is measured at a broader

level of specificity and includes the evaluation of such competence and the feelings of self-worth associated with behaviors in question" (Pajares, 1996, p. 561). Similarly, self-efficacy and other expectancy beliefs share commonalities in their beliefs about the individual's perceived capability, but differ in terms of the contextual framework and specificity. Self-efficacy beliefs are "more task- and situation-specific," and the individual's self-efficacy beliefs are aligned to some type of goal (Pajares, 1996, p. 546). For this reason, self-efficacy has been studied in a number of specific domains such as academics, health, sports, and organizations (Bandura, 1997).

Bandura (1977) indicated that the level and strength of the individuals' belief in their personal competence can be altered. That is, "the theory of self-efficacy postulates that different modes of influence change behavior in part by creating and strengthening self-percepts of efficacy" (Schunk, 1981, p. 93). Bandura presented four major sources of information that can influence individuals' self-efficacy: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal. These four major sources of information are also used by individuals to judge their level of perceived self-efficacy.

First there is the influence of performance accomplishments. Bandura (1977) indicated that the individual's sense of self-efficacy can be increased through accomplished performance. In other words, through repeated successes the individual's sense of self-efficacy increases. Repeated successes are considered to be especially influential because they are based on personal mastery experiences. With repeated successes, the individual's confidence rises. Failures may be experienced; however, the effects of these failures partly depend on the timing and pattern in which they occur.

After self-efficacy has developed and has become stronger, these individuals may find that occasional failures can be overcome by determined effort, and can even strengthen their self-motivated persistence (Bandura, 1977, p. 195).

Next, individuals can also increase their sense of self-efficacy by observing others. By seeing others perform threatening or difficult activities without adverse consequences, individuals will see that that "they too will improve if they intensify and persist in their efforts" (Bandura, 1977, p. 197).

The third source Bandura (1977) mentioned was verbal persuasion. Though not as powerful as repeated successes, individuals' sense of self-efficacy can also be induced through verbal persuasion. Individuals are led, through suggestions and other persuasive means (i.e., exhortation, self-instruction, etc.), to believe that they can successfully overcome their challenges.

The last source Bandura (1977) spoke to was emotional arousal. He stated individuals rely partly on their state of physiological arousal in judging their anxiety and vulnerability to stress (p. 198). By conjuring up fear-provoking thoughts about their ineptitude, individuals can rouse themselves to increased levels of anxiety and cast doubt on their personal belief of their competence. Individuals in this state of mind would more likely not experience success. On the other hand, individuals who are not bedeviled by these aversive arousals would more likely experience success. That is, anxiety reduction will strengthen one's efficacy expectations.

Hence, the individual's behavior can change through guided exposure, modeling, persuasion, and anxiety reduction (Bandura, 1977, 1986; Multon, Brown, & Lent, 1991). The individual's perceived self-efficacy, or efficacy expectations - that is, "one's

conviction that one can successfully execute the behavior required to produce the outcome" - can be altered (Bandura, 1977, p. 193). Through such diverse methods, the individual's efficacy expectations can be increased. These efficacy expectations determine how much effort individuals will expend and how long they will persist in the face of adversities. In other words, "the stronger the perceived self-efficacy, the more active the efforts" (Bandura, 1977, p. 194).

Locus of Control Theory. Julian Rotter (1966) introduced the concept of locus of control. Locus of control, or internal versus external control of reinforcement, refers to "the degree to which persons expect that a reinforcement or an outcome of their behavior is contingent on their own behavior or personal characteristics versus the degree to which persons expect that reinforcement or outcome is a function of chance, luck, or fate, is under the control of the powerful others, or is simply unpredictable" (Rotter, 1990, p. 489). Internal control beliefs are associated with vitality, and external control beliefs are associated with apathy and withdrawal. In other words, locus of control can be viewed as "a mediator of involved commitment in life pursuits" (Lefcourt, 1982, p. 184).

The concept of locus of control emerged from Rotter's (1954) social learning theory. In developing social learning theory, Rotter had departed from instinct-based psychoanalysis and drive-based behaviorism, believing that a psychological theory should have a psychological motivational principle. That motivating principle was the empirical law of effect, which states that "people are motivated to seek out positive stimulation, or reinforcement, and to avoid unpleasant stimulation" (Mearns, 2017, p. 2).

According to Phares (1976), there are six major assumptions of social learning theory. First, both the individual's experience and his or her environment must be taken into account (Mearns, 2017). Next, learned social behavior is emphasized. Third, there is unity to personality; that is, the individual's experiences are influenced by the effects of accumulated knowledge and prior experience. The fourth assumption is that both general and specific determinants of behavior are emphasized. In other words, both situational-specific factors and dispositional elements contribute to the individual's behavior. Fifth, the individual's behavior is motivated or said to be goal-oriented. Finally, behavior is based on expectancy outcomes. In other words, the individual expects that his or her behavior will lead to the goals being met (Phares, 1976, pp. 11-13).

In sum, Rotter's (1954) social learning theory provides a framework for understanding "how choices are made by individuals from a variety of potential behaviors available to them," and to predict goal-directed behavior, "one must consider expectancy, reinforcement value, and the psychological situation" (Phares, 1976, pp. 13-14). The behaviors or actions of individuals are predicted on the basis of their values, their expectations, and the situations they find themselves in (Lefcourt, 1982, p. 32). When individuals are presented with more than one choice to be taken, they will choose the behavior that has the greatest expectancy (probability of reinforcement) and reinforcement value (or need), and they will choose or act differently depending on their locus of control (Phares, 1976).

With the locus of control construct, "a person views himself in conjunction with the things that befall him, and the meaning that he makes of those interactions between his self and his experiences" (Lefcourt, 1982, p. 35). Locus of control refers to the

generalized expectations people hold regarding the degree to which they can control their own fate (Rotter, 1966). Rotter states: "If a person perceives a reinforcement as contingent upon his own behavior, then the occurrence of either a positive or a negative reinforcement will strengthen or weaken potential for that behavior to recur in the same or similar situation. If he sees the reinforcement as being outside his own control or not contingent, that is, depending upon chance, fate, powerful others, or unpredictable, then the preceding behavior is less likely to be strengthened or weakened" (p. 5).

Internals believe that an event or outcome is contingent upon their own behavior. Externals believe that an event or outcome are caused by factors beyond their control (Rotter, 1966; Weiner, Nierenberg, & Goldstein, 1976). It is their belief, or locus of control that serves as a determinant in terms motivation (Phares, 1976). In other words, individuals will exert more effort if they believe that an event or outcome depends at least somewhat on their own actions or choices in comparison to those who believe that an event or outcome depends on external factors, such as luck, chance, or powerful people.

Summary. Based on the Deci and Ryan's (1985) self-determination theory, the self-efficacy component of Albert Bandura's (1986) social cognitive theory, and Rotter's (1966) locus of control theory, for individuals to exert an extraordinary amount of effort consistently over time, there must be the initial interest. Individuals must believe in themselves. They must believe that they are in control of their success. That consistency of interest, or passion, combined with the sustained belief in oneself are what drive the effortful persistence, and become "zeal and prodigious energy" (Galton, 1892) that serve as the predictor of success (Abuhassàn & Bates, 2015; Duckworth et al., 2007; Duckworth & Quinn, 2009). Is it this "zeal and prodigious energy" (Galton, 1892) that is

not assessed in the five-factor model conscientiousness (Abuhassàn & Bates, 2015) and differentiates grit from conscientiousness?

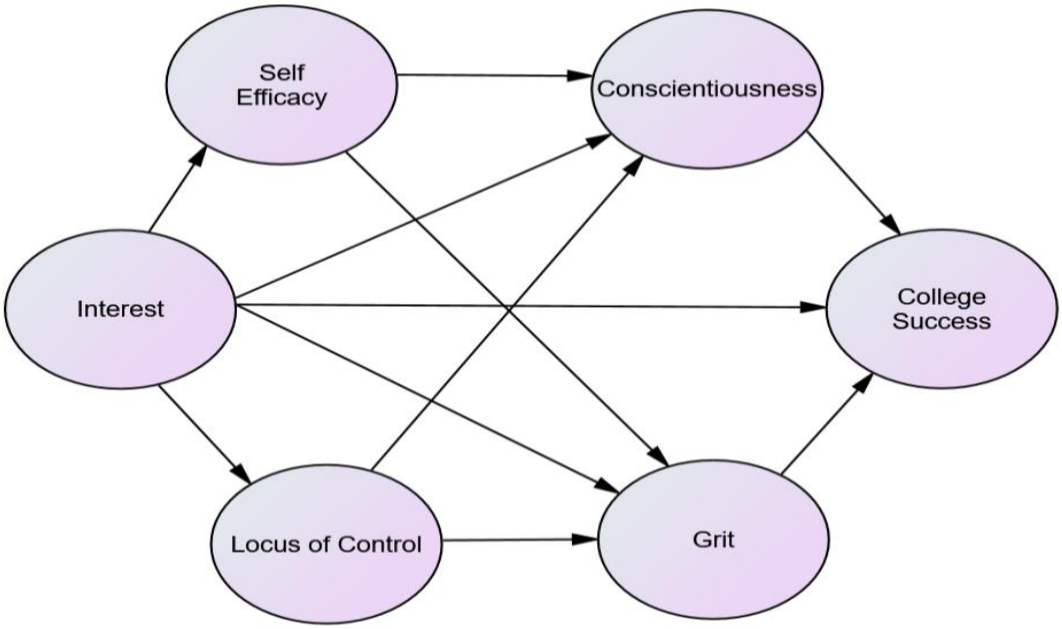

Figure 1. A schematic representation of the proposed model.

The proposed model (see Figure 1) introduces interest, self-efficacy, and locus of control as possible antecedents of grit. It is hypothesized that interest would have a positive direct effect on self-efficacy, locus of control, conscientiousness, grit, and college success, and a positive indirect effect on grit and conscientiousness through self-efficacy and locus of control. Self-efficacy and locus of control would have a positive direct effect on grit and conscientiousness, and a positive indirect effect on college success through grit and conscientiousness. Grit and conscientiousness would have a positive direct effect on college success.

Deci and Ryan's (1985) self-determination theory, the self-efficacy component of Albert Bandura's (1986) social cognitive theory, and Rotter's (1966) locus of control

theory will be used as the theoretical framework in testing and interpreting the results of the above fore-mentioned model and findings from this study.

Background and Need

Grit is currently the "hot" buzzword in education. It has also been called the "new poster child" for non-cognitive variables (Dixson, Worrell, Olszeweski-Kubilius, & Subotnik, 2016). In 2013, the United States Department of Education indicated that it is the responsibility of the educational community to design learning environments that promote grit and its related factors so that students are prepared to meet 21st-Century challenges (p. v). Educational programs have sprung up in the past few years, and decisions are being made to assess grit as part of students' evaluations (Zernike, 2016). School districts across the United States are reportedly considering "teaching grit" into their curricula (Cohen, 2015). However, there are some who see grit as nothing more than something old packaged as something new (Credé et al., 2016; Muenks et al., 2016; Rimfeld, Kovas, Dale, & Plomin, 2016).

Given the technological advancements in the last 30 years, grit has been making headlines beyond the common channels of communication. Angela Duckworth's TED Talk (2013), "Grit: The power of perseverance and passion," has been translated in 49 languages and viewed by over 12 million individuals. The popular teaching website, Edutopia (2017), offers a number of grit videos, blogs, and lesson plans. The Internet has enabled grit to become a household word. Everyone, including today's parents, are talking about grit (Reischer, 2016).

In the first half of 2016, Duckworth published a book – *Grit: The Power of Passion and Perseverance* – in which she stated that "grit predicts success" in a number

of domains (p. 12). Duckworth wrote that individuals can develop and increase their grit. She stated that grit is comprised of four psychological assets. They are interest, practice, purpose, and hope. First, individuals would need to find their interest - something that they "intrinsically enjoy doing" (p. 91). Next, goals are set, and individuals set out on a course of deliberate practice. Duckworth and her colleagues (2011) defined deliberate practice as "engaging in a focused, typically planned training activity designed to improve some aspect of performance" (p. 174). Individuals set "a stretch goal, zeroing in on just one narrow aspect of their overall performance," and they strive to improve specific weaknesses (Duckworth, 2016, p. 121). Individuals must also find a purpose in order to maintain that interest. Their purpose and interest must have both a personal connection and a connection to the well-being of others. And from the beginning to the very end, individuals must sustain hope (Duckworth, 2016).

At the same time, several researchers have become critical of grit's popularity. Credé and his colleagues (2016) conducted a meta-analytic analysis based on 584 effect sizes from 88 independent samples representing 66,807 individuals and found (a) no evidence of the higher-order construct, (b) very strong correlations between grit and conscientiousness, and (c) modest correlations of grit with performance and retention. Rimfeld and colleagues (2016) investigated the genetic and environmental origins of individual difference in grit based on the Grit-S scale. Using a sample of over 4,500 16 year-olds, they found that grit did not contribute to the prediction of academic success beyond the contribution of conscientiousness. All together, these results cast doubt on the construct and predictive validity of grit.

Only in the last three years have researchers decided to explore plausible antecedents of grit. In their seminal work, Duckworth and her colleagues (2007) did find that grittier competitors outranked their less gritty competitors, at least in part because of more accumulated and focused practice. The term was later baptized as "deliberate practice," borrowed from Ericsson's thousands and thousands of hours of focused and goal-oriented practice (Duckworth, 2016). Growth mindset has also been promoted as a requirement in cultivating grit (Dweck, 2010; Fitzgerald & Laurian-Fitzgerald, 2016). Individuals with a growth mindset believe that intelligence is not fixed. These individuals value hard work and effort.

More recently, purpose (Hill, Burrow, & Bronk, 2016), passion (Mueller, Wolfe, & Syed, 2017), motivational orientations (Suzuki, Tamesue, Asahi, & Ishikawa, 2015; Von Culin, Tsukayama, & Duckworth, 2014), meaningful relationships (Datu, 2017), and hope (Vela, Lu, Lenz, & Hinojosa, 2015) were linked to grit. Mueller and his colleagues found that individuals' passion plays a central role in how their goals are pursued, and thus, the degree of grit exerted towards those goals. Other researchers have found that meaning and engagement were related to grit (Suzuki et al., 2015; Von Culin et al., 2014). If grit does predict success, investigating the antecedents of grit becomes a necessity.

Duckworth and her colleagues (2007) had asked, "Why do some individuals accomplish more than others of equal intelligence" (p. 1087)? What possesses them to push themselves to their limits? Could the missing initiator be the individual's personal or intrinsic interest? Though there may be a number of additional factors that have an effect on success via grit (Duckworth et al., 2007), what is important to know is what

initiates the individual's propensity to pursue long-term goals with perseverance and passion.

Is this perseverance and passion that leads to success grit, or a component of conscientiousness? Duckworth and her colleagues (2007) have argued that the two dimensions of grit together were more predictive than either alone, and that grit has instrumental predictive validity of success over and beyond IQ and conscientiousness. In other words, grit is as good or an even better predictor of success than cognitive ability (Duckworth, 2013). Yet, the current research has found the perseverance of effort dimension to be the dominant predictor of success (Abuhassàn & Bates, 2015; Bowman et al., 2015; Credé et al., 2016; Kelly et al., 2014), and questions the construct validity of grit (Credé et al., 2016; Muenks et al., 2016; Rimfeld et al., 2016).

Even with these conflicting results and not knowing what initiates grit, the popularity around grit has continued to grow. Grit has been characterized as the golden ticket for success. Grit is not only the "hot" buzzword in education - parents, government agencies, and the popular press are talking about grit. However, this widespread interest in grit is accompanied by open criticism from prestigious researchers. The responses to grit's criticism has led some researchers to believe that grit is a chameleon. Investigating grit through the lens of motivation and its potential antecedents may help provide clarity.

Research Questions

Therefore, in accordance with this study's purpose, the following research questions were asked:

1. What is the factor structure of grit among college students?

2. Does grit predict college success over and beyond cognitive ability and conscientiousness?
3. To what extent does grit correlate with conscientiousness among college students?
4. To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit relate to each other among college students?
5. To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit predict college success?

Definition of Terms

There are several key terms that need to be defined. These terms are as follow:

Grit is defined as "perseverance and passion for long-term goals," and "entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress" (Duckworth et al., 2007, pp. 1087-1088). Individuals who have grit work hard and stick to their long-term passions and goals (Bashant, 2014, p. 14).

Perseverance of Effort is defined as the individual's tendencies to keep working toward long-term goals despite the hardships that are faced (Duckworth et al., 2007).

Consistency of Interest refers to how steadily individuals keep to their goals (Duckworth, 2016, pp. 57-58). Consistency of interest is associated with focus, undying commitment, and passion (Duckworth, 2016; Duckworth et al., 2007), and interpreted as more goal- and action-oriented and encompasses long-term behavior (Muenks et al., 2016).

Conscientiousness is one of five core personality traits, referred to as the "Big Five," and is defined as purposeful, strong-willed, determined, and organized behavior (Costa & McCrae, 1998).

Motivation reflects "an individual's intensity, direction, and persistence of effort toward achieving a goal" (Robbins, Judge, & Campbell, 2010). Motivation is concerned with the specific reasons for one's behavior and the propensity to pursue goals, motivates, needs, etc. (Cattell & Kline, 1977).

Conation refers to the connection of knowledge and affect to behavior and is associated with the issue of "why" (Huitt, 1999, p. 1). For the purpose of this study, conation is simply defined as "the striving component of motivation" (Huitt, 1999, p. 1).

Self-Regulation "refers to the way in which individuals control their thoughts and action" (Renninger & Hidi, 2016, p. 86).

Future Time Perspective refers to "the degree to which and way in which the chronological future is integrated into the present life-space of an individual through motivational goal-setting processes" (Husman & Lens, 1999, p. 114).

Interest is defined as a psychological state and a motivational variable. As a psychological state, interest is construed by "increased attention, effort, concentration, and affect during engagement," and as a motivational state, there is a "distinction between shorter-term or situational interest and long-term or individual interest that is characterized by reengagement over time" (Renninger & Hidi, 2016, p. 9).

Self-Efficacy is defined as "beliefs in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Wood & Bandura, 1989, p. 408).

Locus of Control refers to the generalized expectations people hold regarding the degree to which they can control their own fate (Rotter, 1966). Internals believe that an event or outcome is contingent upon their own behavior. Externals believe that an event or outcome are caused by factors beyond their control (Rotter, 1966; Weiner et al., 1976). It is their belief, or locus of control, that serves as a determinant in terms of motivation (Phares, 1976).

Deliberate practice entails "engaging in a focused, typically planned training activity designed to improve some aspect of performance" (Duckworth et al., 2011, p. 174).

Flow is defined as "a psychological state in which the person feels simultaneously cognitively efficient, motivated, and happy" (Moneta & Csikszentmihalyi, 1996, p. 277).

Hardiness refers to a pattern of attitudes or skills that provides the courage and motivation needed for enhanced performance in stressful circumstances (Maddi, 2007).

College Success means earning an overall GPA above 3.0, having a happy social life in college, meeting personal long-term college goals, having confidence in one's ability to apply what was learned from college in life, having high expectations to obtain a job within 6 months of graduation, obtaining skills relevant to employability and lifelong learning, and being satisfied with the overall college experience.

CHAPTER II

LITERATURE REVIEW

Grit is a four-letter word that spells success. True, there is a fairly significant amount of literature supporting the link between grit and success, and just the same, a fair amount that states otherwise. But grit, to some, is just something old wrapped as something new (Credé et al., 2016; Muenks et al., 2016; Rimfeld et al., 2016). The appetite in grit is that it can be taught (Duckworth, 2016; Fitzgerald & Laurian-Fitzgerald, 2016), although proponents of grit appear to be ignoring motive (Kohn, 2014). Grit does not appear to come easy, and it may come with a cost (Lucas, Gratch, Cheng, & Marsella, 2015). What drives an individual to work hard with an undying commitment towards one's long-term goals? And if grit does spell success, what initiates grit? The widespread enthusiasm for grit as a predictor and determinate of success calls for a closer investigation of what initiates grit, its relation to conscientiousness, and predictive validity with success.

In this review of literature, I open with an overview of grit, its dimensions, and theories on grit. This is followed by a number of relevant studies on grit and assessing grit. Next, the proposed antecedents of grit are introduced: interest, self-efficacy, and locus of control. An overview of the Big Five, conscientiousness, relevant studies, and measuring conscientiousness is then presented. Finally, the review of literature concludes with a discussion on college success measures.

Grit and Its Dimensions

In 2007, Duckworth and her colleagues originally conceptualized grit within the personality theory (e.g., John & Srivastava, 1999), describing grit as "perseverance and

passion for long-term goals" (p. 1087). Their hypothesis that grit is essential to high achievement evolved during interviews with professionals in a variety of occupations (i.e., investment banking, painting, journalism, academia, medicine, and law). When these individuals were asked what quality distinguishes star performers in their respective fields, "these individuals cited grit or a close synonym as often as talent" (p. 1088). Grit entails working extremely hard, maintaining effort and interest over years despite setbacks (Duckworth et al., 2007). At its core is "passionate perseverance" (Duckworth, 2016).

According to Dumfart and Neubauer (2016), grit integrates aspects of achievement striving, self-control, and consistency of interest, and encourages the realization of existing talents in individuals (p. 8). Abuhassàn and Bates (2015) characterized grit as a measure of self-control. Other researchers have described grit as being largely distinct from cognitive ability (Duckworth et al., 2007; Duckworth & Quinn, 2009; Perkins-Gough, 2013). Grit has also been depicted as a performance character strength: "the qualities that an individual draws upon in achieving his or her potential in a given endeavor" (Soutter & Seider, 2013, p. 352). Kelly and his colleagues (2014) conceptualized grit as "the sustained and passionate pursuit of a given interest or goal" (p. 329). They indicated that grit emphasizes long-term stamina, where effort and interest are maintained over several years.

Grit targets elements of "zeal and prodigious energy" (Galton, 1892) that is not assessed in the five-factor model conscientiousness (Abuhassàn & Bates, 2015). This "zeal and prodigious energy" resembles the striving component of motivation (Huitt, 1999). Bashant (2014) indicated that individuals who have grit work towards their long-

term goal with a sense of purpose. These "grittier" individuals approach achievement as a marathon: their advantage is stamina (Bashant, 2014; Duckworth et al., 2007, p. 1088), and they do not swerve from their goals, even in the absences of positive feedback (Duckworth & Quinn, 2009, p. 166).

Grit is typically conceptualized as a higher-order personality trait comprised of two dimensions: "perseverance of effort," and "consistency of interest" (Duckworth et al., 2007). Duckworth and her colleagues indicated that the two dimensions of grit together were more predictive than either alone. However, research has revealed that the perseverance of effort dimension appears to be the dominant predictor of success (Abuhassàn & Bates, 2015; Bowman et al., 2015; Credé et al., 2016; Kelly et al., 2014). For example, Abuhassàn and Bates found higher perseverance as the most important factor in predicting long-term achievement. They not only distinguished grit from conscientiousness, they indicated that it is the effortful persistence or "elbow grease" that is unique to grit. Grit implies hard work with an undying willingness to persist and strive towards lifelong goals (Bowman et al., 2015). Credé and his colleagues claimed that perseverance of effort is the primary utility of grit. They indicated that to succeed, one must persevere.

What role, then does consistency of interest serve? According to Duckworth (2016), consistency of interest is associated with focus and undying commitment. Bowman and his colleagues (2015) found that individuals with high consistency of interest remain committed to their majors and careers. Duckworth and Quinn (2009) echoed these findings. They found that consistency of interest predicted greater career stability among adults. In other words, adults who reported high consistency of interest

were less likely to change careers. In their examination of grit and its sub-dimensions, Kelly and his colleagues (2014) found that consistency of interest predicted retention. Duckworth (2016) indicated that consistency of interest does not refer to individuals' intensity towards their goals, but instead refers to how steadily individuals keep to their goals (pp. 57-58).

Muenks and her colleagues (2016) interpreted Duckworth and her colleagues' (2007) conceptualization of "consistency of interest" as more goal- and action-oriented that encompasses long-term behavior, "rather than reflecting a personal disposition toward a particular topic (individual interest) or interest that is triggered by a particular situation (situational interest)" (p. 3). That is just one perspective linking individual and situational interest with the consistency of interest dimension of grit. Muenks and her colleagues' point was that each dimension of grit overlaps to some degree with constructs already in the literature. That is not to say that interest does not play a role in grit. Duckworth (2016) wrote that individuals can develop and increase their grit by first finding their interest - something that they "intrinsically enjoy doing" (p. 91). Interest was one of the four elements that Duckworth's paragons of grit had in common.

Almeida (2016) elaborated on the role of interest by presenting an ideal model of grit. His ideal model of grit encompasses three defining features: (a) having a passionate interest, (b) preference for long-term goals, and (c) belief that setbacks can be overcome (p. 568). He claimed that all three components are shaped by factors relating to the sociocultural context, and given that college students are exposed to a variety of ideas and information and their experiences are not the same, the level of grit and its three components may appear to be different among these students. Their interests can be

influenced by a number of factors, though it is their intrinsic interest that is more consistent with the concept of grit. Moreover, these interests and passions are connected with the types of goals and goal orientation individuals attach to a particular activity (Almeida, 2016, p. 570). Interest, and more specifically, intrinsic interest appears to be a telling element of grit.

Theories on Grit

As mentioned earlier, grit emerged from personality theory. However, a number of theories have since been used in examining grit and its dimensions. These theories introduce the reader not only to grit, but include grit's relations to conceptually similar constructs. To date, there is not a single repository on the theoretical perspectives of grit. Based on each of these perspectives, there are implicit, and in some cases explicit connections made to what initiates grit. This is not an exhaustive list, but it does provide a number of theoretical perspectives that future researchers can expand upon and use in their investigation of grit.

McClelland's Achievement Theory of Motivation and Grit. McClelland's achievement theory of motivation (1985) states that "the tendency to achieve success (Ts) is a multiplicative function of motive to achieve success (Ms), expectancy or probability of success (Ps), and incentive value of success (INs)" (p. 812). The achieve to success, or end product of all determinant actions, is also referred to as the term "motivation," which became equivalent to "determination" (p. 812). The term Ms X INs can be best understood as the "attractiveness of success" (p. 813). In other words, individuals who are achievement-needing are motivated by the possibility of success and fear failure

(Fisher, 2009). These individuals are more prone to exert more effort when external motives are presented (McClelland, 1985).

Duckworth and Quinn (2009) indicated that grit is related to but distinct from the need for achievement (*n* Achievement: McClelland, 1961). They argued that what differentiates grit from need for achievement is that "individuals high in grit do not swerve from their goals, even in the absences of positive feedback" (p. 166). In contrast, individuals high in need for achievement will exert more effort when there is an incentive present than when it is not present (McClelland, 1985). Individuals high in grit do not require external motives. They possess an internalized consistency of interest coupled with effortful persistence. In other words, what differentiates grit from need for achievement is that the motivation emerges from within and propels that propensity to persevere.

Self-Regulated Learning Theories and Grit. The concept of self-regulation has often been used as a synonym for conation (Huitt & Cain, 2005). "Self-regulation refers to the way in which individuals control their thoughts and action" (Renninger & Hidi, 2016, p. 86). At its core, self-regulated learning is the process through which students take control of their own learning. Students manage motivational, cognitive and behavioral aspects of their own learning through engagement of various sub-processes that include "goal setting, activation of relevant prior knowledge, progress monitoring, engagement and regulation of learning strategies, and reflection" (as cited in Wolters & Hussain, 2015, p. 295). Self-regulated learners have a strong will and are persistent in their learning (Hrbackova & Suchankova, 2016). However, when students do not have

an interest in learning, in school, on the playing field and so forth, then self-regulation is a problem (Sansone & Thoman, 2005).

Hrbackova and Suchankova (2016) indicated that positive intrinsic motivation is one of the key determinates of the process of self-regulated learning. If students are not intrinsically driven to learn, they cannot be interested in expending their energy towards developing their own learning or future development of themselves (p. 689). This ability to motivate oneself is one of the characteristics of successful people (Sternberg, 1997), and an attribute of self-leadership (Manz, 1986; Neck & Manz, 1996). That is, a self-lead person will do things for their intrinsic value (Williams, 1997) and is able to do the work that must be done, but is not naturally motivating (Manz, 1986).

Ivcevic and Brackett (2014) viewed grit as a self-regulatory personality trait. In their study, they depicted a model of self-regulation influences on indices of school success obtained from records (i.e., rule violation behavior, recognitions, academic honors, and GPA) and self-reported satisfaction with school, where the results point to the importance of a broad trait of conscientiousness instead of the lower-level trait of grit. Their results underscored the joint importance of conscientiousness and students' ability to regulate their emotions. They indicated that students having a choice in their goal can make a difference in their drive towards success. In other words, find or increase students' interest, allow them to have a choice in setting their goals, and they will persevere.

Almeida (2016) connected the goal component of grit with self-regulated learning strategies. He indicated that the preference for long-term goals promotes students to use self-regulated learning strategies. He cited Wolters and Hussain's (2015) work. Wolters

and Hussain's work suggests that self-regulated learning strategies may be seen as a mediating factors between the goal aspect of grit and college success (Almeida, 2016, p. 571). These strategies include the selection of personal goals, monitoring and regulating cognition, motivation, and behavior throughout their learning experience in order to ultimately achieve their personal goals (Hrbackova & Suchankova, 2016; Wolters & Hussain, 2015). Self-regulated learning theory provides a perspective that focuses on the implicit intrinsic motivational determinate and explicit goal component of grit.

A Hierarchical Goal Framework and Grit. Duckworth and Gross (2014) offered an interesting proposal on the similarities and differences between self-control and grit using a hierarchical goal framework that draws on contemporary goal theories. Based on a number of prominent motivation accounts (Carver & Scheier, 1998; Emmons, 1986; Fujita, Trope, Liberman, & Levin-Sagi, 2006; Kruglanski et al., 2002), there is an assumption that goals are organized hierarchically, with lower-level goals serving higher-order goals. The lower-level goals are more numerous, context specific, short-term and exchangeable, whereas the higher-order goals are fewer in number, more abstract, more enduring, and more important to the individual (Duckworth & Gross, 2014).

"Within this framework, self-control refers to the successful resolution of a conflict between two action impulses – one that corresponds to a goal that is more valued in the moment, and another the corresponds to a goal that is of a greater enduring value" (Duckworth & Gross, 2014, p. 321). Duckworth and Gross indicated that grit entails tenaciously working toward a dominant higher-order goal in the face of obstacles and setbacks, often for years or decades. The higher-order goal sits on top of well-organized hierarchy of lower-order goals, and these lower-order goals give rise to actions that

advance the individual towards the higher-order goal. Self-control addresses the conflict between lower-order goals, whereas grit maintains allegiance to the higher-order goal over long periods of time. Duckworth and Gross claimed that with grit, the rival lower-level goals are suppressed and new actions are generated to overcome setbacks in order to pursue the dominate higher-order goal. Grit is more tightly coupled with lifetime achievements, and self-control appears to be more tightly coupled with everyday success. In other words, grit entails working towards a single challenging higher-order goal that takes years, even decades to reach; whereas, self-control entails aligning action with any valued goal, despite alternatives (Duckworth & Gross, 2014).

Based on this hierarchical goal framework, grit is "as much motivation as volition" (Duckworth & Gross, 2014, p. 323). Of importance is the connection of interest with the higher-order or long-term goal. Specifically, the higher-order goal must be of compelling and significant interest for the individual to be inspired and driven towards this lifelong allegiance despite setbacks, mistakes, obstacles, and alternatives. Duckworth and Gross assume that the commitment to a higher-order goal is "a function of that goal's feasibility and desirability and thus that the diverse psychological antecedents to such valuations (e.g., growth mindset, optimism, attribution style, locus of control, counterfactual styles, core self-evaluation, intrinsic motivation, interest, approaches to happiness) are logical targets for intervention and inquiry" (p. 323). The question remains to the researcher, "How then is the higher-order goal decided upon and what role do these antecedents, such as interest, self-efficacy, and locus of control play in the development of grit?"

The Mindset Theory and Grit. The mindset theory looks at what drives people to be successful (Dweck, 2008). Carol Dweck is the leading researcher for mindset theory. In her research (2010), she identified two sets of beliefs: a fixed mindset and a growth mindset. Students with a fixed mindset believe that intelligence is a static trait: "some students are smart and some are not," and that is it – period (Dweck, 2010, p. 26). Students with a growth mindset believe that intelligence can be developed. It implies that everyone's intellectual ability can grow through various means, for example, through effort and instruction (Dweck, 2010, p. 26). Her studies demonstrated that teaching students how the brain is a muscle capable of change and can be developed and used especially when faced with challenges can help them persevere (Hochanadel & Finamore, 2015, p. 48). In other words, teaching students to have a "growth mindset" - that is, the belief that we can grow and change - will help them persevere in the face of adversity.

Duckworth learned that grit can be developed by having a "growth mindset" (Hochanadel & Finamore, 2015). With a growth mindset belief, students focus on learning; they value effort and are resilient in the face of setbacks (Dweck, 2010). Students who believe that their intelligence can be improved with effort may be more likely to seek out rigorous academic challenges (West et al., 2016). Researchers suggest that the interaction between academic perseverance and academic mindset may lead students to "engage in more pro-academic behaviors such as attending school work, doing homework, and studying," (West et al., 2016, p. 150) resulting in higher achievement and success. These individuals exert more effort to succeed. They have "internalized the motivation to persist" (Hochanadel & Finmore, 2015, p. 49). Clearly,

the beliefs that individuals have about themselves and their success play a role in the development of grit and may lead to greater success.

Drive Theory and Grit. The theory of drive refers to the extent to which a person acts on personal motivators, whatever these may be (Siegling & Petrides, 2016, p. 1). The drive construct describes to what extent or how much the individual will do something in terms of commitment, sacrifice, effort, etc. Drive is concerned with the propensity to pursue goals. Based on this definition, drive and grit are conceptually similar not only to each other, but to those personality dimensions that consider effort and self-control, such as conscientiousness (Duckworth et al., 2007; Duckworth & Gross, 2014; Siegling & Petrides, 2016).

Siegling and Petrides (2016) conceptualize drive as "the extent of the person's investment and is more similar to energy" (p. 2). In other words, drive is not a motivator; it is comparable to energy. Grit, too, has been described as "zeal and prodigious energy" (Abuhassàn & Bates, 2015). Siegling and Petrides acknowledge that there are unquestionably recognizable similarities among the two constructs. What appears to differentiate grit from drive, and for that matter quite possibly conscientiousness, is the personal motivator. The personal motivator may initiate both the perseverance dimension of grit and drive, but with grit, the personal motivator becomes "one" with grit. In other words, it is the intrinsic interest characteristic of grit that is coupled with the energy and committed focus that ignites the pursuit towards the individual's long-term personal goals (Duckworth, 2016).

Additional Theories and Grit. Daniel J. Almeida (2016) provides one of the most comprehensive understandings of grit in the context of higher education. In doing

so, he speaks to a number of theoretical perspectives that can or have been used in understanding grit. These include the theory of motivational intensity (Brehm & Self, 1989), a number of resilience theories (Wang, Haertel, & Walberg, 1997), and of interest (although, outside the scope of this study), the human capital theory (Becker, 1964) and the critical race theory (Delgado & Stefancic, 2001).

Almeida (2016) indicated that the theory of motivational intensity (Brehm & Self, 1989) is useful in understanding the connection between grit and one's discipline in regulating one's effort (Silvia et al., 2013). According to this theory, two factors - the perceived importance and difficulty of the goal, respectively - contribute to the amount and type of effort that a person exerts (Almeida, 2016, p. 571). Almeida indicated that one's level of grit, mediated by social environment, may help determine how important success is to a person and the degree of effort the person is willing to exert. He referenced Duckworth and her colleagues' study of the National Spelling Bee Championship. The findings from this study maintained that effort in an activity in the short term may not be intrinsically rewarding, but because these individuals had been socialized to see the importance of the long-term goal of becoming a spelling champion, they exerted an extraordinary amount of effort.

Similarly, Duckworth and her colleagues (2007) cited Bloom's (1985) quantitative study of the development of world-class pianists, neurologists, swimmers, chess players, mathematicians, and sculptors. Bloom observed that accomplished individuals not only had a high interest in their field, they all had a desire to reach "a high level of attainment" in that field and possessed the willingness to put in an extraordinary amount of time and effort. In sum, the importance of that goal, mediated by interest or

social influence, is telling of the intensity level of one's motivation, or in other words, the individual's grit level.

Almeida (2016) also suggested that using resilience theory in understanding grit in the context of higher education may be useful, given the challenges in college can be quite complex. Resilience is conceptualized as "a dynamic process that leads to positive outcomes in the face of adversity" (Bolton, Praetorius, & Smith-Osborne, 2016, p. 171). This dynamic process or drive to overcome obstacles is a descriptive element of not only resilience, but grit. This concept is suggested by grit scale items "Setbacks don't discourage me," or "I have overcome setbacks to conquer an important challenge" (Duckworth et al., 2007, p. 1090). Almeida indicated that grit and resilience are both relevant in terms of overcoming obstacles; however, whereas grit is conceptualized as "an internal trait of individuals independent of social context, resilience in contrast is the interaction between internal as well as external factor" (p. 573).

Given the current debate on promoting grit in education and how race and racism and other form of marginalization may inform the policies and practices around grit (Anderson, 2014), Almeida (2016) used the human capital theory and critical race theory in examining the concept of grit and its application in education. The theory of human capital implies that the deliberate investment of time, money, and other resources in developing the knowledge base and skillset of individuals will result in their increased productivity (Schultz, 1971; as cited in Almeida, 2016, pp. 583-584). Human capital theorists support the idea of preparing students to be productive members of society. Their desire to promote grit is primarily driven by the need for grit in the labor force (Walters, 2004). "A grittier workforce may be more resilient to obstacles and respond

more effectively to changes in the nature of a given industry, thus increasing productivity" (Almeida, 2016, p. 586). To the human capital theorists, grit serves a function (Almeida, 2016).

Almeida (2016) also outlines several concerns, or arguments that the critical theorists provide in respect to grit. One being that in promoting grit, the attention is taken away from larger structural determinants that remain barriers for many students. The critical theorists are concerned with the implications and motivations of promoting grit with regards to race. Developing grit in individual students will not be sufficient to overcome the racism and discrimination in society (Almeida, 2016, p. 589).

Point taken, however, the idea and promotion of grit does not need to be restricted or focused only on a certain population. This study investigated grit using a sample of college students from a private university and junior college. Grit is not a new idea (Kaufman, 2016), and according to some (Credé et al., 2016; Muenks et al., 2016; Rimfeld et al., 2016), it is not that different from conscientiousness. Investigating grit through the lens of motivation and its antecedents can provide a more comprehensive understanding of grit. The current debate on whether grit is racist (Herold, 2015) was outside the scope of this study. The primary focus of this study was to obtain a deeper understanding of the factors that contribute to grit and college success.

Summary. Based on the theoretical perspectives presented and discussed, I hope the reader has gained additional "grit" insights. Exhausting yes, but it should not come as a surprise that Credé and his colleagues (2016) have referred to grit as simply being a case of "old wine in new bottles." Clearly, a number of these theoretical perspectives provide support to the arguments made that question the construct validity of grit (e.g.,

Credé et al. 2016; Muenks et al., 2016; Rimfeld et al., 2016). At the same time, a prime antecedent (interest) has been introduced that may help differentiate grit from conceptually similar constructs. However, before examining the prime antecedent and potential contributors of grit, a review of recent studies examining the antecedents of grit, the construct validity of grit, and the predictive validity of grit is presented, followed by how grit is measured.

Studies on Grit

Since its conception in 2007, grit has received widespread attention. A number of studies have examined grit's factor structure, construct validity, and predictive validity. But it has only been in the last three years that researchers have decided to explore the possible antecedents for cultivating grit.

Antecedents of Grit. Duckworth (2016) gave us some ideas for how individuals can develop and increase their grit. First, individuals will need to find their interest. Next, goals are set. They would then embark on a course of deliberate practice. They must also have a purpose. Having a purpose entails being committed to a goal that serves to organize and plan the individual's daily and long-term activities (McKnight & Kashdan, 2009). And both their purpose coupled with their interest must have personal meaning to them and be connected to the well-being of others. Finally, individuals must sustain hope from the beginning of their pursuit through to the end (Duckworth, 2016).

The first step to a change in one's behavior is changing one's beliefs. By having a growth mindset, grit can be developed (Hochanadel & Finamore, 2015). Individuals with a growth mindset believe that intelligence is not fixed. Intelligence can be developed over time. Individuals with a growth mindset value effort. They exert more

effort to succeed. Hochanadel and Finamore did not mention any specific strategies in promoting grit, other than to challenge students, help them develop a growth mindset, and teach them to "internalize the motivation to persist" (p. 49). By teaching students how to persist, a growth mindset develops, thus improving students' grit so that they are able to overcome adversities.

Hill and his colleagues (2016) sought out to examine two potential antecedents of grit: committed purpose and positive affect. Committed purpose was understood as a catalyst to grit, and viewed as a force that "organizes and stimulates goals, manages behaviors, and provides a sense of meaning" (p. 266). With positive affect, individuals may be able to build passion to deal with obstacles they may face in pursuing their long-term goals. In other words, individuals may exhibit greater interest in pursuit of their long-term goals if they have an existing base of positivity and optimism (p. 259).

Across two studies using college student samples from Canada and the United States, Hill and his colleagues (2016) reported three findings of particular importance: (a) grittier individuals tended to report higher levels of both purpose and positive affect, even when controlling for all Big Five personality traits, and their magnitudes changed little when controlling for age, gender, or racial status, (b) purpose and positive affect were strongly correlated with each other (r = .60 and r = .49) and both appear uniquely predictive of grit; however, (c) only purpose (i.e., a committed purpose) appeared predictive of changes in grit across the semester. Results from their study suggest that having a purpose may help more than positive affect when predicting who is likely to become grittier over a college semester. In other words, these findings point to the value

of finding a purpose and having direction to become successful in school, or for that matter, life.

It appears that positive affect is not enough to develop or promote grit. What about passion? In the eyes of venture capitalists, passion has been considered as the "fire of desire" that motivates entrepreneurs to overcome obstacles and hardships on their road to new venture success (Cardon, Wincent, Singh, & Drnovesk, 2009). Mueller and his colleagues (2017) explored one set of pathways leading from entrepreneurial-developer passion to performance, identifying self-regulatory mode (locomotion and assessment) and grit as significant conduits of this relationship (p. 260). Self-regulation theory details how passion aids in motivation and goal pursuit through the mediating effects of goal-related cognitions (Cardon et al., 2009). Mueller and his colleagues proposed that self-regulatory mode – "an individual's orientation toward either immediately acting to pursue goals (i.e., locomotion) or appraising options for goal pursuit (i.e., assessment) is influenced by passion and plays a central role in determining how goals are pursued, and thus, the degree to which entrepreneurs exhibit grit in attempting to grow their firms" (p. 260). Entrepreneurial passion was defined as a motivational construct, theorizing that this motivation stems from an entrepreneur's identity (Burke, 2004). They found that the relationship between the entrepreneur's passion and grit is mediated by both locomotion and assessment, with results indicating a positive relationship between locomotion and grit (ß = .31, $p < .01$), and a negative relationship between assessment and grit (ß = -.14, $p < .05$). Grit was also found to hold a positive relationship (ß = .13, $p < .01$) with venture performance (Mueller et al., 2017, p. 272).

How might other motivational constructs relate to grit? Based on Borghans, Duckworth, Heckman, and ter Weel's (2008) model of personality that proposes "how people behave, think, and feel is determined by what they want, in conjunction with what they can do, and what they believe, and their situation," Von Culin and her colleagues (2014) predicted that motivational orientations, in part, explain individual differences in grit (pp. 306-307). They were interested in how might motivational orientations relate to grit – particularly approaches to happiness. Based on two cross-sectional studies, grit was associated with pursuing happiness through an orientation towards engagement (r = .39 and r = .32), meaning (r = .30 and r = .25), and to a lesser extent, pleasure (r = .04 and r = -.17). These motivational orientations related differently to the two dimensions of grit. That is, engagement was more strongly associated with perseverance of effort (r = .46 and r = .45), whereas pleasure was more strongly (inversely) associated with consistency of interests over time (r = -.04 and r = -.27).

Suzuki and colleagues (2015) sought to replicate Von Culin and her colleagues' (2014) study. Consistent with Von Culin and her colleagues, orientations to engagement and meaning had positive associations with grit, while an orientation to pleasure had a negative association. However, their results among the orientations showed the strongest association between meaning and grit (ß = .05, p < .001). Suzuki and colleagues indicated that the difference may be explained by cultural difference; that is, collectivist culture tends to value contribution to society, whereas individualist culture emphasis is on the individual over the group. The results from these studies suggest that the differences in grit may be based, in part, from differences in what makes people happy.

But it was hope, not happiness that was linked to grit among 128 Latina/o college students. Using positive psychology and familial factors as their conceptual framework, Vela and his colleagues (2015) examined how presence of meaning in life, searching for meaning in life, happiness, hope, and family importance influenced 128 Latina/o college students' grit. Positive psychology focuses on strengths, psychological well-being, and life satisfaction (Vela, Castro, Cavazos, Cavazos, & Gonzalez, 2014) that includes search for meaning in life, presence of meaning in life, happiness, and hope. Results from the regression analysis yielded a statistically significant model, $F(6, 127) = 10.95$, $p < .01$, $R^2 = .35$, indicative of a large effect size in which hope yielded the strongest positive association (ß = .41, $p < .01$). Other than search for meaning that was negatively correlated with scores related to grit (ß = -.18, $p < .05$), all other variables, including family importance, were not statistically significant.

Adding to the literature on the antecedents of grit, Datu (2017) investigated the social factors (e.g., sense of relatedness) that may potentially cultivate grit in an interdependent setting. Sense of relatedness referred to "the extent to which a person feels accepted by different social partners (i.e., parents, teachers, and friends)" (p. 135). Among 606 Filipino students from a private high school in Metro Manila, Datu found that sense of relatedness with parents and teachers served as an antecedent in promoting and increasing grit. In other words, the results from this study indicate that having positive meaningful relationships with teachers and parents may be linked to higher perseverance and passion for long-term goals. The support and encouragement that teachers and parents can offer to students may boost their determination to successfully achieve their long-term academic and personal goals.

Success does not come easy. Indeed, Duckworth and her colleagues (2011) tied grit to success via the mediating mechanism of deliberate practice. Grittier kids practiced more, that in turn, led to success (Duckworth, 2016). Not just more in terms of "time," but with a plan targeted towards a goal. Deliberate practice entails "engaging in a focused, typically planned training activity designed to improve some aspect of performance" (Duckworth et al., 2011, p. 174). High levels of grit require individuals to persist with practice activities that may be considered "less intrinsically rewarding – but more effective – than other types of preparation" (Duckworth et al., 2011, p. 174). Grittier individuals challenge themselves to "become just a little bit better" than they were the day before (O'Reilly & Soon, 2016).

The above fore-mentioned studies have demonstrated that purpose, passion, happiness, meaningful interpersonal relationships, and hope are connected to grit, and that grit can be developed by having a growth mindset. Believing that intelligence can be developed over time is a start. Finding one's passion through discovering of one's interests would be next, and with deliberate practice grit can grow. Nevertheless, it is the malleable characteristic of grit and its connection to success that has captivated the interest among educators, researchers, parents, and others.

Construct Validity of Grit. The construct validity of grit has been challenged by several researchers (Credé et al., 2016; Muenks et al., 2016; Rimfeld et al., 2016), primarily because of the strong correlations between conscientiousness and grit. Construct validity is best understood as a process for theory validation that subsumes specific test validation procedures (Landy, 1986; Messick, 1980; Smith, 2005). With construct validity, the trait or quality underlying the test is of central importance

(Cronbach & Meehl, 1955). Unlike physical science that has an International Bureau of Weights and Measures, for example, that has a bar measuring the true length of a meter, psychology has no such thing (Smith, 2005, p. 396). Psychological constructs are, essentially, unobservable (Cronbach & Meehl, 1955; Smith, 2005, p. 205). One cannot observe grit, conscientiousness, perseverance of effort, or any other inferred trait. Therefore, the process of basic theory testing or construct validity is necessary. The challenge for researchers is how to measure hypothetical constructs in a convincingly valid way (Smith, 2005).

There are different ways to measure different aspects of construct validity (Messick, 1980; Smith, 2005; Trochim, 2006). One way to provide evidence for construct validity is to test whether "the measure in question is coherently related to different measures of the same construct as well as to other variables that it should relate to on theoretical grounds" (Messick, 1980, p. 1016). This is referred to as convergent validity. Another way is to test whether the measure in question is not related to measures of different constructs. This is known as discriminant validity (Messick, 1980). In other words, convergent validity refers to the degree to which different measures of the same construct are related, and discriminant validity refers to the degree to which measures of different constructs are not related (Trochim, 2006).

There is also the evidence for certain predictive relationships that is traditionally singled out for special attention under the rubric of "criterion-related validity," and therefore considered part of construct validity (Messick, 1980). The criterion-related validity is intended to show the validity, "*not of the test, but of that hypothesis*" of relationship to the criterion (Guion, 1978, p. 207, as cited in Messick, 1980, p. 1016), and

is usually comprised of two types: concurrent validity and predictive validity. Concurrent validity is when the results of a particular measurement correspond to a previously established measurement for the same construct, or when one test is proposed as a substitute for another, and predictive validity assesses the construct's ability to predict something it should theoretically be able to predict (Cronbach & Meehl, 1955).

Credé and his colleagues' (2016) meta-analytic synthesis of grit helps shed light on the nature and construct validity of grit, and its distinction from conscientiousness. Their meta-analytic synthesis of the grit literature was based on a total of 778 potential data sources and the first 500 search results of the Internet using the Google search engine and the search term "grit" to identify additional unpublished sources of information (p. 496). These potential sources were examined more closely to determine if the reported data met the inclusion (e.g., Pearson correlation or information that could be used to estimate the size of a correlation) or exclusion criteria measures of grit (e.g., below middle school age, and significant and non-significant correlations). In the end, 73 studies representing data from 88 unique samples and 66,807 individuals were included in the analysis.

In respect to the structure of grit and its construct validity, Credé and his colleagues (2016) found that the practice of combining the perseverance of effort scores and consistency of interest scores into an overall grit score resulted in a significant loss in the ability to predict performance. In other words, grit as a higher-order construct comprised of two lower-order dimensions was not supported. The perseverance of effort dimension of grit was found to be a better predictor of performance. They did find that grit exhibited very weak relations with cognitive ability (k = 21, N = 11,513, ρ = .05,

SD_ρ = .12); however, grit's relations with other trait variables were much stronger. In particular, conscientiousness was very strongly correlated with overall grit (*k* = 22, *N* = 18,826, ρ = .84, SD_ρ = .07) and also with perseverance of effort (*k* = 8, *N* = 4,967, ρ = .83, SD_ρ = .14) and consistency of interest (*k* = 8, *N* = 4,967, ρ = .61, SD_ρ = .17).

According to Credé and his colleagues (2016), the correlation between overall grit and conscientiousness (ρ = .84), and between perseverance of effort and conscientiousness (ρ = .83) is much stronger than what is typically found between scores on two different global measures of conscientiousness (ρ = .63; Pace & Brannick, 2010). Grit also exhibited a very strong relation with self-control (*k* = 4, *N* = 2,615, ρ = .72, SD_ρ = .05), and relatively strong relations with a number of other variables that are presented as having an influence on success and performance, including generalized self-efficacy (*k* = 3, *N* = 1,908, ρ = .43, SD_ρ = .11), mental toughness (*k* = 6, *N* = 3,817, ρ = .46, SD_ρ = .08), positive affect (*k* = 3, *N* = 670, ρ = .46, SD_ρ = .03), and depression (*k* = 5, *N* = 3,865, ρ = -.48, SD_ρ = .12) (pp. 499-501). These results suggest that grit "as it is currently measured" does not appear all that different from a number of constructs, especially to conscientiousness.

Understanding the importance of construct validity, Muenks and her colleagues (2016) examined the factor structure of grit using the 8-item Grit-Short (Grit-S) scale, and its relation to similar constructs in the personality, self-regulation, and engagement literature. They found that grit's factor structure differed to some degree across high school students (*n* = 203) and college students (*n* = 336), and that for high school students both the consistency of interest and perseverance of effort dimensions of grit were not

clearly distinguished from self-control (r = .58 and r = .52), conscientiousness (r = .40 and r = .64), cognitive self-regulation (r = .33 and r = .47), effort regulation (r = .38 and r = .57), behavioral engagement (r = .30 and r = .57), and behavioral disaffection (r = -.50 and r = -.49), respectively. For college students, grit was not clearly distinguishable from self-control (r = .67), conscientiousness (r = .60), cognitive self-regulation (r = .35), effort regulation (r = .41), behavioral engagement (r = .40), and behavioral disaffection (r = -.50). Although there was much overlap in the various constructs, three out of the four confirmatory models from the high school sample that involved conscientiousness did not converge in terms of iterations. The reliability measure of conscientiousness for the high school sample was also low (α = .58). Thus, the results from their study suggest that grit is not clearly distinguished from these constructs operationally, even if it is conceptually.

Rimfeld and her colleagues (2016) also investigated the construct validity of grit, based on a United Kingdom sample comprised of 2,321 twin pairs of 16-year-olds using the Grit-S scale. Results from principal component analysis using direct oblim rotation suggested a two-factor model of grit. Therefore, only correlations coefficients were reported on the two dimensions of grit with conscientiousness and the other Big Five personality factors. Their core finding was that grit, especially the perseverance of effort dimension, is substantially correlated with conscientiousness, "both phenotypically (r = .53) and genetically (r = .86)" (p. 7). Their results also showed that grit is moderately heritable, with genetic factors explaining about a third of the variance. All together, the results from the above fore-mentioned studies suggest a jangle fallacy (Block, 1995); that

is, similar constructs are sometimes given different labels (Marsh, Craven, Hinkley, & Debus, 2003).

Other researchers have examined grit's relation to conscientiousness. Based on the abstract search of the PsycINFO, ERIC, Education Source, and Academic Search Complete databases, using keywords "conscientiousness" and "grit," a total of 24 potential data sources were identified. Full-text available sources that reported on the Pearson correlation between scores using Duckworth and her colleagues' (2007, 2009) measures of overall grit and self-reported measures of conscientiousness were included. Table 1 presents the results based on the search outlined above.

Table 1
Relations Between Grit and Conscientiousness

Sources	Sample	*N*	Grit Scale	*α*	Conscientiousness Scale	*α*	*r*
Ivcevic & Brackett, 2014	High School	185	Grit-O	.72	BFI	.78	.44
Reed, 2014	Adults	1,161	Grit-S	.78	BFI	.70	.52
Hill et al., 2016	College	320	Grit-S	.71	BFI	.81	.60
Muenks et al., 2016	College	336	Grit-S	.72	TIPI	.65	.60
Duckworth et al., 2007	Cadets	1,308	Grit-O	.79	BFI	.82	.64
West et al., 2016	8th Graders	1,340	Grit-S	.64	BFI	.76	.66
Dumfart & Neubauer, 2016	Adolescents	129	Grit-S	.70	hiPIC	NR	.67
Reed, Pritschet, & Cutton, 2013	Adults	1,171	Grit-S	.79	BFI	.78	.72
Duckworth & Quinn, 2009	Adolescents	190	Grit-S	.82	BFI	.86	.77
Meriac, Slifka, & LaBat, 2015	College	322	Grit-S	.75	BFI	.79	.77
Duckworth & Quinn, 2009	Adults	1,554	Grit-S	.82	BFI	.84	.77
Duckworth et al., 2007	Adults	690	Grit-O	.85	BFI	.86	.77
Abuhassàn & Bates, 2015	Adults	494	Grit-O	NR	NEO-PI-R	NR	.78
Ralph, Wammes, Barr & Smilek, 2017	Adults	164	Grit-O	.90	BFI	.91	.82

Note. Abbreviation key: NR = not reported. BFI = Big Five Inventory. TIPI = Ten-Item Personality Inventory. hiPIC = Hierarchical Personality Inventory for Children. NEO-PI-R = Neuroticism, Extraversion, Openness (NEO) Personality Inventory-Revised.

A total of 12 studies representing data from 14 unique samples and 9,364 individuals were ultimately included in the analysis. These researchers found similar results; that is, the correlation coefficients ranged from .44 to .82, or shared variance ranging from 19% to 67%.

Predictive Validity of Grit. Proponents of grit have asserted that grit is not only distinct from conscientiousness, but that it is highly predictive of success and performance (Duckworth et al., 2007; Duckworth & Quinn, 2009). However, studies examining the predictive validity of grit as it relates to academic success and performance has produced mixed results (Abuhassàn & Bates, 2015; Bowman et al., 2015; Dumfart & Neubauer, 2016; Ivcevic & Brackett, 2014; Kelly et al., 2014). For example, Bowman and his colleagues examined the predictive validity of grit and its two dimensions. They found that grit predicted a wide array of student outcomes (i.e., self-reported and institutional records of college GPA, academic adjustment, college satisfaction, college sense of belonging, faculty-student interaction, co-curricular engagement, and intent to persist in college), though the perseverance of effort dimension of grit was a stronger predictor compared to the consistency of interest dimension of grit for these outcomes. The perseverance of effort dimension also predicted increases in college GPA over time.

Abuhassàn and Bates (2015) tested the two-factor structure of grit and whether grit was separable conscientiousness. Although they found that grit was distinguished from conscientiousness, their findings revealed that grit did not predict high school GPA. Ivcevic and Brackett (2014) echoed these findings. In a sample of private high school

students, they reported that grit did not explain any additional variance in school outcomes.

At West Point, researchers (Kelly et al., 2014) investigated the predictive validity of grit and hardiness, and their dimensions, on retention and military performance. The perseverance of effort dimension of grit was found to be an important contributor, beyond the College Entrance Exam Rank, in predicting military performance. The College Entrance Exam Rank, or CEER, is a traditional measure of academic success and regarded as the primary predictor of academic achievement during the first year at West Point. The CEER is calculated using either the ACT or SAT Verbal and Math score, along with class rank in a weighted formula (Kelly et al., 2014, p. 331). The perseverance of effort dimension added to the predictive power of the CEER among the Class of 2010, increasing the explained variance in 4-year cumulative military performance from .08 to .10 (F for Δ in $R^2 = 29.88$, $p < .001$). For the Class of 2009, only the perseverance of effort dimension of grit added to CEER in predicting cumulative military performance (F for $\Delta R^2 = .14$ to $.16 = 23.06$, $p < .001$).

Grit was also a significant differentiator between those cadets who separated during basic training ($n = 52$) versus the majority ($n = 1{,}256$) who persisted beyond (Kelly et al., 2014). It was the consistency of interest dimension of grit that was the differentiator between the two groups. In other words, those who remained committed and persisted through basic training reported higher levels of interest (at entry) than cadets who separated during basic training. No significant difference was observed between these two groups on the perseverance of effort dimension of grit.

Researchers have also examined the relationship between grit and other predictors of success (Dumfart & Neubauer, 2016; Ivcevic & Brackett, 2014; West et al., 2016). To illustrate, West and his colleagues examined the relationships among conscientiousness, self-control, grit, and growth mindset, student behavior, and academic achievement. At the student level, they found conscientiousness, self-control, grit, and growth mindset positively correlated with attendance, behavior, and test-score gains between fourth grade and eighth grade. However, the test-score gains were not evident at the school level and students attending over-subscribed charter schools scored lower on these non-cognitive measures compared to students attending district schools. They attributed the paradoxical findings to reference bias. In other words, they indicated that because of the charter school demands ("no-excuse" policy), students rated themselves more critically on these these measures.

In regards to academic success in higher education, relations between grit and college success measures have been found, such as college grades (Chang, 2014; Duckworth et al., 2007; Strayhorn, 2014), doctoral program grades (Cross, 2014), and years of education completed by adults (Duckworth et al., 2007; Duckworth & Quinn, 2009). However, these relations disappeared once researchers controlled for other variables. For example, Chang found that the composite score of grit did not predict college students' grade point averages (GPAs) when controlling for demographic background and previous academic achievement, and Cross found no relations of grit to doctoral students' GPA when controlling for student characteristics. Thus, the relation between grit and college success measures is inconsistent across studies.

Summary. Although grit has been touted as being an important predictor of success and performance (Duckworth et al., 2007; Duckworth & Quinn, 2009), there are a number of studies that report differently. It appears that grit is not only hardly distinguishable from conscientiousness, but adds little to success as well (Credé et al., 2016; Rimfeld et al., 2016). A review of how grit is measured is presented next.

Assessing Grit

Duckworth and her colleagues (2007) created the original Grit scale (Grit-O). They wanted to know why some individuals accomplish more than others of equal intelligence. In addition to cognitive ability, they listed a number of attributes likely among high-achieving individuals (e.g., creativity, vigor, emotional intelligence, charisma, self-confidence, physical attractiveness, and other positive qualities). They noted that some traits may be more critical than others for particular vocations, and that some traits might be essential to success no matter the domain (p. 1087). Based on interviews with professionals from a number of fields, grit or a close synonym was cited as often as talent as the quality that identified high-achieving individuals. In the end, grit was suggested as the personal quality shared by the most prominent leaders in every field.

In order to test their hypotheses that grit may be as essential as IQ to high achievement, even more than self-control or conscientiousness, Duckworth and her colleagues (2007) reviewed several published self-report measures. These self-report measures needed to meet the following criteria: "evidence of psychometric soundness, face validity for adolescents and adults pursuing goals in a variety of domains (e.g., not just work or school), low likelihood of ceiling effects in high-achieving populations," and

most important of all, fitting of the construct of grit (p. 1089). They failed to find adequate existing measures; as such, they developed and validated a self-report questionnaire called the Grit scale.

Duckworth and her colleagues (2007) originally began by generating a pool of 27 items tapping the construct of grit. In considering item-total correlations, internal reliability coefficients, redundancy, and simplicity of vocabulary, 10 items were eliminated. Exploratory factor analysis was conducted (n = 772), and seeking a solution that satisfied tests for number of factors (e.g. R. B. Cattell's scree test), they retained 5 or more items with loadings of at least .40, yielding internally consistent factors that made psychological sense, resulting in a two-factor oblique solution (p. 1090). The two-factors were correlated at r = .45. Additional confirmatory factor analysis (n = 773) supported this two-factor solution, though as Credé and his colleagues (2016) pointed out, "a relatively poor fit for the model (i.e., comparative fit index = .83 and root-mean-square error of approximation = .11)" (p. 493). Notwithstanding, the resulting 12-item Grit scale demonstrated high internal consistency (α = .85). Studies have since reported internal reliabilities that range from .68 to .90 (Duckworth et al., 2007; Ivcevic & Brackett, 2014; Ralph et al., 2017; Sheridan, Boman, Mergler, & Furlong, 2015).

The original Grit scale (Grit-O) is consistent with the theory of grit as a compound trait comparing stamina in dimensions of effort and interest (Duckworth et al., 2007). Six items tap perseverance of effort (e.g. "I finish whatever I begin"), and six items tap consistency of interest (e.g., "I often set a goal but later choose to pursue a different one"). Duckworth and her colleagues reported high internal consistency for each factor: consistency of interest (α = .84) and perseverance of effort (α = .78). Studies

have since reported internal reliabilities that range from .74 to .87 for consistency of effort factor and .71 to .87 for perseverance of effort (Abuhassàn & Bates, 2015; Credé et al., 2016; Kelly et al., 2014; Fite, Lindeman, Rogers, Voyles, & Durik, 2017; Ralph et al., 2017).

Muenks and her colleagues (2016) made note that the perseverance of effort construct is similar to *future time perspective*; however, because not all of the perseverance of effort items reflect long-term goals, the conceptualization link may not be accurate. Furthermore, studies have reported that perseverance of effort item ("Setbacks don't discourage me") loads on its own factor (Bowman et al., 2015; Collaço, 2017). Bowman and his colleagues also recognized that the six items that measure the consistency of interest are negatively worded. They stated that because these items are negatively worded, the role of acquiescence bias (e.g., "saying yes") in studies using this scale may be a concern.

Two years later, Duckworth and Quinn (2009) introduced and validated a shorter version of the Grit scale. The short version of the Grit scale (Grit-S) consists of eight items, with each dimension (perseverance of effort and consistency of interest) having four items. Internal reliabilities ranging from .64 to .82 have been reported on the overall Grit-S, from .58 to .81 for perseverance of effort, and from .41 to .83 for consistency of interest (Dumfart & Neubauer, 2016; Lucas et al., 2015; Meriac et al., 2015; Miksza & Tan, 2015; Muenks et al., 2016; Rimfeld et al., 2016; Von Culin et al., 2014; West et al., 2016). Other than eliminating four items, no additional modifications were made. In other words, the "Setbacks don't discourage me" was not dropped from the original scale, and the consistency of interest items remained negatively worded.

To date, Grit-O and Grit-S are the only two measures of "grit." That is not to say there are not comparable measures of the two dimensions of grit. For example, the Industry/Perseverance/Persistence (IPP) Scale (Peterson, & Seligman, 2004) assesses the individual's industriousness, persistence, and/or perseverance and contains items that closely resemble and/or overlap with the perseverance of effort items from the Grit scales. The same conclusions can be drawn by comparing the perseverance of effort items from the Grit scales with the industriousness items from the Six Factor Personality Questionnaire (6FPQ) (Jackson, Paunonen, & Tremblay, 2000).

There are also scales that specifically measure passion from three different domains: activities (Vallerand et al., 2003), entrepreneurship (Cardon et al., 2009), and work (Johri, Misra, & Bhattacharjee, 2016). Vallerand and his colleagues had originally proposed the dualistic approach to passion. They indicated that passion can not only "fuel motivation, enhance well-being, and provide meaning in everyday life," but it can "arouse negative emotions, lead to inflexible persistence, and interfere with achieving a balanced life" (p. 756). Vallerand and his colleagues reported acceptable reliability for both subscales of their Passion scale: harmonious passion, α = .79 and obsessive passion, α = .89. And, because the consistency of interest dimension has been linked to focus and undying commitment (Duckworth, 2016) and interpreted as more goal- and action-oriented (Muenks et al., 2016), similarities can be drawn with scales that measure individuals' commitment, such as Hollenbeck, Williams, and Klein's (1989) Goal Commitment. The reported internal reliability of this measure was .88.

For an easier comparison of both the perseverance of effort dimension and the consistency of interest dimension, the scales and their associated items are presented in Table 2 and Table 3.

Table 2
Comparable Perseverance of Effort Items

Scale	Item
Grit: Perseverance of Effort (Duckworth et al., 2007)	I have overcome setbacks to conquer an important challenge. * Setbacks don't discourage me. I am a hard worker. I finish whatever I begin. I have achieved a goal that took years of work. * I am diligent.
IPP Scale (Peterson & Seligman, 2004)	I don't quit a task before it is finished. I am a goal-oriented person. I finish things despite obstacles in the way. I am a hard worker. I don't get side tracked when I work. I don't finish what I start. (R) I give up easily. (R) I do not tend to stick with what I decide to do. (R)
6FPQ Industriousness items (Jackson et al., 2000)	Work hard. Put work above pleasure. Am under constant pressure. Complete tasks successfully. Am always busy. Have too many things to do. Have extra time on my hands. (R) Have a slow pace to my life. (R) Feel that work is not an important part of my life. (R) Put little time and effort into my work. (R)

Note. (R) denotes reverse-scored items, and * indicates item is not included in the Grit-S scale. The Grit perseverance of effort sub-scale and 6FPQ Industriousness scale uses a five-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). The IPP scale also uses a five-point Likert scale but with different indicators.

Table 3
Comparable Consistency of Interest Items

Scale	Item
Grit: Consistency of Interest (Duckworth et al., 2007)	New ideas and projects sometimes distract me from previous ones. (R) My interests change from year to year. * (R) I have been obsessed with a certain idea or project for a short time but later lost interest. (R) I often set a goal but later choose to pursue a different one. (R) I have difficulty maintaining my focus on projects that take more than a few months to complete. (R) I become interested in new pursuits every few months. * (R)
Passion Scale (Vallerand et al., 2003)	This activity allows me to live a variety of experiences. The new things that I discover with this activity allow me to appreciate it even more. This activity allows me to live memorable experiences. This activity reflects the qualities I like about myself. This activity is in harmony with the other activities in my life. For me it is a passion that I still manage to control. I am completely taken with this activity. I cannot live without it. The urge is so strong I can't help myself from doing this activity. I have difficulty imagining my life without this activity. I am emotionally dependent on this activity. I have a tough time controlling my need to do this activity. I have almost an obsessive feeling for this activity. My mood depends on me being able to do this activity.
Goal Commitment (Hollenbeck et al., 1989)	I am strongly committed to pursuing this ___ goal. I am willing to put forth a great deal of effort beyond what I'd normally do to achieve this ___ goal. Quite frankly, I don't care if I achieve this ___ goal or not. (R) There is not much to be gained by trying to achieve this ___ goal. (R) It is quite likely that this ___ goal may need to be revised, depending on how things go this quarter. (R) It wouldn't take much to make me abandon this ___ goal. (R) It's unrealistic for me to expect to reach this ___goal. (R) Since it's not always possible to tell how tough things can get until you've been in them a while, it's hard to take this goal seriously. (R) I think this ___ goal is a good goal to shoot for.

Note. (R) denotes reverse-scored items, ____ allows for a specific goal, and * indicates item is not included in the Grit-S scale. The Grit Consistency of Interest sub-scale and the Goal Commitment scale uses a five-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). The Passion scale uses a seven-point Likert scale from 1 ("do not agree at all") to 7 ("very strongly agree"). First seven items reflect Harmonious Passion and the later items reflect Obsessive Passion.

Although there may not be an overall measure of grit, other than Grit-O and Grit-S, there are a number of self-report measures that closely resemble both the perseverance of effort and consistency of interest dimensions of grit. Just as there are a number of theoretical perspectives and related constructs, further review on grit may reveal additional measures related to grit. In other words, the aforementioned is not a comprehensive comparison of all related measures, but it does present the reader with a preview of the measures of grit that will be used in this study.

Now, I direct your attention to this study's proposed antecedents of grit, starting with interest.

Interest

William James, one of the important forerunners of empirical psychology, asserted that interest plays a role in directing attention and behavior, and when people are intrinsically motivated, they are following their interests (Deci & Ryan, 1985, pp. 11-12). Researchers have proposed that interest can be seen as a powerful motivator (Deci, 2014, p. 43; Frymier, Shulman, & Houser, 1996; Tobias, 1994). Deci and Ryan (1985) described interest as "an important directive role in intrinsically motivated behavior in that people naturally approach activities that interest them" (p. 34). Interest is considered to be the driving force in the human mind (Schiefele, 1991), and a key contributor to learning and achievement (Harackiewicz & Hulleman, 2010).

Interest Theory. According to Schiefele (1991), interest can be traced back to Johann Friedrich Herbart who was one of the early pioneers of modern psychology. Herbart saw interest as one of the primary goals of education and believed that interest leads to meaningful learning, promotes long-term storage of information, and provides

motivation for continued learning (Schiefele, 1991, p. 300). Interest is considered to be an important mental resource that enhances learning, which leads to better performance and achievement (Hidi, 1990).

In his book, *Interest and Effort in Education*, Dewey (1913) characterized interest as an active "propulsive" state that is based on real objects and has high personal meaning to the individual. He also distinguished between interest-oriented learning and learning that neglects a student's interest. According to Dewey, external attempts to make something interesting lead only to temporary effort and do not result in identification with the material. He indicated that learning based only on effort is mechanical and results in training knowledge that lacks any mental purpose or worth; whereas, interest-based learning associates personal meaning and relevance to the material to be learned. In order to promote meaningful learning, instructional efforts need to connect relevance and meaning to the material to be learned.

According to Renninger and Hidi (2011), there have been multiple approaches to describing interest. Based on their review of the literature, they identified five common characteristics of interest as a motivational variable on which many researchers agree. First, interest is content-specific. In other words, individuals are focused on a specific object or event. Second, interest involves a particular relation between individuals and the environment, and is maintained through interaction between individuals and their environment. The potential for interest resides within the individual, and the content and the environment determines the direction of interest development. Third, interest is comprised of both cognitive and affective components that can vary depending on the phase of interest. Fourth, individuals may not be aware of their interest during

engagement. That is, individuals may not be aware of what triggered their interest, and/or in the later phases of interest, they may be so absorbed that they are not metacognitively aware during engagement. Fifth, interest has a physiological/ neurological basis; that is, brain activities differ when individuals are engaged with interest (Renninger & Hidi, 2011, p. 169). In fact, Hidi (2011) specifically argued that interest is related to the reward circuity, and thus interest functions as a reward (as cited in Renninger & Hidi, 2011, p. 169).

In just the last decade, Hidi and Renninger (2006) outlined a model of interest development. According to this model, there are four phases of interest development: triggered situational interest, maintained situational interest, emerging individual interest, and well-developed individual interest. The phases of interest extend from less developed (triggered situational interest) to more developed (well-developed individual, or personal interest). They defined triggered situational interest as a psychological state resulting from short-term changes in cognitive and affective processing associated with a topic or activity that may or may not result in sustained engagement. Maintained situational interest involves focused attention and reoccurs or persists over time. In this phase, individuals begin to make connections between the content of interest and their own skills, knowledge, and prior experience. Emerging individual interest was described as individuals now beginning to take the initiative on their own by reflecting and reengaging with the content. During this phase, individuals now value the object or topic beyond the situation that first stimulated their interest. It is the beginning of a predisposition to seek reengagement. Well-developed individual interest is conceived as a relatively enduring predisposition to reengage in content over time. Individuals with

well-developed individual interest are able to persevere through frustrations and challenges in order to meet their goals (Renninger & Hidi, 2016, p. 13).

Most contemporary interest theorists have divided interest as a motivational variable into two components: individual interest and situational interest (Krapp, Hidi & Renninger, 2014; Renninger & Hidi, 2016). Individual interest is conceived of as a dispositional quality that is enduring, whereas situational interest is an emotional state that emerges in response to environmental stimuli to particular content or activity (Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer, 2008; Renninger & Hidi, 2016; Schiefele, 1991). It is the individual interest that serves to *hold* or maintain one's interest (Ainley, Corrigan, & Richardson, 2005).

Schiefele (1991) defined individual interest as a content-specific motivational characteristic composed of intrinsic feeling-related and value-related valences. Feeling-related valences refer to the feelings that are associated with an object or object-related activity. These feelings are generally positive. Value-related valences refer to the attribution of personal significance to an object or object-related activity. The object has personal meaning. That is, the object or activity contributes to the individual's development, or competence. He added a third essential feature of interest, and that is "its intrinsic character" (p. 303). Individuals would be involved in an activity for its own sake and not motivated by external factors. In other words, the nature of their interest would become intrinsically motivating.

In addition, some researchers have studied topic interest. According to Renninger and Hidi (2016), topic interest is triggered by presentation of topics or themes and can be influenced by individual or situational factors. For example, Ainley, Hidi and Berndorff

(2002) have shown that individual interest in a domain predicts topic interest in specific texts. They linked topic interest to learning, and in doing so, connected interest, affect, and persistence to learning. In other words, individuals who had a positive feeling from their interest in the text were more persistence in their learning.

Sansone and Thoman (2005) argue that it is the "experience of interest" that intrinsically motivates individuals to continuously pursue their goals. They defined interest as "a phenomenological experience involving both cognitive and affective components" (p. 175). Whereas, the experience of interest was described as "a dynamic state that arises through an ongoing transaction among individuals' goals, activity characteristics, and the surrounding context" (pp. 175-176). The individual remains focused, and at its extreme, he or she may experience "flow" (Csikszentmihalyi, 1990). Although there may be moments of negative feelings during the experience of interest, the general affective tone is positive. For example, Christine, who is working on completing her dissertation may have moments of despair. There may be setbacks, or personal responsibilities that take her focus away from her primary goal. She feels as though she will not be able to complete her research; yet, she continues to persevere. In other words, it is the experience of interest that motivates the individual to continuously persist, even when setbacks are encountered, and particularly for activities that take place over a long period of time (Sansone & Thoman, 2005).

Renninger and Hidi (2016) indicated that triggering interest can result in productive engagement and initiates the potential for optimal motivation (p. 1). They defined interest as a psychological state and a motivational variable. As a psychological state, interest is construed by "increased attention, effort, concentration, and affect during

engagement," and as a motivational state, there is a "distinction between shorter-term or situational interest and long-term or individual interest that is characterized by reengagement over time" (Renninger & Hidi, 2016, p. 9). They indicated that the presence of interest makes learning feel effortless.

Although interest may be described by researchers in a number of ways, the shared commonality is its connection with motivation. Interest, or the "energetic dimension of the human information processing system," has been argued as being central in determining how individuals select and persist in processing certain types of information in preference to others (Hidi, 1990, p. 549). Researchers agree. Interest is key in respect to motivation (Deci & Ryan, 1985; Flowerday & Shell, 2015; Renninger & Hidi, 2016).

Studies on Interest. Harackiewicz and Hulleman (2010) integrated interest theory with two other motivational frameworks: achievement goals and expectancy-value theories to understand how interest in activities and topics develops. Achievement goal theorists posit two types of competence-related goals: performance goals and mastery goals (Ames, 1984; Grant & Dweck, 2003). Mastery goals, also known as learning goals, focus on understanding and growth; whereas, performance goals focus on results and competition. Harackiewicz and Hulleman indicated that the choice in goals provides individuals with purpose for engagement, and orients their attention and effort while engaged in the activity. That is, individuals who orient themselves to mastery goals believe that competence develops over time through practice and effort and are more likely to be intrinsically motivated; whereas, individuals who orient themselves to performance goals believe that competence is a stable characteristic, are concerned with

being judged by their ability, and are more likely to be extrinsically motivated (Ames & Archer, 1988). Expectancy-value models state that individuals are motivated to engage in a task to the extent that they feel they can be successful at it (expectancy) and they perceive that task as being important to them (value). Harackiewicz and Hulleman's review of studies on the role of interest in promoting academic achievement based on the integrated framework of achievement goals theory, expectancy-value theory and interest theory revealed that the goals individuals adopt in achievement situations as well as the perceived value they place on the activities promote the development of subsequent interest in the topics or activities.

Schiefele (1991) reviewed a number of studies related to the concept of interest. The results from these studies revealed that interest not only facilitated "deep level" processing, but it was highly correlated with investment of time and effort. High-interest individuals were also found to be more engaged, compared to low-interest individuals.

In the field of instructional communication, studies have shown positive relationships between measures of student interest and motivation (Frymier et al., 1996; Weber & Patterson, 2000; Weber, 2003). Weber examined the relationship between student interest and motivation. He found that interest was significantly related to intrinsic motivation, but not extrinsic motivation. Further examination revealed that meaningfulness was most strongly related to intrinsic motivation. Other researchers have found interest to be related to self-report measures of activation, involvement, happiness, intensity of attention, use of elaborative strategies, and intrinsic motivation (Schiefele, 1991).

Interest has also been linked to continuous motivation in learning. According to Herndon (1987), the "Zeigarnik effect" is a special type of continuing motivation. It is defined as a willingness to reengage in an uncompleted, intrinsically motivating task (Green, 1963; Kruglanski, Friedman, & Zeevi, 1971). To illustrate, Herndon examined high school seniors' willingness to reengage in solving conditional syllogisms with the most frequently reported learner interests. Seventy-two participants participated in the experiment. They were first divided into two groups on the basis of achievement. A short self-instructional unit on how to solve conditional syllogisms was used as the instructional task. There were two versions of this unit: an "interests" version and a "no interests" version. In the interest version, interest examples were embedded in each syllogistic premise. Interest examples were chosen based on the most frequently reported learner interests. Herndon found that actively incorporating students' interest into an instructional task increased students desire to persist in an unfamiliar and difficult task. He indicated that incorporating students' interests into the learning material may give students a perception of relevance, and that relevance promotes continuous motivation. That is, students experienced the "Zeigarnik effect." He also found that significantly more high- than low-achievers were willing to continue with the task.

Clearly, there is a link between interest and motivation. Interest is what propels the individual to take action. Interest may just as well be the personal motivator for "how much effort is put forth" by the individual. In other words, the greater the interest, the greater the drive towards one's goal. If grit is motivation, or a part of motivation, then is interest the missing personal motivator? And even then, does interest predict success, and if so, to what extent?

In a longitudinal study among 1,199 third-graders, von Maurice, Dörfler, and Artelt (2014) examined the relation between interests and grades. In the teaching subjects of mathematics and German, they found that feedback in terms of grades was a significant predictor of subsequent subject-specific interests. However, interest did not predict grades. Even though interest had no direct effect on school achievement at this level, they are not sure "if and when a reversion of the trend from grades to interest" occurred – which would be in line with Hidi and Renninger's (2006) model of interest development (von Maurice et al., 2014, p. 10). In other words, it is quite possible that students had interest in these subjects prior to the third grade.

Kpolovie, Joe, and Okoto (2014) ascertained the magnitude of relationship and prediction that students' interest in learning and attitude to school individually and collectively have on their academic achievement. Based on a stratified random sample of 518 students who enrolled for the 2013 May/June Senior Secondary Certificate Examination (SSCE) in Bayelsa State, students' interest in learning and their attitude towards school were positively correlated with their academic achievement (r = .33 and r = .37, respectively). Both interest in learning and attitude towards school jointly accounted for 21.6% of the variance in academic achievement.

Other studies suggest that interest predicts academic achievement when students are given a choice. For example, Köller, Baumert, and Schnabel (2001) found that interest in mathematics predicts achievement only at higher grade levels when students have a choice between more or less advanced courses. They also found a direct link between interest and achievement even when controlling for prior achievement.

Harackiewicz, Barron, Tauer, and Elliot (2002) found that college students who were both high in interest and had received higher grades in Introductory Psychology were more likely to take additional psychology courses, and were more likely to declare psychology as their major. However, only previous high school performance and ability measures were found to be significant predictors of academic performance, not interest. Interest, on average, accounted for 2% variance in semester GPA, and 9.6% variance in students' final GPA.

In the same study, Harackiewicz and her colleagues (2002) provided evidence for adoption of both mastery and performance-approach goals in college courses. They found that students who adopted mastery goals expressed continued interest in their coursework, and students who adopted performance-based goals received higher grades in their introductory course, higher grades in additional coursework, as well as higher GPA for all courses over their academic career. Thus, both mastery and performance-approach goals were each independently linked to important components of academic success. They indicated that success in college depends on both performance and interest, and that both mastery and performance-approach goals have positive and complementary consequences for motivation and performance for students attending college.

Schiefele, Krapp, and Winteler (1992) indicated that specific preferences for particular subject areas, or students' "interests," is one of the three factors that are considered to be relevant to a successful prognosis of academic success, the other two factors being cognitive factors and motivational factors. In their meta-analysis on interest as a predictor of academic achievement, they reported that "on average across different

subject areas, types of schools, and age groups the level of interest accounts for about 10% of observed achievement variance" (p. 203).

Assessing Interest. There are a variety of self-reported scales that measures interest in the literature. Wigfield and Cambria (2010) outlined just a few of these scales. These scales include the general and professional interest in special education (Alexander, Sperl, Buehl, Fives, & Chiu, 2004), individual, topic, and depth of interest (Ainley et al., 2002), initial interest, "catch" and "hold" aspects of interest (Harackiewicz et al., 2008), and vocational and academic interests of college students (Schiefele, 2009). Research shows that each of these scales measure different aspects of interest.

For example, Alexander and her colleagues' (2004) 13-item interest measure was created with focus on faculty's interest and involvement in a range of activities relevant to the field of special education. They reported evidence for two kinds of interest, general interest in special education and interest in specific special education research profession (i.e., publishing research and attending conferences). Whereas, Schiefele's (2009) 18-item Study Interest Questionnaire (SIQ) was developed to assess vocational and academic interests of college students. The SIQ measures affective, value, and intrinsic valence aspects of interest. The affective valence is comprised of items that "evaluate how doing work for the major makes the participant feel," the value portion assesses "beliefs about the importance of doing work for their major," and the intrinsic valence is concerned with "the inherent enjoyment of doing work for the major" (Wigfield & Cambria, 2010, p. 14).

Ainley and her colleagues (2002) investigated how individual and situational factors contribute to topic interest and text learning. In their study, they had scales that

measured individual, topic, and in-depth interest. Based on Renninger's (1992) definition of individual interest that is comprised of knowledge and value components, they assessed individual interest with two items. The first item was a rating of knowledge, ("how much I know about it": 1 = *a little*; 5 = *a lot*), and the second a rating of value ("how important it is to me": 1 = *a little*; 5 = *a lot*). Topic interest was measured by asking students about their expected interest with the texts based on the title of the book, and depth of interest was measured using the depth-of-interest subscale of the Two-Factor Curiosity scale (Ainley, 1986). The Two-Factor Curiosity scale is used to provide a measure of students' general individual interest in learning. This subscale measures students' desire to understand and investigate new, unfamiliar, or puzzling phenomena (see Ainley, 1998).

Harackiewicz and her colleagues (2008) measured interest based on students' initial interest in a psychology course, and the two components of situational interest: "catch" and "hold." Initial or personal interest refers to interest that people bring with them (Mitchell, 1993). It is their personal disposition, or previously referenced as individual interest. They measured initial interest in the course based on items used by Barron and Harackiewicz (2003), and they wrote new items to represent Renninger's (1992) conceptualization of individual interest. The "catch" and "hold" are aspects of situational interest; whereas, as Hidi and Baird (1986) noted, "interest has a durational aspect – there are triggering conditions and there are conditions which ensure the continuation of interest" (p. 191) (as cited in Mitchell, 1993, p. 425). The triggering conditions are associated with "catch," and ensuring continuation of interest by finding ways to empower students is "hold" (Mitchell, 1993, p. 426). Harackiewicz and her

colleagues measured situational interest, or "catch," twice with four and five items, respectively. After students completed questions about their goal orientations, they were asked to focus on their reactions to the class and report their situational interest (catch-1). Near the end of the semester, they were asked about their feelings related to the course lectures (catch-2). Nine additional items assessed students' feelings about and personal valuing of the course material (hold).

Indeed, there are a variety of self-reported scales that measures interest in the literature. The general and professional interest in special education (Alexander et al., 2004), individual, topic, and depth of interest (Ainley et al., 2002), initial interest, "catch" and "hold" aspects of interest (Harackiewicz et al., 2008), and vocational and academic interests of college students (Schiefele, 2009) that were described above are just a few examples, and even though each of these scales assesses different aspects of interest, there is the issue of overlap. In other words, there are similar items presented in each of these scales.

It has been suggested that researchers should match carefully the definition of the construct to what they are assessing, and to deal with the overlap issue, "researchers would give several of these measures in one study, and use factor analysis and other methods to examine their empirical distinctiveness" (Wigfield & Cambria, 2010, p. 15). This study defines interest as a psychological state and a motivational variable (see Renninger & Hidi, 2016, p. 9), and recognizing that interest is a multidimensional construct (Mitchell, 1993; Schiefele, 1991; Tobias, 1994) adopts the educational psychologists' definition of interest.

According to Weber and Patterson (2000), educational psychologists have defined interest as being comprised of three dimensions: meaningfulness, involvement, and competence (Mitchell, 1993; Schiefele, 1991; Tobias, 1994). The first dimension of interest is the individual's perceptions of meaningfulness. Meaningfulness refers to the relevance or significance that the individual perceives from the information received. In other words, how important is it to the individual? Is the information being shared valuable to the individual? Weber and Patterson indicated that as the individual's perceived meaningfulness increases, the perceived relevance or significance of information to the individual increases. The second dimension is involvement. Involvement refers to the degree that individuals are actively participating in the activity or topic. In other words, the more active role the individual assumes in the activity or topic, the more involved the individual feels (Weber & Patterson, 2000). Mitchell indicated that these two dimensions (perceptions of meaningfulness and involvement) are associated with the "hold" aspect of situational interest; that is, the two function mainly as empowerment variables (p. 427). Finally, the third dimension of interest is competence. Competence refers to the individual's prior knowledge, whereas increased competence leads to greater interest (Weber & Patterson, 2000, p. 23).

Weber and Patterson (2000) argued that the conceptual similarities between interest and learner empowerment are quite remarkable given that Frymier and her colleagues' (1996) definition of empowerment contains similar notions of meaningfulness, involvement, and competence. Results based on Pearson's correlation's factor-analytic techniques, and relationships with other known variables (motivation) supported their argument; that is, there are similarities between interest and learner

empowerment. Their findings suggest that the Learner Empowerment scale is a valid and reliable measure for the assessment of student interest.

Summary. What is clear from these studies is that there are a number of scales that measure interest, and that interest plays a role to some extent in predicting academic achievement, if not directly then indirectly. Interest may be the personal motive that initiates behavior. However, there appears to be other mediating factors (e.g., prior interest, goal orientation, choice, etc.) that contribute to the relationship between interest and academic achievement.

Deci and Flaste (1995) wrote that "for a positive close relationship to exist between the individual's competence and intrinsic motivation, the activity must be interesting and challenging for the individual" (p. 58). Individuals must first develop an interest - something they "intrinsically enjoy doing" (Duckworth, 2016, p. 91) for them to remain committed and driven towards their goals. It is the individuals' well-developed interest that enables them to persevere through frustrations and challenges in order to meet their goals (Renninger & Hidi, 2016, p. 13). But is interest enough?

I now turn your attention to two possible mediating factors: self-efficacy, followed by locus of control.

Self-Efficacy

Self-efficacy is one of the most highly researched constructs in psychology. Not only has self-efficacy been shown to positively predict effort, persistence, perseverance (Bandura & Schunk, 1981; Lent, Brown, & Larkin, 1984; Schunk & Hanson, 1985) and academic achievement (Pajares, 1996; Usher & Pajares, 2008), self-efficacy has been linked to multiple aspects of motivation such as intrinsic and extrinsic motivation, goal

orientation (D'Lima, Winsler, & Kitsantas, 2014), goal setting (Locke & Latham, 1990; Wood & Locke, 1987), use of self-regulated learning (Pintrich & de Groot, 1990), affective constructs such as optimism, stress, and anxiety (Finney & Schraw, 2003; Luszczynska et al., 2005; Solberg & Villareal, 1997), and a number of interest domains (Autin, Duffy, & Allan, 2017; Hong, Hwang, Tai, & Lin, 2015; Kahu, Nelson, & Picton, 2017; Lambie, Hayes, Griffith, Limberg, & Mullen, 2014; Rottinghaus, Lindley, Green, & Borgen, 2002; Riconscente & Seli, 2012; Tsai & Coleman, 2009).

For example, Tsai and Coleman (2009) reported small to moderate relations between a number of self-efficacies and engagement interest (e.g., for both Hong Kong and Australian college students, persistence efficacy on engagement interest ß = .30 and ß = .28, activity efficacy on engagement interest ß = .14 and ß = .19, and time efficacy on engagement interest ß = .21 and ß = .38, respectively). They found that these self-efficacy factors had greater influence on motivation in regular active recreation and tended to influence students' interest.

Hong and colleagues (2015) studied interest, competitive anxiety, and self-efficacy in game-based learning. They found that self-efficacy was negatively associated with competitive anxiety, and high competitive anxiety was associated with low interest in game-based learning. They suggested that enhancing students' self-efficacy in a specific task can eliminate anxiety and support students' interest in game-based learning.

Kahu and his colleagues (2017) followed 19 students through their first year at a regional Australian university. Based on initial interviews that occurred prior to the semester and subsequent interviews occurring throughout the semester, they found that self-efficacy was an important factor alongside individual interests in choosing courses,

and as the semester progressed, self-efficacy also influenced situational interest. That is, students who believed in their abilities to understand or complete a task reported greater interest and enjoyment in the class.

Other researchers have also examined self-efficacies' relations to a number of interest domains. Based on the abstract search of the PsycINFO, ERIC, Education Source, and Academic Search Complete databases using keywords "self-efficacy," "student interest," and "college students or university students or undergraduates," and limited to peer-reviewed journal articles published between 2007 and 2017, a total of 38 potential data sources were identified. Full-text available sources that reported on the Pearson correlation between scores using self-reported self-efficacy and interest measures were included. Table 4 presents the results based on the search outlined above.

Table 4
Relations Between Self-Efficacy (SE) and Interest

Source	Student Interest	*N*	SE Scale	α	Interest Scale	α	*r*
Shin, Levy, & London, 2016	Role model STEM	123	ASE	.92	STEM	.97	.29
Kim & Seo, 2014	Technical Engineering	660	AMS	.94	TIS	.85	.39
Shin et al., 2016	Control model STEM	154	ASE	.92	STEM	.97	.41
Law & Guo, 2011	Research	328	PRS	.85	IRQ	.93	.50
Law & Guo, 2011	Research	328	WS	.93	IRQ	.93	.50
Law & Guo, 2011	Research	328	RDS	.89	IRQ	.93	.51
Law & Guo, 2011	Research	328	QCS	.90	IRQ	.93	.54
Autin et al., 2017	Social Justice	298	Social Justice	.96	Social Justice	.88	.67
Miller et al., 2009	Social Justice	274	Social Justice	.94	Social Justice	.90	.68

Note. Abbreviation key: ASE = Academic Self-Efficacy. STEM = Science, Technology, Engineering, and Mathematics. AMS = Academic Milestone scale. TIS = Technical Interests scale. PRS = Practical Research Skills. WS = Writing Skills. RDS = Research Design Skills. QCS = Quantitative and Computer Skills. IRQ = Interest in Research questionnaire.

A total of 5 studies representing data from 6 unique samples and 1,837 individuals were ultimately included in the analysis. The correlation coefficients reported ranged from .29 to .68.

More recently, self-efficacy has been shown to be positively related to grit. Using the same search criteria as outlined above, except using keywords "self-efficacy" and "grit" and not limited to "college students or university students or undergraduates," a total of 10 potential data were identified. Full-text available sources that reported on the Pearson correlation between scores using self-reported self-efficacy and overall measures of grit were included. Table 5 presents the results based on the search outlined above.

Table 5
Relations Between Self-Efficacy (SE) and Grit

Source	Sample	*N*	SE Scale	*α*	Grit Scale	*α*	*r*
Schmidt, Fleckenstein, Retelsdorf, Eskreis-Winkler, & Möller, 2017	College	173	GSE	.81	BISS-8	.72	.31
Datu, Yuen, & Chen, 2017	College	150	Academic	.92	Triarchic Model	NR	.38
Gilson, Dix, & Lochbaum, 2017	Cadets	220	Leadership	.84	Grit-S	.72	.40
Sheridan et al., 2015	College	268	GSE	.82	Grit-O	.68	.46
Dumfart & Neubauer, 2016	Adolescents	129	Modified SE	.72	Grit-S	.70	.61
Miksza & Tan, 2015	Adolescents	167	Self-Regulatory	.90	Grit-S	.73	.61

Note. Abbreviation key: GSE = General Self-Efficacy. BISS-8 = Beharrlichkeit and Beständiges Interesse 8-item – the German version of Duckworth and Quinn's (2009) Grit-S. NR = not reported.

A total of 6 studies representing data from 6 unique samples and 1,107 individuals were ultimately included in the analysis. The correlation coefficients reported ranged from .31 to .61.

In addition, Wolters and Hussain (2015) reported significantly moderate relations between self-efficacy and the perseverance of effort dimension of grit (r = .41) and minimal relations with the consistency of interest dimension of grit (r = .03). Self-efficacy reported higher correlations with a variety of learning strategies, such as metacognition strategy, motivational strategies, and time and study management strategies, as well as value in comparison to both dimensions of grit.

Dixson and colleagues (2016) also found moderate relations between self-efficacy and the perseverance dimension of grit (r = .40) and to a lesser extent with the consistency of interest of interest (r = 19). In an academically talented sample, they found that hope and academic self-efficacy were significant predictors of perceived ability, and after controlling for perceived ability, academic self-efficacy was found to be significant predictor of achievement. Grit did not contribute to perceived ability, nor achievement.

In the academic setting, self-efficacy has been shown to positively predict important learning processes and outcomes, such as learning strategies, persistence, and achievement (Usher & Pajares, 2008). Multon and colleagues' (1991) meta-analysis of research in educational settings found that self-efficacy was related to both academic performance (r = .38) and to persistence (r = .34). Similarly, other studies have found evidence for the relation between academic self-efficacy and academic achievement, persistence, and high academic aspirations (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Dixson et al., 2016). Valentine, Dubois, and Cooper (2004) showed that positive self-efficacy beliefs predict academic achievement. Students high in academic self-efficacy beliefs manage their time more effectively, make greater use of cognitive

strategies in learning, and are better at monitoring and regulating their own effort (Chemers, Hu, & Garcia, 2001).

Studies have also linked self-efficacy to conscientiousness. Based on the previously outlined search criteria using keywords "self-efficacy" and "conscientiousness" and limited to "college students or university students or undergraduates," a total of 20 potential data were identified. Full-text available sources that reported on the Pearson correlation and included scales' reliability between scores using self-reported self-efficacy and overall measures of conscientiousness were included. Table 6 presents the results based on the search outlined above.

Table 6
Relations Between Self-Efficacy (SE) and Conscientiousness

Source	Specific SE	*N*	SE Scale	*α*	Conscientiousness Scale	*α*	*r*
Lent, Ezeofor, Morrison, Penn, & Ireland, 2016	Decisional Coping	180	CEDSE-CE	.86	BFI	.79	.13
Lent et al., 2016	Decisional	180	CEDSE-BD	.96	BFI	.79	.31
Lent et al., 2016	Career Decision	180	CEDSE-SF	.94	BFI	.79	.31
Bullock-Yowell, Andrews, & Buzzetta, 2011	Career Decision-Making	322	CDSE	.94	IPIP	.78	.34
McIlroy, Poole, Ursavas, & Moriarty, 2015	Academics	106	ASE	.85	FFM	.83	.38
Conrad & Patry, 2012	Academics	223	MSLQ	.89	NEO	.89	.40
McIlveen, Beccaria, & Burton, 2013	Academic Major Satisfaction	529	GSES	.82	NEO-FFI	.86	.42
Lightsey et al., 2014	Meaning in Life	274	GSES	.79	BFI	.78	.47

Note. Abbreviation key: CEDSE-CE = Coping Efficacy, CEDSE-BD = Self-Efficacy; CEDSE-SF = Career Decision Self-Efficacy Short Form; CDSE = Career Decision Self-Efficacy. BFI = Big Five Inventory. IPIP = International Personality Item Pool. ASE = Academic Self-Efficacy. FFM = Five Factor Model. MSLQ = Motivated Strategies for Learning Questionnaire. NEO = NEO Five Factor Inventory. GSES = Generalised Self-Efficacy Scale.

A total of 8 studies representing data from 6 unique samples and 1,634 individuals were ultimately included in the analysis. The correlation coefficients reported ranged from .13 to .47.

According to Chemers and his colleagues (2001), the relationship between self-efficacy and educational achievement is based on both the increased use of specific cognitive skills and on the positive impact of efficacy beliefs on the broader, more general classes of metacognitive skills and abilities. They indicated that self-efficacy beliefs are related to an enhanced ability to solve problems and make decisions, to plan and manage personal resources efficiently, to entertain more positive expectations, and to set higher goals. Individuals with high self-efficacy beliefs see demanding situations as challenges rather than threats. They will exert more effort in order to reach their goals.

Pajares (1996) indicated that there is ample reason to believe that self-efficacy is an igniting motivational force and works well in predicting college success. However, the problem that researchers have faced is assessing or measuring the individual's perceived self-efficacy (see Zimmerman, 1996). Researchers have either assessed self-efficacy at the general level or at the specificity level that corresponds to the interested outcome(s). Pajares stated that domain-specific assessments are more explanatory and predictive than general self-perceptions of competence, and to increase accuracy of prediction, that self-efficacy beliefs should be assessed at the specificity that corresponds with the task or outcome being analyzed (p. 547). The reason being, self-efficacy judgments are task and domain specific (Bandura, 1986).

On the whole, studies have shown that self-efficacy is positively related to domains of interest, grit, conscientiousness, and a number of achievements. Self-efficacy

has also been assessed at both a general and domain-specific level. The individual's perceived self-efficacy in one's interest may just as well heighten the individual's level of grit that leads to greater success. But to what extent does the perceived belief in one's capabilities relate to grit, conscientiousness, and college success, and what role does one's belief in control, or the individual's locus of control play?

Locus of Control

Least to say, there is a breadth of research on locus of control. An abstract search using keyword "locus of control" of the PsycINFO, ERIC, Education Source, and Academic Search Complete databases from 1960 to 2017 revealed over 17,500 peer-reviewed journal articles. Limiting the search to college students reveals close to 3,000 peer-reviewed journal articles. Lefcourt (1982) also presents a variety of historical studies concerning locus of control, where a number of empirical findings are reported on the relationship between locus of control and cognitive activities, coping behavior, and achievement-related behavior.

Among college students, researchers have found significant relationships between locus of control and motivational persistence (Sariçam, 2015), self-esteem (Tamta & Rao, 2017), subjective well-being (Malhotra, 2017), procrastination (Janssen & Carton, 1999), happiness (Abedini & Majareh, 2015), optimism and academic success (Nilson-Whitten, Morder, & Kapakla, 2007), and perceived employment opportunities (Bargsted, 2017). Specifically, Janssen and Carton found that students with internal locus of control did not hesitate to begin work with the aim of reaching their goal. More recently, Sagone and De Caroli (2014) reported that university students who adopted an internal locus of control

perceived themselves as highly efficient in academic context - that is, they were able to overcome difficulties and make decisions.

Cassidy (2012) conceptualized locus of control along with self-efficacy as perceptions of personal control that serve to enhance human performance. The locus of control perception relates to outcome expectancies, in the sense that the outcome is either controllable or not; whereas, the self-efficacy perception relates to "judgments regarding one's own capacity to perform appropriate actions which, in turn, produce desired outcomes" (Cassidy, 2012, p. 794). Though both serve to enhance human performance, self-efficacy appears to be a better predictor of performance.

For example, Cassidy (2012) assessed the relative influence of academic locus of control and academic self-efficacy along with student approaches to learning on academic achievement in higher education. He found that academic self-efficacy was positively correlated with both final year dissertation mark (r = .29) and final degree mark (r = .40), and proved to be a significant predictor of GPA, accounting for 6.2% variance. Internal academic locus of control and student perceived academic proficiency relationship with final year dissertation mark (r = .18 and r = .11, respectively), and final degree mark (r = .19 and r = .19, respectively) failed to reach statistical significance. Cassidy indicated that while student motivation is likely to depend in part on perceptions that their learning environment is controllable, it is self-efficacy beliefs which mediate and determine likelihood of any such control being exerted.

Suphi and Yaratan (2012) also reported significant positive relationships between self-efficacy and GPA (r = .25) and course grade (r = .34), and failed to reach statistical significance between locus of control and GPA (r = -.09) and course grade (r = -.10).

However, locus of control was found to be statistically significant to surface approach learning (r = .33), and negatively related to the difference between deep approach learning and surface approach learning (r = -.28), "showing that students who have external locus of control are more likely to use surface approach learning" (p. 432). The surface approach learning, or rote learning, is where the student's intention is just to memorize terms; whereas, deep approach learning is where the student's intention is to understand and make sense of the material (Kember, 1996).

Although locus of control is considered to be one of the widely studied individual differences in psychology, studies examining the relationship between locus of control and college students' interest are not that rich. Based on the abstract search of the PsycINFO, ERIC, Education Source, and Academic Search Complete databases using keywords "locus of control," "student interest," and "college students or university students or undergraduates," a total of four potential data sources were identified. None of the four potential sources reported on the Pearson correlation between scores using self-reported locus of control and interest measures.

A more general search using keywords "locus of control" and "student interest," did reveal eight peer-reviewed journal articles. Only one study reported on the Pearson correlation between scores using self-reported locus of control and interest measures. Ashby, Kottman, and Draper (2002) reported statistically significant inverse correlations between both external locus of control by chance and powerful others and social interest (r = -.16 and r = -.20, respectively). These individuals may feel intimidated by others, and therefore they would not be inclined to connect with others. Conversely, there was no relationship found between internal locus of control and social interest (r = -.03).

They indicated that the lack of significant relationship between internal locus of control and social interest may be because a person who feels in control of his or her life would not feel threatened by others, and this perception would not have an influence on his or her feeling of connectedness with others. It may also be "a function of the hypothesized stable nature of social interest (Mosak, 1995) and the unstable nature of internal locus of control" (Ashby et al., 2002, p. 58).

Similarly, only one peer-reviewed journal article appeared based on the same database search using the keywords "locus of control" and "grit." Fisher and Oyserman (2017) used measures of motivations that included locus of control, self-efficacy, growth, grit, regulatory forces, and mental toughness in testing convergent and discriminatory validation in developing scales associated with experienced ease and experienced difficulties motivational constructs. They did not report on the Pearson correlation between locus of control and grit scores. However, they did find a medium-to-large-sized correlation between work self-efficacy and locus of control (r = .49), small-to-moderate sized correlation between grit and growth mindset, (r = .27), and a large-sized correlation between grit and mental toughness (r = .68).

With the same search criteria as previously outlined using the keywords "locus of control," "conscientiousness," and "college students or university students or undergraduates," a total of nine peer-reviewed journal articles were found. Six reported on the Pearson correlation between scores using self-reported locus of control and overall measures of conscientiousness. Table 7 presents the results based on the search outlined above.

Table 7
Relations Between Locus of Control (LOC) and Conscientiousness

Source	LOC	*N*	LOC Scale	*α*	Conscientiousness Scale	*α*	*r*
Watson, 1998	Chance	244	LLCS	.71	FFM	.92	-.07
Watson, 1998	Powerful Others	244	LLCS	.75	FFM	.92	-.04
Avery, 2003	External	96	LOC	.84	Goldberg	.91	.09
Bostic & Ptacek, 2001	Powerful Others	60	IPC	.79	IASR-B5	.85	.13
Bostic & Ptacek, 2001	Chance	60	IPC	.75	IASR-B5	.85	.24
Roth, Hearp, & Switzer III, 1999	Internal	234	Interview	.44	Factor G	.52	.05
Lemos-Giráldez & Fidalgo-Aliste, 1997	Internal	427	HLC	NR	NEO-PI	.84	.06
Lemos-Giráldez & Fidalgo-Aliste, 1997	Internal	757	HLC	NR	NEO-PI	.84	.08
Roth et al., 1999	Internal	234	Interview	.44	Interview	.15	.09
Hall et al., 2015	Internal	256	ND-LOC	.74	NEO-FFI	.70	.11
Watson, 1998	Internal	244	LLCS	.62	FFM	.92	.22
Roth et al., 1999	Internal	234	I-E	.73	Interview	.15	.24
Roth et al., 1999	Internal	234	I-E	.73	Factor G	.52	.31

Note. Abbreviation key: LLCS = Levenson's Locus of Control scale. FFM = Five Factor Model. LOC = 15-item Locus of Control scale. IPC = Levenson's Internal, Powerful Others, and Chance. IASR-B5 = extension of the Interpersonal Adjective Scale-Revised. Factor G = part of the 16 Personality Factors test. HLC = Health Locus of Control. NEO-PI = NEO Personality Inventory. I-E = Rotter's Internal-External scale. NR = not reported. Lemos-Giráldez and Fidalgo-Aliste reported correlation coefficients based on gender: males' correlation coefficient was slightly lower than females' correlation coefficient.

A total of 13 studies representing data from 7 unique samples and 2,074 individuals were ultimately included in the analysis. The correlation coefficients for external locus of control and conscientiousness ranged from -.07 to .24, and for internal locus of control and conscientiousness ranged from .05 to .31.

Locus of control has also been linked to academic motivation. Karaman and Watson (2017) compared measures of achievement motivation, life satisfaction, academic stress, and locus of control among 307 U.S. and international undergraduate

students. They found that locus of control, academic stress, and life satisfaction explained 18% of the variance in achievement motivation, whereas, locus of control had explained a significant portion of the variance in achievement motivation $F(1, 305) = 31.96$, $p < 0.001$, $R^2 = 0.10$. Au (2015) echoed these findings, and indicated that perceived control beliefs (both locus of control and self-efficacy) play a role in students' "willingness to persevere, the amount of stress they expect to experience in their courses, and how much they enjoy their courses" (p. 440).

Sariçam (2015) investigated the relationship between academic locus of control and motivational persistence among 413 public high school students. He found statistically significant correlations between academic locus of control and dimensions of motivational persistence. More specifically, internal academic locus of control was related positively to long-term purposes pursuing ($r = .51$), current purposes pursuing ($r = .49$), recurrence of unattained purposes ($r = .54$), and motivational persistence ($r = .52$). On the contrary, external academic locus of control was negatively related to long-term purposes pursuing ($r = -.36$), current purposes pursuing ($r = -.31$), recurrence of unattained purposes ($r = -.39$), and motivational persistence ($r = -.41$). These findings suggest that an internal academic locus of control may play a role in affecting intrinsic motivation and increasing motivational persistence.

In the academic context, researchers have found that students with more of an internal locus of control achieve greater academic achievement (Bar-Tal & Bar-Zohar, 1977; Findley & Cooper, 1983; Hasan & Khalid, 2014). For example, Shepherd, Owen, Fitch, and Marshall (2006) found that students in the higher GPA group reported higher scores on internal locus of control. Internal locus of control has also been linked to

obtaining an undergraduate degree in a timely manner (Hall, Smith, & Chia, 2008), and academic achievement satisfaction (Uguak, Elias, Uli, & Suandi, 2007).

A number of studies show that academic locus of control plays a mediating role in determining students' involvement in the pursuit of achievement. For example, Ogden and Trice (1986) found that Academic Locus of Control (ALC) scores obtained early in the freshmen year predicted GPA at the end of the year. They also found that the most external locus quartile had withdrawn from school or were on academic probation. Nordstrom and Segrist (2009) found that ALC scores were statistically significant, with a five-item rating of how strongly psychology majors early in college expected to go to graduate school. They also reported a correlation of -.32 between ALC and psychology majors' GPA in a career exploration course. In other words, internal academic locus of control orientation was positively related to course GPA.

In 2004, Twenge, Zhang, and Im conducted 2 meta-analyses that included 97 samples of college students (n = 18,310) and 4 samples of children ages 9 to 14 (n = 6,554) gathered from dissertation research. They found that the average college student in 2002 had a more external locus of control than 80% of college students in the early 1960's. The increase in college students also appeared in child samples. Though they could not provide exact reasons why locus of control has become more external, several trends were mentioned: greater cynicism, alienation, and individualism. Of course, these findings are not the least encouraging. Students who have external locus of control have consistently achieved less in school (Cappella & Weinstein, 2001; Kalechstein & Nowicki, 1997).

Overall, studies have shown that locus of control plays a role in academic motivation, academic success, and academic achievement satisfaction. Students with an internal locus of control value effort. They attribute their academic outcomes to internal factors, such as intelligence, hard work, and ability (Hasan & Khalid, 2014). Though the research is limited between locus of control and both interest and grit, locus of control has been linked to conscientiousness, intrinsic motivation, and willingness to persevere. Locus of control may be a mediating factor that not only affects students' academic endeavors, but plays a role in differentiating grit from conscientiousness and predicts success in college.

The Big Five

The Big Five model has provided a descriptive framework for research on personality traits that predict success (Goldberg, 1990; John & Srivastava, 1999). The "Big Five" refers to the five core personality traits: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (John & Srivastava, 1999). In order to avoid misunderstanding, John and Srivastava provided a short definition for each trait: (a) Openness means being open to experiences and "describes the breadth, depth, originality, and complexity of an individual's mental and experiential life," (b) Conscientiousness "describes socially prescribed impulse control that facilitates task- and goal-directed behavior, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks," (c) Extraversion refers to "an energetic approach" to life, and includes traits such as "sociability, activity, assertiveness, and positive emotionality," (d) Agreeableness means having "a prosocial and communal orientation toward others" and include traits such as "altruism, tender-mindedness, trust,

and modesty," and (e) Neuroticism was defined as "negative emotionality, such as feeling anxious, nervous, sad, and tense" (p. 121). By taking the beginning letter of each trait, the reader will notice that these letters form the OCEAN of personality dimensions (John & Srivastava, 1999).

According to John and Srivastava (1999), the Big Five personality traits do not represent a particular theoretical perspective. They were derived from analyses of the natural language terms that people used to describe themselves or others (John & Srivastava, 1999, p. 103). The big five traits are the most commonly used scientific measure of personality and have been related to a wide range of behaviors and outcomes (Ozer & Benet-Martinez, 2006), including academic achievement (Komarraju, Karau, & Schmeck, 2009), mortality, divorce, and occupational attainment (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), workplace performance (Barrick & Mount, 1991), subjective well-being (Soto, 2015), and more recently, educational attainment, annual income, and life outcome satisfaction (Kajonius & Carlander, 2017). Relative to the other Big Five traits, conscientiousness appears to be the personality trait with the most predictive utility of academic performance (Poropat, 2009).

Conscientiousness. Conscientiousness is the Big Five personality trait that has also been referred to as "will to achieve," (Digman & Takemoto-Chock, 1981; Fiske, 1949) and includes a number of lower-level traits, such as self-control and perseverance (MacCann et al., 2009; Roberts et al., 2005). In multiple studies, persistence, being a component of the perseverance of effort dimension of grit, has been identified as one of the facets of conscientiousness (Hough & Ones, 2001; MacCann et al., 2009). Duckworth and her colleagues (2007) have even suggested that it is quite possible that

the construct of grit was omitted from measures of Big Five conscientiousness because the "Big Five" was derived from analyses of the natural language terms people used to describe themselves (see John & Srivastava, 1999, p. 103). A variety of other labels have also been given to the domain of conscientiousness that include dependability (Tellegen & Waller, 1987), impulsivity (Buss & Plomin, 1975), prudence (Hogan, 1986), constraint (Tellegen, 1982), and superego strength (Cattell, 1957) (see John & Srivastana, 1999, p 123). The range of labels suggests that conscientiousness encompasses a diverse set of traits that is divisible into at least two major groups: proactive and inhibitive (Costa & McCrae, 1998, p. 120). The proactive aspect is seen most clearly in "the need in achievement and commitment to work," and the inhibit aspect is seen in "moral scrupulousness and cautiousness" (Costa, McCrae, & Dye, 1991, p. 889). At one point, Costa and his colleagues indicated that conscientiousness took on the domain name of "direction" because it implied both movement and focus.

Conscientiousness has been defined as purposeful, strong-willed, determined, and organized behavior (Costa & McCrae, 1998). It refers to the extent to which one is achievement-oriented, dependable, organized, dutiful, and responsible (Goldberg, 1990). Most researchers concur that conscientiousness is a global personality construct; however, Hough (1992) and Paunonen and Jackson (1996) have stated otherwise. According to Paunonen and Jackson, conscientiousness is "best thought of as three separate, but overlapping dimensions related to being (a) methodical and orderly, (b) dependable and reliable, and (c) ambitious and driven to succeed" (p. 55). They also indicated that there may not be enough overlap among the three facets to justify their inclusion in an overall conscientiousness measure. However, if these three facets are

operationalized as NEO-PI-R order, dutifulness, and achievement striving, they certainly belong in the conscientiousness domain (Costa & McCrae, 1998). Studies have shown that the conscientiousness facets of the NEO-PI-R define a single factor in adults and college students, and in self-reports and observer ratings (Costa & McCrae, 1998).

There are also reported differences in the descriptive dimensions of conscientiousness' conceptual structure. For example, Roberts and his colleagues (2005) identified six dimensions: industriousness (hard-working, ambitious, confident, and resourceful), order (planning and organized), self-control (cautious, levelheaded, and patient), traditionalism (willing to comply with current rules, customs, norms, and expectations), responsibility (cooperative and dependable), and virtue (follows rules of good or moral behaviors to act as a moral exemplar). In the NEO PI-R, conscientiousness is comprised of competence (being capable, sensible, and accomplished), orderliness (being tidy and well-organized), dutifulness (strict adherence to standards of conduct), achievement striving (striving for excellence), deliberation (planning and thoughtfulness), and self-discipline (ability to continue with a task despite boredom or other distractions) (Costa et al., 1991, pp. 889-890). Costa and his colleagues also hypothesized that competence would be related to locus of control, and considered self-discipline to be one aspect of self-control.

Based on these conceptual definitions, the achievement striving/industriousness and self-discipline dimensions of conscientiousness are closely linked to the perseverance of effort dimension of grit. The perseverance of effort dimension of grit entails working hard despite the hardships or obstacles that are faced (Duckworth et al., 2007). Costa and his colleagues (1991) defined self-discipline in terms of persistence, and achievement

striving in terms of pursuit for excellence. Industriousness referenced working hard. These individuals are not only hard-working and determined, they are less likely to give up when faced with frustration. Comparably, individuals high in the perseverance of effort of grit possess an undying willingness to work towards their goals (Abuhassàn & Bates, 2015).

Using the previous abstract search with keywords "conscientiousness" and "grit," 7 out of the 24 potential sources identified reported on the Pearson correlation between scores using Duckworth and her colleagues' (2007, 2009) measures of the two dimensions of grit and self-reported measures of conscientiousness. Table 8 presents the results based on the search outlined above. Included in the results from the abstract search are the correlations from Rimfeld and her colleagues' (2016) study. Rimfeld and her colleagues' presented phenotypic (trait) correlations between the two dimensions of grit and self-reported measures of conscientiousness, as well as genetic, shared environmental correlations (SE), and non-shared environmental correlations (NSE) between the two dimensions of grit and self-reported measures of conscientiousness.

A total of 7 studies from 8 unique samples and 7,873 individuals were ultimately included in the analysis. The correlation coefficients between conscientiousness and both dimensions of grit reported moderate to large correlations, though the perseverance of effort dimension clearly shows more overlap. The shared variance between conscientiousness and the perseverance of effort dimension of grit (excluding the low and high extremes) ranged from 40% to 67%.

Table 8
Relations Among Conscientiousness and Perseverance of Effort (POE) Dimension and Consistency of Interest (COI) Dimension of Grit

Source	Sample	*N*	Conscientiousness Scale	*α*	POE *α*	POE *r*	COI *α*	*COI r*
Muenks et al., 2016	College	336	TIPI	.65	.65	.35	.41	.28
Rimfeld et al., 2016	Twins (NSE)	4,642	FFMRF	.78	.63	.37	.73	.18
Rimfeld et al., 2016	Twins (SE)	4,642	FFMRF	.78	.63	.48	.73	-.97
Rimfeld et al., 2016	Twins (Trait)	4,642	FFMRF	.78	.63	.53	.73	.28
Meriac et al., 2015	Employed Students	322	9-Item BFI	.79	.65	.63	.75	.69
Muenks et al., 2016	High School	203	TIPI	.58	.71	.64	.67	.40
Fite et al., 2017	Adults	142	10-Item IPIP	.87	.81	.66	.84	.49
Abuhassàn & Bates, 2015	Adults	494	NEO-PI-R	NR	.79	.72	.84	.52
Duckworth & Quinn, 2009	Adults	1,554	BFI	.84	.70	.74	.77	.64
Ralph et al., 2017	Adults	180	9-Item BFI	.91	.87	.82	.86	.65
Rimfeld et al., 2016	Twins (Genetic)	4,642	FFMRF	.78	.63	.86	.73	.63

Note. Abbreviation key: TIPI = Ten-Item Personality Inventory. FFMRF = Five Factor Model Rating Form. BFI = Big Five Inventory. IPIP = International Personality Item Pool. NEO-PI-R = NEO Personality Inventory-Revised. NR = not reported. NSE = non-shared environmental. SE = shared environmental.

Briggs (1989) stated that the lower level dimensions may not only provide a clearer conceptual understanding of these constructs, but they themselves mark important individual differences. Researchers have even suggested that the dimensions of conscientiousness are associated differently with academic performance, with the "achievement-oriented" dimensions being the strongest predictors in university settings (Noftle & Robins, 2007; Paunonen & Ashton, 2013). For example, Costa and McCrae (1998) reported strong correlations between achievement striving and assured-dominant

(r = .52), achievement (r = .59), and persistent (r = .47). Along the same line, several researchers have reported the perseverance of effort dimension of grit as the dominate predictor of success (Abuhassàn & Bates, 2015; Bowman et al., 2015; Credé et al., 2016; Kelly et al., 2014). These conceptual similarities and reported shared variance between conscientiousness and grit, particularly the perseverance of effort dimension, provide support to those researchers who view grit as not being that different from conscientiousness.

Studies on Conscientiousness. As stated earlier, conscientiousness is considered to be the most important of the Big Five predictors (Poropat, 2009; Richardson & Abraham, 2009). Studies have shown that conscientiousness is an important predictor of school achievements (Chamorro-Premuzic & Furnham, 2006), adjustment to college life (Priyanka, Luqman & Grover, 2014), college GPA and retention (Tross, Harper, Osher, & Kneidinger, 2000), job performance (Barrick & Mount, 1991), subjective well-being (Soto, 2015), and health-related behaviors (Bogg & Roberts, 2004). Previous analysis also revealed small to large correlations between self-efficacy and conscientiousness (see Table 6 in Chapter II, p. 80), and small to medium correlations between locus of control and conscientiousness (see Table 7 in Chapter II, p. 86).

Based on the abstract search of the PsycINFO, ERIC, Education Source, and Academic Search Complete databases using keywords "conscientiousness," "interest," and "college students or university students or undergraduates," and limited to peer-reviewed journal articles published between 2007 and 2017, a total of 21 potential data sources were identified. Included in the results from the abstract search are the correlations from Berenbaum, Chow, Schoenleber, and Flores, Jr.'s (2016) study.

Berenbaum and his colleagues' presented correlations between conscientiousness and interest in pleasurable emotions and pleasurable activities correlations as rated by the participants' themselves (N = 235, N = 71, and N = 152), their peers (N = 120), and judges. The number of judges was not reported. Table 9 presents the results based on the search outlined above.

Table 9
Relations Between Conscientiousness and Interest

Source	Specific Interest	*N*	Conscientiousness Scale	*α*	Interest Scale	*α*	*r*
Berenbaum et al., 2016	Pleasurable Activities	NR	IPIP	.80	Based on descriptions	.80	-.08
de Oliveira, Braun, Carlson, & de Oliveira, 2009	Summer Course	127	BFI	.77	3 Items	.90	-.03
de Oliveira et al., 2009	Teacher	127	BFI	.77	SAQ - American	.71	-.02
Berenbaum et al., 2016	Pleasurable Emotions	235	NEO-FFI & IPIP	.88 & .85	Based on terms	.77	.02
Berenbaum et al., 2016	Pleasurable Emotions	71	TIPI	.74	Based on terms	.82	.04
Berenbaum et al., 2016	Pleasurable Activities	152	IPIP	.80	Based on descriptions	.80	.08
Feist, 2012	Science	655	BFI	NR	SAI-Interest	.89	.08
Berenbaum et al., 2016	Pleasurable Emotions	120	TIPI	.74	Based on terms	.82	.18
de Oliveira et al., 2009	Teacher	126	BFI	.77	SAQ – Foreign	.87	.18

Note. Abbreviation key: NR = not reported. IPIP = International Personality Pool Item. BFI = Big Five Inventory. NEO-FFI = NEO Five Factor Inventory. TIPI = Ten-Item Personality Inventory. SAQ = Student Attitude Questionnaire. SAI = Scientific Attitude Inventory-II.

Excluding scores on vocational interest, 9 studies representing data from 7 unique samples and 1,360 individuals were ultimately included in the analysis. The correlation coefficients reported ranged from -.08 to .18.

Using the abstract search of the aforementioned databases with keywords "conscientiousness," and "college GPA," and limited to peer-reviewed journal articles published between 2007 and 2017, a total of five potential data sources were identified. Full-text available sources that reported on the Pearson correlation between scores using self-reported conscientiousness measures and college GPA were included. Table 10 presents the results based on the search outlined above. Smidt (2015) reported negative correlation coefficients, bearing in mind the grading system in Germany uses "1 = very good to 6 = insufficient."

Table 10
Relations Between Conscientiousness and College GPA

Sources	*N*	Conscientiousness Scale	α	GPA Mean	GPA *SD*	*r*
Kulasegaram, Reiter, Wiesner, Hackett, & Norman, 2010	538	NEO-5	NR	3.84	.12	.02
Keiser, Sackett, Kuncel, & Brothen, 2016	1,978	BPP	.73	3.24	.54	.18
Noftle & Robins, 2007	265	NEO-PI-R	.90	2.89	.51	.18
Noftle & Robins, 2007	475	NEO-FFI	.81	3.14	.54	.19
Noftle & Robins, 2007	470	HEXACO	.89	3.00	.56	.20
Noftle & Robins, 2007	10,497	BFI	.81	2.92	.55	.22
Wielkiewicz & Meuwissen, 2014	360	Mini-IPIP	.79	3.35	.46	.25
Smidt, 2015	465	BFI-S	.73	1.95	.61	-.28
Smidt, 2015	238	BFI-S	.69	1.74	.41	-.31

Note. Abbreviation key: NEO-5 = Neuroticism, Extraversion, and Openness 5. NR = not reported. BPP = Berkeley Personality Profile. NEO-PI-R = NEO Personality Inventory-Revised. NEO-FFI = NEO Five Factor Inventory. HEXACO = Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, Openness to Experience. BFI = Big Five Inventory. Mini-IPIP = Mini International Personality Inventory Pool. BFI-S = Big Five-Inventory-SOEP.

A total of 5 studies from 9 unique samples and 15,286 individuals were ultimately included in the analysis. The correlation coefficients reported ranged from .02 to .31.

The predictive validity of conscientiousness for GPA is well-documented (Poropat, 2009). According to Smidt (2015), the predictive validity of conscientiousness for GPA may be explained by a number of reasons. O'Connor and Paunonen (2007) present a few of these reasons. First, personality traits, and in particular conscientiousness, may manifest themselves in "characteristic adaptations" (McCrae & Costa, 1996, p. 69). For example, reflecting back on the dimensions of conscientiousness, there are certain dimensions or behaviors that may affect academic success such as achievement-striving, industriousness, and self-discipline. Second, because personality traits reflect what individuals "will do" rather than "what they can do," as is the case for cognitive ability measures (Furnham & Chamorro-Premuzic, 2004), they may be better predictors of academic success than cognitive abilities. Specifically, higher conscientiousness relates to better GPA (Poropat, 2009). Third, because the predictive power of cognitive abilities may be reduced at the college level due to restricted range of intelligence scores (Furnham et al., 2003), conscientiousness becomes a better predictor at higher levels in education (as cited in Smidt, 2015, p. 388).

At the collegiate level, the predictive power of conscientiousness extends beyond GPA. For example, Kappe and van der Flier (2012) found conscientiousness to be related to a broad spectrum of academic achievement measures. These measures include skills training (negotiation, debate, and how to conduct an interview), exams based on lectures, group projects (developing human resource management training products), internship training (working in a business setting), 30-page thesis, and students' cumulative GPA. In terms of the correlation coefficients, the size of the observed correlations was medium to large (r = .36 for skills training, r = .37 for exams based on

lectures, r = .26 for group projects, r = .44 for internship, r = .33 for thesis, and r = .47 for GPA). Not only was conscientiousness related to each of the five specific performance criteria, it accounted for 22% of the variance in GPA and 17% of the variance in time-to-graduation after controlling for intelligence.

Researchers have also linked motivation to conscientiousness in predicting academic success (De Feyter, Caers, Vigna, & Berings, 2012; Richardson & Abraham, 2009). De Feyter and his colleagues showed that conscientiousness positively affected academic performance indirectly through academic motivation. Specifically, results of their hierarchical regression analysis of academic performance showed that the interaction between academic motivation and conscientiousness accounted for an incremental variance of 4% over the variance explained by the main and interaction effects of the Big Five personality traits and self-efficacy. Richardson and Abraham found that achievement motivation mediates the influence of conscientiousness on GPA for both female and male students. And even though conscientiousness was positively correlated with GPA (r = .25 for female students, and r = .35 for male students), the direct effect of conscientiousness on GPA was not significant.

Cheng and Ickes (2009) found that the interaction between conscientiousness and self-motivation accounted for a portion of the variance in college GPA, $\Delta F(1, 373) = 5.13$, $\Delta R^2 = 1.3\%$, $p < .05$, with a relatively high score on one predictor compensating for a relatively low score on the other predictor. These results reveal that a relatively high level of conscientiousness can compensate for a relatively low level of self-motivation and visa versa, in affecting college students' overall academic performance.

Furthermore, even after previous academic performance and ability were statistically controlled for, these results were still evident.

Summary. Most researchers will agree that conscientious individuals have a willingness to work hard. They are dependable, organized, dutiful, and responsible (Goldberg, 1990). They have a tendency to persist in a careful, planned-out manner until their goals are realized (Tross et al., 2000). To some extent, the same can be said about grit. The moderate to large correlations reported between conscientiousness and the two dimensions of grit supports this claim (Cohen, 1992), with the perseverance of effort dimension clearly showing more overlap with conscientiousness.

Conscientiousness also has influences on academic performance. Based on the literature review, the relationship between conscientiousness and college GPA has reported small to moderate correlations. Studies investigating conscientiousness' relation to interest is sparse, and its reported correlations are small. Conscientiousness link with self-efficacy and locus of control are more common with reported correlations ranging from small to large and small to medium, respectively (Cohen, 1992). In this study, it will be interesting to see how these antecedents (interest, self-efficacy, and locus of control) directly and indirectly affect college success, and what role they play in differentiating conscientiousness from grit.

Now, a discussion on college success is presented.

College Success

College success has been predominately defined in terms of academic achievement – primarily via grades with GPA as the dominant criterion (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Poropat, 2009). The validity of GPA has been

documented by research that has indicated relations between GPA and measures of career success (Roth, BeVier, Switzer III, & Schippmann, 1996), as well as by research on relations between GPA and measures such as performance-related self-efficacy and achievement test scores (Richardson, Abraham, & Bond, 2012) (as cited in Smidt, 2015, p. 387). However, there are potential flaws in using GPA as a measure of academic success because of its "systematic biases against students enrolled in more rigorous curricula" (Johnson, 1997, p. 251) and different grading policies (Didier, Kreiter, Buri, & Solow, 2006). Furthermore, GPA does not always accurately measure learning, or growth in cognitive abilities (Arum & Roksa, 2011). Researchers are now suggesting to expand their definition of college success beyond that of academic achievement (York, Gibson, & Rankin, 2015).

In 2006, Kuh and his colleagues had offered a broader definition of student success. They defined student success as "academic achievement, engagement in educationally purposeful activities, satisfaction, acquisition of desired knowledge, skills and competencies, persistence, attainment of educational objectives, and post-college performance" (p. 1). Recognizing that some students entering college are better prepared than others to succeed academically, they provided a synopsis on an array of social, economic, cultural, and educational factors that relate to student success in college. Their report also included an emphasis on what colleges can do to foster student success, such as creating a student-centered culture, encouraging students to develop meaningful relationships, and providing multiple learning support networks.

York and his colleagues (2015) used Astin's (1991) Inputs-Environments-Outcomes (I-E-O) Model as their theoretical framework to propose a revised definition

and new conceptual model of academic success. The I-E-O model views college outcomes as a function of three sets of elements: inputs (demographic characteristics, family backgrounds, and previous students' experiences), environment (people, programs, policies, cultures, and experiences students experience while in college), and outcomes (knowledge, skills, attitudes, values, beliefs, and behaviors as they exist after college) (Astin, 1991, p. 53). York and his colleagues used this model because it provides a way to clearly identify academic success as an outcome, creating a definition of academic success "unclouded by aspects more accurately defined as inputs or environment" (p. 2).

York and his colleagues' (2015) analytic review of literature resulted in a revised definition and model of academic success. Academic success was defined as "inclusive of academic achievement, attainment of learning objectives, acquisition of desired skills and competencies, satisfaction, persistence, and post-college performance" (p. 5). Their model of academic success included these six elements and their measurements: (a) academic achievement measures that included GPA and grades, (b) attainment of learning outcomes that could be measured by course evaluations, GRE, ETS proficiency profile, and LSAT, (c) acquisition of desired skills and competencies that included instruments intended to capture affective competencies, such as self-regulated learning strategies and hope scale, (d) satisfaction that could be measured through course evaluations, or through larger nationally available surveys such as Cooperative Institutional Research Program's (CIRP), (e) persistence that could be measured by graduation rates and retention, and (f) post-college performance, or career success that

included both intrinsic measures (career satisfaction or professional goal attainment) and extrinsic measures (job attainment rates and promotion histories).

Jennings, Lovett, Cuba, Swingle, and Lindkvist (2013) looked at how students defined success. Jennings and her colleagues interviewed a total of 64 students three times in the first year of college and once each semester thereafter. Students were asked, "Thinking ahead to the end of the year, what would make this a successful year for you?" (p. 2). Using a grounded theory approach (Glaser & Strauss, 1967; Jones, Torres, & Arminio, 2006) to analyze the responses to this question about success, Jennings and colleagues identified four thematic categories: academic achievement (getting good grades, reaching milestones, engaging in career-oriented activities, or improving a variety of skills), social and residential life (making new friends, maintaining and strengthening friendships, or pursuing extracurricular activities), life management (maintaining well-being, better time management, developing effective study skills, and balancing academics with one's social or personal life), and academic engagement (expressing a desire to learn, taking interesting classes, or engaging in independent research). A vast majority of students defined success using one or more of these academic achievement themes with the most common of which being achieving good grades.

Even though there are to be a variety of ways to define college success, both researchers and students lean towards defining college success in terms of academic achievement, with GPA being the dominant criterion. GPA is recognized as an index of performance among students, universities, and employers alike (Richardson et al., 2012). Studies have linked GPA with career success (Roth et al., 1996), training and employment opportunities (Plant, Ericsson, Hill, & Asberg, 2005), and occupational

status (Strenze, 2007). However, defining and measuring college success based on GPA has its flaws. Therefore, researchers are encouraged to expand their definition of college success that encompasses a variety of aspects of success in college.

Summary of Literature Review

Grit has been investigated from a number of theoretical lens. These perspectives provide the reader with a conceptual understanding of grit. These perspectives included McClelland's (1985) achievement of motivation theory, self-regulated learning theories, Dweck's (2008) mindset theory, and number of other theories. Investigating grit through the theoretical lens that incorporates Deci and Ryan's (1985) self-determination theory, the self-efficacy component of Albert Bandura's (1986) social cognitive theory, and Rotter's (1966) locus of control theory may help provide clarity in not only what initiates grit, but what differentiates grit from conscientiousness.

The comprehensive review of literature has shown modest to significant relations between interest and self-efficacy, self-efficacy and grit, and self-efficacy and conscientiousness. The relations between interest and locus of control, interest and conscientiousness, and locus of control and conscientiousness have reported modest to moderate correlations. There were no studies that reported the correlations between locus of control and grit. Of interest is the relationship between conscientiousness and grit, where the correlations reported were significant, supporting claims that grit does not appear to be that different from conscientiousness.

Research has also shown that interest, self-efficacy, locus of control, and conscientiousness are positively related to college success. Interest as a predictor of academic achievement accounted for about 10% of the observed achievement variance

(Schiefele et al., 1992). Meta-analytic effect sizes for academic self-efficacy, locus of control, and conscientiousness have been estimated to be $r = .31$, $r = .13$, and $r = .19$, respectively (Richardson et al., 2012). These are modest to moderate correlations (Cohen, 1992). Studies on grit, however, contain conflicting results, and the perseverance of effort dimension of grit appears to be the dominant predictor of success.

Based upon evidence from the literature, a further examination of the grit construct and what initiates grit is warranted with the intent to contribute to the current understanding of grit, and its predictive validity with college success.

CHAPTER III

METHODOLOGY

This quantitative study collected evidence on the construct validity of grit using convergent, discriminant, and predictive validity principles, drawing upon Deci and Ryan's (1985) self-determination theory, the self-efficacy component of Albert Bandura's (1986) social cognitive theory, and Rotter's (1966) locus of control theory as its theoretical framework. This study extends previous research on the construct validity of grit by (a) taking into account different measures of conscientiousness and ostensibly comparable measures of grit, and (b) using a number of statistical analyses and techniques. This study also introduces potential antecedents of grit, and includes multiple measures of college success.

This chapter reviews the research questions, articulates the research design, describes the procedures for protecting human subjects, the participants, and discusses the instrumentation, procedures, and preliminary data analyses. The chapter concludes with a summary that serves to help the reader with the statistical analyses used in answering each of the research questions.

Research Questions

Five research questions were considered for this study. Statistical Package for the Social Science 23 (SPSS 23) with AMOS was used to answer the five research questions. The five research questions were:

1. What is the factor structure of grit among college students?
2. Does grit predict college success over and beyond cognitive ability and conscientiousness?

3. To what extent does grit correlate with conscientiousness among college students?
4. To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit relate to each other among college students?
5. To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit predict college success?

Research Design

Using a correlational design, the study examined the relationships among five explanatory constructs: grit, interest, self-efficacy, locus of control, and conscientiousness, and one response construct, college success. These constructs were chosen because of their logical potential relationship to grit and because some had been used in prior research on grit. An instrument comprised of 18 scales with 187 items measured the five explanatory constructs, and 5 scales with 27 items measured the response construct. All scales were scored according to the authors' instructions, including reflecting negatively-worded items. Of the 18 scales, 13 scales were designed by the authors to be a single measure of a construct; 4 were designed to be measures of 2 sub-constructs, and one was designed to be a measure of 3 sub-constructs. One scale (IE-4 Internal; 2 items) was dropped due to low reliability (α = .37). Thus, a total of 23 scales or sub-scales were obtained measuring the five explanatory constructs.

Of the 5 scales with 27 items that measured the response construct, 3 scales (GPA, Cognitive Ability, and Long-Term College Goals) were either selected or created by the researcher to be measures of college success. The other two scales (Acquired Skills and College Satisfaction) were selected by the researcher from the Course Experience Questionnaire (Curtis & Keeves, 2000), a questionnaire designed to measure

students' perceptions of the quality of completed courses. Consequently, the data analysis was based on the 28 summed scales.

The basic strategy used in this study was factor analysis. According to Williams, Onsman, and Brown (2010), factor analysis serves three purposes: (a) it reduces a large number of variables into a smaller set of variables, often referred to as components or factors, (b) it establishes underlying dimensions between manifest variables and latent constructs, thereby allowing the formation and refinement of theory, and (c) it provides construct validity evidence of tests and scales. The two main types of factor analysis are exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Brown, 2015; Williams et al., 2010). As the title suggests, EFA allows the researcher to *explore* the main dimensions among a set of intercorrelations; that is, having limited or no preconceptions of the number or nature of the latent constructs. In CFA, the researcher *tests* a theory or model about the latent constructs, having prior information regarding the number of factors, and which factor theories or models best fit (Williams et al., 2010). In other words, both EFA and CFA aim to reproduce the observed relationships among a group of variables with a smaller set of latent variables, "but they differ fundamentally by the number and nature of a priori specifications and restrictions made on the factor model" (Brown, 2015, p. 11).

There are a number of extraction methods, including principal components (PCA), principal axis factoring (PAF), image factoring, maximum likelihood (ML), alpha factoring, and canonical factoring. The most commonly used extraction methods in the published literature are PCA and PAF (Brown, 2015; Fabrigar & Wegener, 2012). PCA is done on an intercorrelation matrix with unities on the main diagonal, while the other

forms of EFA insert commonalities -- estimates of common variance shared among the tests and scales.

In this study, EFA was employed using both PCA and PAF extraction methods. PCA was used as a data-reduction tool to create one or more composite variables from a larger set of scale scores. It was used to transform a number of possibly correlated variables into a smaller set that still contains most of the information from the larger set. PCA achieves this purpose by using a linear combination of a set of variables and the composite variables created called components. These initial components are always orthogonal (Fabrigar & Wegener, 2012). In other words, each component explains non-redundant information. PCA does not discriminate between common and unique variance (Brown, 2015). PCA aims to account for the variance in the observed measures rather than explain the correlations among them with the fewest number of principle components (Brown, 2015).

PCA and PAF are identical methods, except for one difference. PCA analyzes a correlated matrix with unities on the main diagonal, while PAF analyzes a correlation matrix with communalities on the main diagonal estimating how much variance in the test or scale is shared with the other tests or scales being factored. In other words, PAF uses a *reduced* correlation matrix. Instead of using the regular correlation matrix among variables where the diagonals are all "1", the "1s" are replaced with the commonalities of observed variables. Commonalities are how much variance in the item, scale, or test scores that are explained by the factor structure (Fabrigar & Wegener, 2012).

The factors were rotated for ease of interpretation, and analyzed using both varimax and promax rotation. Varimax rotation is an orthogonal rotation, meaning that it

results in uncorrelated components or factors; promax rotation is an oblique rotation, and it results in correlated components or factors (Brown, 2015; Fabrigar & Wegener, 2012). Prior to the extraction of the factors, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was used to assess the suitability of the data for factor analysis (Williams et al., 2010). The criteria used to determine factor extractions were (a) the Kaiser-Guttman rule (also referred to as the Kaiser criterion, or eigenvalues > 1.0 rule) (Brown, 2015; Kaiser, 1960) and (b) Cattell's (1966) scree test.

Research Question 1. To address the first research question, "What is the factor structure of grit among college students?" EFA was employed based on four sources of evidence: (a) the 12-item scores from the Grit-O scale (Duckworth et al., 2007), (b) the six perseverance of effort (POE) item scores from the Grit-O scale with the six positively-worded consistency of interest item scores (PCOI) that were created by the author, (c) the 14-item scores from Vallerand and colleagues' (2003) Passion scale with the 12-item scores from the Grit-O scale, and (d) different measures of grit.

Research Question 2. To address the second research question, "Does grit predict college success over and beyond cognitive ability and conscientiousness?" a series of path analysis models were tested. Specifically, four path analysis models were tested. Path analysis models contain only observed variables. They provide estimates of the magnitude and significance of hypothesized causal connections between sets of variables. In other words, a path analysis model is a structural model for observed (manifest) variables (Kline, 2011).

The exogenous variables were cognitive ability, conscientiousness, and grit. Cognitive ability was measured by the cognitive ability test. Conscientiousness was

measured by the conscientiousness subscale of the BFI (John & Srivastava, 1999), and grit was measured by either Duckworth and her colleagues' (2007) 12-item Grit-O scale or its two 6-item subscale. The endogenous variable was college success, and was measured by a subjective measure of college success (Long-Term College Goals) and an objective measure of college success (GPA).

Duckworth and her colleagues (2007) argued that the two dimensions of grit together were more predictive than either alone, and that grit is as good or an even better predictor of success than cognitive ability. Therefore, four different path analysis models were tested to determine whether the two dimensions of grit together are more predictive than either alone, and whether grit is as good or an even better predictor of success than cognitive ability.

Figure 2 illustrates the four path analysis models: A, B, C, and D. Model A and B represents the hypothesis that cognitive ability, conscientiousness, and grit, each have an effect on college success, as measured by long-term college goals, and that grit is related to conscientiousness and cognitive ability. Model A measured grit by the Grit-O scale, and Model B measured grit by the two dimensions of the Grit-O scale. Model C and D replicate Model A and B with the difference being the endogenous variable is GPA.

Using SPSS 23 with AMOS, the path analysis models were first tested for goodness-of-fit, followed by reviewing and reporting on the correlation coefficients among grit and conscientiousness, and among grit and cognitive ability. Finally, direct effects between the exogenous variables and endogenous variable were reviewed and reported. Statistical estimates of direct effects are path coefficients, which are interpreted just as regression coefficients in multiple regression (Kline, 2011, p. 103).

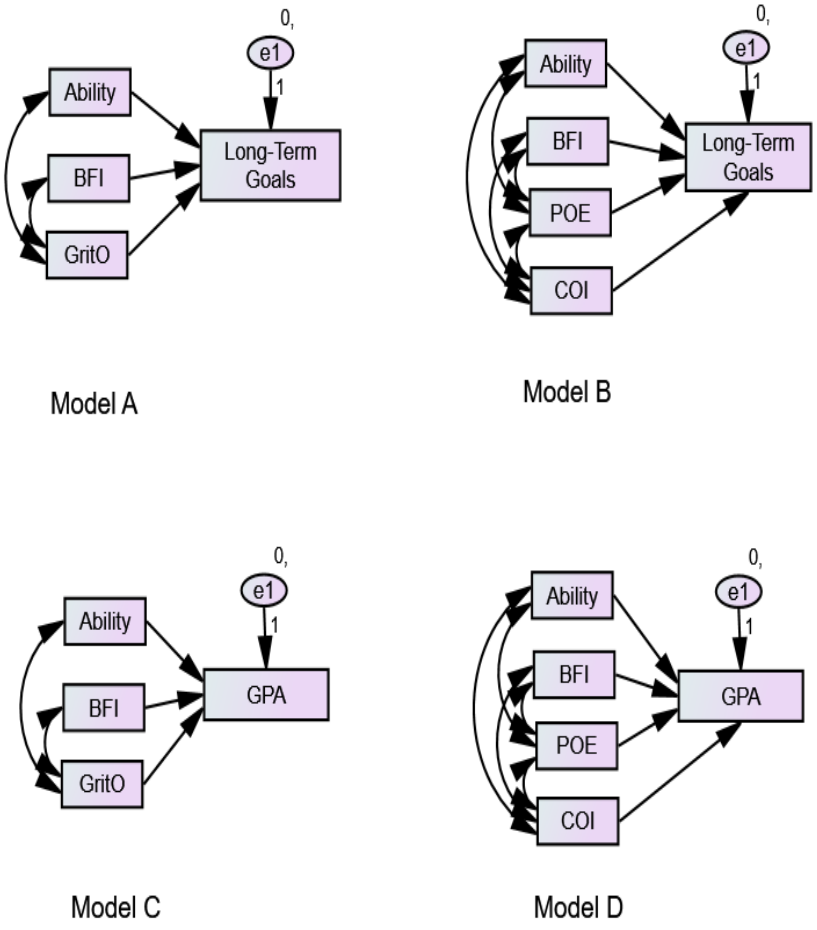

Figure 2. A schematic representation of the four path analysis models.

The directional straight lines (arrowhead on one end only) represent hypothesized causal connections. The connecting curved lines with bi-directional arrows acknowledge possible correlations between these variables. The endogenous variable may also be affected by external effects (variables and factors from outside of the model), including measurement error. These effects are depicted by the circle with a letter *e* or error terms in the models.

Research Question 3. To address the third research question, "To what extent does grit correlate with conscientiousness among college students?" bivariate (Pearson product-moment *r*) correlation analysis was used. The Pearson correlation coefficient quantifies the *magnitude* and *direction* of the linear relationship between two variables. In other words, the Pearson correlation coefficient allows for comparison of the strength and direction of association between different pairs of variables (Glass & Hopkins, 1996). Correlation analysis was based on the different measures of grit and conscientiousness.

Research Question 4. To address the fourth research question, "To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit relate to each other among college students?" correlation analysis based on CFA was conducted. The CFA was based on a hypothesized factor analyses model relating the scale scores to their constructs.

Using SPSS 23 with AMOS, the CFA model was first tested for goodness-of-fit. The goodness-of-fit test statistics measured how well the observed data corresponded to the assumed model. These statistics included standardized root mean square (SRMR), root mean square error of approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) (Brown, 2015). Brown indicated that SRMR, RMSEA, CFI, and TLI are good indices to use to test for goodness-of-fit (see Hu & Bentler 1995, 1999 for evidence). SRMR assess model fit at an absolute level, and can be viewed as the average discrepancy between correlations observed in the input matrix and correlations predicted by the model. It takes a range of values between 0.0 and 1.0, with 0.0 indicating a perfect fit (i.e., the smaller the SRMR, the better the model fit). Similarly, RMSEA values close to 0 suggest a good fit. RMSEA is different from SRMR. RMSEA

incorporates a penalty function for poor model parsimony (i.e., number of freely estimated parameters as expressed by model *df*). Both CFI and TLI are comparative fit indices. They evaluate the fit of a user-specified solution in relation to a more restricted, nested baseline model. CFI and TLI values closer to one imply good model fit, though TLI is non-normed, meaning that its values can fall outside the range of zero to one (Brown, 2015, pp. 70-73).

Brown (2015) also indicated that a reasonable good fit between the target model and the observed data (assuming ML estimation) is obtained in instances where (1) SRMR values are close to .08 or below; (2) RMSEA values are close to .06 or below; and (3) CFI and TLI values are close to .95 or greater (p. 74). He also cited additional guidelines (e.g., MacCallum, Browne, & Sugawara, 1996, and Bentler, 1990) such as "RMSEAs in the range of 0.08-0.10 suggest 'mediocre' fit," "models with RMSEA ≥ 0.10 should be rejected," and "CFI and TLI values in the range of .90 and .95 may be indicative of acceptable model fit" (pp. 74-75).

Research Question 5. To address the final research question, "To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit predict college success?" structural equation modeling techniques (Bollen & Noble, 2011) were used. The primary antecedent (interest) was examined as an exogenous variable. Grit, conscientiousness, self-efficacy, locus of control, and college success were examined as endogenous variables. The latent constructs underlying the explanatory variables were already known based on the previous analysis from Research Question 4. However, the five scales for the response construct had not been previously analyzed. PCA of the five scales identified two constructs: objective college success and subjective college success.

Using SPSS 23 with AMOS, the proposed model presented in Figure 1, Chapter I was tested. The model was first tested for goodness-of-fit, followed by reviewing and reporting on the latent variables' direct and indirect effects and their statistical significance. To obtain statistical significance on the indirect effects, a bootstrap procedure was used (Byrne, 2016).

This latent variable structural equation model is presented in Figure 3. The circle with a letter *e* stands for error, or variance in the latent variable that was not explained by the observed variables. Similarly, the circle with a letter *d* written in stands for disturbance, and it represents in the latent variable that was not accounted for by the presumed causes in the model (Keith, 2015; Kline, 2011).

It was hypothesized that interest would have a positive direct effect on self-efficacy, locus of control, conscientiousness, grit, and college success, and a positive indirect effect on grit and conscientiousness through self-efficacy and locus of control. Self-efficacy and locus of control would have a positive direct effect on grit and conscientiousness, and a positive indirect effect on college success through grit and conscientiousness. Grit and conscientiousness would have a positive direct effect on college success.

Protection of Human Subjects

The procedures for the protection of human subjects were followed. Approval from the University of San Francisco Institution Review Board, and the University of the Pacific Institution Review Board were obtained prior to surveying the participants, and the approval letters are presented in Appendix A.

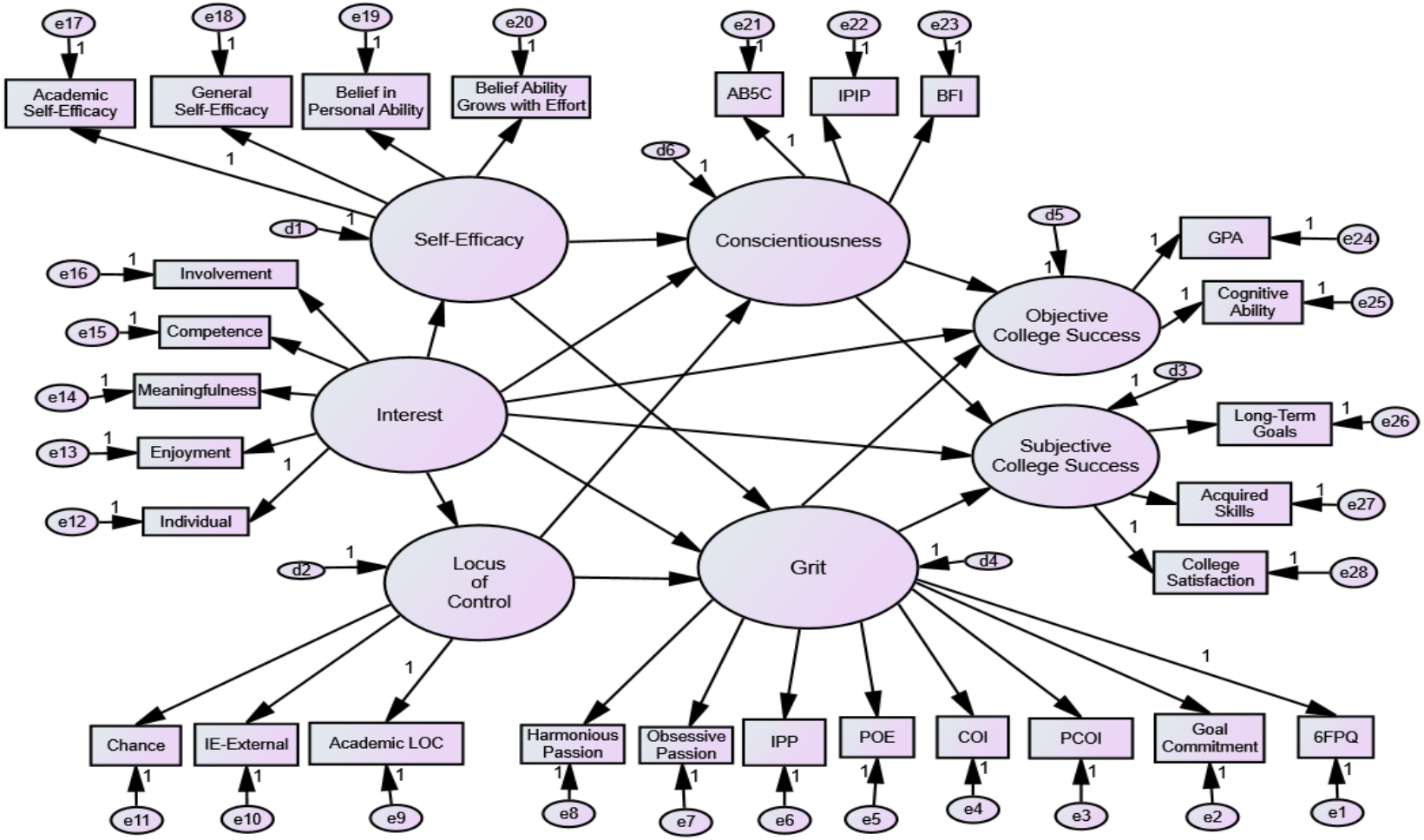

Figure 3. The latent variable structural equation model .

Participants

Participants in this study were 299 college students: 191 were from a private university and 108 from a junior college. Table 11 presents relevant background characteristics.

Table 11
Demographic Characteristics of Participants

	Private University (*N* = 191)		Junior College (*N* = 108)		Total (*N* = 299)	
Variables	*n*	%	*n*	%	*n*	%
Gender						
Female	120	62.8	61	56.5	181	60.5
Male	71	37.2	46	42.6	117	39.1
Self-describe	0	0	1	0.9	1	0.3
Year in College						
Freshman	94	49.2	47	43.5	141	47.2
Sophomore	33	17.3	36	33.3	69	23.1
Junior	24	12.6	16	14.8	40	13.4
Senior	35	18.3	8	7.4	43	14.4
Graduate	5	2.6	1	0.9	6	2.0
Age						
17 – 20	133	69.6	69	63.9	202	67.6
21 – 24	34	17.8	24	22.2	58	19.4
25 – 30	12	6.3	8	7.4	20	6.7
31+	12	6.3	7	6.5	19	6.3
Ethnicity						
Asian/Pacific Islander	74	38.7	20	18.5	94	31.4
Hispanic	35	18.3	34	31.5	69	23.1
Caucasian	38	19.9	19	17.6	57	19.1
Multi-ethnic/Other	26	13.6	15	13.9	41	13.7
African American	18	9.4	20	18.5	38	12.7
Majors						
Communication	27	14.1	8	7.4	35	11.7
Pre-pharmacy	24	12.6	1	1.0	25	8.4
Biology	19	9.9	2	1.8	21	7.0
Undecided	2	1.0	14	13.0	16	5.4
All Other	119	62.3	83	76.8	202	67.5
Extra-curriculum						
Involved	133	69.6	35	32.4	168	56.2
Not Involved	58	30.4	73	67.6	131	43.8

Note: Total percentages do not always equal 100% due to rounding.

The majority of all participants were female, in their first year of college, and between the age of 17 to 20. The average age was 21.2 years (*SD* = 5.74). Participants came from a variety of ethnicity and majors, and more than half were involved in extra-curriculum activities. Thirty-one percent of all participants who were involved in extra-curriculum activities indicated they participated in more than one activity. Thirty-six percent of all participants involved in extra-curriculum activities stated their role as member.

Instrumentation

The 222-item instrument was comprised of 8 demographic items, a 12-item cognitive ability test, and three different measures for grit (59 items), interest (32 items), self-efficacy (31 items), locus of control (33 items), conscientiousness (32 items) and college success (15 items). The test and scales were selected for this study primarily based on conceptual similarities, acceptable reliability, and accessibility (e.g., available for use at "no cost"). The 222-item instrument is presented in Appendix C.

Demographics. The demographic items included major, year in college, and extra-curricular activities. Participants were asked to indicate their major, year in college, and if they participated in any extra-curricular activities. If they did participate in any extra-curricular activities, they were asked to indicate the activity or activities, and their role.

Cognitive Ability Test. The cognitive ability test assessed students' quantitative reasoning and problem solving abilities. It is comprised of 12 number series items that test students' cognitive abilities. Participants were asked to find the rule used to predict the next number in a number series.

The researcher created the 12-item cognitive ability test using Thorndike and Hagen's (1986) Cognitive Abilities Test (CogAT) - specifically, Quantitative Battery Test 2 Number Series, and a number of other quantitative reasoning tests that are readily available on the Internet as guides. Schmidt and Hunter (2004) have argued that cognitive ability matters in personnel selection. Schneider and Newman (2015) concurred. They indicated that cognitive ability may be the most important predictor of job performance. For this study, the cognitive ability test was used as an additional measure of college success, and as a stand-alone reasoning ability measure.

Measuring Grit. The original 12-item Grit scale from Duckworth and her colleagues (2007) was used in this study. Studies have reported internal reliabilities that range from .68 to .90. Six items tap perseverance of effort (e.g. "I finish whatever I begin"), and six items tap consistency of interest (e.g., "I often set a goal but later choose to pursue a different one"). For the perseverance of effort dimension, studies have reported internal reliabilities that range from .71 to .87, and for the consistency of interest dimension, studies have reported internal reliabilities that range from .74 to .87. Participants indicated the degree to which each item applied to them on a scale from 1 ("strongly disagree") to 5 ("strongly agree").

An additional 6-item consistency of interest scale was constructed for this study. The six Duckworth and her colleagues (2007) items measuring the consistency of interest are all negatively worded (while the six items for perseverance of effort are all positively worded). The six negatively-worded items were reworded to positively worded statements, attempting to maintain the same meaning but in a positively-worded statement. This was done because of the possibility that Duckworth and colleagues'

(2007) instrument could be confounded (Vogt & Johnson, 2011). In other words, the two-factor structure may be a result of people responding to negatively-worded and positively-worded items, and not to the two constructs thought to underline responses to the items. Participants indicated the degree to which each item applied to them on a scale from 1 ("strongly disagree") to 5 ("strongly agree"). Table 12 presents the 6-item positively-worded consistency of interest (PCOI) scale. The reported reliability of this scale was good (α = .81).

Table 12
Positively-Worded Consistency of Interest (PCOI) Scale

Item
1. New ideas and projects usually do not distract me from previous one.
2. My interests stay pretty much the same from year to year.
3. When I have been obsessed with a certain idea or project, I stick with it without losing interest.
4. When I set a goal I usually pursue it to the end.
5. I do not have difficulty maintaining my focus on projects that take more than a few months to complete.
6. When I become interested in a new pursuit I see it to the end.

Duckworth and her colleagues' (2007) 12-item Grit scale is the current measure of the grit construct. However, there are ostensibly comparable measures of the two dimensions of grit. First, Peterson and Seligman's (2004) IPP scale and the 6FPQ Industriousness items (Jackson et al., 2000) are similar to the perseverance of effort dimension of grit. Second, Vallerand and colleagues (2003) Passion scale and Hollenbeck and colleagues (1989) Goal Commitment scale are similar to the consistency of interest dimension of grit (see Table 2 and Table 3 in Chapter II, pp. 59-60). These

scales were chosen for this study because they are closely aligned to assessing grit, and the two dimensions of grit.

The IPP scale consists of eight Likert-type items (e.g., "I finish things despite obstacles in the way"). Participants responded on a scale from 1 ("not very like me") to 5 ("very like me"). The 6FPQ Industriousness scale consists of 10 Likert-type items (e.g., "I work hard"). Participants responded on a scale from 1 ("strongly disagree") to 5 ("strongly agree). Both scales have reported acceptable reliability (α = .81 and α = .75, respectively) ("Industriousness Scale," 2017; "Industry/Perseverance/Persistence Scale," 2017). The Passion scale consists of 14 Likert-type items. It has two subscales: harmonious passion and obsessive passion. Participants responded on a scale from 1 ("not agree at all") to 7 ("very strongly agree"). Vallerand and his colleagues (2003) reported acceptable reliability for both subscales (α = .79 and α = .89, respectively). When responding to the items, participants were asked to think of an academic activity. Hollenbeck and colleagues' (1989) Goal Commitment scale consists of nine Likert-type items. Participants indicated the degree to which each item applied to them on a scale from 1 ("strongly disagree") to 5 ("strongly agree). Hollenbeck and colleagues reported acceptable reliability (α = .88).

Measuring Interest. Since this study is concerned with assessing the dimensions of student interest that include the individual's intrinsic interest, Frymier and her colleagues' (1996) Learner Empowerment scale (LES), Harackiewicz and her colleagues' (2008) Individual Interest scale and the Interest/Enjoyment subscale of the Intrinsic Motivation Inventory ("Intrinsic Motivation Inventory," 2017) were used in this study.

These scales were chosen for this study because they are closely aligned to assessing individual interest, and the intrinsic nature of interest and its motivational aspects.

The LES consists of 18 Likert-type items. The overall scale and three subscales have reported good reliability: α = .93 for the overall scale, and α = .91 for meaningfulness, α = .88 for involvement (impact), and α = .92 for competence (Weber & Patterson, 2000). With permission from the authors of this scale, a few of the items associated the LES was modified slightly to correspond to the study's criterion variable; specifically, the word "class" was changed to "college." For example, "My participation is important to my success in this class" was changed to "My participation is important to my success in college." Participants indicated how true each of the items were for them on a scale from 1 ("completely disagree") to 7 ("completely agree").

Harackiewicz and her colleagues' (2008) Individual (*Initial)* Interest scale assess student's intrinsic interest in psychology, and includes items to represent Renninger's (1992) conceptualization of individual interest. It consists of seven Likert-type items. The reported reliability of this scale is good (α = .90). With permission from the authors of this scale, a few of the items associated with the individual interest scale was modified slightly to correspond to the study's criterion variable; specifically, the word "psychology" was changed to "college." For example, "I've always been fascinated by psychology" was changed to "I've always been fascinated by college. Participants indicated the degree to which each item applied to them on a scale from 1 ("strongly disagree") to 5 ("strongly agree").

The Interest/Enjoyment subscale of the Intrinsic Motivation Inventory (IMI) assesses individuals' intrinsic motivation, comprised of seven Likert-type items. The

reported reliability of this subscale is good (α = .78) (McAuley, Duncan, & Tammen, 1989). Participants indicated how true each of the items were for them on a scale 1 ("not true at all") to 7 ("very true"). When responding to the items, participants were asked to think of an academic activity.

Measuring Self-Efficacy. One of the most used general measures of self-efficacy is Schwarzer and Jerusalem's General Self-Efficacy scale (GSE). It was developed in German and has been translated into 28 different languages, including English (Schwarzer & Jerusalem, 1995). Schwarzer and Jerusalem's GSE was designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. The original GSE was comprised of 20 items. In 1981, the original GSE 20-item scale was reduced to 10 items and subsequently adapted to 33 languages. The GSE 10-item scale was used in this study. Participants responded on a scale from 1 ("not at all") to 4 ("exactly true"). Reported internal reliabilities range from .76 to .90 (Schwarzer, 2014).

In addition to Schwarzer and Jerusalem's (1995) GSE 10-item scale, Gaumer Erickson, Soukup, Noonan, and McGurn's (2016) Self-Efficacy Questionnaire (SEQ) and Chemers and his colleagues' (2001) Academic Self-Efficacy scale (ASE) were used in this study. Both measures are associated with college success. These scales were chosen for this study because they are closely aligned to assessing individual's general self-efficacy beliefs and beliefs associated with being successful in college.

The SEQ was developed based on an extensive review of related research that resulted in the identification of two components that are essential for developing self-efficacy: (1) belief that ability grows with effort and (2) belief in personal ability. The belief that ability grows with effort subscale consists of 5 items (α = .82) and the belief in

personal ability scale consisted of 8 items (α = .85). The overall self-efficacy questionnaire has reported high reliability (α = .90) (Gaumer Erickson et al., 2016). The questionnaire is comprised of 13 Likert-type items. Participants responded on a scale from 1 ("not very like me") to 5 ("very like me"). Chemers and his colleagues' (2001) ASE is comprised of eight items designed to reflect a variety of specific skills pertinent to academic achievement, such as note taking, test taking, and general statements regarding scholarly ability. This measure is focused on overall college performance. The reported reliability is good (α = .81) (Chemers et al., 2001). Participants indicated how true each of the items were for them on a scale from 1 ("does not describe me well at all") to 7 ("describes me very well").

Measuring Locus of Control. Julian Rotter (1966) developed the original Locus of Control questionnaire. Rotter's I-E scale is a measure of control beliefs comprised of 23 pairs of statements, using a forced-choice format, plus six filler items (Marsh & Richards, 1986). Even though Rotter's I-E scale is still in use, researchers are turning to more specific measures of locus of control and/or to multidimensional measures (e.g., Halpert & Hill, 2011).

In 1975, Rotter had suggested that context-specific locus of scales may lead to more precise predictions in specific contexts (Curtis & Trice, 2013; Lefcourt, 1981). Since then, a number of locus of control scale were developed. One such scale is Trice's (1985) Academic Locus of Control scale for College Students (ALC). The original scale is a 28-item True/False format scale measuring the construct of locus of control in the college and/or university context. Scores range from 0 to 28 with high scores indicating a more external locus of control. The reported test-retest reliability was .92 over a five-

week interval, and using the KR-20 statistic, the internal consistency was .70. Construct validity was also supported by a .50 correlation with Rotter's I-E scale, and the scale was found not to have a social desirability response set (Curtis & Trice, 2013, p. 818).

In 2013, Curtis and Trice presented a revised scale. They indicated it would be advisable to see whether some items should be deleted since in the past 30 years, changes have taken place in colleges and universities. The internal consistency reliability of the revised 21-item scale reported similar to the original scale (α = .68). For this study, the revised ALC scale was used. Participants were advised that they were being presented with a different format. Participants responded T for True and F for False to each item. Participants' final score is obtained by adding up the number of matched items. False answered items are 2, 6, 7, 8, 10, 11, 12, 18, and 21, and the remaining are true. For example, if participants indicated T (true) for item 2, they would receive zero points, but if they answered F (false) for item 2, they would receive one point. The total number of "matched" items (points) would result in their final score. In this study, high scores indicated a more internal locus of control.

Other researchers have proposed that locus of control is a multidimensional construct (Levenson, 1972; Reid & Ware, 1973). For instance, Levenson (1973) reasoned that people who believe the world is unordered (chance) would behave and think differently than people who believe that the world is ordered but that powerful others are in control (p. 398). In other words, Levenson's claim is that externally oriented people's behavior may differ depending on whether they are to be controlled by chance, or by powerful others.

In order to measure belief in chance or fate expectancies from powerful others orientation, Levenson (1972) constructed three new scales: Internal, Powerful Others, and Chance. Each scale is comprised of eight items. The self-report items attempt to measure the degree to which participants perceive events in their life as a consequence of their own actions. The scale uses less ambiguous wording, and is set up such that items for each different subscale are similar to questions in the other. For instance, if an item from the powerful other scale involves friendship, the Chance and Internal scales will also include an item about friendship. The reliability estimates reported are quite similar to Rotter's I-E scale, and there is a low social desirability bias. Blau's (1984) reliability comparison showed Rotter's was .71 vs. .67 (internal), .73 (powerful others), and .80 (chance), and suggested that the Chance scale within the Levenson measure is an expedient way to measure locus of control. In this study, Levenson's Chance scale was used. Participants indicated the degree to which each item applied to them on a scale from 1 ("strongly disagree") to 5 ("strongly agree"). In this study, low scores indicated a more internal locus of control.

In addition to the Curtis and Trice's (2013) ALC scale and Levenson's (1972) Chance scale, Kovaleva's (2012) IE-4 scale was used in this study. These scales were chosen for this study because they are closely aligned to assessing the individual's locus of control and academic locus of control.

Four empirical studies were undertaken to construct and validate Kovaleva's (2012) IE-4 scale. The IE-4 scale uses two items per dimension. The subscales of the IE-4 have been shown to have sufficient psychometric properties, good scale homogeneities and retest reliabilities, stable factorial structure and construct validity.

The subscales result in reliability coefficients from .75 to .80 (Kovaleva, 2012, p. 89). Participants indicated the degree to which each item applied to them on a scale from 1 ("doesn't apply at all") to 5 ("applies completely"). For this study, the locus of control measures were converted to *z*-scores, and then to *t*-scores.

Measuring Conscientiousness. There are a variety of measures available to assess the Big Five personality traits. The Big Five, also known as the five factor model, are the five core personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism. As indicated, conscientiousness is one of the Big Five. Most of the Big Five scales are developed in specific research areas, and some have been constructed using items from existing instruments (John & Srivastava, 1999). John and Srivastava stated that the NEO questionnaires represent the best-validated Big Five measures in the questionnaire tradition. However, there is a cost to use the NEO questionnaires.

The Big Five Inventory (BFI), which is a self-report inventory designed to measure the Big Five dimensions, is easily made available for use by researchers. It is a multidimensional personality scale comprised of 44 items, and consists of short phrases with relatively accessible vocabulary. The conscientiousness subscale of the BFI is comprised of nine items (John & Srivastava, 1999). Studies have reported reliability estimates ranging from .76 to .91 (see Table 1 in Chapter II, p. 51). Participants were presented with a number of characteristics, and asked to indicate the degree to which the characteristics may or may not apply to them. Responses were scored along a five-point Likert scale from 1 ("disagree strongly") to 5 ("agree strongly").

The International Personality Item Pool's website includes over 3,000 items and over 250 scales for researchers to use (see http://ipip.ori.org). The items in each of the

International Personality Item Pool (IPIP) scales measure constructs similar to those in the 5 NEO-PI-R broad domains. In the NEO-PI-R, conscientiousness has six facets: competence, orderliness, dutifulness, achievement striving, deliberation, and self-discipline (Costa et al., 1991). There is a short 10-item conscientiousness scale and a 20-item conscientiousness scale from the revised version of the NEO Personality Inventory (NEO-PI-R: Costa & McCrae, 1992). The two scales have reported high reliabilities (α = .81 and .90, respectively ("International Personality Item Pool," 2017). For this study, the short 10-item conscientiousness scale (10-item IPIP) was used. Participants indicated the degree to which each item applied to them on a scale from 1 ("disagree strongly") to 5 ("agree strongly").

According to DeYoung, Quilty, and Peterson (2007), the AB5C-IPIP provides the most comprehensive facet-level coverage of the Big Five of any instrument presently available. The facet level structure (Goldberg, 1999) was created by an algorithm that provides a more complete coverage of the universe of personality descriptors. The Abridged Big Five Dimensional Circumplex (AB5C) model, which was developed by Hofstee, De Raad, and Goldberg (1992), takes advantage of the fact that almost all trait-descriptive adjectives can be represented as a blend of two Big Five dimensions (DeYoung et al., 2007). For example, as previously mentioned, conscientiousness has been described "as having both proactive and inhibitive aspects" (Costa et al., 1991, p. 887); the proactive aspects associated with achievement and commitment, and the inhibitive aspects associated with moral integrity and cautiousness. These two subdomains are commonly labeled industriousness and order (Roberts et al., 2005).

The AB5C-IPIP contains 485 five-point Likert scale items and breaks each of the Big Five down into nine facets (DeYoung et al., 2007). The 45 AB5C-IPIP facet scales (e.g., friendliness, assertiveness, leadership, creativity, etc.) are assessed by 9 to 13 items each, and the reported internal reliabilities ranged from .67 to .90. Conscientiousness was assessed by 13 items. Participants responded on a scale from 1 ("not very like me") to 5 ("very like me").

The above fore-mentioned conscientiousness scales were chosen for this study because they were used in previous studies that have investigated the relationship between grit and conscientiousness, have reported consistent internal reliabilities, and for their accessibility.

Measuring College Success. There are a variety of measures that focus on discrete aspects of college success, such as motivation, career decidedness, academic skills, emotional and psychological factors, and social and interpersonal factors (Prevatt, Li, Welles, Festa-Dreher, Yelland, & Lee, 2011, p. 26). In this study, multiple measures of college success were used. These measures were comprised of academic achievement, attainment of long-term college goals, acquired skills, college satisfaction, and the previously mentioned cognitive ability test. These scales were chosen for this study because they are closely aligned to assessing college success based on the review of literature.

Academic achievement in college has predominately been measured using GPA (Kuh et al., 2006; Poropat, 2009). GPA is an objective measure with good internal reliability and temporal stability (e.g. Bacon & Bean, 2006). It is defined as the mean of marks from students' course work that contributes to the assessment of the students'

undergraduate degree (Richardson et al., 2012). In this study, participants were asked to report their overall GPA in numeric format.

And because the goal component of grit refers to long term goals, that is, grit is defined as "perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087), items associated to long-term college goals were used. Kuh and his colleagues' (2006) definition of college success included acquisition of desired knowledge, skills and competencies, attainment of educational objectives, satisfaction, engagement in educational purposeful activities, and post-college performance, in addition to academic achievement.

Based on Kuh and his colleagues' (2006) definition of college success, the researcher created the following 7-item scale.

1. I have experienced a happy social life in college.
2. I am on track towards meeting all of my long-term college goals.
3. I am confident that I will be able to use what I learned from college in my future career.
4. I am confident in my abilities.
5. I have acquired new skills in college.
6. I am certain that I will succeed in life.
7. I expect to obtain a job within 6 months of graduation.

Participants indicated the degree to which each item applied to them on a scale from 1 ("strongly disagree") to 5 ("strongly agree"). The reliability of this scale was good (α = .72). Engagement in educational purposeful activities was assessed using the questions that asked participants about their involvement in extra-curricular activities.

In addition, participants were asked to respond to a series of six items assessing generic skills development, and an additional item to assess their satisfaction with their overall college experience. The generic skills development items and the overall college experience satisfaction are subscales of the Course Experience Questionnaire (CEQ). The CEQ is a survey instrument that seeks to obtain graduates' perceptions of the quality of the courses they have completed (Curtis & Keeves, 2000). The generic skills subscale measures the reported acquisition of generic skills for the workforce (York et al., 2015). Slight modifications to a few of the items of the proposed scale were made to better align with the context of this study with permission from the authors of these scales (e.g., use of the word "college," instead of "course"). Participants indicated the degree to which each item applied to them on a scale from 1 ("strongly disagree") to 5 ("strongly agree"). For this study, the college success measures were converted to z-scores.

Procedures

Eleven professors who were teaching courses at the private university and/or junior college during the spring semester were contacted by the researcher and asked if they would be interested in helping to recruit participants for a research study. Three professors (one who teaches at both schools) agreed to give extra credit and three professors (one who teaches at the junior college) gave the researcher permission to administer the instrument during class time. In addition, a number of the researcher's previous students helped recruit participants via word-of-mouth. Specific locations at the private university were reserved for participants to complete the survey. Flyers were posted on the private university's campus as well.

Table 13 presents the recruitment strategies by school. The majority of all participants came from the courses where the professors gave permission to the researcher to administer the instrument during class time. Only 44 students participated in the study without an external incentive.

Table 13
Recruitment Strategies by School

	Private University (*N* = 191)		Junior College (*N* = 108)		Total (*N* = 299)	
Strategy	*n*	%	*n*	%	*n*	%
In-Class	52	27.2	86	79.6	138	46.2
Extra Credit	95	49.7	22	20.4	117	39.1
No Incentive	44	23.0	0	0.0	44	14.7

There were a total of 15 assessment times; 7 took place during class time. Three of assessments took place in the morning (e.g., 8am to 9am), and the remaining 12 took place in the afternoon. At the time of the assessment, participants were informed of the purpose of the study. They were then given the informed consent form to read, review, and sign. Once signed, the researcher collected the signed informed consent forms. The researcher then explained to all participants that they will be receiving a paper-clipped packet that contains a one-page cognitive ability test, and stapled 5-page double-sided questionnaire. A unique number was assigned to each packet (e.g., cognitive ability test page had the same unique number as the stapled 5-page questionnaire). Participants were told that they will have six minutes to complete the test, and that if they did not complete the test, their grade was not affected; and if they completed the test before the time, they can return that portion of the instrument to the researcher. Participants were also told that the researcher will let them know when there was a minute left in completing the test. The researcher then reviewed the instructions associated with the cognitive ability test,

followed by asking the participants if they had any questions. Any questions that were asked were answered. The six-minute time was set, and participants were told to start taking the test.

After completing the cognitive ability test, the researcher collected that portion of the instrument, and told participants that they can now complete the 5-page double-sided questionnaire. The researcher reminded participants that if they did not know their GPA, they can find their GPA by accessing their student record via their school's website. The participants were also asked to check to see if they accidently overlooked any items before returning that portion of the instrument to the researcher. Most participants completed this portion of the instrument in less than 40 minutes.

The researcher visually scanned the completed 5-page double-sided questionnaire to check for any overlooked items, and asked participants to address any missing items. Participants participating in the study for extra credit were asked to sign an extra credit log. All participants were told that their participation was highly appreciated. The researcher provided a record to those professors who had offered their students extra credit for participating in this study, and also thanked them for their support.

Preliminary Data Analyses

After data collection, the item scores of the survey and the ability test, overall GPA, and participants' background were entered into SPSS 23 with AMOS. The data file was checked for out-of-range values, and corrections were made by checking the original questionnaire. The data file was also checked for missing values. Table 14 presents the frequencies and percentages of missing values by school. Because there

were so few missing values (n = 21 items), series mean method was used to replace missing values.

Table 14
Frequencies and Percentages of Missing Values by School

		Private University (N = 191)		Junior College (N = 109)		Total (N = 299)	
Item	Scale	*n*	%	*n*	%	*n*	%
GPA	GPA	10	5.23	1	.92	11	3.68
Setbacks don't discourage me.	Grit-O	1	.52	0	.00	1	.33
It's unrealistic for me to expect to reach my college goals.	Goal Commitment	0	.00	1	.92	1	.33
I don't see things through.	10-item IPIP	1	.52	0	.00	1	.33
I have often found that what is going to happen will happen.	Chance	1	.52	0	.00	1	.33
I can remain calm when facing difficulties because I can rely on my coping abilities.	GSE	1	.52	0	.00	1	.33
I am goal-oriented.	IPP	1	.52	0	.00	1	.33
I put work above pleasure.	6FPQ	1	.52	0	.00	1	.33
I have a tough time controlling my need to do this activity.	Passion	1	.52	0	.00	1	.33
I am good at research and writing papers.	ASE	1	.52	0	.00	1	.33
I can't influence what happens in college.	LES	1	.52	0	.00	1	.33

Preliminary data analyses also included reporting on the means, standard deviations, and reliability coefficients of the scale scores, and on any statistically significant differences between the two schools. In addition, the normality of the scale scores was assessed. Table 15 presents the means, standard deviations, and reliability coefficients organized by construct.

Table 15
Means, Standard Deviations, and Reliability Coefficients for Scale Scores Organized by Construct

		Private University (N = 191)			Junior College (N = 108)			Total (N = 299)		
Construct	Scale (number of items)	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α
Grit	Grit (12)	3.36	.51	.75	3.30	.49	.69	3.34	.51	.73
	POE (6)	3.87	.56	.67	3.81	.58	.64	3.85	.57	.66
	COI (6)	2.86	.70	.73	2.78	.71	.71	2.83	.71	.72
	PCOI (6)	3.47	.65	.78	3.56	.80	.84	3.50	.71	.81
	Goal Commitment (9)	4.17	.61	.84	4.04	.65	.81	4.12	.63	.83
	IPP (8)	3.95	.61	.80	3.88	.58	.69	3.93	.60	.76
	6FPQ Industriousness (10)	3.82	.54	.75	3.69	.54	.65	3.77	.54	.71
	Passion (14)	4.09	1.14	.91	4.27	1.21	.92	4.16	1.17	.92
	Harmonious (7)	5.06	1.14	.89	5.10	1.15	.90	5.07	1.14	.89
	Obsessive (7)	3.13	1.51	.92	3.44	1.65	.94	3.24	1.56	.93
Interest	Individual Interest (7)	4.03	.66	.84	3.95	.81	.88	4.00	.72	.86
	Interest/Enjoyment (7)	5.05	1.37	.94	4.54	1.32	.90	4.87	1.37	.93
	LES (18)	5.63	.77	.89	5.47	.76	.83	5.57	.77	.87
	Meaningfulness (6)	5.92	.89	.85	5.66	1.07	.82	5.82	.97	.84
	Involvement (6)	5.18	.98	.76	5.06	.87	.58	5.14	.94	.70
	Competence (6)	5.78	.93	.84	5.69	.90	.70	5.75	.92	.79
Self-Efficacy	GSE (10)	3.21	.44	.85	3.24	.47	.84	3.22	.45	.84
	SEQ (13)	4.17	.50	.84	4.26	.55	.88	4.20	.52	.86
	Ability Grows with Effort (5)	4.17	.55	.69	4.23	.60	.76	4.19	.57	.72
	Personal Ability (8)	4.16	.55	.78	4.28	.58	.84	4.20	.56	.80
	ASE (8)	5.27	1.00	.86	5.38	1.02	.87	5.31	1.01	.86
Locus of Control	ALC (21)	13.19	3.74	.73	13.26	3.86	.74	13.21	3.78	.74
	Chance (8)	2.33	.67	.77	2.18	.71	.74	2.27	.69	.76
	IE-4 (4)	3.15	.48	.02	3.21	.71	.40	3.17	.58	.23
	IE-4 Internal (2)	4.06	.67	.37	4.17	.84	.37	4.10	.73	.37
	IE-4 External (2)	2.75	.87	.53	2.73	1.13	.68	2.74	.97	.60
Conscientiousness	BFI (9)	3.76	.63	.79	3.75	.69	.78	3.76	.65	.79
	10-item IPIP (10)	3.58	.61	.83	3.55	.63	.79	3.57	.61	.81
	AB5C-IPIP (13)	3.87	.56	.84	3.75	.59	.80	3.83	.58	.82
College Success	GPA (1)	3.20	.56		2.95	.68		3.11	.62	
	Cognitive Ability (12)	6.09	1.87	.49	5.42	2.07	.58	5.85	1.97	.54
	Long-Term College Goals (7)	4.00	.52	.70	4.09	.56	.73	4.03	.54	.71
	Acquired Skills (6)	3.88	.60	.78	3.83	.74	.84	3.86	.65	.81
	College Satisfaction (1)	3.84	.87		4.01	1.00		3.90	.92	

Note: Refer to Appendix B for a complete list of the scales and their items organized by construct.

Independent-sample *t* tests at the .05 level of significance were performed to determine if there were any statistically significant difference on the scale scores between the two schools. Results from independent-sample *t* tests revealed statistically significant difference between the two schools on the interest/enjoyment scale ($t = 3.10$, $df = 297$, $p < .05$, 95% CI for mean difference .18 to .83, $d = .03$), meaningfulness subscale of LES ($t = 2.22$, $df = 297$, $p < .05$, 95% CI for mean difference .03 to .48, $d = .02$), GPA ($t = 3.45$, $df = 297$, $p < .05$, 95% CI for mean difference .11 to .39, $d = .04$), and cognitive ability test scores ($t = 2.89$, $df = 297$, $p < .05$, 95% CI for mean difference .22 to 1.14, $d = .03$). The difference between the two schools on the other 29 scale scores was not statistically significant. And because there was no significant difference found on grit between the two schools, the results were pooled into one data set.

Normality of all variables was assessed by a visual inspection of their histograms. The histograms showed some negative skewness and outliers on a few variables, but nothing significant. As a result, no transformation was performed and the original variables were used.

Summary

The correlational design used in this study included a number of statistical analyses and techniques. The instrument was comprised of multiple measures. IRB approvals were obtained prior to surveying the participants. There were 299 college students who participated in this study. SPSS 23 with AMOS were used to analyze the data. Descriptive statistics, including means, standard deviations, and reliability coefficients for all of the scale scores were reported. Table 16 presents a summary of the data analysis procedures by research question.

Table 16
Data Analyses by Research Question

Research Question	Based On	Statistical Analysis
1. What is the factor structure of grit among college students?	Four sources of evidence: • The 12-item scores from the Grit-O scale • The six POE item scores from the Grit-O scale with the six positive worded COI item scores • The 14-item scores from the Passion scale with the 12-item scores from the Grit-O scale • Measures of grit	EFA with PCA and PAF using both varimax and promax rotation
2. Does grit predict college success over and beyond cognitive ability and conscientiousness?	Scale scores associated with: The exogenous variables: • Cognitive ability test scores • The 12-item Grit-O scale • The 6-item POE and 6-item COI from the Grit-O scale • The 9-item conscientiousness subscale of the BFI The endogenous variables: • Long-term college goals • GPA	Path analysis
3. To what extent does grit correlate with conscientiousness among college students?	Different measures of grit: • The 12-item Grit-O scale • The 12-item Grit-C scale • The two sub-scales from the 12-item Grit-O scale • The three sub-scales from the 12-item Grit-C scale • Comparable measures of grit Different measures of conscientiousness: • The 9-item conscientiousness subscale of the BFI • The 10-item IPIP scale • The 13-item conscientiousness subscale of the AB5C-IPIP	Pearson product-moment *r* correlation
4. To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit relate to each other?	Scale scores associated with: • The three LES subscales, the Individual Interest scale, and the Interest/Enjoyment subscale of the IMI • The GSE scale, the ASE scale, and the two subscales from the SEQ scale • The ALC scale, the Chance scale, and the IE-4 External sub-scale of the IE-4 Scale • The conscientiousness subscale of the BFI, the 10-item IPIP scale, and the conscientiousness subscale of the AB5C-IPIP • The two subscales from the 12-item Grit-O scale • Comparable measures of grit	Correlation analyses based on CFA
5. To what extent do interest, self-efficacy, locus of control, conscientiousness and grit predict college success?	Latent constructs associated with: • Interest • Self-efficacy • Locus of control • Conscientiousness • Grit • Objective and subjective college success	Structural equation model

Note: The measures of grit were based on scale scores and derived from (a) the two sub-scales from the Grit-O scale (Duckworth et al., 2007), and (b) comparable measures of grit. Comparable measures of grit were derived from: (a) the PCOI scale created by the author, (b) Hollenbeck and colleagues' (1989) Goal Commitment scale, (c) Peterson and Seligman's (2004) IPP scale, (d) 6FPQ Industriousness scale (Jackson et al., 2000), and (3) Vallerand and colleagues' (2003) Harmonious and Obsessive sub-scales.

CHAPTER IV

RESULTS

The purpose of this study was to (a) examine the factor structure of grit, (b) determine whether grit is a better predictor of college success than cognitive ability and conscientiousness, (c) examine the relationship between grit, its two dimensions, and measures of conscientiousness, (d) examine grit's relation to interest, self-efficacy, locus of control, and conscientiousness, and (e) investigate their predictive validity with college success. That is, the primary purpose of this study was to collect evidence on the construct validity of grit using convergent, discriminant, and predictive validity principles. Using SPSS 23 with AMOS, this study examined each of these issues using a number of statistical analyses, including confirmatory factor analysis and structural equation modeling techniques.

This chapter reports findings from the statistical analysis of the data. The chapter opens with presenting the first research question, the statistical analysis used, and the results. Then each of the remaining research questions are presented, their statistical analysis used, and their results. Because each of the research questions addressed different sets of the 28 variables, the full correlation matrix is provided in Appendix D.

Research Question 1: Factor Structure of Grit

What is the factor structure model of grit among college students?

The first research question investigated the factor structure of grit among college students based on four sources of evidence. To address the first research question, EFA was conducted using PCA and PAF extraction methods with both varimax and promax

rotations. Independent of extraction and rotation method, the resulting factor structure among college students differed based on the four sources of evidence.

The first source of evidence was based on the 12-item scores from Duckworth and her colleagues' (2007) Grit-O scale. EFA results based on the first source of evidence are presented in Table 17. Independent of extraction and rotation method, two factors were revealed: (1) perseverance of effort and (2) consistency of interest. The two-factor structure explained 42.84% of the variance in grit scores; the oblique rotations indicated the factors were correlated at .27 and .19 (PAF and PCA, respectively). This result is consistent with Duckworth and colleagues' two-factor solution of grit comprised of perseverance of effort and consistency of interest.

The second source of evidence was based on the six POE item scores from Duckworth and colleagues' Grit-O scale (2007) with the six PCOI item scores that were created by the author – together, introducing the 12-item Grit-C scale. EFA results based on the second source of evidence are presented in Table 18. Independent of extraction and rotation method, three factors were revealed: (1) goal attainment (2) focus, and (3) perseverance. This perseverance factor is not the same as Duckworth and colleagues' perseverance of effort (POE) factor because this perseverance factor is comprised of four items (e.g., "I am a hard worker," "I am diligent," "I have overcome setbacks to conquer an important challenge," and "Setbacks don't discourage me"), and Duckworth and colleagues' POE is comprised of six items. This perseverance factor does not include items "I finish whatever I begin," and "I have achieved a goal that took years of work." The three-factor structure explained 56.22% of the variance in grit scores; the oblique rotations indicated the first and second factors were correlated at .40 and .31, the first and

Table 17

PAF and PCA Factor Matrices: The 12-Item Scores from Duckworth and Colleagues' (2007) Grit-O Scale

	PAF Factor Matrices						PCA Factor Matrices					
	Orthogonal Pattern		Oblique Pattern		Oblique Structure		Orthogonal Pattern		Oblique Pattern		Oblique Structure	
Item	I	II	I	II	I	II	I	II	I	II	I	II
I often set a goal but later choose to pursue a different one.	.71		.71		.73		.75		.75		.76	
I have difficulty maintaining my focus on projects that take more than a few months to complete.	.67	.31	.66		.71	.39	.71	.32	.70		.74	.38
My interests change from year to year.	.59		.60		.59		.69		.69		.69	
I have been obsessed with a certain idea or project for a short time but later lost interest.	.53		.53		.54		.63		.63		.64	
New ideas and projects sometimes distract me from previous ones.	.49		.50		.49		.61		.63		.61	
I become interested in new pursuits every few months.			.33				.42	-.34	.45	-.39	.38	-.31
I am a hard worker.		.73		.73		.74		.76		.75		.76
I am diligent.		.58		.61		.57		.67		.69		.66
I finish whatever I begin.		.47		.46	.36	.50	.33	.55		.52	.39	.57
I have overcome setbacks to conquer an important challenge.		.45		.43		.44		.58		.59		.57
I have achieved a goal that took years of work.		.41		.40		.42		.53		.53		.54
Setbacks don't discourage me.		.39		.38		.41		.50		.49		.51

Note: N = 299. KMO = .772. Promax Kappa was set at 2. Coefficients < .30 were suppressed.

Table 18

PAF and PCA Factor Matrices: Duckworth and Colleagues' (2007) Six Perseverance of Effort Item Scores with Six Positively-Worded Consistency of Interest (PCOI) Item Scores

	PAF Factor Matrices									PCA Factor Matrices								
	Orthogonal Pattern			Oblique Pattern			Oblique Structure			Orthogonal Pattern			Oblique Pattern			Oblique Structure		
Item	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
When I set a goal I usually pursue it to the end.	.83			.86			.91	.44	.39	.83			.82			.88	.40	
I finish whatever I begin.	.66			.68			.71		.35	.81			.84			.82		
When I become interested in a new pursuit I see it to the end.	.58	.37		.57			.68	.48	.31	.71	.33		.70			.76	.43	
I have achieved a goal that took years of work.							.37		.32	.44			.43			.49		.34
New ideas and projects usually do not distract me from previous ones.		.70			.71		.34	.74	.32		.75			.74		.31	.78	.31
When I have been obsessed with a certain idea or project I stick with it without losing interest.	.39	.59		.32	.53		.53	.66		.45	.64		.38	.59		.55	.70	
My interests stay pretty much the same from year to year.		.51			.51			.52			.74			.75			.74	
I do not have difficulty maintaining my focus on projects that take more than a few months to complete.	.32	.47			.40		.47	.55	.38	.40	.50	.26	.33	.45		.51	.58	.34
I am a hard worker.			.67			.63	.44		.71	.39		.66	.33		.62	.49		.70
I am diligent.			.60			.60			.62			.73			.72			.75
I have overcome setbacks to conquer an important challenge.			.40			.39			.43			.64			.64			.65
Setbacks don't discourage me.		.33	.33		.30			.38	.37		.45	.50		.45	.48		.49	.52

Note: N = 299. KMO = .862. Promax Kappa was set at 2. Coefficients < .30 were suppressed.

third factors at .37 and .26, and the second and third factors at .26 and .16 (PAF and PCA, respectively). The fact that the six positively-worded consistency of interest items with Duckworth and colleagues' six POE items did not produce the same factor structure as the six negatively-worded consistency of interest items with Duckworth and colleagues' six POE items does not rule out the possibility that Duckworth and colleagues' Grit-O instrument is confounded.

The third source of evidence was based on the 14-item scores from Vallerand and colleagues' (2003) Passion scale with the 12-item scores from Duckworth and colleagues' (2007) Grit-O scale. The Kaiser-Guttman rule (Brown, 2015; Kaiser, 1960) indicated five factors; however, Cattell's (1966) scree test revealed four factors. It was decided to retain four factors, because the fifth factor only had a single variable. EFA results based on the third source of evidence are presented in Table 19 and Table 20. Table 19 presents the EFA results using PAF extraction method, and Table 20 presents the EFA results using PCA extraction method. Independent of extraction and rotation method, four factors were revealed: (1) obsessive passion, (2) harmonious passion, (3) consistency of interest, and (4) perseverance of effort. The four-factor structure explained 56.64% of the variance in grit scores; the oblique rotation indicated the first and second factors were correlated at .34 and .31, the first and third factors at -.06 (for both PAF and PCA), the first and fourth factors at .08 and .07, the second and third factors at .02 and .01, the second and fourth factors at .29 and .26, and the third and fourth factors at .24 and .19 (PAF and PCA, respectively). These results suggest that grit is not comprised of passion.

The fourth source of evidence was based on different measures of grit. The different measures of grit were characterized by the scale scores associated with: (a) the two dimensions of Duckworth and colleagues' (2007) Grit-O scale, (b) Peterson and Seligman's (2004) IPP scale, (c) the PCOI scale that was created by the author, (d) the 6FPQ Industriousness scale (Jackson et al., 2000), (e) Vallerand and colleagues' (2003) Harmonious Passion and Obsessive Passion subscales, and (f) Hollenbeck and colleagues' (1989) Goal Commitment scale. Table 21 presents the EFA results based the fourth source of evidence. Independent of extraction and rotation method, two factors were revealed: (1) grit and (2) passion. The two-factor structure explained 59.28% of the variance in grit score; the oblique rotations indicated the factors were correlated at .17 and .13 (PAF and PCA, respectively). These results provide further evidence that grit is not comprised of passion.

Research Question 2: Path Analysis

Does grit predict college success over and beyond cognitive ability and conscientiousness?

Duckworth and her colleagues (2007) argue that grit has instrumental predictive validity of success over and beyond IQ and conscientiousness, and that the two dimensions of grit are more predictive of success than either alone. Indeed, Duckworth (2013) argues that grit is as good or an even better predictor of success than cognitive ability. The second research question investigated these claims. In other words, the second research question investigated the predictive validity of grit on college success over and beyond cognitive ability and conscientiousness.

Table 19

PAF Factor Matrices: The 12-Item Scores from Duckworth and Colleagues' (2007) Grit-O Scale with the 14-Item Scores from Vallerand and Colleagues' (2003) Passion Scale

	PAF Factor Matrices											
	Orthogonal Pattern				Oblique Pattern				Oblique Structure			
Item	I	II	III	IV	I	II	III	IV	I	II	III	IV
I am emotionally dependent on this activity.	.88				.90				.89			
I have almost an obsessive feeling for this activity.	.83				.85				.84			
I have a tough time controlling my need to do this activity.	.80				.82				.80			
The urge is so strong I can't help myself from doing this activity.	.79	.31			.77				.83	.45		
I have difficulty imagining my life without this activity.	.78	.32			.76				.82	.45		
I cannot live without it.	.74	.32			.71				.79	.46		
My mood depends on me being able to do this activity.	.71				.73				.71			
This activity allows me to live memorable experiences.		.83				.87				.84		
The new things that I discover from this activity allow me to appreciate it even more.		.77				.79				.79		
This activity is a passion that I still manage to control.		.71				.70			.40	.76		
This activity allows me to live a variety of experiences.		.70				.72				.73		
This activity is in harmony with the other activities in my life.		.68				.69			.31	.71		
This activity reflects the qualities I like about myself.		.65				.64				.70		.30
I am completely taken by this activity.	.47	.53			.39	.48			.55	.62		
I often set a goal but later choose to pursue a different one.			.72				.72				.73	
I have difficulty maintaining my focus on projects that take more than a few months to complete.			.69				.68				.72	.36
My interests change from year to year.			.58				.59				.59	
I have been obsessed with a certain idea or project for a short time but later lost interest.			.53				.53				.54	
New ideas and projects sometimes distract me from previous one.			.48				.49				.48	
I become interested in new pursuits every few months.							.31					
I am a hard worker.				.71				.70				.73
I am diligent.				.59				.61				.59
I finish whatever I begin.			.30	.45				.42			.36	.49
I have overcome setbacks to conquer an important challenge.				.43				.42				.44
Setbacks don't discourage me.				.40				.39				.41
I have achieved a goal that took years of work.				.39				.38				.41

Note: N = 299. KMO = .877. Promax Kappa was set at 2. Coefficients < .30 were suppressed.

Table 20

PCA Factor Matrices: The 12-Item Scores from Duckworth and Colleagues' (2007) Grit-O Scale with the 14-Item Scores from Vallerand and Colleagues' (2003) Passion Scale

	PCA Factor Matrices											
	Orthogonal Pattern				Oblique Pattern				Oblique Structure			
Item	I	II	III	IV	I	II	III	IV	I	II	III	IV
I am emotionally dependent on this activity.	.89				.90				.90			
I have almost an obsessive feeling for this activity.	.86				.87				.86			
I have a tough time controlling my need to do this activity.	.84				.86				.84			
The urge is so strong I can't help myself from doing this activity.	.81	.31			.78				.85	.44		
I have difficulty imagining my life without this activity	.80	.32			.78				.84	.44		
My mood depends on me being able to do this activity.	.77				.79				.77			
I cannot live without it.	.76	.32			.74				.81	.45		
This activity allows me to live memorable experiences.		.85				.88				.86		
The new things that I discover from this activity allow me to appreciate it even more.		.81				.83				.83		
This activity allows me to live a variety of experiences.		.76				.77				.78		
This activity is a passion that I still manage to control.		.75				.74			.39	.80		
This activity is in harmony with the other activities in my life.		.74				.75				.77		
This activity reflects the qualities I like about myself.		.71				.71				.75		
I am completely taken by this activity.	.48	.57			.41	.52			.57	.65		
I often set a goal but later choose to pursue a different one.			.75				.75				.77	
I have difficulty maintaining my focus on projects that take more than a few months to complete.			.72				.71				.75	.36
My interests change from year to year.			.68				.69				.69	
I have been obsessed with a certain idea or project for a short time but later lost interest.			.63				.63				.64	
New ideas and projects sometimes distract me from previous one.			.61				.62				.60	
I become interested in new pursuits every few months.			.40				.42	-.33			.37	
I am a hard worker.				.73				.73				.76
I am diligent.				.67				.69				.67
I have overcome setbacks to conquer an important challenge.				.56				.56				.57
I finish whatever I begin.			.33	.54				.52			.39	.57
Setbacks don't discourage me.				.53				.53				.54
I have achieved a goal that took years of work.				.53				.53				.54

Note: N = 299. KMO = .877. Promax Kappa was set at 2. Coefficients < .30 were suppressed.

Table 21

PAF and PCA Factor Matrices: Measures of Grit Based on Scale Scores

	PAF Factor Matrices						PCA Factor Matrices					
	Orthogonal Pattern		Oblique Pattern		Oblique Structure		Orthogonal Pattern		Oblique Pattern		Oblique Structure	
Scale Score	I	II	I	II	I	II	I	II	I	II	I	II
Industry/Perseverance/Persistence (IPP)	.80		.80		.81		.82		.82		.83	
Perseverance of Effort (POE)	.73		.72		.75	.30	.76		.75		.78	.32
Goal Commitment	.65		.66		.64		.73		.74		.72	
Positively-Worded COI (PCOI)	.62		.61		.65	.32	.69		.67		.71	.34
Consistency of Interest (COI)	.54		.55		.53		.65		.67		.63	
Industriousness (6FPQ)	.51		.52		.52		.61		.62		.61	
Obsessive Passion		.75		.76		.74		.85		.87		.85
Harmonious Passion		.65		.64		.66		.81		.81		.82

Note: N = 299. KMO = .731. Promax Kappa was set at 2. Coefficients < .30 were suppressed.

Using SPSS 23 with AMOS, four different path analysis models were tested. The independent variables were cognitive ability, conscientiousness, and grit. Cognitive ability was measured by the cognitive ability test scores. Conscientiousness was measured by the conscientiousness subscale of the BFI (John & Srivastava, 1999), and grit was measured by Duckworth and her colleagues' (2007) Grit-O scale and the two dimensions of the Grit-O scale. The dependent variable was college success. College success was measured by GPA and Long-Term College Goals.

The path analysis models were first tested for goodness-of-fit. All four model fits were good (e.g., RMSEA = .000). The models then tested the relationship between the independent variables and dependent variables. Figure 4 presents the results of all four path analysis models. Beta weights and correlation coefficients above .21 were statistically significant at the .01 level.

Model A and B tested the hypothesis that cognitive ability, conscientiousness, and grit, each have an effect on college success, as measured by Long-Term College Goals, and that grit is related to conscientiousness and cognitive ability. Model A measured grit by the Grit-O scale (Duckworth et al., 2007), and Model B measured grit by the two dimensions of the Grit-O scale. The dependent variable for Model A and B was long-term college goals. Model C and D replicate Model A and B with the difference being the dependent variable. The dependent variable in Model C and D was GPA.

The results show that cognitive ability predicted GPA and grit and its perseverance of effort dimension predicted long-term college goals. The sole predictor of both GPA and long-term college goals was conscientiousness. To be more specific, conscientiousness predicted both GPA and long-term college goals over and beyond

cognitive ability and grit. These results suggest that conscientiousness has instrumental predictive validity of college success over and beyond cognitive ability and grit – and not grit.

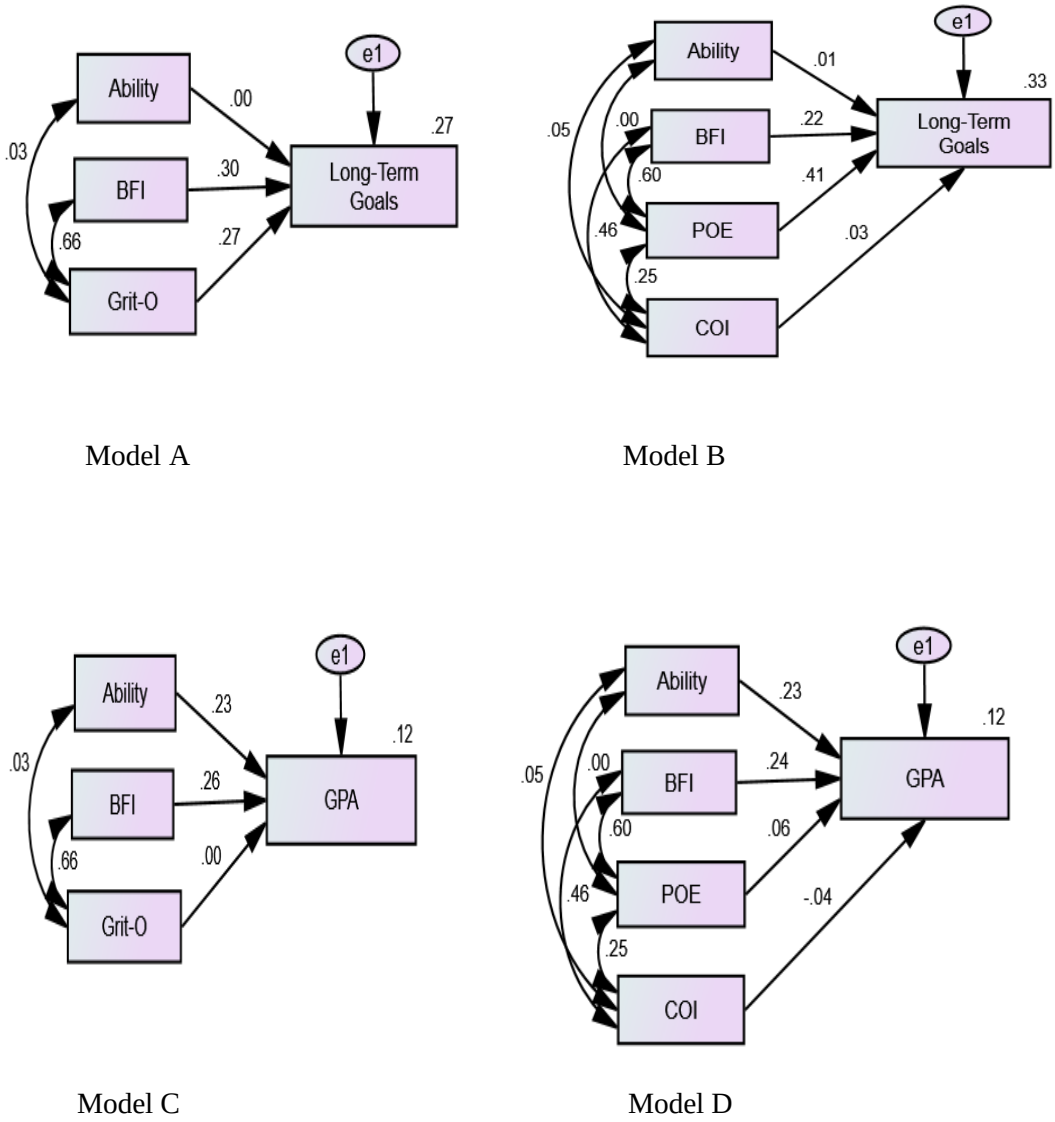

Figure 4. Four different path analysis models testing the predictive validity of grit.

Research Question 3: Correlation Analysis

To what extent does grit correlate with conscientiousness among college students?

The third research question investigated the relationship between grit and conscientiousness among college students. To address the third research question, a series of correlation analyses was run based on the scale scores associated with different measures of grit and conscientiousness. Results from the correlation analyses are presented in Table 22, Table 23, Table 24, and Table 25.

Table 22 presents the correlation coefficients based on the scale scores for Grit-O, Grit-C (POE plus six positive worded COI items), BFI conscientiousness, 10-item IPIP conscientiousness, and AB5C-IPIP conscientiousness. All of the observed correlation coefficients were statistically significant at the .01 level (two-tailed), indicating a strong positive relationship between grit and conscientiousness. These results suggest that grit is hardly distinguishable from conscientiousness.

Table 23 presents the correlation coefficients based on the scale scores for POE, COI, Goal Attainment, Focus, Perseverance, PCOI, Goal Commitment, IPP, Industriousness (6FPQ), Harmonious Passion, Obsessive Passion, BFI conscientiousness, 10-item conscientiousness, and AB5C-IPIP conscientiousness. Observed correlation coefficients greater than .15 were statistically significant at the .01 level (two-tailed), and greater than .12 were statistically significant at the .05 level (two-tailed), indicating a moderate to strong positive relationship among dimensions of grit and conscientiousness, and small positive relationship between harmonious passion and conscientiousness. These results suggest that the perseverance of effort dimension of grit is hardly distinguishable from conscientiousness.

Table 22

Observed Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, and AB5C-IPIP

Scale Score	1	2	3	4
1. Grit-O				
2. Grit-C	.79			
3. BFI Conscientiousness	.66	.63		
4. 10-item IPIP Conscientiousness	.62	.61	.78	
5. AB5C-IPIP Conscientiousness	.51	.47	.73	.72

Note: N = 299. Refer to Appendix E for observed correlations reported in 3-decimal.

Table 23

Observed Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, AB5C-IPIP, and Comparable Measures of Grit

Scale Score	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Perseverance of Effort (POE)													
2. Consistency of Interest (COI)	.25												
3. Goal Attainment	.77	.36											
4. Focus	.51	.49	.56										
5. Perseverance	.89	.17	.48	.45									
6. Positively-Worded COI (PCOI)	.59	.50	.74	.95	.49								
7. Goal Commitment	.43	.37	.35	.23	.42	.30							
8. Industry/Perseverance/Persistence (IPP)	.64	.42	.58	.41	.56	.49	.54						
9. Industriousness (6FPQ)	.44	.20	.36	.18	.39	.24	.42	.41					
10. Harmonious Passion	.28	-.02	.25	.22	.27	.26	.13	.28	.16				
11. Obsessive Passion	.09	-.11	.16	.17	.05	.19	-.07	.02	-.02	.47			
12. BFI Conscientiousness	.60	.46	.52	.47	.55	.53	.51	.71	.52	.28	.08		
13. 10-item IPIP Conscientiousness	.58	.41	.56	.44	.51	.52	.55	.67	.48	.21	.01	.78	
14. AB5C-IPIP Conscientiousness	.44	.37	.42	.35	.38	.40	.51	.68	.45	.23	-.08	.73	.72

Note: N = 299. Refer to Appendix F for observed correlations reported in 3-decimal.

Table 24

Alphas (α) and True Score Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, and AB5C-IPIP

Scale Score	*α*	1	2	3	4
1. Grit-O	.73				
2. Grit-C	.83	1.01			
3. BFI Conscientiousness	.79	.87	.78		
4. 10-item IPIP Conscientiousness	.81	.81	.74	.97	
5. AB5C-IPIP Conscientiousness	.82	.66	.57	1.15	1.12

Note: N = 299.

Table 25

Alphas (α) and True Score Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, AB5C-IPIP, and Comparable Measures of Grit

Scale Score	*α*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Perseverance of Effort (POE)	.66													
2. Consistency of Interest (COI)	.72	.36												
3. Goal Attainment	.75	1.09	.49											
4. Focus	.73	.73	.68	.76										
5. Perseverance	.60	1.41	.26	.72	.68									
6. Positively-Worded COI (PCOI)	.81	.81	.65	.95	1.23	.70								
7. Goal Commitment	.83	.58	.48	.44	.29	.59	.37							
8. Industry/Perseverance/Persistence (IPP)	.76	.90	.57	.77	.55	.83	.62	.68						
9. Industriousness (6FPQ)	.71	.64	.28	.49	.25	.60	.32	.55	.56					
10. Harmonious Passion	.89	.36	-.02	.31	.27	.37	.31	.15	.34	.20				
11. Obsessive Passion	.93	.11	-.13	.19	.21	.07	.22	-.08	.02	-.02	.52			
12. BFI Conscientiousness	.79	.83	.61	.68	.62	.80	.66	.63	.92	.69	.33	.09		
13. 10-item IPIP Conscientiousness	.81	.79	.54	.72	.57	.73	.64	.67	.85	.63	.25	.01	.97	
14. AB5C-IPIP Conscientiousness	.82	.60	.48	.54	.45	.54	.49	.62	.86	.59	.27	-.09	.91	.88

Note: N = 299.

Table 24 and Table 25 report the true score correlation; that is, the observed correlation coefficients were corrected for the *attenuation* resulting from measurement error. Observed correlations are unattenuated by unreliabilities. Therefore, some researchers suggest that observed correlations are corrected (Hunter & Schmidt, 1991). This is done by dividing the correlation coefficient by the square root of the product of the two scores' reliabilities (Glass & Hopkins, 1996). When this is done, it is possible to generate correlation coefficients greater than 1 because the correlation and the two reliabilities are estimates themselves (Muchinsky, 1996). These results indicate a strong to very strong positive relationship between grit and conscientiousness, and a strong positive relationship among the dimensions of grit and conscientiousness, and provide additional support that grit and its perseverance of effort dimension are hardly distinguishable from conscientiousness.

Research Question 4: Confirmatory Factor Analysis

To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit relate to each other among college students?

The fourth research question investigated the relationship among interest, self-efficacy, locus of control, conscientiousness, and grit. Using SPSS 23 with AMOS, correlation analysis based on CFA was conducted. The CFA was based on a hypothesized factor analyses structure relating the scale scores to their constructs. The CFA model was then tested for goodness-of-fit, followed by reviewing and reporting on the correlation coefficients among each of the latent constructs. The initial CFA model fit based on the hypothesized structure was deemed unsatisfactory (e.g., RMSEA greater than .10; Brown, 2015). Although Pedhazur (1997) cautions against using fit indices for

model modifications, a review of the covariance error matrix led to a few errors being correlated which allowed for improved fit for the CFA model. The resulting CFA model is presented in Figure 5.

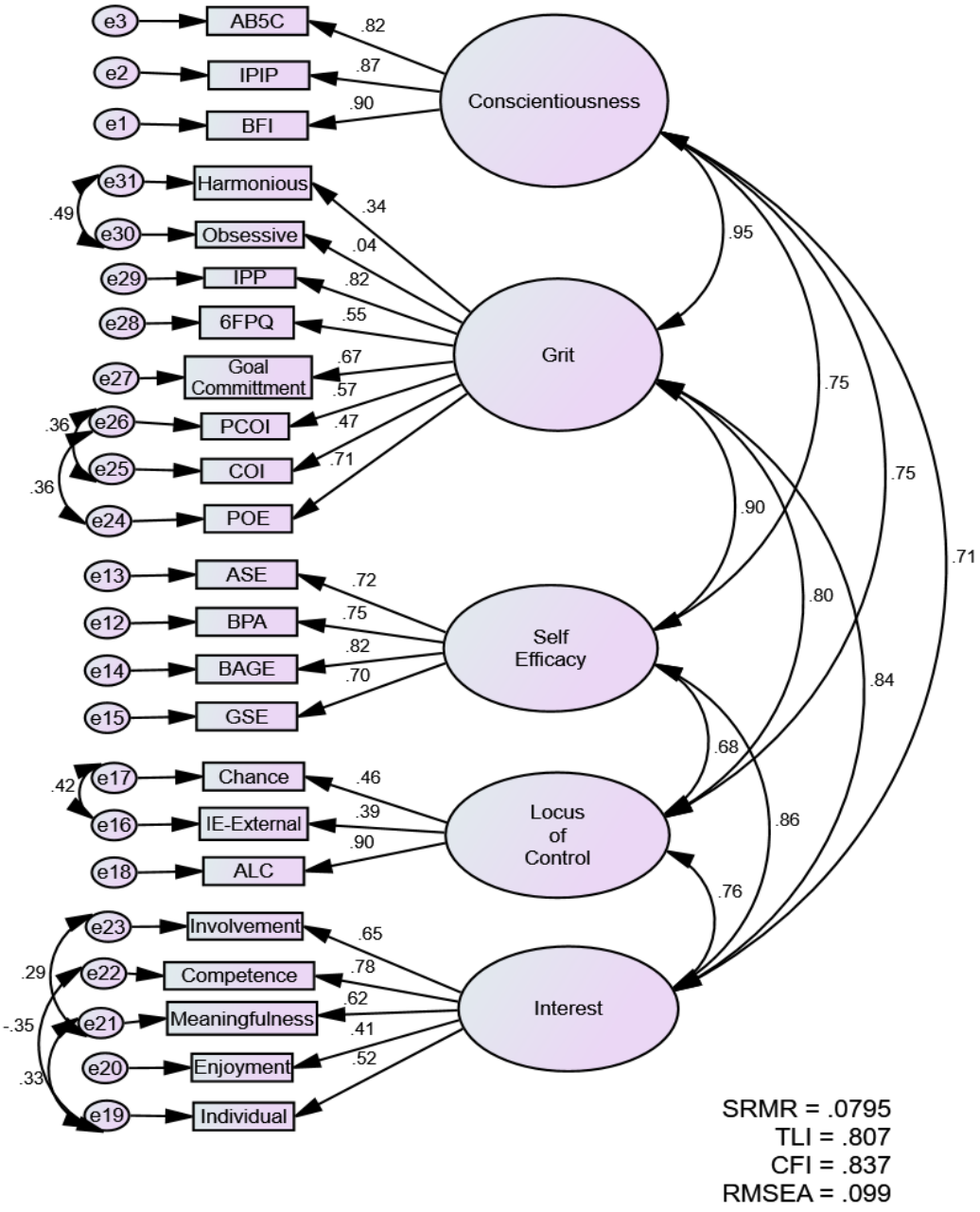

Figure 5. CFA model based on the hypothesized factor analyses structure relating the scale scores to their respective constructs.

As shown in Figure 5, the CFA's correlation coefficients based on the latent constructs are also presented in Table 26. The correlation coefficients among all five latent constructs indicate strong to very strong positive relationships. These results re-affirm that grit is not only hardly distinguishable from conscientiousness, grit is hardly distinguishable from interest, self-efficacy, and locus of control. It is possible that the magnitude of these correlation coefficients could cause a problem in addressing the final research question.

Table 26
Correlations Coefficients Among Latent Constructs Based on Relating Scale Scores to their Pre-Defined Constructs

Latent Construct	1	2	3	4
1. Conscientiousness				
2. Grit	.95			
3. Self-Efficacy	.75	.90		
4. Locus of Control	.75	.80	.68	
5. Interest	.71	.84	.86	.76

Note: N = 299.

Research Question 5: Structural Equation Modeling

To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit predict college success?

The final research question investigated the potential antecedents of grit and the predictive validity of grit on college success. Using SPSS 23 with AMOS, the proposed structural equation model was tested. The model was based on the hypothesized structure relating the scale scores to their constructs. The model was first tested for goodness-of-fit, followed by reviewing and reporting the direct and indirect effects, and statistical significance.

Review of the modification indices for the proposed model led to a few errors being correlated which allowed for improved fit. Results from the goodness-of-fit tests suggest a mediocre fit (e.g., RMSEA in the range of 0.08 – 0.10; Brown, 2015). Figure 6 presents the proposed structural equation model based on the hypothesized factor analyses structure.

An examination of Figure 6 revealed a number of standardized path coefficients that were greater than 1. Standardized path coefficients greater than 1 suggest a high degree of multicollinearity (Brown, 2015; Deegan, 1978). With multicollinearity, the parameter estimates (coefficients) become unstable, making it difficult to interpret the results (Grewall, Cote, & Baumgartner, 2004). The high correlations among the latent constructs that were found in addressing Research Question 4 did, in fact, present a problem. Therefore, it was decided to check the construct validity of the measurement model. This was done by conducting an EFA using varimax rotation on all 28 scale scores. Table 27 presents the latent constructs' factor loadings based on EFA using varimax rotation on all 28 scale scores.

The results from the EFA revealed seven latent constructs: conscientiousness, interest, self-efficacy, locus of control, passion, subjective college success (SCS), and objective college success (OCS). The majority of the scale scores associated with grit had been factored into conscientiousness, and a new construct, passion, emerged. It was unclear how to use passion in the new structural equation model as it was not part of the original hypothesized model as shown in Figure 3; therefore, the passion construct was not used in testing the new structural equation model.

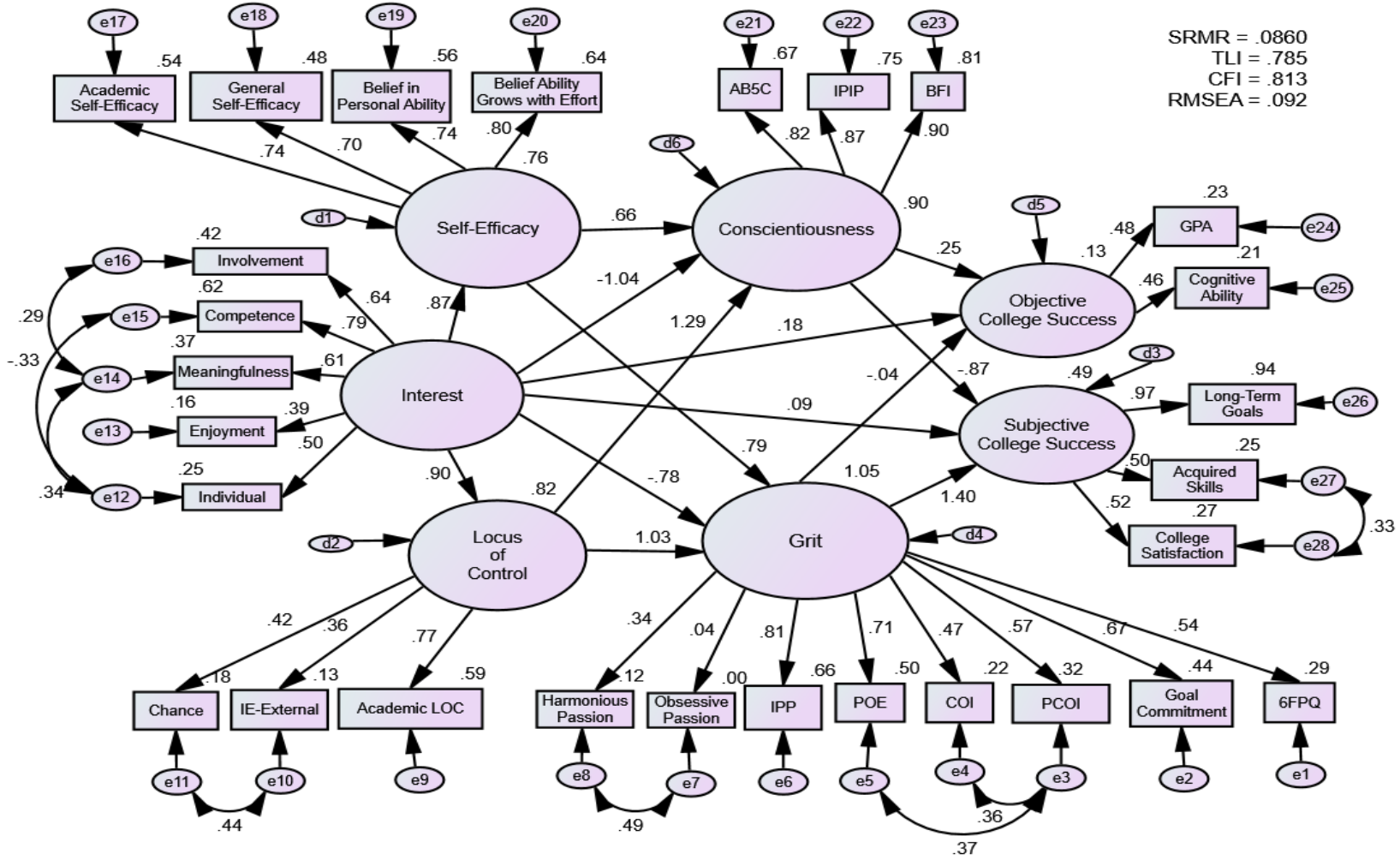

Figure 6. The proposed structural equation model based on the hypothesized factor analyses structure.

Table 27

Latent Constructs' Factor Loadings Based on Exploratory Factor Analysis with Varimax Rotation of all 28 Scale Scores

Scale	Conscientiousness	Self-Efficacy	Interest	Locus of Control	Passion	SCS	OCS
Big Five Conscientiousness (BFI)	.84						
10-item IPIP Conscientiousness	.79						
AB5C-IPIP Conscientiousness	.73						
Industry/Perseverance/Persistence (IPP)	.65	.40					
Positively-Worded COI (PCOI)	.61					.31	-.36
Academic Self-Efficacy (ASE)	.56	.32					.36
Perseverance of Effort (POE)	.54	.49					
Academic Locus of Control (ALC)	.54			.40			
Consistency of Interest (COI)	.52			.40			
Industriousness (6FPQ)	.48						
Competence	.44	.40		.32			.32
Belief in Personal Ability (BPA)	.32	.74					
Belief Ability Grows with Effort (BAGE)	.33	.66					
General Self-Efficacy (GSE)	.36	.61					
Meaningfulness			.77				
Individual Interest			.61			.33	
Involvement		.34	.54				
Chance				.71			
IE-External				.63			
Goal Commitment	.43		.37	.46			
Harmonious Passion					.88		
Interest/Enjoyment			.32		.62		
Obsessive Passion					.52		
College Satisfaction						.65	
Long-Term College Goals	.31	.41				.63	
Acquired Skills			.32			.57	
GPA							.53
Cognitive Ability							.31

Note: N = 299. Coefficients < .30 were suppressed.

The new structural equation model was first tested for goodness-of-fit, followed by reviewing and reporting their direct and indirect effects, and their statistical significance. Review of the modification indices suggested a better fit would be obtained by correlating a few errors. Results from the goodness-of-fit tests for the new model suggest mediocre fit. Figure 7 presents the new structural equation model. The results are also presented in Table 28. Table 28 reports the standardized direct effects and indirect effects for the new structural equation model based on the construct validity measurement structure.

Table 28

Standardized Direct Effects and Indirect Effects for the New Structural Equation Model Based on the Construct Validity Measurement Structure

Latent Construct Relationship	Total	Direct	Indirect
Interest → Locus of Control	.65	.65	
Interest → Self-Efficacy	.64	.64	
Interest → Conscientiousness	.61	-.02	.63
Interest → SCS	.68	.50	.18
Interest → OCS	.13	-.15	.28
Locus of Control → Conscientiousness	.42	.42	
Locus of Control → SCS	.12		.12
Locus of Control → OCS	.19		.19
Self-Efficacy → Conscientiousness	.56	.56	
Self-Efficacy → SCS	.16		.16
Self-Efficacy → OCS	.26		.26
Conscientiousness → SCS	.28	.28	
Conscientiousness → OCS	.46	.46	

Note: N = 299. Bootstrap sample size = 2,000, and statistical significance was set at the .05 level.

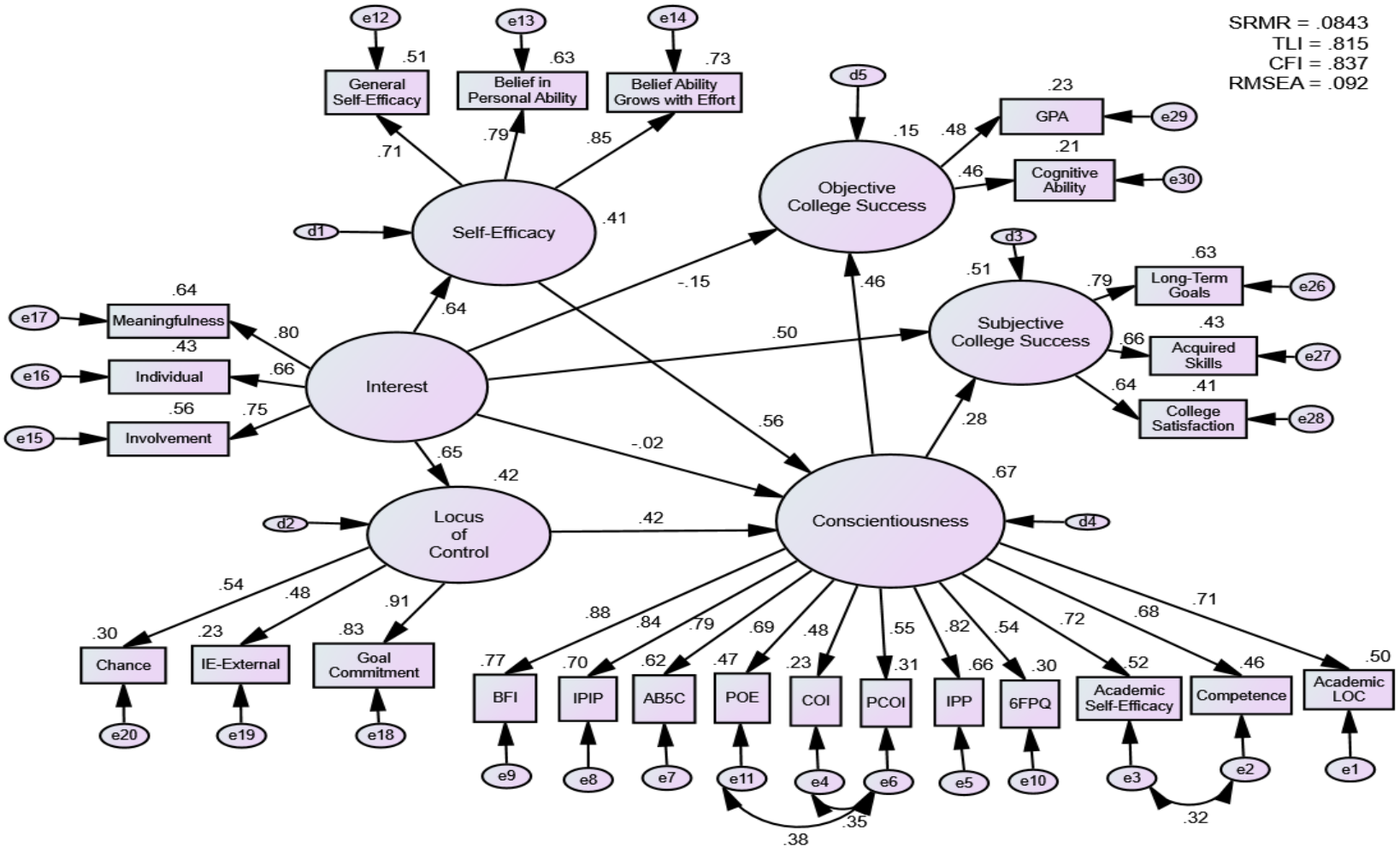

Figure 7. The new structural equation model based on the construct validity measurement structure.

Results from the new structural equation model revealed that interest had a statistically significant positive direct effect on self-efficacy, locus of control, and subjective college success ($p < .01$), but not on conscientiousness and objective college success ($p = .85$ and $p = .30$, respectively). Interest had a statistically positive indirect effect on both subjective college success ($p < .05$), and objective college success ($p < .01$) through self-efficacy, locus of control, and conscientiousness. Self-efficacy and locus of control had a statistically significant positive direct effect on conscientiousness ($p < .01$). Interest also had a statistically significant positive indirect effect on conscientiousness through self- efficacy and locus of control ($p < .01$). Interest, self-efficacy, and locus of control had a statistically indirect effect on both subjective college success ($p < .05$), and objective college success through conscientiousness ($p < .01$). Conscientiousness had a statistically significant positive direct effect on both subjective college success and objective college success ($p < .01$). This analysis suggests that interest, self-efficacy, and locus of control contribute to conscientiousness, and conscientiousness leads to success.

Summary

This study examined the relationship between grit, interest, self-efficacy, locus of control, conscientiousness, and college success using a variety of multivariate statistical analyses. The statistical analyses included both exploratory and confirmatory factor analysis, correlation analysis, and structural equation modeling techniques.

First, independent of extraction method, the series of factor analyses based on four sources of evidence revealed four different factor structures among college students. The 12-item scores from Duckworth and colleagues' (2007) revealed a two-factor solution that explained 42.84% of the total variance. The six positively-worded

consistency of interest item scores (PCOI) with Duckworth and colleagues' six perseverance of effort items revealed a three-factor solution that explained 56.22% of the total variance. The 14-item scores from Vallerand and colleagues' (2003) Passion Scale with the 12-item scores from Duckworth and colleagues' Grit-O scale revealed a four-factor solution that explained 56.64% of the total variance. Comparable measures of grit revealed a two-factor solution that explained 59.28% of the total variance. Although these results found support for Duckworth and colleagues' two-factor structure of grit, the fact that the six positively-worded consistency of interest items with Duckworth and colleagues' six POE items produced a three-factor structure does not rule out the possibility that Duckworth and colleagues' Grit-O instrument is confounded. The findings from these results also suggest that grit is not comprised of passion.

Second, the results from four different path analysis models revealed conscientiousness as the sole predictor of both GPA and long-term college goals. Conscientiousness was an even better predictor of college success than cognitive ability – not grit. Cognitive ability predicted GPA, and grit and its perseverance of effort dimension only predicted long-term college goals. These results suggest that conscientiousness has instrumental predictive validity of college success over and beyond cognitive ability and grit – and not grit.

Third, the results based on the correlation analyses showed that there was a statistically significant strong positive relationship between grit and conscientiousness. The resulting Pearson correlation coefficients between the scale scores associated to grit and conscientiousness reported large correlations, and the perseverance of effort dimension of grit and conscientiousness reported moderate to large correlations (Cohen,

1992). The observed scores' shared variance between grit, as measured Duckworth and colleagues' (2007) Grit-O scale, and conscientiousness ranged from 26% to 43%, and between the perseverance of effort dimension of grit and conscientiousness the shared variance ranged from 19% to 36%. The true scores' shared variance between grit, as measured by Duckworth and colleagues' Grit-O scale, and conscientiousness ranged from 43% to 76%, and between the perseverance of effort dimension of grit and conscientiousness the shared variance ranged from 36% to 69%. To a great extent, these results (e.g., moderate to large correlations) hold true for the comparable measures of grit – the exception being passion. These results suggest that grit is hardly distinguishable from conscientiousness.

Fourth, the results based on the correlation analysis among the latent constructs showed that there was a statistically significant "very" strong positive relationship among all of the independent variables. The resulting Pearson correlation coefficients between all of the five latent constructs reported large correlations (Cohen, 1992). The shared variance among these latent constructs ranged from 46% to 90%; the 90% shared variance was between grit and conscientiousness. The findings from these results provide additional support that grit is hardly distinguishable from conscientiousness.

Finally, the proposed structural equation model based on the hypothesized structure relating the scale scores to their construct revealed a high degree of multicollinearity, making it difficult to interpret the results. EFA using varimax rotation was then conducted on all 28 scale scores to check the construct validity of the measurement model. The results from the EFA produced a new structural equation model. In the new model, grit was not defined. The majority of the scale scores

associated with grit had been factored into conscientiousness. Results from the new structural equation model revealed that conscientiousness had a direct positive effect on both subjective college success and objective college success. Interest was found to have a statistically significant positive direct effect on subjective college success, but not objective college success. Self-efficacy and locus of control was found to have a statistically significant positive indirect effect on subjective college success and objective college success through conscientiousness. In the end, the dominant predictor of both subjective college success and objective college success was conscientiousness.

CHAPTER V

DISCUSSION

This study investigated the construct validity of grit using convergent, discriminant, and predictive validity principles. First, the factor structure of grit was examined using exploratory factor analysis based on four sources of evidence. Next, a variety of multivariate analyses, including confirmatory factor analysis and structural equation modeling techniques, tested whether grit is a better predictor of college success than cognitive ability and conscientiousness, and the degree to which (a) grit is related to conscientiousness, (b) grit is related to interest, self-efficacy, locus of control, and conscientiousness, and (c) interest, self-efficacy, locus of control, conscientiousness, and grit predict college success. In doing so, this study extended previous research on the construct validity of grit by (a) taking into account different measures of conscientiousness and ostensibly comparable measures of grit, and (b) using a number of statistical analyses techniques. This closing chapter summarizes the study, followed by a discussion of the main findings, limitations of the study, and relating the findings to the literature in light of the limitations. The chapter ends with conclusions, and implications for research and practice.

Summary of Study

Growing research has suggested that non-cognitive variables are related to college success (Andretta et al., 2014; Duckworth et al., 2011; Dumfart & Neubauer, 2016), and that a particular non-cognitive variable, called grit, contributes more towards success than conscientiousness and IQ (Duckworth, 2013; Duckworth et al., 2007). Proponents of grit have asserted that grit is highly predictive of success and performance, and that grit

provides information about individuals that is meaningfully distinct from conscientiousness (Duckworth et al., 2007; Duckworth & Quinn, 2009). Grit is not only the "hot" buzzword in education; parents, government agencies, and the popular press are talking about grit.

In 2007, Duckworth and her colleagues originally conceptualized grit within the personality theory (e.g., John & Srivastava, 1999), describing grit as "perseverance and passion for long-term goals" (p. 1087). They argued that grit, a higher-order construct comprised of a perseverance of effort dimension and a consistency of interest dimension, predicts success - and even better predictor of success than cognitive ability. Since then, grit has received widespread attention.

The majority of the current research on grit has focused on its construct and predictive validity (Abuhassàn & Bates, 2015; Bowman et al., 2015; Credé et al., 2016; Duckworth & Gross, 2014; Duckworth et al., 2007; Duckworth & Quinn, 2009; Ivcevic & Brackett, 2014; Kelly et al., 2014). Other than the links between growth mindset (Dewck, 2010), and deliberate practice (Duckworth et al., 2011; Duckworth et al., 2007), the antecedents of grit are less explored. Only within the last three years have researchers decided to investigate the plausible antecedents of grit.

More recently, and what attracts many educators to grit, is that grit can apparently be taught (Duckworth, 2016; Fitzgerald & Laurian-Fitzgerald, 2016). In the first half of 2016, Duckworth published a book – *Grit: The Power of Passion and Perseverance* – in which she stated "grit predicts success" in a number of domains (p. 12). She indicated that grit is comprised of four psychological assets: interest, practice, purpose, and hope. She wrote that individuals can develop and increase their grit by first finding their interest

- something that they "intrinsically enjoy doing" (p. 91). Next, they would set goals and set out on a course of deliberate practice. She continued, stating that individuals must also find a purpose in order to maintain that interest. Their purpose and interest must have both a personal connection and a connection to the well-being of others. And from the beginning to the very end, individuals must sustain hope (Duckworth, 2016). Yet, based on a review of the literature, there is no empirical support that connects interest with grit.

At the same time, grit has been criticized as hardly being distinguishable from conscientiousness (Credé et al., 2016; Muenks et al., 2016; Rimfeld et al., 2016). Conscientiousness is one of the Big Five personality traits that includes a number of lower-level traits, such as self-control and perseverance (MacCann et al., 2009; Roberts et al., 2005). The predictive validity of grit has also been questioned; that is, research has found the perseverance of effort dimension of grit rather than the consistency of interest dimension of grit as being the most important predictor of success (Abuhassàn & Bates, 2015; Bowman et al., 2015; Kelly et al., 2014). All of these issues are associated with the construct validity of grit.

Despite these issues, the popularity of grit has continued to grow. Grit has been investigated from a number of theoretical lens. Educators are attracted to grit because grit is a malleable skill. Schools are being challenged to promote grit (U.S. Department of Education, 2013). Yet, if grit is hardly distinguishable from conscientiousness (a personality trait), and its predictive validity is problematic, should there be educational programs in place to promote grit, a personality trait? In other words, should educators be promoting grit, or are there other "non-cognitive" skills that warrant attention?

In order to answer these questions and provide additional evidence on the construct validity of grit, this study drew upon a theoretical framework that incorporates Deci and Ryan's (1985) self-determination theory, the self-efficacy component of Albert Bandura's (1986) social cognitive theory, and Rotter's (1966) locus of control theory. Deci and Ryan's self-determination theory provides a framework for the study of human motivation and personality. Self-efficacy theory recognizes the diversity of human capabilities (Bandura, 1977), and locus of control serves as a motivation determinant (Rotter, 1966). Each of these theories share motivational commonalities. Investigating grit though the lens of motivation and its potential antecedents may help shed light on what initiates grit, what differentiates grit from conscientiousness, and what could be the reason for the conflicting results with the predictive power of grit.

Using a correlational design, this study examined the relationships among six constructs: grit, interest, self-efficacy, locus of control, conscientiousness, and college success. A total of 299 college students participated in this study. There were a total of 15 assessment times; 7 took place during class time, each taking no longer than 60 minutes. The 222-item instrument was comprised of 8 demographic items and 28 scales that measured the six constructs. The basic strategy used in this study was factor analysis.

With the primary purpose of investigating the construct validity of grit, the following research questions were asked:

1. What is the factor structure of grit among college students?
2. Does grit predict college success over and beyond cognitive ability and conscientiousness?

3. To what extent does grit correlate with conscientiousness among college students?
4. To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit relate to each other among college students?
5. To what extent do interest, self-efficacy, locus of control, conscientiousness, and grit predict college success?

Summary of Findings

This study used a number of different multivariate statistical analyses that included both exploratory factor analysis, confirmatory factor analysis, correlation analysis, and structural equation modeling techniques. The statistical analyses addressed the five research questions focused on investigating the construct validity of grit. SPSS 23 with AMOS was used to answer the five research questions.

The first research question investigated the factor structure of grit among college students based on four sources of evidence. Independent of extraction methods, the resulting series of factor analyses based on these four sources of evidence revealed four different factor structures among college students. The first source of evidence based on the 12-item scores from Duckworth and colleagues' (2007) Grit-O scale revealed two factors: (a) perseverance of effort and (b) consistency of interest. The two-factor structure explained 42.84% of the variance in grit scores. The second source of evidence based on the six positively-worded consistency of interest item scores (PCOI) with Duckworth and colleagues' six perseverance of effort items revealed three factors: (a) goal attainment, (b) focus, and (c) perseverance. The three-factor structure explained 56.22% of the variance in grit scores. The third source of evidence based on the 14-item

scores from Vallerand and colleagues' (2003) Passion scale with the 12-item scores from Duckworth and colleagues' Grit-O scale revealed four factors: (a) obsessive passion, (b) harmonious passion, (c) consistency of interest, and (d) perseverance of effort. The four-factor structure explained 56.64% of the variance in grit scores. The fourth source of evidence based on the different measures of grit characterized by the scale scores associated with: (a) the two dimensions of Duckworth and colleagues' Grit-O scale, (b) Peterson and Seligman's (2004) IPP scale, (c) the PCOI scale created by the author, (d) the 6FPQ Industriousness scale (Jackson et al., 2000), (e) Vallerand and colleagues' Harmonious Passion and Obsessive Passion subscales, and (f) Hollenbeck and colleagues' (1989) Goal Commitment scale revealed two factors: (a) grit and (b) passion. The two-factor structure explained 59.28% of the variance in grit scores.

The second research question investigated the predictive validity of grit on college success over and beyond cognitive ability and conscientiousness. The results from four different path analysis models showed that cognitive ability predicted GPA, and grit and its perseverance of effort dimension predicted long-term goals. Conscientiousness was found to be the sole predictor of both GPA and long-term college goals. Conscientiousness was an even better predictor of college success than cognitive ability – not grit.

The third research question investigated the relationship between grit and conscientiousness among college students. A series of correlation analyses was run based on the scale scores associated with different measures of grit and conscientiousness. The results showed that there was a statistically significant positive relationship between grit and conscientiousness. The resulting Pearson correlation

coefficients between the scale scores associated to grit and conscientiousness, and the perseverance of effort dimension of grit and conscientiousness reported large correlations (Cohen, 1992). The observed scores' shared variance between grit, as measured Duckworth and colleagues' (2007) Grit-O scale, and conscientiousness ranged from 26% to 43%, and between the perseverance of effort dimension of grit and conscientiousness the shared variance ranged from 19% to 36%. The true scores' shared variance between grit, as measured by Duckworth and colleagues' Grit-O scale, and conscientiousness ranged from 43% to 76%, and between the perseverance of effort dimension of grit and conscientiousness the shared variance ranged from 36% to 69%. To a great extent, these results (e.g., moderate to large correlations) held true for the comparable measures of grit – the exception being passion.

The fourth research question investigated the relationship among interest, self-efficacy, locus of control, conscientiousness, and grit. The resulting CFA's Pearson correlation coefficients were based on a hypothesized factor analyses structure relating the scale scores to their constructs. The results showed that there was a statistically significant "very" strong positive relationship among all five latent constructs: interest, self-efficacy, locus of control, conscientiousness, and grit. The resulting Pearson correlation coefficients among all five latent constructs reported large correlations (Cohen, 1992). The shared variance among these latent constructs ranged from 46% to 90%; the 90% shared variance was between grit and conscientiousness.

The final research question investigated the potential antecedents of grit and the predictive validity of grit on college success. The proposed model based on the hypothesized factor analyses structure relating the scale scores to their construct revealed

a high degree of multicollinearity, making it difficult to interpret the results. EFA using varimax rotation was then conducted on all 28 scale scores to check the construct validity of the measurement model. The results from the EFA produced a new structural equation model. In the new model, grit was not defined. The majority of the scale scores associated with grit had been factored into conscientiousness.

Results from the new structural equation model revealed that conscientiousness had a positive direct effect on both subjective college success and objective college success. Interest was found to have a statistically significant positive direct effect on subjective college success, but not objective college success. Self-efficacy and locus of control was found to have a statistically significant positive indirect effect on subjective college success and objective college success through conscientiousness. In the end, the dominant predictor of both subjective college success and objective college success was conscientiousness.

Limitations

This study breaks from previous research on grit in a number of ways by: (a) taking into account different measures of conscientiousness, and using ostensibly comparable measures of grit, (b) examining potential antecedents of grit, (c) including different measures of college success, and (d) using a number of statistical analyses, including confirmatory factor analysis and structural equation modeling techniques. Although the different multivariate statistical analyses are unique contributions to this study, it does present a number of limitations. This section will examine the four central limitations of the present study, including the sampling procedure and the nature of the sample, the self-report nature of all the major variables, the set of scales, and the design.

The first limitation involves the sampling procedure and the nature of the sample used in this study. A convenience sample was used, and therefore, the data set was not based on a random sample in which each student had an equal chance of being selected for this study. The sample also consisted of college students. College students are young adults and represent only a segment of the general population. Thirty-nine percent of the students were externally motivated to participate in this study; that is, they received extra credit from their professors. Almost half of the students were in their first year of college, and sixty percent were female college students. Because of the nature of the sample, and more so that a random sample was not used, it is difficult to generalize these findings over a broader population.

The second limitation involves the self-report nature of all the major variables, including students' self-report of their GPA, long-term college goals, and acquired skills. A number of these measures are vulnerable to social desirability bias. Social desirability bias refers to the fact that in self-reports, respondents will often choose responses to present themselves in the best possible light (Thorndike, 2005). Although students were told that the results are confidential, some participants may still be more motivated than others by the desire to look good. Students were also told that they can check their GPA by accessing their student record via their school's website. A majority of students did validate their GPA in this manner. Therefore, the majority of students' reported GPA may not be subject to social desirability bias. However, students' responses to acquired skills and long-term goals may be considered questionable because almost half of the sample consisted of first-year students. Conclusions could be strengthened by use of college success indicators that are more direct (e.g., official school records) instead of

self-report GPA and other indicators. Using a multi-method, multisource approach to measurement is also preferable, which would also address the concern of shared method variance.

The third limitation involves the set of scales used in this study. That is, a different set of scales may have produced different results. Now, the majority of scales used in this study had good reliability. A few of the scales have been used in other studies on grit. Most notably, the conscientiousness subscale of the BFI (John & Srivastava, 1999) not only showed good reliability, it has been used the most in studies that have examined the relationship between grit and conscientiousness. Therefore, it is not likely that there would be different results based on these scales. However, there were two scales that reported low reliability: the IE-4 Internal subscale (α = .37), and the cognitive ability test (α = .54). The IE-4 Internal subscale was not used in the analyses and in reporting the results from this study. The cognitive ability test was used. It is quite possible that there would be different results based on this scale. Plus, the cognitive ability test is a quantitative ability measure. Participants could have stronger verbal reasoning ability versus working with numbers.

An additional concern connected to the set of scales used in this study ties back to the hypothesized factor analyses structure. It was hypothesized that the scales used in this study would be associated to the constructs that they measure. However, in this study, because of the multicollinearity issue presented in the proposed structural equation model, the researcher had to test a new model based on the construct validity of the measurement structure. Interestingly enough, grit did not emerge as a construct based on

the new structural equation model. It is possible that there could be different results based on different tests or scales.

The fourth limitation involves this study's design. This study used a correlational design examining the relationship among six constructs: grit, interest, self-efficacy, locus of control, conscientiousness, and college success. Correlation does not equate to causation. Structural equation modeling is a model-testing procedure (Bollen & Noble, 2011; Keith, 2015). Although the term "cause" or the phrase "casual modeling" has been used with structural equation modeling, many assumptions must be met for structural equation modeling to provide adequate evidence for causation.

Discussion of Findings

The findings from this study extend previous research on the construct validity of grit and help shed light on what predicts college success. This section situates the findings of the present study within the broader conversation around the construct validity of grit, taking into account Duckworth and her colleagues' (2007) arguments and previous research, and discusses those findings in relation to: (a) the factor structure of grit, (b) whether grit is a better predictor of college success than cognitive ability and conscientiousness? (c) grit's relation to conscientiousness, (d) grit's relation to interest, self-efficacy, locus of control, and conscientiousness, and (e) the extent grit and other motivational constructs predict success.

Factor Structure of Grit. Much of the existing literature has recognized grit as a two-factor structure comprised of perseverance of effort and consistency of interest (Abuhassàn & Bates, 2015; Credé et al., 2016; Duckworth & Gross, 2014; Duckworth et al., 2007; Duckworth & Quinn, 2009; Ivcevic & Brackett, 2014). The two-factor

structure of grit emphasizes long-term stamina where effort and interest are maintained over several years (Kelly et al., 2014). As a matter of fact, grit is often described as "perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087).

Even though researchers have recognized that the six consistency of interest items are negatively worded (Bowman et al. 2015), consideration has not been given to the possibility that the two-factor structure may be a result of Duckworth and colleagues' (2007) instrument being confounded. That is, the two-factor structure may be a result of all the positive items and all negative items rather than the two constructs thought to underline responses to the items. People may respond to negative and positive items differently, and therefore, the instrument could be confounded (Vogt & Johnson, 2011). In addition, proponents of grit have referred to the consistency of interest dimension of grit as being associated with focus, undying commitment, and passion (Duckworth, 2016; Duckworth et al., 2007). Indeed, Duckworth has referred to the consistency of interest as "the passion piece" of grit (Dahl, 2016). In the present study, these considerations were addressed by investigating the factor structure of grit based on four sources of evidence.

The first source of evidence resulted in a two-factor structure. That is, this study found support of the two-factor structure with the 12-item scores from Duckworth and colleagues' (2007) Grit-O scale (e.g., six positive worded perseverance of effort items with six negatively-worded consistency of interest items). However, the second source of evidence that was based on the six positively-worded consistency of interest items that were created by the author with Duckworth and colleagues' six positively-worded perseverance of effort items resulted in a three-factor structure. These findings suggest that the two-factor structure based on Duckworth and colleagues' Grit-O scale may be the

result of the instrument being confounded by having all perseverance of effort items worded positively, and consistency of interest items worded negatively. That is, when the six negatively-worded consistency of interest items were worded positively, a three-factor structure emerged: goal attainment, focus, and perseverance. This three-factor grit structure (namely, Grit-C) may be a more appropriate model to test as a measure of grit, given the three factor structure explained 56.22% of the variance in grit compared to the two-factor structure that explained 42.84% of the variance in grit. Both the Grit-C scale and the positively-worded consistency of interest sub-scale (PCOI) had also reported better reliability (α =.83 and α =.81, respectively).

Furthermore, the results from the last two factor analyses also reveal an interesting finding. Though the consistency of interest dimension of grit has been referred to as the "passion piece" of grit (Dahl, 2016), and grit even defined as "perseverance and *passion* for long-term goals," (Duckworth et al., 2007, p. 1087), the later two factor analyses' results indicate otherwise. The latter two factor analyses included item scores and sub-scales that measured passion. That is, the last two factor analyses were based on the 14-item scores from Vallerand and colleagues' (2003) Passion scale with the 12-item scores from Duckworth and colleagues' Grit-O scale, and different measures of grit that included Vallerand and colleagues' Harmonious Passion and Obsessive Passion sub-scales. The results from these last two factor analyses indicate that passion - comprised of harmonious passion and obsessive passion - is different from the consistency of interest dimension of grit. In other words, these findings suggest that grit is not comprised of passion.

Is Grit Better Than Cognitive Ability? Duckworth and her colleagues (2007) argue that grit has instrumental predictive validity of success over and beyond IQ and conscientiousness. Moreover, Duckworth (2013) claims that grit is as good or an even better predictor of success than cognitive ability. To address these claims, four different path analysis models were tested. Duckworth and colleagues' (2007) Grit-O scale and the conscientiousness subscale of the BFI (John & Srivastava, 1999) were used, along with two different college success measures: GPA and Long-Term College Goals. The results from the four path analysis models show that grit and its perseverance of effort dimension predicted long-term college goals, and cognitive ability predicted GPA. Conscientiousness was the sole predictor of both GPA and long-term college goals. Conscientiousness was an even better predictor of college success than cognitive ability – not grit.

Now, Duckworth and her colleagues (2007) did distinguish grit from other constructs by its focus on long-term outcomes. This study did recognize this distinction about grit, and included different measures of college success – in particular, long-term college goals. The results from the path analysis models did show that grit and its perseverance of effort dimension predicted long-term college goals. However, grit and its perseverance of effort dimension did not predict GPA. One possibility is that students have greater interest in meeting their long-term college goals and in obtaining confidence from their experience in college that enables them to succeed in life rather than focus on the grade. In other words, these students may not view the "grade" as being a long-term college goal. Grit's predictive validity on success may be limited to those goals that are considered important or meaningful to the individual.

These results also refute Duckworth and her colleagues' (2007) claim that grit is a better predictor of success over and beyond IQ (as measured by cognitive ability) and conscientiousness. Although grit and its perseverance of effort dimension did predict long-term college goals consistent with Duckworth and her colleagues' conceptualization of grit and the perseverance of effort dimension of grit predicted long-term goals more strongly than the consistency of interest dimension of grit another finding that is consistent with previous research (Abuhassàn & Bates, 2015; Bowman et al., 2015; Credé et al., 2016; Kelly et al., 2014), conscientiousness nonetheless demonstrated incremental predictive validity of college success measures over and beyond cognitive ability and grit.

These findings also raise an important caveat for researchers and educators to consider: should educators and government agencies direct their attention to promoting conscientiousness? For example, the results of this study suggest that perseverance of effort contributes to college success. That is, students working toward their long-term goals despite hardships are more likely to experience success in college. This perseverance of effort dimension of grit is closely linked to the achievement striving and self-discipline dimensions of conscientiousness. Thus, there may be dimensions of conscientiousness that may be amendable by direct instruction, and that does not necessarily "changes" the students' personalities. These "non-cognitive" skills are linked to the proactive aspect of conscientiousness; that is, related to achievement and commitment to work (Costa et al., 1991). Interestingly, these "non-cognitive" skills are also also associated to grit.

Grit's Relation to Conscientiousness. In their seminal work, Duckworth and her colleagues (2007) reported strong to moderate correlations between grit and Big Five conscientiousness (r = .77) and neuroticism (r = -.38), along with statistically significant relations with agreeableness, extraversion, and openness to experience (r = .24, .22, and .14, respectively) suggesting significant construct overlap, especially for conscientiousness. Since then, researchers have found similar results between grit and measures of conscientiousness (Abuhassàn & Bates, 2015; Credé et al., 2016; Ralph et al., 2017), and to a greater extent between the perseverance dimension of grit and measures of conscientiousness (Duckworth & Quinn, 2009; Fite et al., 2017; Meriac et al., 2015; Muenks et al., 2016; Rimfeld et al., 2016). These results have led researchers to see grit as nothing more than something old packaged as something new (Credé et al., 2016; Muenks et al., 2016; Rimfeld et al., 2016).

In this study, the relationship between grit and conscientiousness among college students based on a series of correlation analyses among different measures of grit and conscientiousness revealed a strong to very strong positive relationship between grit and conscientiousness. That is, the resulting Pearson correlation coefficients among the scale scores associated to grit and conscientiousness reported large correlations. The observed scores' shared variance between grit, as measured by Duckworth and colleagues' (2007) Grit-O scale, and conscientiousness ranged from 26% to 43%, and the true scores' shared variance ranged from 43% to 76%. These findings suggest that grit is hardly distinct from conscientiousness.

This study also found a moderate to strong positive relationship between the perseverance of effort dimension of grit and conscientiousness based on a series of

correlation analyses among different measures of grit and conscientiousness. That is, the resulting Pearson correlation coefficients among the scale scores associated to the perseverance of effort dimension of grit and conscientiousness reported moderate to large correlations. The observed scores' shared variance between the perseverance of effort dimension of grit, as measured by Duckworth and colleagues' (2007) Grit-O scale, and conscientiousness ranged from 19% to 26%, and the true scores' shared variance ranged from 36% to 69%. These findings suggest that the perseverance of effort dimension of grit is moderately distinct from conscientiousness.

Together, these findings not only lend support to previous studies that found grit to be hardly distinguishable from conscientiousness (Credé et al., 2016; Muenks et al., 2016; Rimfeld et al., 2016), they add to the current research taking into account different measures of grit and conscientiousness. The results from the correlation analyses found much overlap among different measures of grit and conscientiousness. Thus, these findings suggest a jangle fallacy (Block, 1995) may be operating; that is, different names are being given to similar constructs.

Grit's Relation to Similar Constructs. There are different ways to measure different aspects of construct validity (Messick, 1980; Smith, 2005; Trochim, 2006). One way to provide evidence for construct validity is to test whether "the measure in question is coherently related to different measures of the same construct as well as to other variables that it should relate to on theoretical grounds" (Messick, 1980, p. 1016). This is referred to as convergent validity. Another way is to test whether the measure in question is not related to measures of different constructs. This is known as discriminant validity (Messick, 1980). Discriminant validity refers to the degree to which measures of

different constructs are not related (Trochim, 2006), and the correlation coefficient is used to estimate the degree to which different measures are related or not related to each other (Smith, 2005). It is one of the ways in which the construct validity of grit was examined.

Grit's relation to similar constructs, namely, interest, self-efficacy, locus of control, and conscientiousness, was investigated based on confirmatory factor analysis. To be exact, a confirmatory factor analysis based on a hypothesized factor analyses structure relating the scale scores to their constructs was tested, and the resulting Pearson correlation coefficients among the latent constructs were analyzed. The results from the correlation analyses based on latent constructs associated to grit, interest, self-efficacy, locus of control, and conscientiousness revealed that grit is not only hardly distinguishable from conscientiousness, grit is hardly distinguishable from the remaining latent constructs. The resulting Pearson correlation coefficients among all of the five latent constructs reported large correlations (Cohen, 1992). The shared variance among these latent constructs ranged from 46% to 90%; the 90% shared variance was between grit and conscientiousness. These findings re-affirm a jangle fallacy (Block, 1995), and to the author's knowledge, the first study in investigating the discriminant validity of grit using multiple measures of grit and related constructs.

Interestingly, Muenks and her colleagues (2016) had noted that the jangle fallacy is not only a problem with grit, but likely to occur with constructs that are related to each other. They indicated that the jangle fallacy problem is two-fold: (a) researchers fail to define a given construct clearly and consistently, and (b) their measures do not fit its definition and include items reflecting other constructs. The findings from this study

support their conclusions. For instance, an examination of the scales associated to these constructs show that they do share similar items. Muenks and her colleagues also made a point that the jangle fallacy issue may especially be problematic when these constructs become the focus of intervention work. In other words, is it grit, its perseverance effort dimension, or aspects of conscientiousness that educators should focus on in their intervention and training programs? I will return to this point in the following discussion that addresses grit and other motivational constructs' prediction of college success.

Grit and Other Motivational Constructs' Prediction of College Success.

Another type of construct validity is called predictive validity. With predictive validity, the construct's ability to predict something it should theoretically be able to predict is assessed (Trochim, 2006). Proponents of grit have asserted that grit is not only distinct from conscientiousness, but that it is highly predictive of success and performance (Duckworth et al., 2007; Duckworth & Quinn, 2009). However, studies examining the predictive validity of grit as it relates to academic success and performance has produced mixed results (Abuhassàn & Bates, 2015; Bowman et al., 2015; Dumfart & Neubauer, 2016; Ivcevic & Brackett, 2014; Kelly et al., 2014). A number of these studies found the perseverance of effort dimension to be the dominant predictor of success (Abuhassàn & Bates, 2015; Bowman et al., 2015; Credé et al., 2016; Kelly et al., 2014).

Grit and other motivational constructs' predictive validity of college success was investigated based on two structural equation models: (a) the proposed hypothesized model that associated the scale scores to their pre-defined constructs, and (b) the construct validity measurement model (e.g., not relating the scale scores to their constructs). The primary antecedent (interest) was examined as an exogenous variable.

Grit, conscientiousness, self-efficacy, locus of control, and college success were examined as endogenous variables.

Results from the proposed model revealed a high degree of multicollinearity, making it difficult to interpret the results. EFA was then conducted on all 28 scale scores to check the construct validity of the measurement model. In doing so, grit was not defined. Some researchers have suggested grit to be a fine-grained measure of conscientiousness (Duckworth et al., 2007; Ivceciv & Brackett, 2014; MacCann et al., 2009). The results from the EFA do support this claim. The majority of the scale scores associated with grit were loaded on the factor defined as conscientiousness.

The second structural equation model based on the EFA results (e.g., the construct validity of the measurement model) found conscientiousness as the dominant predictor of both subjective college success and objective college success. Given that conscientiousness was found as the sole predictor of both subjective college success and objective college success, do we consider teaching conscientiousness? There are a few researchers who argue that conscientiousness, as a personality trait, should not be amendable by direct instruction (Credé et al., 2016). But are there factors or attributes associated to conscientiousness that may be amendable by direct instruction? Is it better to call it "grit," to avoid the controversy on "teaching conscientiousness?"

Duckworth and her colleagues (2007) have suggested that it is quite possible that the grit construct was omitted from measures of the Big Five conscientiousness, because the "Big Five" was derived from analyses of the natural language terms people used to describe themselves (see John & Srivastava, 1999). Research also shows that conscientiousness has been described by a variety of labels that include dependability

(Tellegen & Wallter, 1987), impulsivity (Buss & Plomin, 1975), "will to achieve" (Digman & Takemoto-Chock, 1981; Fiske, 1949), and superego strength (Cattell, 1957) – to name a few. There are definite conceptual similarities between grit and these labels that describe conscientiousness. Plus, the findings from this study do show that grit is hardly distinguishable from conscientiousness.

At one point, Costa and his colleagues (1991) indicated that conscientiousness once favored the term "direction" as the domain name because it implied both movement and focus. Most parents will not argue against teaching their children to be responsible and dependable, and to remain focused and committed to their goals. To help students acquire values and skills that they can rely on throughout their entire life will give them a chance to have a full and productive life (U.S. Department of Education, 2013). Character matters. This study did find that conscientiousness and perseverance of effort is associated with success.

Studies have shown that conscientiousness is a single factor in adults and college students (Costa & McCrae, 1998), although researchers have reported difference in the descriptive dimensions of conscientiousness' conceptual structure. These dimensions include being ambitious, hard-working, confident, resourceful, organized, levelheaded, patient, responsible, and being willing to comply with rules, customs, norms, and expectations (Roberts et al., 2005). Costa and colleagues (1991) added being capable, tidy, striving for excellence and being thoughtful, in addition to having the ability to continue with a task despite boredom and other distractions to the list. What is wrong with teaching these values in our educational system? The question actually should be "how?"

Though this study did not answer the question on what initiates grit, the results from the structural equation modeling did find that interest, coupled with both high self-efficacy and internal locus of control, have a positive direct effect on conscientiousness, and conscientiousness was found to have a positive direct effect on both subjective college success and objective college success. Deci and Ryan's (1985) self-determination theory states that for individuals to remain committed and driven towards their goals, they must first develop an interest. Interest is what initially inspires individuals to be driven towards their goals despite setbacks, mistakes, obstacles, and alternatives. Bandura (1977) indicated that individuals with high self-efficacy exert greater effort and persevere when obstacles are encountered. These individuals are not only more interested in achieving their goals, they see difficult tasks as challenges to be mastered, and sustain greater effort at difficult times (Becker & Gable, 2009). In this study, these students believed in their capabilities to succeed in college. They believed that they are in control of their outcomes - their goals, including GPA. In the end, interest, coupled with high self-efficacy and an internal locus of control predicted conscientiousness, and conscientiousness predicted college success. Regardless of the controversy that may exist whether to teach conscientiousness or not, these findings from this study show that conscientiousness is an important predictor of college success.

Conclusion

In this study, we learned that grit may be comprised of more than two factors, and that grit is not comprised of passion, although the literature suggests that grit, by name, is referred to as "passion and perseverance of effort" (Duckworth et al., 2007; Duckworth, 2016). We also learned that Duckworth and colleagues' two dimensions of grit are not

more predictive of college success than either alone, and that the dominant predictor of college success, as measured by long-term college goals, is the perseverance of effort dimension of grit. Conscientiousness was found to be the sole predictor of both subjective college success and objective college success, and more predictive of GPA and long-term college goals over and beyond cognitive ability and grit. In the end, grit was not only hardly distinguishable from conscientiousness and other motivational constructs, it disappeared altogether. Although the question of what initiates grit could not be answered, a number of constructs that contribute to college success was identified.

Teaching conscientiousness may be considered controversial (Credé et al., 2016); however, there are non-cognitive skills that are associated to "being conscientiousness" that contributes to students' college success. These non-cognitive skills include being responsible, self-determined, and hard working. The development of these skills starts with interest and belief in our capabilities. Success does not always come easy, and talent gets us so far. These non-cognitive skills provide a competitive advantage in reaching our long-term goals.

Implications for Future Research

Future research in this domain are encouraged to consider five broad issues. First, it is possible that the results would be different among a different group of participants, or using a different set of measures. Future researchers may want to examine these comparable and related measures of grit using a different group of participants. Given that one of the locus of control measures and the cognitive ability test both reported low reliability, it would be advisable for researchers to look carefully at measures that report better reliability. Furthermore, if future researchers are interested in duplicating this

study with different comparable measures associated to interest, self-efficacy, locus of control, grit, and conscientiousness, I would advise these researchers to look carefully at the measures used to assess these constructs, to be sure the measures accurately reflect their theoretical definition.

Second, the results of this study did reveal that just by replacing Duckworth and her colleagues' (2007) negatively-worded consistency of interest with positively-worded consistency of interest items, a different factor structure emerged. It is quite possible that the Grit-C scale, the three-factor solution comprised of focus, perseverance, and goal attainment is a more appropriate measure to use. This measure would need to be tested to determine its effectiveness in predicting success, and could help clarify the nature of the grit-performance relation.

Third, the results of this study did show that the perseverance of effort was the primary utility of grit. This finding suggests that grit researchers may want to focus on the perseverance of effort dimension of grit. The perseverance of effort dimension of grit did predict long-term college goals. The results also show that interest coupled with self-efficacy and locus of control are related to conscientiousness. Testing the models presented in this study with a different set of participants and/or in different domains (e.g., work settings) may reveal different results. The self-report nature of this study is not only subject to social desirability bias and shared method variance, but cannot provide causation, or actual proof that these constructs truly do predict college success. True experiments will need to be conducted.

Fourth, additional college success measures were introduced in this study. College success is predominately defined in terms of academic achievement – primarily

via grades with GPA as the dominant criterion (Kuh et al., 2006; Poropat, 2009). With the introduction of these additional college success measures (e.g., long-term college goals), future researchers may profit from including these measures when examining outcomes associated with college success. Future researchers are encouraged to seek input from their sample demographics (e.g., college students) using qualitative methods, such as interviews or focus groups, to obtain additional insight on what college success means to them. There are flaws in using GPA as a measure of college success (Arum & Roksa, 2011; Johnson, 1997), and researchers may benefit from not feeling restricted to continue to use the dominant criterion. Future researchers may want to incorporate additional measures that capture not only objective college success, but subjective college and post-college success. The latter would likely require a longitudinal study.

Finally, the results of this study present interest and conscientiousness as the predictors of college success. Future researchers might examine other possible predictors of college success, and use a variety of cognitive ability measures when examining predictive validity among constructs. Incorporating a number of statistical analyses techniques – though challenging – can reveal additional findings, as well as provide validation with the results from their study. There is always more to learn.

Implications for Educational Practice

There are two major conclusions that educators can gain from this study. First, the popularity around grit may just be in its name. After all, the word "grit" is more engaging - more "hip," than the word conscientiousness. With that in mind, accompanied by the results of this study, when it comes to developing the "non-cognitive skills" curriculum, the focus should be on the perseverance dimension of grit, or for the sake of

argument, a lower-level trait of conscientiousness (MacCann et al., 2009; Roberts et al., 2005). Hard work, overcoming adversities, and not allowing setbacks to discourage our students from realizing their goals are key components of persevering. We can be honest with our students and tell them life is not easy, and that to be successful requires continuous perseverance.

Second, the results of this study did not differentiate grit from conscientiousness. As a matter of fact, it was conscientiousness and not grit that was the sole predictor of both objective college success and subjective college success, and a better predictor of college success over and beyond cognitive ability and grit. The results from this study also found that interest coupled with self-efficacy and locus of control predict conscientiousness, and conscientiousness predicts college success. Educators can help students find their interests. They can help students increase their perception of their competence, and help students feel that they have an impact not only in the classroom and academics, but in the world. They can also provide students with opportunities that allow them to experience success. Through repeated success, students' sense of self-efficacy increases (Bandura, 1977). We need to also recognize that success in college is more than just getting a good grade.

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APPENDIXES

APPENDIX A

IRB Approval Letters

UNIVERSITY OF SAN FRANCISCO

IRBPHS - Approval Notification

To: Christine Collaco
From: Terence Patterson, IRB Chair
Subject: Protocol #941
Date: 01/02/2018

The Institutional Review Board for the Protection of Human Subjects (IRBPHS) at the University of San Francisco (USF) has reviewed your request for human subjects approval regarding your study.

Your research (IRB Protocol **#941**) with the project title **What initiates grit and is it that different from conscientiousness?** has been approved by the IRB Chair under the rules for expedited review on **01/02/2018**.

Any modifications, adverse reactions or complications must be reported using a modification application to the IRBPHS within ten (10) working days.

If you have any questions, please contact the IRBPHS via email at IRBPHS@usfca.edu. Please include the Protocol number assigned to your application in your correspondence.

On behalf of the IRBPHS committee, I wish you much success in your research.

Sincerely,

Terence Patterson, EdD, ABPP

Professor & Chair, Institutional Review Board for the Protection of Human Subjects

University of San Francisco

irbphs@usfca.edu

USF IRBPHS Website

Note: The title of this dissertation has since changed.

UNIVERSITY OF THE
PACIFIC

OFFICE OF RESEARCH AND SPONSORED PROGRAMS | INSTITUTIONAL REVIEW BOARD (IRB)

TO: Christine Collaço
Communication College of the Pacific
FROM: Valerie Andeola, IRB Administrator

DATE: January 31, 2018

RE: IRB Cooperative Agreement Approval- Collaco, #18-86

Your Cooperative Research Agreement entitled ***"What Initiates Grit and Is it that Different from Conscientiousness?"*** submitted to the University of the Pacific IRB has been approved. This approval is effective through **January 31, 2019**.

Please be aware that any procedural changes or amendments initiated by the Lead Institution must be submitted to Pacific IRB for review and approval prior to implementing revision. Changes may NOT be made without Pacific IRB approval except to eliminate apparent immediate hazards. Revisions made without prior IRB review and approval may result in noncompliance of research. Complete **Protocol Revision Form** and submit to IRB@pacific.edu.

Best wishes for continued success in your research. Feel free to contact our office if you have any questions.

Sincerely, IRB Administrator
Valerie Andeola | IRB & IACUC Administrator
University of the Pacific|Office of Research & Sponsored Programs
3601 Pacific Avenue|Stockton, CA 95211

Note: The title of this dissertation has since changed.

APPENDIX B

Complete List of the Scales and their Items Organized by Construct

Grit

Scale	Item
Grit: Perseverance of Effort (Duckworth et al., 2007)	I have overcome setbacks to conquer an important challenge.
	Setbacks don't discourage me.
	I am a hard worker.
	I finish whatever I begin.
	I have achieved a goal that took years of work.
	I am diligent.
Grit: Consistency of Interest (Duckworth et al., 2007)	New ideas and projects sometimes distract me from previous ones. (R)
	My interests change from year to year. (R)
	I have been obsessed with a certain idea or project for a short time but later lost interest. (R)
	I often set a goal but later choose to pursue a different one. (R)
	I have difficulty maintaining my focus on projects that take more than a few months to complete. (R)
	I become interested in new pursuits every few months. (R)
Positively-Worded Consistency of Interest	New ideas and projects usually do not distract me from previous ones.
	My interests stay pretty much the same from year to year.
	When I have been obsessed with a certain idea or project, I stick with it without losing interest.
	When I set a goal I usually pursue it to the end.
	I do not have difficulty maintaining my focus on projects that take more than a few months to complete.
	When I become interested in a new pursuit I see it to the end.
Goal Commitment (Hollenbeck et al., 1989)	I am strongly committed to pursuing this _____goal.
	I am willing to put forth a great deal of effort beyond what I'd normally do to achieve this _____ goal.
	Quite frankly, I don't care if I achieve this _____ goal or not. (R)
	There is not much to be gained by trying to achieve this_____ goal. (R)
	It is quite likely that this_____ goal may need to be revised, depending on how things go this quarter. (R)
	It wouldn't take much to make me abandon this_____ goal. (R)
	It's unrealistic for me to expect to reach this_____ goal. (R)
	Since it's not always possible to tell how tough this can get until you've been in them a while, it's hard to take this goal seriously. (R)
	I think this_____ goal is a good goal to shoot for.

Note. (R) denotes reverse-scored items, and _____ allows for a specific goal. For this study, the specific goal was "college."

Grit

Scale	Item
IPP Scale (Peterson & Seligman, 2004)	I don't quit a task before it is finished.
	I am a goal-oriented person.
	I finish things despite obstacles in the way.
	I am a hard worker.
	I don't get side tracked when I work.
	I don't finish what I start. (R)
	I give up easily. (R)
	I do not tend to stick with what I decide to do. (R)
6FPQ Industriousness (Jackson et al., 2000)	Work hard.
	Put work above pleasure.
	Am under constant pressure.
	Complete tasks successfully.
	Am always busy.
	Have too many things to do.
	Have extra time on my hands. (R)
	Feel that work is not an important part of my life. (R)
	Put little time and effort into my work. (R)
Harmonious Passion (Vallerand et al., 2003)	This activity allows me to live a variety of experiences.
	The new things that I discover with this activity allow me to appreciate it even more.
	This activity allows me to live memorable experiences.
	This activity reflects the qualities I like about myself.
	This activity is in harmony with other activities in my life.
	For me it is a passion that I still manage to control.
	I am completely taken with this activity.
Obsessive Passion (Vallerand et al., 2003)	I cannot live without it.
	The urge is so strong I can't help myself from doing this activity.
	I have difficulty imagining my life without this activity.
	I am emotionally dependent on this activity.
	I have a tough time controlling my need to do this activity.
	I have almost an obsessive feeling for this activity.
	My mood depends on me being able to do this activity.

Note. (R) denotes reverse-scored items.

Interest

Scale	Item
Individual Interest	I've always been fascinated by psychology. *
(Harackiewicz et al., 2008)	I chose to attend psychology because I'm really interested in learning.
	I'm really excited about psychology.
	I'm really looking forward to learning more about psychology.
	I think the field of psychology is an important discipline.
	I think what we will study in Introductory Psychology will be important for me to know.
	I think what we will study in Introductory Psychology will be worthwhile to know.
Interest/Enjoyment	I enjoyed doing this activity very much.
("Intrinsic Motivation Inventory," 2017)	This activity was fun to do.
	I thought this activity was a boring activity. (R)
	This activity did not hold my attention at all. (R)
	I would describe this activity as very interesting.
	I thought this activity was quite enjoyable.
	While I was doing this activity, I was thinking about how much I enjoyed it.
LES: Meaningfulness	The work that I do in this class is meaningful to me. *
(Frymier et al., 1996)	The work that I do for this class is valuable to me.
	The things I learn in this class are useful.
	This class will help me achieve my goals in life.
	The work that I do in this class is a waste of my time. (R)
	This class is not important to me. (R)
LES: Involvement	I have the power to make a difference in how things were done in this class.
(Frymier et al., 1996)	My participation is important to the success of this class.
	I can help others learn in this class.
	I can't influence what happens in this class. (R)
	My participation in this class makes no difference. (R)
	I can influence the teacher.
LES: Competence	I can do well in this class.
(Frymier et al., 1996)	I don't think that I can do the work in this class. (R)
	I believe in my ability to do well in this class.
	I don't have the confidence in my ability to do well in this class. (R)
	I feel very competent in this class.

Note. (R) denotes reverse-scored items. * For this study, the word "psychology" was changed to "college," and the word "class" was changed to "college."

Self-Efficacy

Scale	Item
General Self-Efficacy (GSE) (Schwarzer & Jerusalem, 1995)	I can always manage to solve difficult problems if I try hard enough.
	If someone opposes me, I can find the means and ways to get what I want.
	It is easy for me to stick to my aims and accomplish my goals.
	I am confident that I could deal efficiently with unexpected events.
	Thanks to my resourcefulness, I know how to handle unforeseen situations.
	I can solve most problems if I invest the necessary effort.
	I can remain calm when facing difficulties because I can rely on my coping abilities.
	When I am confronted with a problem, I can usually find several solutions.
	If I am trouble, I can usually think of a solution.
	I can usually handle whatever comes my way.
SEQ: Ability Grows with Effort (Gaumer Erickson et al., 2016)	I believe hard work pays off.
	My ability grows with effort.
	I believe that the brain can be developed like a muscle.
	I think that no matter who you are, you can significantly change your level of talent.
	I can change my basic level of ability considerably.
SEQ: Belief in Personal Ability (Gaumer Erickson et al., 2016)	I can learn from what is being taught in class this year. *
	I can figure out anything if I try hard enough.
	If I practiced every day, I could develop just about any skill.
	I am confident that I will achieve the goals that I set for myself.
	Once I've decided to accomplish something that's important to me, I keep trying to accomplish it, even if it is harder than I thought.
	When I'm struggling to accomplish something difficult, I focus on my progress instead of feeling discouraged.
	I will succeed in whatever career path I choose.
	I will succeed in whatever college major I choose.
Academic Self-Efficacy (ASE) (Chemers et al., 2001)	I know how to schedule my time to accomplish my tasks.
	I know how to take notes.
	I know how to study to perform well on tests.
	I am good at research and writing papers.
	I am a very good student.
	I usually do very well in school and at academic tasks.
	I find my college academic work interesting and absorbing.
	I am very capable of succeeding at the college level.

Note. *For this study, the word "class" was changed to "college."

Locus of Control

Scale	Item
Academic Locus of Control (ALC) (Curtis & Trice, 2013)	I came to college because it was expected of me.
	I have largely determined my own career goals.
	Some people have a knack for writing, while others will never write well no matter how hard they try.
	There are some subjects in which I could never do well.
	I sometimes feel that there is nothing I can do to improve my situation.
	I never feel really hopeless – there is always something I can do to improve my situation.
	I would never allow social activities to affect my studies.
	Studying every day is important.
	For some courses it is not important to go to class.
	I consider myself highly motivated to achieve success in life.
	I am a good writer.
	Doing work on time is always important to me.
	I am easily distracted.
	I can be easily talked out of studying.
	I get depressed sometimes and then there is no way I can accomplish what I know I should be doing.
	Things will probably go wrong for me some time in the near future.
	I keep changing my mind about my career goals.
	I feel I will someday make a real contribution to the world if I work hard at it.
	There has been at least one instance in school where social activity impaired my academic performance.
	I would like to graduate from college, but there are more important things in my life.
	I plan well and I stick to my plans.
Chance (Levenson, 1972)	To a great extent my life is controlled by accidental happenings.
	Often there is no chance of protecting my personal interests from bad luck happening.
	When I get what I want, it's usually because I am lucky.
	I have often found that what is going to happen will happen.
	Whether or not I get into a car accident is mostly a matter of luck.
	It's not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune.
	Whether or not I get to be leader depends on whether I am lucky enough to be in the right place at the right time.
	It's chiefly a matter of fate whether or not I have few friends or many friends.
IE-4 Internal (Kovaleva, 2012)	If I work hard, I will succeed.
	I'm my own boss.
IE-4 External (Kovaleva, 2012)	Whether at college or in my private life: What I do is mainly determined by others.
	Fate often gets in the way of my plans.

Conscientiousness

Scale	Item
BFI: Conscientiousness sub-scale (John & Srivastava, 1999)	Does a thorough job. Can be somewhat careless. (R) Is a reliable worker. Tends to be disorganized. (R) Tends to be lazy. (R) Perseveres until the task is finished. Does things efficiently. Makes plans and follows through with them. Is easily distracted. (R)
10-item IPIP ("International Personality Item Pool," 2017)	Am always prepared. Don't see things through. (R) Shirk my duties. (R) Carry out my plans. Pay attention to details. Waste my time. (R) Get chores done right away. Find it difficult to get down to work. (R) Do just enough work to get by. Make plans and stick to them.
AB5C-IPIP: Conscientiousness sub-scale ("International Personality Item Pool," 2017)	Accomplish my work on time. Do things according to a plan. Am careful to avoid making mistakes. Am often late to work. (R) Keep my checkbook balanced. Like to plan ahead. Put off unpleasant tasks. (R) Return borrowed items. Do not plan ahead. (R) Leave my work undone. (R) Take tasks too lightly. (R) Neglect my duties. (R) Often forget to put things back in their proper place. (R)

Note. (R) denotes reverse-scored items.

College Success

Scale	Item
Cognitive Ability	Refer to the Cognitive Ability Test in Appendix C, p. 232.
Long-Term College Goals	I have experienced a happy social life in college. I have met, or currently on track, towards meeting all of my long-term college goals. I am confident that I will be able to use what I learned from college in my future career. I am confident in my abilities. I have acquired new skills in college. I am certain that I will succeed in life. I expect to obtain a job within 6 months of graduation.
Acquired Skills (Curtis & Keeves, 2000)	The course developed my problem solving skills. * The course sharpened my analytical skills. The course helped me develop my ability to work as a team member. As a result of my course, I feel confident about tackling unfamiliar problems. The course improved my skills in written communication. My course helped me to develop the ability to plan my own work.
College Satisfaction (Curtis & Keeves, 2000)	Overall, I am satisfied with the quality of this course. *

Note. *For this study, the word "course" was changed to "college."

APPENDIX C

College Success Survey

Thank you for taking part in this survey. Please do not write your name on the questionnaire. This is a volunteer survey - thus you can choose not to participate. All information collected is confidential and anonymous. If anyone has any questions regarding this survey, please let me know. Thank you for your participation.

This survey is comprised of two parts: (1) cognitive ability test, and (2) series of statements. You will first be presented with a cognitive ability test. The cognitive ability test is a timed test. You will be given 6 minutes to complete this test. Do not start until the instructor tells you to and stop when the instructor tells you to stop. After completing the test, you will be presented with a series of statements along with further instructions. There is no time limit associated to the second part of this survey.

Cognitive Ability Test

In your life, both in and out of school, you encounter situations that require you to understand numbers, and to use them in solving problems. You will be presented with a series of 12 items that test your cognitive abilities. You need to find the rule used to arrange the numbers. Then you are to choose the number that should come next in the series.

1.	20	30	40	50	60	A. 50	B. 55	C. 60	D. 65	E. 70
2.	9	10	12	15	19	A. 23	B. 24	C. 25	D. 26	E. 27
3.	2	6	9	27	30	A. 33	B. 60	C. 63	D. 90	E. 93
4.	3	2	5	7	12	A. 26	B. 19	C. 22	D. 20	E. 24
5.	13	14	17	22	29	A. 35	B. 36	C. 37	D. 38	E. 39
6.	45	9	76	13	88	A. 4	B. 22	C. 12	D. 16	E. 8
7.	44	39	35	32	30	A. 25	B. 26	C. 27	D. 28	E. 29
8.	22	6	-2	-6	-8	A. -10	B. 10	C. -9	D. 8	E. -22
9.	5	7	10	43	45	A. 46	B. 47	C. 48	D. 49	E. 50
10.	9	91	8	28	7	A. 17	B. 71	C. 27	D. 73	E. 37
11.	10	19	10.5	20	11	A. 22	B. 23	C. 24	D. 25	E. 26
12.	6	11	5.5	12	4	A. 1	B. 11	C. 6	D. 13	E. 3.25

Answer key: 1E, 2B, 3D, 4B, 5D, 6D, 7E, 8C, 9C, 10D, 11B, and 12B

Please answer all of the following questions as completely and truthfully as possible.

1. Please indicate your overall GPA in numeric format: _____

2. Please indicate your year in college:

    1. Freshman _____
    2. Sophomore _____
    3. Junior _____
    4. Senior _____
    5. Graduate _____

3. Please indicate your college major. If undecided, state undecided:

    _____

4. What is your gender?

☐ Female ☐ Male ☐ Prefer not to say

☐ Prefer to self-describe _____

5. What is your age? _____

6. Please indicate your ethnicity?

☐ African American ☐ Asian/Pacific Islander ☐ Caucasian

☐ Hispanic or Latino/a ☐ Native American ☐ Other

7. Are you involved in any extra-curricular activities or clubs?

☐ Yes ☐ No

8. If Yes, please indicate all of the the clubs or activities that you are involved in:

☐ Speech and Debate ☐ Community Service ☐ Athletics ☐ Greek Life

☐ Government ☐ Public Relations ☐ Arts and Culture ☐ Spiritual and Religious

☐ Academics ☐ Internship or Job ☐ Inclusion ☐ Special Interests

☐ Other Activity or Club (please identify): _____

9. If Yes, please indicate your role?

You will now be presented with a series of statements. Please record (circle) your first impression by indicating the degree to which each statement applies to you. Be honest – there are no right or wrong answers.

	Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
1. I have experienced a happy social life in college.	1	2	3	4	5
2. I have met, or currently on track, towards meeting all of my long-term college goals.	1	2	3	4	5
3. I am confident that I will be able to use what I learned from college in my future career.	1	2	3	4	5
4. I am confident in my abilities.	1	2	3	4	5
5. I have acquired new skills in college.	1	2	3	4	5
6. I am certain that I will succeed in life.	1	2	3	4	5
7. I expect to obtain a job within 6 months of graduation.	1	2	3	4	5
8. College has helped me develop my problem-solving skills.	1	2	3	4	5
9. College has sharpened my analytical skills.	1	2	3	4	5
10. College has developed my ability to work as a team member.	1	2	3	4	5
11. As a result of college, I feel confident about tackling unfamiliar problems.	1	2	3	4	5
12. College has improved my skills in written communication.	1	2	3	4	5
13. College has helped me to develop the ability to plan my own work.	1	2	3	4	5
14. Overall, I am satisfied with my college experience.	1	2	3	4	5
15. I have overcome setbacks to conquer an important challenge.	1	2	3	4	5
16. New ideas and projects sometimes distract me from previous ones.	1	2	3	4	5
17. My interests change from year to year.	1	2	3	4	5
18. Setbacks don’t discourage me.	1	2	3	4	5
19. I have been obsessed with a certain idea or project for a short time but later lost interest.	1	2	3	4	5
20. I am a hard worker.	1	2	3	4	5
21. I often set a goal but later choose to pursue a different one.	1	2	3	4	5
22. I have difficulty maintaining my focus on projects that take more than a few months to complete.	1	2	3	4	5

	Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
23. I finish whatever I begin.	1	2	3	4	5
24. I have achieved a goal that took years of work.	1	2	3	4	5
25. I become interested in new pursuits every few months.	1	2	3	4	5
26. I am diligent.	1	2	3	4	5
27. I've always been fascinated by college.	1	2	3	4	5
28. I chose to attend college because I'm really interested in learning.	1	2	3	4	5
29. I'm really excited about college.	1	2	3	4	5
30. I'm really looking forward to learning more in college.	1	2	3	4	5
31. I think college is important.	1	2	3	4	5
32. I think what we will study in college will be important for me to know.	1	2	3	4	5
33. I think what we will study in college will be worthwhile for me to know.	1	2	3	4	5
34. New ideas and projects usually do not distract me from previous ones.	1	2	3	4	5
35. My interests stay pretty much the same from year to year.	1	2	3	4	5
36. When I have been obsessed with a certain idea or project I stick with it without losing interest.	1	2	3	4	5
37. When I set a goal I usually pursue it to the end.	1	2	3	4	5
38. I do not have difficulty maintaining my focus on projects that take more than a few months to complete.	1	2	3	4	5
39. When I become interested in a new pursuit I see it to the end.	1	2	3	4	5
40. To a great extent my life is controlled by accidental happenings.	1	2	3	4	5
41. Often there is no chance of protecting my personal interests from bad luck happening.	1	2	3	4	5
42. When I get what I want, it's usually because I am lucky.	1	2	3	4	5
43. I have often found that what is going to happen will happen.	1	2	3	4	5
44. Whether or not I get into a car accident is mostly a matter of luck.	1	2	3	4	5
45. It's not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune.	1	2	3	4	5

	Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
46. Whether or not I get to be leader depends on whether I am lucky enough to be in the right place at the right time.	1	2	3	4	5
47. It's chiefly a matter of fate whether or not I have few friends or many friends.	1	2	3	4	5
48. I am strongly committed to pursuing my college goals.	1	2	3	4	5
49. I am willing to put forth a great deal of effort beyond what I'd normally do to achieve my college goals.	1	2	3	4	5
50. Quite frankly, I don't care if I achieve my college goals or not.	1	2	3	4	5
51. There is not much to be gained by trying to achieve my college goals.	1	2	3	4	5
52. It is quite likely that my college goals may need to be revised, depending on how things go this semester.	1	2	3	4	5
53. It wouldn't take much to make me abandon my college goals.	1	2	3	4	5
54. It's unrealistic for me to expect to reach my college goals.	1	2	3	4	5
55. Since it's not always possible to tell how tough things can get until you've been in them a while, it's hard to take my college goals seriously.	1	2	3	4	5
56. I think my college goals are good goals to shoot for.	1	2	3	4	5
57. I am always prepared.	1	2	3	4	5
58. I don't see things through.	1	2	3	4	5
59. I shirk my duties.	1	2	3	4	5
60. I carry out my plans.	1	2	3	4	5
61. I pay attention to details.	1	2	3	4	5
62. I waste my time.	1	2	3	4	5
63. I get chores done right away.	1	2	3	4	5
64. I find it difficult to get down to work.	1	2	3	4	5
65. I do just enough work to get by.	1	2	3	4	5
66. I make plans and stick to them.	1	2	3	4	5

	Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
67. I work hard.	1	2	3	4	5
68. I am always busy.	1	2	3	4	5
69. I put work above pleasure.	1	2	3	4	5
70. I have extra time on my hands.	1	2	3	4	5
71. I put little time and effort into my work.	1	2	3	4	5
72. I am under constant pressure.	1	2	3	4	5
73. I feel that work is not an important part of my life.	1	2	3	4	5
74. I complete tasks successfully.	1	2	3	4	5
75. I have too many things to do.	1	2	3	4	5
76. I have a slow pace to my life.	1	2	3	4	5

Please record (circle) your first impression by indicating the degree to which each statement applies to you.

	Not at all	Hardly true	Moderately true	Exactly true
1. I can always manage to solve difficult problems if I try hard enough.	1	2	3	4
2. If someone opposes me, I can find the means and ways to get what I want.	1	2	3	4
3. It is easy for me to stick to my aims and accomplish my goals.	1	2	3	4
4. I am confident that I could deal efficiently with unexpected events.	1	2	3	4
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	1	2	3	4
6. I can solve most problems if I invest the necessary effort.	1	2	3	4
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	1	2	3	4
8. When I am confronted with a problem, I can usually find several solutions.	1	2	3	4
9. If I am in trouble, I can usually think of a solution.	1	2	3	4
10. I can usually handle whatever comes my way.	1	2	3	4

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
1	2	3	4	5

I see Myself as Someone Who…

_____ 1. Does a thorough job

_____ 2. Can be somewhat careless

_____ 3. Is a reliable worker

_____ 4. Tends to be disorganized

_____ 5. Tends to be lazy

_____ 6. Perseveres until the task is finished

_____7. Does things efficiently

_____8. Makes plans and follows through with them

_____9. Is easily distracted

Please respond to the following items using the following scale. Be honest – there are no right or wrong answers.

	Not Very Like Me	Not Like Me	Neutral	Like Me	Very Like Me
1. I can learn from what is being taught in college this year.	1	2	3	4	5
2. I can figure out anything if I try hard enough	1	2	3	4	5
3. If I practiced every day, I could develop just about any skill.	1	2	3	4	5
4. I am confident that I will achieve the goals that I set for myself.	1	2	3	4	5
5. Once I've decided to accomplish something that's important to me, I keep trying to accomplish it, even if it is harder than I thought.	1	2	3	4	5
6. When I'm struggling to accomplish something difficult, I focus on my progress instead of feeling discouraged.	1	2	3	4	5
7. I will succeed in whatever career path I choose.	1	2	3	4	5
8. I will succeed in whatever college major I choose.	1	2	3	4	5

	Not Very Like Me	Not Like Me	Neutral	Like Me	Very Like Me
9. I believe hard work pays off.	1	2	3	4	5
10. My ability grows with effort.	1	2	3	4	5
11. I believe that the brain can be developed like a muscle.	1	2	3	4	5
12. I think that no matter who you are, you can significantly change your level of talent.	1	2	3	4	5
13. I can change my basic level of ability considerably.	1	2	3	4	5
14. I accomplish my work on time.	1	2	3	4	5
15. I do things according to a plan.	1	2	3	4	5
16. I am careful to avoid making mistakes.	1	2	3	4	5
17. I am often late to work.	1	2	3	4	5
18. I keep my checkbook balanced.	1	2	3	4	5
19. I like to plan ahead.	1	2	3	4	5
20. I put off unpleasant tasks.	1	2	3	4	5
21. I return borrowed items.	1	2	3	4	5
22. I do not plan ahead.	1	2	3	4	5
23. I leave my work undone.	1	2	3	4	5
24. I take tasks too lightly.	1	2	3	4	5
25. I neglect my duties.	1	2	3	4	5
26. I often forget to put things back in their proper place.	1	2	3	4	5
27. I don’t quit a task before it is finished.	1	2	3	4	5
28. I am a goal-oriented person.	1	2	3	4	5
29. I finish things despite obstacles in the way.	1	2	3	4	5
30. I am a hard worker.	1	2	3	4	5
31. I don’t get side tracked when I work.	1	2	3	4	5
32. I don’t finish what I start.	1	2	3	4	5
33. I give up easily.	1	2	3	4	5
34. I do not tend to stick with what I decide to do.	1	2	3	4	5

Now using the following scale, please record (circle) your first impression by indicating the degree to which each statement applies to you. Be honest – there are no right or wrong answers.

	Doesn't apply at all	Applies a bit	Applies somewhat	Applies mostly	Applies completely
1. If I work hard, I will succeed.	1	2	3	4	5
2. I'm my own boss.	1	2	3	4	5
3. Whether at college or in my private life: What I do is mainly determined by others.	1	2	3	4	5
4. Fate often gets in the way of my plans.	1	2	3	4	5

Now, thinking of an academic activity, please respond to the following items using the following scale.

Not agree at all	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Very strongly agree
1	2	3	4	5	6	7

1. This activity allows me to live a variety of experiences.	1	2	3	4	5	6	7
2. The new things that I discover from this activity allow me to appreciate it even more.	1	2	3	4	5	6	7
3. This activity allows me to live memorable experiences.	1	2	3	4	5	6	7
4. This activity reflects the qualities I like about myself.	1	2	3	4	5	6	7
5. This activity is in harmony with the other activities in my life.	1	2	3	4	5	6	7
6. This activity is a passion that I still manage to control.	1	2	3	4	5	6	7
7. I am completely taken with this activity.	1	2	3	4	5	6	7
8. I cannot live without it.	1	2	3	4	5	6	7
9. The urge is so strong I can't help myself from doing this activity.	1	2	3	4	5	6	7
10. I have difficulty imagining my life without this activity.	1	2	3	4	5	6	7
11. I am emotionally dependent on this activity.	1	2	3	4	5	6	7
12. I have a tough time controlling my need to do this activity.	1	2	3	4	5	6	7
13. I have almost an obsessive feeling for this activity.	1	2	3	4	5	6	7
14. My mood depends on me being able to do this activity.	1	2	3	4	5	6	7

For each of the following statements, think of an academic college activity, and indicate how true it is for you, using the following scale.

Not at all true	Not True	Somewhat not true	Undecided	Somewhat true	True	Very True
1	2	3	4	5	6	7

1. I enjoyed doing this activity very much.	1	2	3	4	5	6	7
2. This activity was fun to do.	1	2	3	4	5	6	7
3. I thought this activity was a boring activity.	1	2	3	4	5	6	7
4. This activity did not hold my attention at all.	1	2	3	4	5	6	7
5. I would describe this activity as very interesting.	1	2	3	4	5	6	7
6. I thought this activity was quite enjoyable.	1	2	3	4	5	6	7
7. While I was doing this activity, I was thinking about how much I enjoyed it.	1	2	3	4	5	6	7

For each of the following statements, please indicate how true it is for you, using the following scale.

Does not describe me very well	Does not describe me	Somewhat does not describe me	Neutral	Somewhat describes me	Describes me well	Describes me very well
1	2	3	4	5	6	7

1. I know how to schedule my time to accomplish my tasks.	1	2	3	4	5	6	7
2. I know how to take notes.	1	2	3	4	5	6	7
3. I know how to study to perform well on tests.	1	2	3	4	5	6	7
4. I am good at research and writing papers.	1	2	3	4	5	6	7
5. I am a very good student.	1	2	3	4	5	6	7
6. I usually do very well in school and at academic tasks.	1	2	3	4	5	6	7
7. I find my college academic work interesting and absorbing.	1	2	3	4	5	6	7
8. I am very capable of succeeding at the college level.	1	2	3	4	5	6	7

For each of the following statements, please indicate how true it is for you, using the following scale.

Completely disagree	Disagree	Somewhat disagree	Undecided	Somewhat agree	Agree	Completely agree
1	2	3	4	5	6	7

1. I have the power to make a difference in how things were done in college.	1	2	3	4	5	6	7
2. My participation is important to my success in college.	1	2	3	4	5	6	7
3. I can help others learn in college.	1	2	3	4	5	6	7
4. I can't influence what happens in college.	1	2	3	4	5	6	7
5. My participation in college makes no difference.	1	2	3	4	5	6	7
6. I can influence the teachers.	1	2	3	4	5	6	7
7. The work that I do in college is meaningful to me.	1	2	3	4	5	6	7
8. The work that I do in college is valuable to me.	1	2	3	4	5	6	7
9. The things I learn in college are useful.	1	2	3	4	5	6	7
10. College will help me achieve my goals in life.	1	2	3	4	5	6	7
11. The work I do in college is a waste of my time.	1	2	3	4	5	6	7
12. College is not important to me.	1	2	3	4	5	6	7
13. I can do well in college	1	2	3	4	5	6	7
14. I don't think that I can do the work in college.	1	2	3	4	5	6	7
15. I believe in my ability to do well in college.	1	2	3	4	5	6	7
16. I have what it takes to do well in college.	1	2	3	4	5	6	7
17. I don't have the confidence in my ability to do well in college.	1	2	3	4	5	6	7
18. I feel very competent in college.	1	2	3	4	5	6	7

Almost done. You are now presented with a different format to answer the following items. Answer T for True or F for False to each statement.

_____1. I came to college because it was expected of me.

_____2. I have largely determined my own career goals.

_____3. Some people have a knack for writing, while others will never write well no matter how hard they try.

_____4. There are some subjects in which I could never do well.

_____5. I sometimes feel that there is nothing I can do to improve my situation.

_____6. I never feel really hopeless – there is always something I can do to improve my situation.

_____7. I would never allow social activities to affect my studies.

_____8. Studying every day is important.

_____9. For some courses it is not important to go to class.

_____10. I consider myself highly motivated to achieve success in life.

_____11. I am a good writer.

_____12. Doing work on time is always important to me.

_____13. I am easily distracted.

_____14. I can be easily talked out of studying.

_____15. I get depressed sometimes and then there is no way I can accomplish what I know I should be doing.

_____16. Things will probably go wrong for me some time in the near future.

_____17. I keep changing my mind about my career goals.

_____18. I feel I will someday make a real contribution to the world if I work hard at it.

_____19. There has been at least one instance in school where social activity impaired my academic performance.

_____20. I would like to graduate from college, but there are more important things in my life.

_____21. I plan well and I stick to my plans.

APPENDIX D

Correlations Among All 28 Scale Scores

Correlations Among All 28 Scale Scores

Scale Score	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Perseverance of Effort (POE)														
2. Consistency of Interest (COI)	.252													
3. Positively-Worded COI (PCOI)	.594	.497												
4. Goal Commitment	.431	.375	.297											
5. IPP	.636	.418	.494	.537										
6. Industriousness (6FPQ)	.445	.201	.240	.422	.407									
7. Harmonious Passion	.280	-.021	.258	.132	.280	.161								
8. Obsessive Passion	.091	-.107	.194	-.074	.017	-.020	.475							
9. Individual Interest	.284	.093	.327	.337	.215	.159	.341	.201						
10. Interest/Enjoyment	.230	.095	.165	.233	.253	.162	.631	.306	.419					
11. Meaningfulness	.264	.250	.199	.528	.397	.281	.307	.058	.585	.406				
12. Competence	.450	.354	.333	.573	.560	.343	.196	-.077	.200	.204	.422			
13. Involvement	.347	.164	.223	.431	.404	.248	.354	.056	.468	.311	.605	.445		
14. General Self-Efficacy (GSE)	.562	.237	.384	.387	.499	.273	.218	.024	.138	.149	.182	.492	.326	
15. Belief Ability Grows w/Effort	.524	.279	.403	.488	.575	.339	.248	.068	.353	.239	.427	.564	.472	.611
16. Belief in Personal Ability	.585	.173	.449	.391	.576	.341	.314	.137	.247	.239	.295	.479	.447	.570
17. Academic Self-Efficacy (ASE)	.509	.273	.424	.441	.573	.405	.353	.041	.308	.275	.413	.659	.405	.485
18. Academic Locus of Control	.461	.458	.406	.533	.567	.342	.239	.056	.305	.283	.457	.551	.428	.387
19. Chance	.182	.323	.062	.479	.288	.249	.016	-.176	.018	.108	.246	.372	.250	.217
20. IE-4 External	.152	.265	.066	.423	.296	.146	.016	-.129	.031	.102	.182	.326	.180	.176
21. BFI Conscientiousness	.604	.458	.526	.514	.714	.523	.279	.077	.317	.228	.351	.565	.337	.501
22. 10-item IPIP Conscientiousness	.585	.413	.516	.546	.666	.479	.207	.007	.265	.195	.369	.512	.336	.460
23. AB5C-IPIP Conscientiousness	.445	.374	.401	.509	.677	.454	.231	-.080	.227	.202	.400	.519	.295	.385
24. GPA	.194	.095	.036	.209	.180	.193	.026	-.123	-.019	.024	.118	.331	.070	.198
25. Cognitive Ability	-.016	.038	-.125	.108	.024	-.011	-.081	-.166	-.094	-.054	.061	.086	-.019	.015
26. Long-Term College Goals	.546	.233	.456	.424	.443	.228	.291	.133	.305	.196	.338	.528	.380	.462
27. Acquired Skills	.299	.035	.278	.165	.216	.121	.388	.165	.484	.317	.396	.192	.370	.213
28 College Satisfaction	.230	.114	.193	.150	.216	.000	.201	.055	.376	.158	.360	.232	.316	.177

Correlation Among All 28 Scale Scores continues.

Correlations Among All 28 Scale Scores continued

Scale Score	15	16	17	18	19	20	21	22	23	24	25	26	27
16. Belief Personal Ability	.672												
17. Academic Self-Efficacy	.543	.442											
18. Academic Locus of Control	.492	.433	.527										
19. Chance	.207	.164	.234	.409									
20. IE-4 External	.210	.196	.136	.349	.525								
21. BFI Conscientiousness	.511	.477	.635	.623	.217	.193							
22. 10-item IPIP	.442	.473	.604	.593	.273	.205	.779						
23. AB5C-IPIP Conscientiousness	.442	.415	.581	.525	.261	.224	.733	.719					
24. GPA	.123	.038	.383	.213	.193	.103	.256	.258	.276				
25. Cognitive Ability	.091	-.074	.050	.030	.169	.034	-.020	.001	.077	.220			
26. Long-Term College Goals	.520	.527	.540	.483	.259	.190	.477	.481	.367	.217	-.002		
27. Acquired Skills	.270	.290	.361	.203	-.018	-.025	.262	.294	.208	.031	-.108	.484	
28. College Satisfaction	.286	.215	.266	.185	.081	.070	.162	.202	.136	.056	-.008	.503	.501

N = 299.

APPENDIX E

Observed Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, and AB5C-IPIP

Observed Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, and AB5C-IPIP

Scale Score	1	2	3	4
1. Grit-O				
2. Grit-C	.789			
3. BFI Conscientiousness	.659	.627		
4. 10-item IPIP Conscientiousness	.617	.611	.779	
5. AB5C-IPIP Conscientiousness	.511	.470	.733	.719

N = 299.

APPENDIX F

Observed Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, AB5C-IPIP, and Comparable Measures of Grit

Observed Correlations Among Scale Scores for Grit-O, Grit-C, BFI, 10-item IPIP, AB5C-IPIP, and Comparable Measures of Grit

Scale Score	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Perseverance of Effort (POE)													
2. Consistency of Interest (COI)	.252												
3. Goal Attainment	.774	.356											
4. Focus	.510	.492	.563										
5. Perseverance	.893	.175	.482	.448									
6. Positively-Worded COI (PCOI)	.594	.497	.742	.954	.493								
7. Goal Commitment	.431	.375	.351	.232	.421	.297							
8. Industry/Perseverance/Persistence (IPP)	.636	.418	.579	.409	.561	.494	.537						
9. Industriousness (6FPQ)	.445	.201	.360	.182	.393	.240	.422	.407					
10. Harmonious Passion	.280	-.021	.254	.222	.266	.258	.132	.280	.161				
11. Obsessive Passion	.091	-.107	.164	.170	.055	.194	-.074	.017	-.020	.475			
12. BFI Conscientiousness	.604	.458	.522	.474	.555	.526	.514	.714	.523	.279	.077		
13. 10-item IPIP Conscientiousness	.585	.413	.559	.436	.513	.516	.546	.666	.479	.207	.007	.779	
14. AB5C-IPIP Conscientiousness	.445	.374	.424	.349	.385	.401	.509	.677	.454	.231	-.080	.733	.719

N = 299.