

EXPLORING THE USE OF NON-COGNITIVE FACTORS IN PREDICTING COLLEGE
ACADEMIC OUTCOMES

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ABSTRACT

The present study evaluated the incremental utility of a blended model of cognitive and non-cognitive variables versus a cognitive-only set of variables to predict academic success among new college students. Traditional cognitive predictors include high school grade point average and ACT scores. The non-cognitive factors of interest were grit, goal orientation, and academic self-efficacy. It was hypothesized that the blended model would demonstrate stronger predictive validity than cognitive predictors alone, grit would be associated with goal orientations and academic self-efficacy, and that academic self-efficacy would mediate the relationship between other non-cognitive predictors and academic success outcomes. The results from archival data ($N = 8,742$) and online survey collection ($N = 624$) suggest non-cognitive factors improve traditional prediction models, particularly through grit and academic self-efficacy. Self-efficacy also mediated the non-cognitive to academic success relationship. Higher Educational institutions could consider the implementation of blended models, using key non-cognitive predictors.

DEDICATION

This thesis is dedicated to my father, who has always been and will always be my rock. His teachings instilled in me an unrelenting thirst for knowledge, a compassion for others, and a belief that all things are possible with effort and patience. These lessons are unmeasurable and no amount of discourse could possibly convey my gratitude. For all these things, and so much more, I am forever grateful.

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LIST OF ABBREVIATIONS

MaAP, Mastery Approach goal orientation

PAP, Performance Approach goal orientation

PAV, Performance Avoidance goal orientation

CHAPTER I

INTRODUCTION

Incoming college students adjust to difficult transitions during their initial years on campus, potentially influencing their academic success at the post-secondary level. In addition to adjusting to higher academic expectations, these students must effectively adapt to social, personal, and financial transitions, among others. Poor adjustment to these factors may be a contributing factor to commonly observed first-year dropout rates that approach 30% in many institutions as well as generally poor academic performance in the classroom (Aud et al., 2011). In addition to adjustment challenges, freshmen students' first semester college grade point average (GPA) appears to significantly impact decisions to continue or drop out of college (McGrath & Braunstein, 1997). Just as beginning college students face their own significant adjustment challenges, colleges and universities also face related challenges associated with high rates of attrition and lower-than-desired academic performance within the students they are attempting to educate. That these issues persist after decades of attention raises the question of whether there may be better strategies, tools, and predictive models for universities to utilize when forming admissions decisions and attempting to identify students who are most at risk for poor performance and attrition.

A meta-analysis of academic success predictors suggested that traditional factors, (e.g., standardized test scores, socioeconomic status, and high school grade point average) accounted for only 25% of the variance in academic performance and 9% of variance in retention at the

post-secondary level (Robbins et al., 2004). Although most institutions rely on these traditional predictors when making admissions decisions, Robbins et al. (2004) also showed that a less commonly deployed blended model that includes both traditional and non-cognitive factors accounted for 34% of the variance in academic achievement and 23% in retention (when fully corrected for measurement error). Thus, it appears that real progress toward predicting and eventually improving student attrition and achievement requires a better understanding of cognitive *and* non-cognitive factors that can influence these important outcomes; yet few institutions are focusing their efforts on these blended approaches.

Predicting Student Success: Cognitive and Non-Cognitive Factors

Efforts to predict and improve the academic performance of incoming freshmen are essential to a university's success. Among the many reasons for this are state and federal funding formulas that require public institutions of higher learning to demonstrate adequate student progress toward degree completion. Students also benefit from more valid admissions decisions when multiple predictors of their success are considered. The use of statistical predictive modeling involving non-cognitive constructs to help forecast and augment academic success within educational institutions is not a new practice. Tinto (1975) originally proposed what would now be seen as non-traditional predictive model for student attrition, suggesting that students bring unique sets of traits to college, which ultimately influence their academic performance and attrition.

These non-cognitive traits are based on individual characteristics, upbringing, and prior education. Although one of the first to suggest that non-cognitive traits can influence educational attainment, Tinto's model is still widely cited today (e.g., Credé & Kuncel, 2008; Robbins et al.,

2004; Valentine et al., 2011). Despite long support for more comprehensive models, indicators of prospective students' cognitive ability (e.g., SAT, ACT, high school GPA) remain the primary predictors of academic performance and retention (e.g., Komarraju, Ramsey, & Rinella, 2013; Lucio, Hunt, & Bornovalova, 2012) although these factors account for a limited proportion of variance. There is a need, therefore, to examine the predictive utility of both cognitive and non-cognitive factors together (Komarraju et al., 2013).

Non-cognitive factors of success in an academic environment include a large number of constructs, but have been categorized into five general categories: academic behaviors, academic mindsets, learning strategies, academic perseverance, and social skills (Farrington et al., 2012). Typical non-cognitive predictors include such things as psychosocial traits, student affect, and behavioral tendencies. Aside from the very pragmatic reasons for seeking alternative predictors of academic success (e.g., traditional predictors still leave a significant proportion of unexplained variance in target outcomes), there is also a strong theoretical rationale for the intuitive link between non-cognitive factors such as personality traits and underlying learning-related competencies to actual student cognitions and behaviors, a link potentially stronger than with students' high school academic performance history or the abstract standardized college entrance exam scores.

Indeed, recent research has established the validity of several non-cognitive predictors of academic performance (Robbins et al., 2004). The following sections summarize the evidence base for a subset of these possible predictors that are especially likely to play a critical role in determining student success in a higher education environment.

Grit

One potentially promising non-cognitive predictor of academic success is known as *grit*, defined as a person's "trait-level perseverance and passion for long term goals" (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). Duckworth et al. (2007) has shown that grit is distinct from general self-control in that it emphasizes a person's consistent interests and long term persistence for achieving goals (while self-control is more focused on the short-term situation). As an example, an individual with a high degree of self-control may be able to follow a diet or maintain his or her temper on a day-to-day basis, but still be unable to hold a job consistently over an extended period of time. In this way, "grittier" individuals would be able to endure long term self-control and efficaciously pursue long range goals of weight loss or career aspirations.

Limited research in an academic environment suggests that grit is a strong predictor of student performance and retention, over and above SAT scores, weighted high school rank, self-control, and leadership potential (Duckworth et al., 2007). For instance, Duckworth et al. (2007) found that West Point cadets who scored a standard deviation higher than the mean on a grit scale were 60% more likely to be retained after an arduous summer training course, while cadets who scored a single standard deviation higher than the average on a self-control assessment were only 50% more likely to finish training. These results fit with previous findings that personal preference for long term goals is positively associated with academic performance (Ting, 1997).

Based on this existing work, grit is expected to be a significant predictor of student attrition risk and academic performance within a university environment. Because gritty individuals are expected to "work strenuously toward challenges, maintaining effort and interest over years, despite failure, adversity, and plateaus in progress" (Duckworth et al., 2007, p. 1088),

individuals with more grit (vs. those with less grit) should be more likely to succeed academically, benefit from possible training interventions, and stay in school. Due to grit's positive influence on academic outcomes, it is expected that:

Hypothesis 1: Grit is positively associated with academic performance outcomes and negatively associated with attrition risk.

While most of the existing research on grit within higher education has focused on students in rather selective institutions and high achievers, there is reason to believe the existing findings will generalize to other groups of students; the present study examined that possibility (Farrington et al., 2012).

Goal Orientation

Goal orientation constructs derived from achievement motivation theory have also been linked to academic performance (e.g., A. J. Elliot & McGregor, 2001; Vandewalle, Cron, & Slocum, 2001). Goal orientation refers to the approach a student employs when developing, enacting, and demonstrating competence or skills to others. The two distinct approaches of goal orientation are commonly referred to as performance and mastery orientations (Button, Mathieu, & Zajac, 1996; E. S. Elliot & Dweck, 1988; Nicholls, 1984).

In an academic context, students who prefer a mastery approach goal (MaAP) orientation are interested in gaining deeper knowledge and see academic goals as a way of furthering their own academic acumen. In contrast, students who prefer performance approach goal orientations are more concerned with their ability to portray knowledge on the surface level and demonstrating their competence to others (e.g., Church, Elliot, & Gable, 2001; A. J. Elliot & McGregor, 2001; Vandewalle et al., 2001). Within mastery and performance orientations, there

is a further distinction commonly drawn between approach and avoidance, leading to four possible goal orientation types (Pintrich, 2003). Students with a preference for performance-approach goal (PAP) orientations are focused on using their skills to demonstrate their abilities or competence to others. Conversely, students with a preference for performance-avoidance goal (PAV) orientations tend to avoid using their skills so that they will not risk demonstrating poor competence or failure if they do not successfully perform in a given situation.

There are mixed findings regarding which type of goal orientation best facilitates academic success within academic settings. For instance, Okun, Fairholme, Karoly, Ruehlman, and Newton (2006) demonstrated that MaAP oriented students scored lower than PAP oriented students on an introductory psychology course exam. However, VandeWalle et al. (2001) demonstrated a positive link between higher college business course exam performance and MaAP orientation. It has been suggested that these types of inconsistencies may be tied to the possibility that a person's goal orientation is situational (Pintrich, 2000). In other words, students may exercise a PAP orientation for a mid-term examination, and then take a MaAP orientation approach towards their overall class performance.

Carrying this logic one step further, Barron and Harackiewicz (2001) demonstrated that individual factors (e.g., goal task, interest level, self-assigned versus assigned goals) may also lead students to adapt multiple goal orientations. These researchers linked a student's preference for MaAP orientations to task interest, while linking a preference for PAP orientations to performance outcomes for self-assigned academic goals. However, personality factors moderated the achievement goal relationship when students were encouraged to adapt a particular type goal orientation via instruction. Individuals low in achievement orientation rated higher interest in a task when instructed to adapt a MaAP type goal, yet high achievement oriented individuals rated

higher interest when instructed to adapt a PAP type goal. Thus, while there is evidence that goal orientation may influence academic success, further research is needed to establish other constructs that may affect goal orientation preferences within secondary education setting. Based on the existing goal orientation research, it is proposed that:

Hypothesis 2: (a) MaAP orientation and (b) PAP orientation are positively associated with academic performance outcomes and negatively associated with attrition risk.

Hypothesis 3: PAV orientation is negatively associated with academic performance outcomes and positively associated with attrition risk.

Academic Self-Efficacy

Academic self-efficacy has also emerged as a key predictor of grade point average and retention at the college level (Robbins et al., 2004). Self-efficacy is generally defined as an individual's evaluation of their ability to successfully complete a task (Bandura, 1977). When students believe they are capable of completing a course assignment or test successfully, they are more likely to put forth the required effort. Extensive research illustrated that domain specific *academic self-efficacy* is closely associated with academic performance and retention (e.g., Bong, 2001; Hackett, Betz, Casas, & Rocha-Singh, 1992; Zajacova, Lynch, & Espenshade, 2005; Zhang & RiCharde, 1999).

Hsieh, Sullivan, and Guerra (2007), for example, studied academic efficacy and goal orientation among college students who were either high or low academic performers. Their results demonstrated that perceived academic self-efficacy was higher for students in good academic standing when compared to students on academic probation. Of particular relevance to

the present study, Hsieh and colleagues also found that students with higher academic self-efficacy tended to employ “significantly stronger mastery goals than those who had lower self-efficacy” (p. 465). For both groups in their study (high and low academic self-efficacy), there was a stronger preference for MaAP orientations than for PAP and PAV orientations. However, students on academic probation with higher levels of perceived academic efficacy were more likely to use PAV goals than higher academic performers. These findings suggest that, although some at-risk students may perceive themselves as capable of academic success, they still may engage in self-sabotaging behaviors, such as not asking for help or shying away from difficult situations. Considering the preceding evidence on academic self-efficacy, it was expected that:

Hypothesis 4: Academic self-efficacy is positively associated with academic performance outcomes and negatively associated with attrition risk.

Additional Objectives

The present study focused on freshmen and sophomore students at a moderately sized public university in the southeastern United States. Similar to comparable universities, roughly 67% of the first-year students at this institution typically proceed to the sophomore level (representative of the university’s Advisement and Student Success Center, personal communication, January 25, 2013). Most of the existing academic support programs for loosely defined “at-risk” students at this institution are similarly loose in their structure and are voluntary in their nature (i.e., students have to opt-in). The institution also does not have a structured formula or approach for identifying at-risk students at the time of admission (representative of Advisement and Student Success Center, personal communication, January 25, 2013).

Unfortunately, existing intervention efforts in the participating institution, and many other universities, do not address fundamental psychological and behavioral issues that may be directly linked to student success. For example, in two recent surveys of university freshmen in the participating university's optional Freshmen Success orientation course, test preparation, time management, and class attendance ranked as the top three perceived and self-reported factors impeding academic performance (representative of Advisement and Student Success Center, personal communication, January 25, 2013). These factors are psychologically-oriented and behavioral in nature, meaning they lend themselves to formalized training and development interventions. Interestingly, all of these factors are also likely to be associated with grit, goal orientation, and academic self-efficacy. Test preparation and proper time management require setting goals and the belief that an individual can successfully complete the task. Similarly, test preparation, time management, and class attendance are associated with interest and perseverance, which are core components to grit.

In addition to the previously stated hypotheses, therefore, the present study evaluated the incremental utility of a blended model (i.e., cognitive and non-cognitive) set of predictors of academic success versus a standard cognitive set of predictors. Because grit, goal orientation, and academic self-efficacy are not synonymous with cognitive ability or the traits of the Five Factor Model of personality, and due to the established interrelationships among these non-cognitive predictors of behavior, it was expected that each of the alternative non-cognitive characteristics described above would positively impact academic success, over and above the impact of students' prior academic performance, such that:

Hypothesis 5: A blended model containing traditional cognitive factors, and the non-cognitive factors grit, goal orientation, and academic self-efficacy is a better

predictor of academic success outcomes (performance and attrition risk), than traditional cognitive factors alone (see Figure 1).

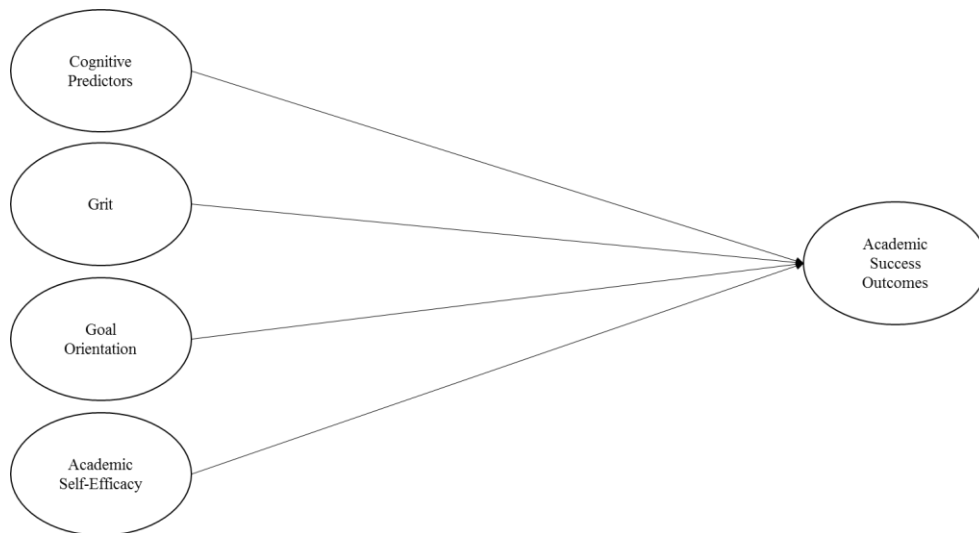


Figure 1 Proposed model of expected relationships.

In addition to the anticipated predictor-outcome relationships already identified, the present study also contributes to the developing literature regarding the promising, yet still novel construct of grit. It is logical to expect that grit is closely associated with a person's primary goal orientation because both concepts are achievement motivation oriented. Duckworth et al. (2007) also suggested that grit is influenced by personal beliefs about the impact of external causes, one's own capabilities, and the attributions of undesirable and positive events. In line with this suggestion, it was further expected in the present study that grit would be positively related to higher levels of perceived academic self-efficacy. In other words, it was expected that students' with higher levels of grit would also have the confidence necessary to remain enrolled and perform at a high level within the academic environment. Building upon this logic, it was expected that:

Hypothesis 6: Grit is positively associated with (a) MaAP and (b) PAP orientations, but (c) negatively related to PAV orientation.

Hypothesis 7: Academic self-efficacy is positively associated with grit.

A final and exploratory question relating to academic self-efficacy was also considered in the present study. Self-efficacy is partially developed through performance accomplishments, vicarious learning, social persuasion, and physiological responses (Bandura, 1977). Incoming freshmen and early stage sophomore students lack significant performance experiences within the college environment. As students experience college life and coursework, their experiences guide their motivation to attempt further accomplishments. Successes increase the belief that a student can master the task, but repeated failures, particularly early on, decrease the student's belief they can successfully complete the task (Bandura, 1977). This later development of academic self-efficacy may influence how students respond to collegiate environments, which may affect other non-cognitive factors that develop prior to college. The anticipated relationships among the non-cognitive predictors at the heart of the present study suggest the possibility that academic self-efficacy may be influenced by grit and goal orientation, and may itself function as a mediator of the influence of these non-cognitive predictors on academic success outcomes.

Hypothesis 8: Academic self-efficacy mediates the relationships between (a) grit, (b) MaAP goal orientation, and (c) PAP goal orientation, and (d) PAV goal orientation, and academic success outcomes (performance and attrition risk, see figure 2).

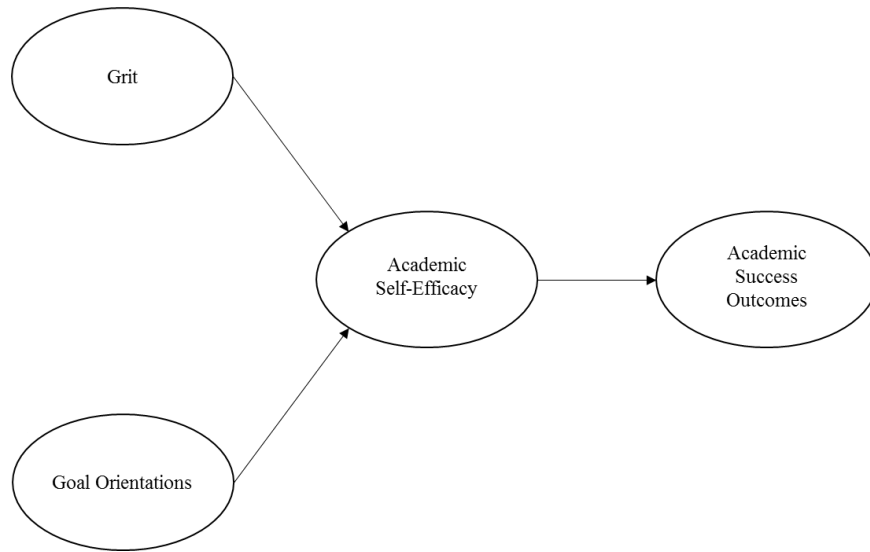


Figure 2 Exploratory conceptual model of proposed relationships.

CHAPTER II

METHOD

Participants

All data for this study came from a medium-sized, public university in the southeastern U.S.A. The primary data for testing the present hypotheses were gathered from surveys of the participating university's current freshmen and sophomore students and from the university's recent admissions records. Current students were recruited for the survey portion of the study via indirect advertisements (e.g., posters) in campus dormitories and via direct campus email invitations. Approximately 4,600 students were contacted to participate with help from the participating institution's Center for Advisement and Student Success. A response rate of 15-20% was expected as typical for internet-based surveys with small reward incentives (Bosnjak & Tuten, 2003; Cook, Heath, & Thompson, 2000). The final response rate for the present data collection was roughly 15-16% ($n = 721$). Additional data were obtained from the participating university's admissions records. These data pertained to incoming freshmen and sophomores over the most recent four cohorts of incoming students ($n = 8,742$).

Measures

Data for testing the hypotheses were gathered from the survey participants using the following measures (see Appendix for all items). All measures have demonstrated adequate

internal consistency reliabilities in previous studies; the reliabilities observed in the present data are summarized in the Results section.

Grit

The Grit-O scale (Duckworth et al., 2007) was used to assess individual levels of the grit construct. Developed in 2007, the Grit-O scale has been validated in diverse population sets (e.g., military academy, primary school, college). The scale includes 12 descriptive items that respondents rate on a five-point Likert scale, ranging from 1 (not like me at all) to 5 (very much like me). Previous factor analysis indicated that the scale represents two broader dimensions of consistency of interest and perseverance for long term goals. In Duckworth's (2007) study the use of an individual factor did not provide predictive power over the opposing factor. Because of this, and the correlation between factors ($r = .45$), prior studies have averaged overall item responses to develop an overall grit score. Across various studies, the overall scale and the individual factors have demonstrated good internal consistency reliability (Duckworth et al., 2007; Duckworth & Quinn, 2009; Strayhorn, 2013). The scale has also demonstrated incremental predictive validity over similar constructs such as self-control, conscientiousness, and hardiness (Duckworth et al., 2007; Maddi, Matthews, Kelly, Villarreal, & White, 2012).

Goal Orientation

The revised achievement goal questionnaire (AGQ-R), developed by Elliot and Murayama (2008) was used to assess individual goal orientation. This scale is an adapted version of the achievement goal questionnaire (AGQ), which was originally developed by Elliot and McGregor in 2001. The AGQ-R assesses four orientations of GO: MaAP, PAP, PAV, and

mastery-avoidance orientation. There are a total of 12 items, with each dimension consisting of 3 items. There has been some debate among researchers about whether the mastery-avoidance dimension of the AGQ-R should be used. Some believe that the approach-avoidance distinction applies to both the mastery and performance dimensions (e.g., Conroy, Elliot, & Hofer, 2003; Pintrich, 2000). Others, however, believe that the mastery avoidance construct is too abstract and difficult to understand, and therefore worth ignoring when assessing a person's goal orientation (Hsieh et al., 2007; Payne, Youngcourt, & Beaubien, 2007). Whereas the mastery avoidance form of goal orientation still needs to be better validated and incorporated in to the application of goal orientation theory (Elliot & Murayama, 2008), the other three goal orientation dimensions measured by the AGQ-R have been validated (e.g., Day, Radosevich, & Chasteen, 2003; Elliot & Church, 1997; Payne et al., 2007). In the present study, these three forms were the focus, while the mastery avoidance items were excluded to avoid confusing participants and to ensure the most direct and valid assessment of the most influential goal orientations.

Academic Self-Efficacy

The college self-efficacy inventory (CSEI), developed by Solberg, O'Brien, Villareal, Kennel, and Davis (1993), was employed to measure academic self-efficacy. The CSEI consists of 19 items representing three dimensions: course efficacy, roommate efficacy, and social efficacy. These dimensions represent the broader experiences one might encounter while in college. Although other academic self-efficacy scales focus on course efficacy alone, the comprehensive nature of the CSEI emphasizes other factors that are important to freshmen success at an institution. The scale is scored on a nine-point Likert scale with zero representing little confidence and eight representing extreme confidence to complete the task successfully.

For this study, the scale was modified to a seven-point Likert scale by omitting the totally unconfident and totally confident items. It was believed that the nine-point Likert scale would be too confusing, and participants would have a harder time distinguishing between totally confident and very confident, or totally unconfident and very unconfident. An average composite score for each dimension is typically employed. The overall scale has strong internal reliability ($\alpha = .93$), and established convergent and discriminant validity (Solberg et al., 1993).

Personality

To measure the traits of the Five Factor Model of personality, the 50-item International Personality Item Pool Big Five Questionnaire (Goldberg, 1999) was used. The 50-item International Personality Item Pool Big Five Questionnaire (IPIP) is an internationally used scale that assesses extroversion, openness to experience, agreeableness, conscientiousness, and neuroticism. The scale has demonstrated internal consistency and consists of 50 items (Goldberg, 1999). Participants are asked to choose the response to each item that accurately describes them. The assessment uses a seven-point Likert scale (1=completely inaccurate to 7=completely accurate). Including measures of these traits in the statistical analyses made is possible to demonstrate the incremental validity that grit, goal orientation, and academic self-efficacy provide over and beyond those of the Five Factor Model of personality traits. This was particularly important, given some evidence that suggests grit may be a facet of conscientiousness, but also offer distinct predictive value beyond conscientiousness (Duckworth et al., 2007).

Demographics

For the purpose of sample description and to identify potentially relevant covariates for the analyses, certain demographic variables were also assessed. Participants were asked to provide their age, sex, ethnicity, and race. Based on previous research (e.g., Robbins et al., 2004; Strayhorn, 2013; Tinto, 1975), other background questions were included to reduce the possibility of covariates and to increase the ability to establish true relationships. These included items related to educational attainment, specifically: grade level, credit hours taken to date, current number of credits enrolled, educational attainment goals, and class attendance. A five-point Likert scale was employed to evaluate class attendance (1=never to 5=always), and educational attainment goals (1=some college to 5=doctoral degree). Other factors that may limit a student's ability to focus on their education were also assessed, including: employment status, marital status, involvement in extracurricular activities, recreational drug use, and athlete status. Yes and no responses were used to measure employment status, involvement in extracurricular activities, and athlete status (no=1, yes=2). The marital status item included single, married, living as married, and divorced as response options. Frequency of drug use was evaluated on a five-point Likert scale (1=never to 5=always). Beyond these, socioeconomic factors and individual backgrounds have also been known to influence academic attainment. As such, students responded to questions regarding first generation college student status, current residence status, financial assistance, student transfer information, if English is their primary language, and in state versus out of state status. All of which were evaluated with yes and no responses, with the exception of residence status. Residence status used an on-campus versus off-campus response option (on-campus=1, off-campus=2).

Cognitive Predictors

Archival data were provided by the participating university pertaining to traditional and cognitive predictors of academic success. For the present study, cognitive predictors included standardized admissions test scores (i.e., ACT composite) and high school grade point average. The ACT has four sections (English, mathematics, reading, and science), totaling 215 items. The ACT has been validated as a predictor of academic performance, but like other standardized tests, minorities and females tend to score lower than majority and/or male candidates (ACT, 2007). The participating university in the present study considers the overall ACT score as the primary standardized test score at the time of student admission, but student applicants are also able to submit SAT scores if desired (although very few students submit both, leading to the exclusion of SAT scores from the present study).

In addition to the ACT, the participating university used high school GPA as a secondary indicator of cognitive ability and historical academic performance. High school GPA typically ranges from 0-4.00, although depending on the high school, some students may score above a 4.00 if they receive higher course marks and honors credit. It has been argued that high school GPA is influenced by contextual factors and may be less valid as a predictor than standardized test scores. Despite these criticisms, high school GPA has clearly been identified as a valid predictor of college academic performance (Pintrich, 2003), and recent research suggests it may be the best predictor of college-level academic performance when compared to other traditional predictors, including standardized test scores (Hiss & Franks, 2014).

Academic Performance

One form of the general academic success outcome targeted in this study was students' academic performance. This was measured in terms of first and second semester GPAs as documented in the participating university records. To evaluate a more subjective perceived form of academic performance (likely to be influential on college-related self-efficacy), two additional items were adapted from Heaven, Mak, Barry, and Ciarrochi (2002). Participants responded to these two items on a scale of 1=Below average to 5=Top 10% of students, indicating where they perceived themselves to fall relative to other students in terms of the following: "How would you rate yourself in terms of general academic performance?" and "Where do you usually score on tests in college classes?"

Attrition Risk

A second indicator of academic success was student attrition risk, assessed via self-reported intent to leave the university. The intent to leave the university items were adapted from items developed by Tepper et al. (2009) to assess employee intentions to quit (e.g., "I plan on leaving this organization very soon" Adapted to read "I plan on leaving this educational institution very soon.").

Procedure

Archival Data Collection

The procedure for this study began by collecting archival data on freshmen between the summer of 2013 and fall of 2014 from the institution's Center for Advisement and Student Success. Institutional staff provided data regarding student demographics, admissions test scores,

and high school GPA. Archival data were gathered over the summer and fall of 2013 regarding academic performance, retention, and demographic data on the 2010, 2011, 2012, and 2013 incoming freshmen cohorts. These archival data made it possible to test a traditional, cognitively focused prediction model that is based on standardized test scores and high school GPA as the primary predictors of academic performance outcomes. Additional information regarding non-cognitive predictors at the student level was gathered using a survey administered to current freshmen and sophomore students at the participating university.

Survey Data Collection

Freshmen and sophomores were recruited in late fall of 2013 through a partnership with the university's Housing Administration. Participants were informed of the study via notices hanging in student dormitories and campus email, asking them to participate. Upper level college students were omitted from the study to reduce possible influential effects of age and acculturation to the college environment. The questionnaires were administered online and students were given a link to the survey during the recruiting phase. The questionnaires were developed and managed through SurveyMonkey. Before responding to the questionnaire, each student filled out a consent form and then completed the aforementioned scales. The assessment took approximately 15 minutes to complete. Only those over the age of 18 were allowed to participate. As an incentive, students were entered into a raffle drawing to earn a small \$10 or \$20 incentive placed on their student ID cards. Fifty total students were rewarded incentives for their participation. Students were also debriefed on the purpose of the study and provided contact information for future communication. Survey data collection finalized early in fall of 2014.

To facilitate testing of the blended predictor model, these two sources of data were matched to each other using a relational database to link students by their institutional IDs. This matched data set was then exported to SPSS (v. 21) for analyses.

Analyses

Several preliminary steps were taken to ensure optimal data quality before analyses began. First, participants who did not consent to participate or did not meet the basic inclusion criteria for the study (i.e., self-identified as a non-freshman or non-sophomore) were removed from the data set ($n = 10$). The remaining data were then evaluated for missing item responses or duplicate survey entries. Survey participants who failed to respond to more than 25% of the items or completed the survey more than once, were also omitted ($n = 87$). The number of usable participant survey data then totaled 624.

All participant records were examined for item-level missing data. Various imputation techniques were used to replace missing item-level data that was sporadic and missing at random. Person mean imputation was employed for the Grit-O scale questions if the participant responded to at least three items within a subscale. For the AGQ-R, mean imputation techniques were used if participants responded to at least two questions within the subscales. If participants left more than one response blank for the AGQ-R subscales, a “neutral” response was imputed. Mean imputation techniques were also used for the CSEI subscales when participants omitted two items or less. If three or more items were left blank, the “undecided” response was employed. Similar rules were applied to the IPIP scale, except that instead of a mean response, the neutral mid-point response was recorded when three or more items were missing. For the

intent to leave measure, mean imputation was employed if participants left one item blank, and the “neutral” response was assigned to an item if participants had more than one blank.

Following the addressing of missing data, items that needed to be reverse scored or dummy coded were identified and recoded in SPSS Internal consistency reliabilities for each scale and subscale were measured with Cronbach’s alpha. Reliabilities for each scale are presented in Table 2. Finally, scale scores were calculated.

From the archival data ($N = 8,742$), the mean age of participants was 20 years ($SD = 1.36$). From these data, the participant’s sex and ethnicity were also extracted. Of the 8,742 participants in this data set, 5,050 were female (57.8%) and 3,692 were male (42.2%). The majority of participants were white ($n = 6,313$, 72.2%), African American ($n = 1,076$, 12.3%), or indicated multiple ethnicities ($n = 1,019$, 11.7%). A small percentage were Asian ($n = 143$, 1.6%), American Indian ($n = 21$, 0.2%), or Hispanic/Latino ($n = 73$, 0.8%). There were 97 students (1.1%) for which ethnicity information was not available.

The demographics from survey participants ($N = 624$) were similar to those seen in the archival data. Most survey participants were white ($n = 474$, 83%) females ($n = 399$, 69.9%). Additional demographic information collected from the survey sample is presented below in Table 1. As can be seen, survey participants were mainly freshmen ($n = 349$, 61.1%) that were not employed ($n = 353$, 61.8%), single ($n = 555$, 97.2%), and living on-campus ($n = 436$, 76.4%). Approximately 16% of these respondents ($n = 90$) were the first in their family to attend college.

Table 1 Sample Demographic Information

<i>Variable</i>	<i>Survey</i>		<i>Archival</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Male				
<i>Male</i>	172	30.10	5050	57.76
<i>Female</i>	399	69.90	3692	42.23
Ethnicity				
<i>White</i>	472	82.70	6313	72.20
<i>African American</i>	59	10.30	1076	12.30
<i>Asian</i>	12	2.10	143	1.60
<i>More than one</i>	19	3.30	1019	11.70
<i>American Indian</i>	0	.00	21	.20
<i>Hispanic/Latino</i>	3	.50	73	.80
Year in School				
<i>Freshmen</i>	349	61.10		
<i>Sophomore</i>	207	36.30		
<i>Junior</i>	5	.90		
<i>Senior</i>	0	.00		
Employment				
<i>No</i>	353	61.80		
<i>Yes</i>	207	36.30		
Marital Status				
<i>Single</i>	555	97.20		
<i>Married</i>	3	.50		
<i>Living as married</i>	5	.90		
<i>Divorced</i>	1	.20		
First in Family to go to College				
<i>No</i>	475	83.20		
<i>Yes</i>	90	15.80		
Residence				
<i>On-Campus</i>	436	76.40		
<i>Off-Campus</i>	122	21.50		

Note. Cumulative percentages may be less than 100 due to missing data.

Chi-Square tests were used to statistically test whether survey respondents differed significantly from the broader university student body in terms of key demographic variables. The limited demographic information in the archival data, however, only made it possible to compare the sex and general ethnicity of the two sets of data. Some ethnic categories were collapsed because of differences in category labeling between the archival data and the institutional data, and ethnic minorities only representing very small overall percentages. Therefore, the ethnic categories that were used in the Chi-Square tests were White, African American, and all others. Results from the Chi-Square tests indicated that the survey sample included significantly more females and fewer minority students than the broader freshmen student population within the available archival data set. Survey participants were also compared to the demographics of their current cohort members. Here as well, there were significantly more females and majority students in the survey sample than in the broader current freshman and sophomore student population.

Because the preceding tests indicated significant differences in sex proportions between the survey participants and the broader freshmen and sophomore population at the participating institution, independent samples *t*-tests were then employed to evaluate whether significant differences existed in terms of the primary study variables across the sex and ethnic groupings. Corrected significance levels were used to evaluate all independent *t*-test results to reduce errors caused by multiple comparisons. For all significant differences between genders, women scored higher than males. In line with prior research, women typically scored higher than men on the academic performance variables (Conger & Long, 2010; Snyder, Dillow, & Hoffman, 2009). There were also significant differences in the Big Five Factor Model. Women scored higher on agreeableness, conscientiousness, and emotional stability, which is consistent with recent

research as well (Costa, Terracciano, & McCrae, 2001; Schmitt, Realo, Voracek, & Allik, 2008). The only non-cognitive factor that demonstrated significant differences was MaAP goal orientation, with females scoring higher than males. Ablard and Lipschultz (1998) showed that females tended to adapt stronger mastery goal orientations than males. At this institution, the majority of students are white. To evaluate ethnicity, all minorities were combined into one group and then compared to the majority. The only significant differences were in academic performance outcomes. Minorities typically scored lower than whites, which is an ongoing issue within all higher education institutions.

These analyses fed into a careful review of other demographic and personality variables that were potential meaningful statistical covariates in the analyses. The preceding information, as well as bivariate correlations between the theoretically justified possible demographic and personality covariates and the other core study variables, was carefully considered. These preliminary analyses highlighted statistically significant relationships between the following demographic and personality variables and one or more of the other core study predictor or outcome variables: sex, ethnicity, current employment status, participation in extracurricular activities, where students live, level of education students plan on obtaining, use of recreational drugs or alcohol, and all five of the Five Factor Model traits. The remaining demographic variables measured as part of the current student survey were not considered further either because of low variability in responses to the measures of these variables or because these variables did not correlate with any of the other predictor or outcome variables in the present study.

To test the actual hypotheses, correlation and regression techniques were used. Multiple linear regression helps to determine the amount of variability within the dependent variable that

is accounted for by multiple predictors or covariates. The variability can be represented in a regression equation that can be used to predict outcome variables. Regression techniques are often used for predicting outcomes because the results of such an analysis can be used to create a predictive equation useful in identifying performance potential among future applicants. This type of regression equation is often stated as $y = b_1 x_1 + b_2 x_2 + c$ (Miles & Shevlin, 2001). With y representing the outcome variable, x_1 representing the first predictor variable, x_2 the next predictor, x_3 the following predictor, and so forth. C represents the constant, or the estimated value of the dependent variable, when the predictor has no influence. Each predictor variable has an associated slope, b , which indicates the expected increase or decrease that would occur if the predictor value increased by one. Correlation and regression techniques were used to evaluate the proposed relationships in Hypothesis 1 through Hypothesis 5. Hypothesis 6 through 8 were evaluated using the MEDIANTE macro (Hayes, 2013) in SPSS, which facilitates OLS regression-based testing of complex indirect effects such as those hypothesized in the present study.

Table 2 Reliabilities for All Measures

Measure	<i>N</i>	# of Items	Cronbach's α
Grit	559	12	.81
Grit Interest	559	6	.79
Grit Perseverance	559	6	.79
MaAP Goal Orientation	550	3	.88
PAP Goal Orientation	550	3	.89
PAV Goal Orientation	550	3	.93
Academic Self-Efficacy	545	19	.91
Course Self-Efficacy	546	7	.85
Roommate Self-Efficacy	546	4	.85
Social Self-Efficacy	545	8	.90
Extraversion	515	10	.89
Agreeableness	515	10	.82
Conscientiousness	515	10	.79
Stability	515	10	.84
Openness to Experience	515	10	.77
Subjective Performance	512	2	.83
Intent to Leave	507	4	.88

CHAPTER III

RESULTS

Descriptive statistics for all study variables are summarized in Table 3. From the bivariate correlations summarized here, it is evident that the academic success outcomes are associated with the non-cognitive predictors that were the primary target of interest in the present study. All core predictor and outcome variables demonstrated relatively normal distributions (i.e., no evidence of severe skewness or kurtosis). Before proceeding further with the regression analyses, the following diagnostics were considered as tests of possible multicollinearity among predictors: variance inflation factors higher than 10, average variance inflation factors significantly larger than 1, and tolerance levels less than .02 (Field, 2013). Multicollinearity was not detected among the study variables and the analyses proceeded as planned.

Table 3 Descriptive Summary for Main Study Variables

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Male															
2. Ethnicity	-.01														
3. Employed	-.09 *	-.05													
4. Extracurricular Activities	-.02	-.06	-.05												
5. Residence	.10 *	-.08	.25 **	-.19 **											
6. Educational Attainment Goals	-.03	.05	.09 *	-.01	-.04										
7. Recreational Drug Use	.08	-.03	.07	-.06	.01	.06									
8. Extraversion	-.03	-.05	.11 *	.10 *	-.05	.10 *	.15 **								
9. Agreeableness	-.21 **	-.05	.07	.10 *	-.04	.14 **	-.02	.29 **							
10. Conscientiousness	-.09 *	-.07	.01	.01	.01	.04	-.20 **	.06	.29 **						
11. Stability	.21 **	-.02	.00	-.02	.04	.02	-.06	.22 **	.14 **	.16 **					
12. Openness	.05	-.08	.14 **	-.07	.08 *	.14 **	.03	.20 **	.36 **	.18 **	.14 **				
13. High School GPA	-.22 **	-.07 **	.09 *	.08	-.02	.10 *	-.16 **	-.10 *	.03	.15 **	.06	-.04			
14. ACT Composite	.04 **	-.19 **	.07	.05	.02	.21 **	.02	-.09 *	.06	-.02	.08	.21 **	.39 **		
15. ACT Math	.15 **	-.15 **	.04	.04	.03	.13 **	-.04	-.04	-.03	.06	.18 **	.06	.37 **	.77 **	
16. ACT Reading	-.03 *	-.17 **	.05	.00	-.02	.19 **	.04	-.11 *	.11 *	-.05	-.02	.24 **	.25 **	.82 **	.41 **
17. ACT Science	.16 **	-.16 **	.05	.05	.05	.20 **	-.02	-.12 **	.02	-.03	.09 *	.19 **	.28 **	.80 **	.61 **
18. ACT English	-.10 **	-.15 **	.10 *	.04	.01	.17 **	.06	-.05	.10 *	-.03	.06	.20 **	.36 **	.85 **	.54 **
19. Grit	.02	.05	.06	.08	.03	.12 **	-.14 **	.17 **	.20 **	.49 **	.28 **	.24 **	.18 **	.00	.07
20. Grit Interest	-.03	.07	.02	.06	.04	.09 *	-.12 **	.04	.10 *	.38 **	.24 **	.07	.14 **	-.03	.03
21. Grit Perseverance	.07	.01	.08 *	.07	.01	.10 *	-.12 **	.25 **	.23 **	.42 **	.21 **	.34 **	.16 **	.04	.08
22. MaAP Goal Orientation	-.11 **	-.03	.03	.05	-.01	.19 **	-.07	.10 *	.33 **	.33 **	.09 *	.22 **	.10 *	.14 **	.04
23. PAP Goal Orientation	-.06	.00	.03	.08	-.04	.09 *	-.08	.07	.11 **	.23 **	-.01	.13 **	.08	.11 *	.04
24. PAV Goal Orientation	-.04	-.01	-.01	.01	.00	-.06	-.03	-.04	.05	.13 **	-.09 *	.06	.00	-.03	-.10 *
25. Course Self-Efficacy	-.05	-.05	.03	.11 **	.07	.15 **	-.10 *	.15 **	.21 **	.40 **	.23 **	.32 **	.18 **	.20 **	.14 **
26. Roommate Self-Efficacy	-.08	.05	-.06	.09 *	-.01	.07	-.03	.21 **	.31 **	.23 **	.21 **	.20 **	-.02	.00	.00
27. Social Self-Efficacy	.05	.01	.02	.22 **	.07	.12 **	-.02	.50 **	.28 **	.24 **	.23 **	.28 **	-.02	-.03	-.02
28. First Semester GPA	-.17 **	-.05 **	.03	.14 **	.01	.13 **	-.20 **	-.03	.02	.14 **	.06	-.09 *	.49 **	.26 **	.22 **
29. Second Semester GPA	-.16 **	-.07 **	-.01	.17 *	-.11	.06	-.07	-.06	-.01	.14	.08	-.04	.46 **	.27 **	.23 **
30. Subjective Performance	-.05	-.12 **	.00	.14 **	-.05	.07	-.11 *	.06	.08	.16 **	-.04	-.02	.33 **	.22 **	.20 **
31. Intent to Leave	-.03	.02	.04	-.13 **	.02	-.09 *	.02	-.10 *	-.18 **	-.15 **	-.17 **	-.03	-.10 *	-.08	-.08

(table continues)

Table 3 Descriptive Summary for Main Study Variables

Measure	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
17. ACT Science	.54 **														
18. ACT English	.64 **	.54 **													
19. Grit	-.04	.03	-.04												
20. Grit Interest	-.05	.00	-.08	.83 **											
21. Grit Perseverance	-.01	.06	.01	.80 **	.33 **										
22. MaAP Goal Orientation	.14 **	.14 **	.14 **	.33 **	.15 **	.41 **									
23. PAP Goal Orientation	.09 *	.14 **	.09 *	.20 **	.06	.27 **	.49 **								
24. PAV Goal Orientation	.00	-.02	.00	.04	-.06	.12 **	.29 **	.59 **							
25. Course Self-Efficacy	.18 **	.15 **	.18 **	.41 **	.26 **	.43 **	.37 **	.26 **	.11 *						
26. Roommate Self-Efficacy	.02	-.01	-.03	.23 **	.13 **	.25 **	.22 **	.17 **	.15 **	.47 **					
27. Social Self-Efficacy	-.06	.00	-.01	.35 **	.18 **	.41 **	.30 **	.16 **	.04	.58 **	.42 **				
28. First Semester GPA	.18 **	.18 **	.27 **	.14 **	.10 *	.12 **	.11 **	.08	-.04	.28 **	.00	.06			
29. Second Semester GPA	.19 **	.19 **	.26 **	.15 *	.02	.23 **	.22 **	.18 **	.07	.17 *	-.02	-.01	.67 **		
30. Subjective Performance	.14 **	.16 **	.21 **	.09 *	.00	.16 **	.13 **	.11 *	.00	.16 *	.03	.14 **	.42 **	.44 **	
31. Intent to Leave	-.03	-.11 **	-.05	-.21 **	-.20 **	-.15 **	-.21 **	-.10 *	.01	-.16 **	-.15 **	-.19 **	-.12 **	-.10	-.02

Note. N = 624; * $p < .05$, ** $p < .01$; male coded 0=female, 1=male; ethnicity coded 0=white, 1=all other ethnicities; employed coded no=0, yes=1; residence coded on-campus=0, off-campus=1.

Hypothesis Tests

Hierarchical regression procedures were used to test Hypotheses 1 through 4. The first step in each of these models included the identified set of demographic and individual difference covariates (i.e., sex, ethnicity, current employment status, participation in extracurricular activities, on/off-campus living status, level of education students plan on obtaining, use of recreational drugs or alcohol, and the Five Factor Model traits). Following this initial step, the non-cognitive factors were then added to the regression model to determine their possible incremental influence over and above the covariates. The two main outcomes tested in these models were academic performance (in terms of first, second semester GPA, and subjective performance) and attrition risk (in terms of intent to leave the university). The results of each hypothesis test, considering all four outcomes, are outlined in the following subsections. Unless otherwise stated, the sub-dimensions of grit and academic self-efficacy were tested as separate predictors, given their low to moderate intercorrelations with their related sub-dimensions.

Hypothesis 1

Hypothesis 1 stated that grit was positively associated with academic performance and negatively related to attrition risk. To establish whether grit affected academic outcomes, over and above the first model, grit-consistency of interest was added in step two and grit-perseverance of long term goals in step three. Table 4 presents the regression results for predicting first semester GPA. The covariates accounted for approximately 12% of variance ($p < .01$). The largest contributors to the model were sex, ethnicity, extracurricular activities, educational attainment goals, recreational drug use, and openness. Overall, these covariates seemed to contribute the most in each model throughout all of the hypotheses. Adding

consistency of interest did not significantly improve the model above step one for first semester GPA, but adding perseverance of long term goals did. Perseverance also improved the prediction of second semester GPA ($\beta = .27$), although in a reduced sample of participants. Perseverance of long term goals enhanced the predictive models for subjective performance too. Finally, when predicting intent to leave, consistency of interest made a significant contribution to the overall model ($\beta = -.15$). Taken together, these results support Hypothesis 1, that grit is positively associated with academic performance and negatively associated with attrition risk, over and above knowledge of several other relevant student demographic characteristics. However, the increase in variance accounted for are only modest improvements.

Table 4 Academic Success Outcomes Predicted by Grit

	First Semester GPA (<i>n</i> = 485)			Second Semester GPA (<i>n</i> = 168)			
	β			β			
<i>Predictors</i>							
Male	-.11 *	-.11 *	-.12 *	.12	.12	.09	
Ethnicity	-.18 **	-.18 **	-.19 **	-.10	-.10	-.13	
Employment	.02	.02	.01	.10	.10	.10	
Extracurricular Activities	.12 **	.12 **	.11 *	.10	.10	.08	
Residence	.04	.04	.04	-.14	-.14	-.13	
Educational Attainment Goals	.16 **	.16 **	.16 **	.07	.06	.07	
Recreational Drug Use	-.18 **	-.18 **	-.18 **	-.02	-.03	-.07	
Extraversion	-.05	-.05	-.08	-.17 *	-.17	-.23 *	
Agreeableness	-.04	-.04	-.04	.05	.05	.04	
Conscientiousness	.07	.07	.03	.16 *	.18 *	.11	
Stability	.09	.08	.08	.10	.11	.10	
Openness	-.12 **	-.13 **	-.16 **	-.12	-.12	-.17 *	
Grit Interest		.02	-.01		-.04	-.08	
Grit Perseverance			.13 *			.27 **	
	ΔR^2	.14	.00	.01	.11	.00	.05
	ΔF	6.76 **	.19	6.32 *	1.69	.24	10.16 **
	Adjusted R^2	.12	.12	.13	.04	.04	.09
	F	6.76 **	6.24 **	6.31 **	1.69	1.57	2.27 **

(table continues)

Table 4 Academic Success Outcomes Predicted by Grit

<i>Predictors</i>	Subjective Performance (<i>n</i> = 473)			Intent to Leave (<i>n</i> = 470)			
	β	β	β	β	β	β	
Male	.00	.00	-.02	-.04	-.04	-.04	
Ethnicity	-.11 *	-.10 *	-.11 *	.00	.02	.02	
Employment	.01	.01	.00	.04	.04	.04	
Extracurricular Activities	.11 *	.11 *	.10 *	-.11 *	-.10 *	-.10 *	
Residence	-.02	-.01	-.01	.00	.00	.00	
Educational Attainment Goals	.08	.08	.08	-.08	-.07	-.07	
Recreational Drug Use	-.10 *	-.10 *	-.09 *	-.01	-.01	-.01	
Extraversion	.07	.07	.04	-.04	-.04	-.04	
Agreeableness	.01	.01	.01	-.12 *	-.12 *	-.12 *	
Conscientiousness	.14 **	.16 **	.11 *	-.09	-.04	-.03	
Stability	-.07	-.06	-.06	-.13 **	-.10 *	-.10 *	
Openness	-.06	-.06	-.10	.03	.03	.04	
Grit Interest		-.06	-.09		-.15 **	-.14 **	
Grit Perseverance			.16 **			-.03	
	ΔR^2	.07	.00	.02	.08	.02	.00
	ΔF	3.10 **	1.37	8.32 **	3.36 **	8.95 **	.25
	Adjusted R^2	.05	.05	.07	.06	.07	.07
	F	3.10 **	2.97 **	3.39 **	3.36 **	3.85 **	3.58 **

Note. * $p < .05$, ** $p < .01$; male coded 0=female, 1=male; ethnicity coded white=0, all other ethnicities=1; employed coded no=0, yes=1; residence coded on-campus=0, off-campus=1.

Hypotheses 2 and 3

Hypothesis 2 stated that MaAP and PAP goal orientations would be positively associated with academic performance outcomes, and negatively associated with attrition risk. Hypothesis 3 posited that PAV goal orientation would be negatively associated with academic performance outcomes, but positively associated with attrition risk. To test these hypotheses, MaAP goal orientation was added in step two of the regression and PAP goal orientation was added during step three; PAV goal orientation was then added in step four. As in the tests of Hypothesis 1, the covariates accounted for the approximately 12% in first semester GPA. PAP goal orientation was a significant predictor for first semester GPA ($\beta = .14$), but only when PAV goal orientation ($\beta = -.15$) was added to the model.

In predicting second semester GPA, MaAP goal orientation added significant weight in step two and was positively associated with second semester GPA ($\beta = .23$). Goal orientation did not help to predict subjective performance beyond the covariate predictors. When predicting intent to leave, MaAP goal orientation explained a significant amount of variance over the covariates. Contrary to expectations PAV goal orientation was not significantly associated with attrition risk. These results supported Hypothesis 2 and partially supported Hypothesis 3. The results of these analyses are summarized in Table 5.

Table 5 Academic Success Outcomes Predicted by Goal Orientations

	First Semester GPA ($n = 485$)				Second Semester GPA ($n = 168$)			
	β				β			
<i>Predictors</i>								
Male	-.11 *	-.11 *	-.11 *	-.10 *	.12	.13	.13	.13
Ethnicity	-.18 **	-.18 **	-.18 **	-.18 **	-.10	-.12	-.13	-.13
Employment	.02	.02	.02	.01	.10	.11	.13	.12
Extracurricular Activities	.12 **	.12 **	.12 **	.11 *	.10	.05	.04	.04
Residence	.04	.04	.04	.04	-.14	-.15 *	-.16 *	-.16 *
Educational Attainment Goals	.16 **	.16 **	.16 **	.13 **	.07	.03	.03	.03
Recreational Drug Use	-.18 **	-.18 **	-.18 **	-.17 **	-.02	-.06	-.06	-.06
Extraversion	-.05	-.05	-.05	-.06	-.17 *	-.20 *	-.20 *	-.21 *
Agreeableness	-.04	-.05	-.04	-.04	.05	.00	.02	.02
Conscientiousness	.07	.06	.06	.05	.16 *	.12	.11	.11
Stability	.09	.08	.09	.08	.10	.08	.08	.08
Openness	-.12 **	-.13 **	-.13 **	-.13 **	-.12	-.15	-.16 *	-.16 *
MaAP Goal Orientation		.04	.02	.02		.23 **	.19 *	.20 *
PAP Goal Orientation			.05	.14 *			.10	.12
PAV Goal Orientation				-.15 **				-.02
ΔR^2	.14	.00	.00	.01	.11	.04	.01	.00
ΔF	6.76 **	.76	.91	8.04 **	1.69	7.31 **	1.50	.05
Adjusted R^2	.12	.12	.12	.13	.04	.08	.08	.08
F	6.76 **	6.29 **	5.91 **	6.13 **	1.69	2.18 *	2.14 *	1.99 *

(table continues)

Table 5 Academic Success Outcomes Predicted by Goal Orientations

<i>Predictors</i>	Subjective Performance (<i>n</i> = 473)				Intent to Leave (<i>n</i> = 470)			
	β				β			
Male	.00	.00	.00	.01	-.04	-.05	-.05	-.05
Ethnicity	-.11 *	-.11 *	-.11 *	-.11 *	.00	.00	.00	.00
Employment	.01	.01	.01	.00	.04	.04	.04	.04
Extracurricular Activities	.11 *	.11 *	.10 *	.10 *	-.11 *	-.11 *	-.11 *	-.11 *
Residence	-.02	-.02	-.02	-.01	.00	.00	.00	.00
Educational Attainment Goals	.08	.07	.07	.05	-.08	-.06	-.06	-.05
Recreational Drug Use	-.10 *	-.09 *	-.09 *	-.09	-.01	-.01	-.01	-.01
Extraversion	.07	.07	.07	.06	-.04	-.04	-.04	-.04
Agreeableness	.01	-.01	.00	.00	-.12 *	-.08	-.09	-.09
Conscientiousness	.14 **	.12 *	.11 *	.11 *	-.09	-.06	-.05	-.05
Stability	-.07	-.07	-.07	-.08	-.13 **	-.12 *	-.12 *	-.11 *
Openness	-.06	-.07	-.07	-.07	.03	.05	.05	.04
MaAP Goal Orientation		.08	.06	.06		-.15 **	-.15 **	-.15 **
PAP Goal Orientation			.05	.10			-.01	-.05
PAV Goal Orientation				-.09				.06
ΔR^2	.07	.01	.00	.01	.08	.02	.00	.00
ΔF	3.10 **	2.90	.81	2.57	3.36 **	3.66 **	.06	1.26
Adjusted R^2	.05	.05	.05	.06	.06	0.1	0.07	0.07
F	3.10 **	3.09 **	2.93 **	2.91 **	3.36 **	3.91 **	3.62 **	3.47 **

Note. * $p < .05$, ** $p < .01$; male coded 0=female, 1=male; ethnicity coded white=0, all other ethnicities=1; employed coded no=0, yes=1; residence coded on-campus=0, off-campus=1.

Hypothesis 4

Hypothesis 4 was that academic self-efficacy would be positively related to academic performance outcomes and negatively associated with attrition risk. For this hypothesis, following the conventions used in testing the previous hypotheses, the separate self-efficacy factors were entered separately following the inclusion of covariates: course self-efficacy on step two, roommate self-efficacy on step three, and social self-efficacy on step four. Results partially supported this hypothesis. Course self-efficacy significantly improved the explanatory power of the model for first semester GPA ($\beta = .24$), as did roommate and social self-efficacy, albeit in an opposite direction from what was expected ($\beta = -.13, -.11$). When predicting second semester GPA, academic self-efficacy did not improve predictive power beyond the covariates. For the subjective performance models, course self-efficacy did significantly improved the explanatory power of the overall model beyond the covariates. None of the academic self-efficacy dimensions significantly explained variability in intent to leave. Results of these analyses are summarized in Table 6

Table 6 Academic Success Outcomes Predicted by Academic Self-Efficacy

<i>Predictors</i>	First Semester GPA (<i>n</i> = 485)				Second Semester GPA (<i>n</i> = 168)			
	β				β			
Male	-.11 *	-.09 *	-.09 *	-.08	.12	.14	.13	.13
Ethnicity	-.18 **	-.18 **	-.17 **	-.16 **	-.10	-.09	-.08	-.08
Employment	.02	.02	.01	.01	.10	.09	.07	.06
Extracurricular Activities	.12 **	.09 *	.09 *	.11 *	.10	.08	.08	.09
Residence	.04	.01	.01	.02	-.14	-.16 *	-.15 *	-.15
Educational Attainment Goals	.16 **	.14 **	.14 **	.14 **	.07	.06	.06	.06
Recreational Drug Use	-.18 **	-.17 **	-.17 **	-.17 **	-.02	-.03	-.04	-.04
Extraversion	-.05	-.06	-.05	.00	-.17 *	-.20 *	-.18 *	-.15
Agreeableness	-.04	-.02	.01	.01	.05	.08	.10	.10
Conscientiousness	.07	-.01	.00	.00	.16 *	.12	.12	.12
Stability	.09	.05	.06	.06	.10	.09	.10	.10
Openness	-.12 **	-.18 **	-.19 **	-.18 **	-.12	-.16	-.16	-.16
Course Self-Efficacy		.24 **	.29 **	.34 **		.16	.21 *	.24 *
Roommate Self-Efficacy			-.13 **	-.13 *			-.13	-.12
Social Self-Efficacy				-.11				-.06
ΔR^2	.14	.04	.01	.01	.11	.02	.01	.00
ΔF	6.76 **	24.04 **	7.71 **	3.12	1.69	3.58	2.39	.29
Adjusted R^2	.12	.16	.17	.18	.04	.06	.07	.06
F	6.76 **	8.38 **	8.44 **	8.12 **	1.69	1.86 *	1.91 *	1.80 *

(table continues)

Table 6 Academic Success Outcomes Predicted by Academic Self-Efficacy

<i>Predictors</i>	Subjective Performance (<i>n</i> = 473)				Intent to Leave (<i>n</i> = 470)			
	β				β			
Male	.00	.01	.01	.00	-.04	-.04	-.04	-.04
Ethnicity	-.11 *	-.11 *	-.11 *	-.11 *	.00	.00	.00	.01
Employment	.01	.01	.01	.01	.04	.04	.03	.03
Extracurricular Activities	.11 *	.09 *	.09 *	.08	-.11 *	-.10 *	-.10 *	-.09
Residence	-.02	-.03	-.03	-.04	.00	.01	.01	.01
Educational Attainment Goals	.08	.07	.07	.07	-.08	-.07	-.07	-.07
Recreational Drug Use	-.10 *	-.09 *	-.09 *	-.09	-.01	-.01	-.01	-.01
Extraversion	.07	.06	.07	.03	-.04	-.04	-.03	.00
Agreeableness	.01	.02	.02	.02	-.12 *	-.12 *	-.11 *	-.10
Conscientiousness	.14 **	.10	.10	.10 *	-.09	-.07	-.06	-.07
Stability	-.07	-.09	-.09	-.09	-.13 **	-.11 *	-.11 *	-.11 *
Openness	-.06	-.09	-.09	-.09	.03	.05	.05	.05
Course Self-Efficacy		.12 *	.14 *	.10		-.08	-.06	-.02
Roommate Self-Efficacy			-.04	-.04			-.06	-.05
Social Self-Efficacy				.08				-.08
ΔR^2	.07	.01	.00	.00	.08	.01	.00	.00
ΔF	3.10 **	5.62 *	.49	1.57	3.36 **	2.45	1.15	1.43
Adjusted R^2	.05	.06	.06	.06	.06	.06	.06	.06
F	3.10 **	3.32 **	3.11 **	3.01 **	3.36 **	3.30 **	3.15 **	3.04 **

Note. * $p < .05$, ** $p < .01$; male coded 0=female, 1=male; ethnicity coded white=0, all other ethnicities=1; employed coded no=0, yes=1; residence coded on-campus=0, off-campus=1.

Hypothesis 5

To test Hypothesis 5, a combined blended model was evaluated to determine whether non-cognitive predictors could explain additional variance in academic success outcomes over and above demographic covariates and traditional cognitive predictors. Following the inclusion of the demographic covariates on step one, traditional cognitive predictors were then added (high school GPA and ACT scores), followed by grit scores on step three, goal orientation scores on step four, and academic self-efficacy scores on step five. As summarized in Table 7, adding high school GPA and the ACT sub-dimensions (cognitive predictors) accounted for a significant portion of variance in first semester GPA. High school GPA was particularly helpful ($\beta = .41$). None of the ACT sub-dimensions improved the model beyond high school GPA and the initial covariates. Course self-efficacy produced the only significant non-cognitive change for first semester GPA beyond the covariates and traditional predictors ($\beta = .24$). For second semester GPA, perseverance of long term goals ($\beta = .26$) was a helpful predictor, and impacted the overall model, when other non-cognitive predictors did not. ACT reading was a significant predictor for second semester GPA ($\beta = .25$). Perseverance also made a significant contribution to the subjective performance models beyond the covariates and cognitive predictors.

Finally, when predicting intent to leave, high school GPA and ACT scores did not provide a significant change to the model beyond the covariates in step one. Interestingly, consistency of interest did contribute significant weight to the intent to leave model ($\beta = -.14$) as did MaAP goal orientation ($\beta = -.14$), but not to a degree to improve upon the explanatory power of grit-consistency of interest.

Table 7 Academic Success Outcomes Predicted by Cognitive and Non-Cognitive Variables

<i>Predictors</i>	First Semester GPA (<i>n</i> = 459)					Second Semester GPA (<i>n</i> = 160)					
	β					β					
Male	-.10 *	-.01	-.02	-.01	.00	.11	.14	.12	.13	.12	
Ethnicity	-.17 **	-.05	-.06	-.06	-.05	-.09	.03	.00	-.01	-.01	
Employment	.02	-.04	-.04	-.04	-.04	.08	-.03	-.01	.00	-.02	
Extracurricular Activities	.13 **	.10 *	.09 *	.09 *	.09 *	.12	.14 *	.12	.11	.10	
Residence	.02	.03	.03	.03	.02	-.14	-.10	-.10	-.11	-.11	
Educational Attainment Goals	.17 **	.09 *	.09 *	.08	.07	.08	-.04	-.04	-.04	-.04	
Recreational Drug Use	-.19 **	-.15 **	-.15 **	-.15 **	-.14 **	-.01	.01	-.04	-.06	-.07	
Extraversion	-.03	.06	.05	.04	.07	-.14	-.02	-.08	-.08	-.08	
Agreeableness	-.03	-.02	-.02	-.02	.01	.03	.11	.09	.07	.10	
Conscientiousness	.07	.04	.02	.02	-.02	.17 *	.17 *	.12	.10	.10	
Stability	.09	.02	.02	.02	.00	.10	.04	.04	.03	.04	
Openness	-.13 **	-.15 **	-.17 **	-.16 **	-.19 **	-.11	-.25 **	-.31 **	-.31 **	-.32 **	
High School GPA		.41 **	.40 **	.40 **	.40 **		.17	.13	.13	.11	
ACT Math		.03	.03	.02	.02		.06	.03	.04	.05	
ACT Reading		.08	.08	.08	.06		.25 *	.29 **	.28 **	.29 **	
ACT Science		.03	.02	.01	.02		.05	.05	.04	.05	
ACT English		.09	.09	.09	.07		.14	.14	.13	.11	
Grit Interest			-.02	-.03	-.04			-.05	-.04	-.06	
Grit Perseverance			.08	.08	.06			.26 **	.22 *	.23 *	
MaAP Goal Orientation				-.02	-.03				.09	.08	
PAP Goal Orientation				.07	.05				-.01	-.02	
PAV Goal Orientation				-.09	-.07				.04	.06	
Course Self-Efficacy					.24 **					.08	
Roommate Self-Efficacy					-.04					-.12	
Social Self-Efficacy					-.09					.02	
	ΔR^2	.15	.23	.00	.01	.03	.11	.20	.04	.01	.01
	ΔF	6.45 **	32.33 **	1.48	1.19	6.22 **	1.56	8.89 **	4.96 **	.55	.87
	Adjusted R^2	.12	.35	.35	.35	.37	.04	.23	.27	.26	.26
	F	6.45 **	15.62 **	14.16 **	12.41 **	12.05 **	1.56	3.99 **	4.28 **	3.74 **	3.38 **

(table continues)

Table 7 Academic Success Outcomes Predicted by Cognitive and Non-Cognitive Variables

<i>Predictors</i>	Subjective Performance (<i>n</i> = 447)					Intent to Leave (<i>n</i> = 444)					
	β					β					
Male	.01	.06	.05	.05	.05	-.04	-.05	-.05	-.06	-.06	
Ethnicity	-.11 *	-.04	-.04	-.04	-.04	-.04	-.06	-.05	-.05	-.04	
Employment	-.01	-.04	-.04	-.04	-.03	.04	.05	.06	.05	.04	
Extracurricular Activities	.12 *	.09 *	.09	.09	.06	-.12 **	-.12 *	-.10 *	-.11 *	-.10 *	
Residence	-.03	-.03	-.02	-.02	-.04	.00	.00	.01	.01	.02	
Educational Attainment Goals	.09 *	.05	.05	.04	.03	-.08	-.06	-.04	-.03	-.03	
Recreational Drug Use	-.10 *	-.08	-.08	-.07	-.07	.01	-.01	-.01	-.02	-.01	
Extraversion	.08	.13 **	.11 *	.11 *	.07	-.04	-.07	-.06	-.07	-.05	
Agreeableness	.00	.01	.00	.00	-.01	-.12 *	-.12 *	-.12 *	-.09	-.08	
Conscientiousness	.14 **	.13 **	.11 *	.10	.09	-.08	-.08	-.03	-.01	.01	
Stability	-.07	-.11 *	-.10 *	-.10 *	-.11 *	-.13 *	-.11 *	-.08	-.07	-.06	
Openness	-.06	-.06	-.09	-.09	-.10	.03	.03	.04	.04	.04	
High School GPA		.26 **	.25 **	.26 **	.26 **	-.10	-.08	-.09	-.09	-.09	
ACT Math		.02	.02	.03	.03	.05	.04	.03	.03	.03	
ACT Reading		.01	.02	.02	.02	.06	.06	.06	.06	.07	
ACT Science		.00	-.01	-.03	-.03	-.15 *	-.15 *	-.13 *	-.13 *	-.13 *	
ACT English		.10	.10	.09	.09	.03	.00	.01	.01	.01	
Grit Interest			-.09	-.09	-.09			-.14 *	-.14 **	-.14 **	
Grit Perseverance			.12 *	.10	.08			-.03	.02	.03	
MaAP Goal Orientation				.04	.03				-.14 *	-.13 *	
PAP Goal Orientation				.09	.09				.00	.00	
PAV Goal Orientation				-.07	-.07				.02	.03	
Course Self-Efficacy					.01					.00	
Roommate Self-Efficacy					.02					-.08	
Social Self-Efficacy					.10					-.04	
	ΔR^2	.08	.09	.01	.01	.01	.08	.02	.02	.01	.01
	ΔF	3.33 **	9.84 **	3.61 *	1.11	1.23	3.26 **	1.96	3.84 *	2.06	1.05
	Adjusted R^2	.06	.14	.15	.15	.15	.06	.07	.08	.09	.09
	F	3.33 **	5.48 **	5.34 **	4.76 **	4.35 **	3.26 **	2.90 **	3.03 **	2.92 **	2.70 **

Note. * $p < .05$, ** $p < .01$; male coded 0=female, 1=male; ethnicity coded white=0, all other ethnicities=1; employed coded no=0, yes=1; residence coded on-campus=0, off-campus=1.

Hypotheses 6 and 7

Hypotheses 6 and 7 were tested to provide additional construct validation of the grit construct. The expectation was that grit would be positively associated with MaAP and PAP goal orientations, but negatively related to PAV goal orientations (H6) and that grit would be positively associated with academic self-efficacy (H7). These hypotheses were also evaluated using regression models, using the grit sub-dimensions as the outcomes. The covariates were added in step one, goal orientation in step two, and academic self-efficacy in step three. The covariates accounted for 18% of the consistency of interest variance. Goal orientation and academic self-efficacy did not contribute to the consistency of interest model. The covariates explained 29% of the variance in perseverance of long term goals. MaAP goal orientation contributed a significant amount of weight to the perseverance of long term model ($\beta = .23$). Course self-efficacy also contributed to the perseverance model in step three ($\beta = .12$). Results are presented in Table 8.

To get a more complete understanding of the relationships occurring between grit, goal orientation, and academic self-efficacy both models were tested excluding the covariates. In each model, goal orientation and academic self-efficacy helped to predict consistency of interest and perseverance. These results are presented in Table 9.

Table 8 Grit Predicted by Covariates, Goal Orientations, and Academic Self-Efficacy

<i>Predictors</i>	Grit Interest (<i>n</i> = 485)			Grit Perseverance (<i>n</i> = 485)		
	β			β		
Male	-.05	-.05	-.04	.09 *	.10 *	.10 *
Ethnicity	.11 **	.12 **	.11 **	.07	.07	.06
Employment	.01	.01	.02	.03	.03	.04
Extracurricular Activities	.07	.07	.05	.08 *	.08 *	.04
Residence	.04	.04	.03	-.01	-.01	-.03
Educational Attainment Goals	.08	.06	.05	.03	-.01	-.02
Recreational Drug Use	-.02	-.01	-.01	-.02	-.01	-.01
Extraversion	-.02	-.02	-.04	.17 **	.17 **	.13 **
Agreeableness	-.05	-.05	-.04	-.02	-.07	-.05
Conscientiousness	.37 **	.36 **	.34 **	.37 **	.29 **	.25 **
Stability	.20 **	.18 **	.17 **	.06	.05	.02
Openness	.01	.01	-.01	.24 **	.21 **	.18 **
MaAP Goal Orientation		.02	.00		.23 **	.20 **
PAP Goal Orientation		.03	.02		.09	.07
PAV Goal Orientation		-.13 *	-.12 *		-.03	-.03
Course Self-Efficacy			.07			.12 *
Roommate Self-Efficacy			.00			-.01
Social Self-Efficacy			.04			.11
ΔR^2	.20	.01	.01	.31	.06	.02
ΔF	10.09 **	2.40	1.39	17.93 **	15.16 **	6.26 **
Adjusted R^2	.18	.19	.19	.29	.35	.37
F	10.09 **	8.62 **	7.43 **	17.93 **	18.64 **	17.08 **

Note. * $p < .05$, ** $p < .01$; male coded 0=female, 1=male; ethnicity coded white=0, all other ethnicities=1; employed coded no=0, yes=1; residence coded on-campus=0, off-campus=1.

Table 9 Grit Predicted by Goal Orientations and Academic Self-Efficacy

	Grit Interest ($n = 543$)		Grit Perseverance ($n = 543$)	
	β		β	
<i>Predictors</i>				
MaAP Goal Orientation	.15 **	.08	.37 **	.25 **
PAP Goal Orientation	.07	.04	.13 *	.09
PAV Goal Orientation	-.14 **	-.13 *	-.06	-.04
Course Self-Efficacy		.22 **		.19 **
Roommate Self-Efficacy		.02		.01
Social Self-Efficacy		.02		.20 **
ΔR^2	.04	.05	.18	.11
ΔF	6.65 **	9.30 **	40.31 **	27.77 **
Adjusted R^2	.04	.05	.18	.28
F	6.65 **	8.13 **	40.31 **	37.02 **

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

Hypothesis 8

Finally, Hypothesis 8 was that academic self-efficacy would mediate the relationships between grit and goal orientation, and academic success outcomes. This hypothesis was tested using the Hayes (2013) *MEDIATE* procedure in SPSS. Because the current data lacks full information from all participants and some variables had small response rates, bias-corrected percentile bootstrapping methods were employed. Bootstrapping allows SPSS to generate a large portion of smaller samples from within the primary set of data that can be used to test the probability of a true relationship between constructs. Using these techniques, it was possible to test the multiple hypothesized indirect pathways linking grit interest, grit perseverance, MaAP, PAP, and PAV goal orientation with course self-efficacy, roommate self-efficacy, and social self-efficacy to the academic success outcomes (i.e., first semester GPA, second semester GPA, subjective performance, and intent to leave).

It is important to note that all results presented in this section are over and above the influence of the core set of covariates (i.e., sex, ethnicity, currently employed, participation in extracurricular activities, etc.) on predictors, mediators, and outcomes in these models; the results pertaining to these covariates are available upon request to the author, but are not included here as they were not the focus of the present study. Tables 10, 11, 12, and 13 summarize the indirect effect results for each of the outcomes of interest, and the mediation pathways are represented in Figures 3, 4, 5, and 6. In these figures, direct relationships are represented by dashed lines, while solid lines represent indirect pathways.

Table 10 Indirect Effects for First Semester GPA

	Point Estimate	SE	BC 95% CI	
			Lower	Upper
<i>IV's to Course Self-Efficacy to First Semester GPA</i>				
Grit Interest	.018	.022	-.023	.065
Grit Perseverance	.072 *	.030	.023	.142
MaAP Goal Orientation	.031 *	.016	.006	.068
PAP Goal Orientation	.019	.013	-.003	.048
PAV Goal Orientation	-.007	.009	-.025	.010
TOTAL	.015 *	.008	.004	.031
<i>Full Model F (17, 479) = 13.91, p <.01, Adj. R² = .31</i>				
<i>IV's to Roommate Self-Efficacy</i>				
Grit Interest	-.002	.008	-.023	.011
Grit Perseverance	-.010	.010	-.037	.004
MaAP Goal Orientation	-.002	.006	-.017	.008
PAP Goal Orientation	.002	.005	-.006	.016
PAV Goal Orientation	-.008 *	.005	-.023	-.001
TOTAL	-.001	.002	-.004	.001
<i>Full Model F (17, 479) = 6.89, p <.01, Adj. R² = .17</i>				
<i>IV's to Social Self-Efficacy to First Semester GPA</i>				
Grit Interest	-.005	.009	-.033	.007
Grit Perseverance	-.024 *	.015	-.065	-.001
MaAP Goal Orientation	-.013 *	.009	-.037	-.001
PAP Goal Orientation	.001	.005	-.005	.015
PAV Goal Orientation	.000	.004	-.007	.009
TOTAL	-.003	.002	-.008	.001
<i>Full Model F (17, 479) = 20.95, p <.01, Adj. R² = .41</i>				

Note. * $p < .05$, ** $p < .01$, These estimates were generated using a procedure from Hayes (2013); CI = Confidence Interval; BC = Bias Corrected; Based on 10,000 bootstrap resamples.

Table 11 Indirect Effects for Second Semester GPA

	Point Estimate	SE	BC 95% CI	
			Lower	Upper
<i>IV's to Course Self-Efficacy to Second Semester GPA</i>				
Grit Interest	.039 *	.029	.001	.126
Grit Perseverance	.017	.029	-.022	.097
MaAP Goal Orientation	.015	.020	-.011	.072
PAP Goal Orientation	.002	.014	-.020	.038
PAV Goal Orientation	.014	.013	-.002	.053
TOTAL	.009	.010	-.005	.027
<i>Full Model $F(17, 162) = 4.50, p < .01, \text{Adj. } R^2 = .25$</i>				
<i>IV's to Roommate Self-Efficacy to Second Semester GPA</i>				
Grit Interest	-.006	.015	-.054	.013
Grit Perseverance	-.011	.021	-.072	.017
MaAP Goal Orientation	-.005	.013	-.039	.014
PAP Goal Orientation	.009	.013	-.006	.051
PAV Goal Orientation	-.017	.013	-.054	.000
TOTAL	-.002	.005	-.012	.004
<i>Full Model $F(17, 162) = 2.67, p < .01, \text{Adj. } R^2 = .14$</i>				
<i>IV's to Social Self-Efficacy to Second Semester GPA</i>				
Grit Interest	-.016	.026	-.088	.021
Grit Perseverance	-.010	.021	-.081	.016
MaAP Goal Orientation	-.005	.012	-.045	.009
PAP Goal Orientation	.006	.011	-.007	.044
PAV Goal Orientation	-.005	.010	-.036	.008
TOTAL	-.002	.006	-.015	.008
<i>Full Model $F(17, 162) = 9.23, p < .01, \text{Adj. } R^2 = .44$</i>				

Note. * $p < .05$, ** $p < .01$, These estimates were generated using a procedure from Hayes (2013); CI = Confidence Interval; BC = Bias Corrected; Based on 10,000 bootstrap resamples.

Table 12 Indirect Effects for Subjective Performance

	Point Estimate	SE	BC 95% CI	
			Lower	Upper
<i>IV's to Course Self-Efficacy to Subjective Performance</i>				
Grit Interest	.002	.005	-.003	.020
Grit Perseverance	.009	.010	-.007	.035
MaAP Goal Orientation	.004	.005	-.003	.018
PAP Goal Orientation	.002	.003	-.002	.014
PAV Goal Orientation	-.001	.002	-.008	.001
TOTAL	.002	.002	-.002	.008
<i>Full Model $F(17, 467) = 6.53, p < .01, \text{Adj. } R^2 = .16$</i>				
<i>IV's to Roommate Self-Efficacy to Subjective Performance</i>				
Grit Interest	-.001	.003	-.012	.003
Grit Perseverance	-.002	.004	-.016	.004
MaAP Goal Orientation	.000	.002	-.007	.002
PAP Goal Orientation	.000	.002	-.002	.007
PAV Goal Orientation	-.001	.003	-.009	.003
TOTAL	.000	.001	-.002	.001
<i>Full Model $F(17, 467) = 6.53, p < .01, \text{Adj. } R^2 = .16$</i>				
<i>IV's to Social Self-Efficacy to Subjective Performance</i>				
Grit Interest	.002	.004	-.003	.017
Grit Perseverance	.009	.009	-.005	.032
MaAP Goal Orientation	.005	.005	-.003	.018
PAP Goal Orientation	-.001	.002	-.008	.002
PAV Goal Orientation	.000	.002	-.004	.003
TOTAL	.001	.001	-.001	.004
<i>Full Model $F(17, 467) = 19.92, p < .01, \text{Adj. } R^2 = .40$</i>				

Note. * $p < .05$, ** $p < .01$, These estimates were generated using a procedure from Hayes (2013); CI = Confidence Interval; BC = Bias Corrected; Based on 10,000 bootstrap resamples.

Table 13 Indirect Effects for Intent to Leave

	Point Estimate	SE	BC 95% CI	
			Lower	Upper
<i>IV's to Course Self-Efficacy to Intent to Leave</i>				
Grit Interest	.001	.010	-.014	.032
Grit Perseverance	.003	.028	-.048	.069
MaAP Goal Orientation	.002	.013	-.023	.034
PAP Goal Orientation	.001	.008	-.013	.022
PAV Goal Orientation	.000	.004	-.011	.006
TOTAL	.001	.006	-.011	.015
<i>Full Model $F(17, 464) = 12.82, p < .01, \text{Adj. } R^2 = .29$</i>				
<i>IV's to Roommate Self-Efficacy to Intent to Leave</i>				
Grit Interest	-.003	.010	-.038	.009
Grit Perseverance	-.009	.013	-.053	.006
MaAP Goal Orientation	-.001	.007	-.022	.008
PAP Goal Orientation	.002	.006	-.005	.024
PAV Goal Orientation	-.008	.008	-.029	.003
TOTAL	-.001	.002	-.006	.002
<i>Full Model $F(17, 464) = 6.53, p < .01, \text{Adj. } R^2 = .16$</i>				
<i>IV's to Social Self-Efficacy to Intent to Leave</i>				
Grit Interest	-.004	.012	-.052	.007
Grit Perseverance	-.020	.026	-.089	.020
MaAP Goal Orientation	-.011	.014	-.049	.011
PAP Goal Orientation	.002	.006	-.005	.022
PAV Goal Orientation	.000	.004	-.011	.007
TOTAL	-.002	.004	-.012	.004
<i>Full Model $F(17, 464) = 19.60, p < .01, \text{Adj. } R^2 = .40$</i>				

Note. * $p < .05$, ** $p < .01$, These estimates were generated using a procedure from Hayes (2013); CI = Confidence Interval; BC = Bias Corrected; Based on 10,000 bootstrap resamples.

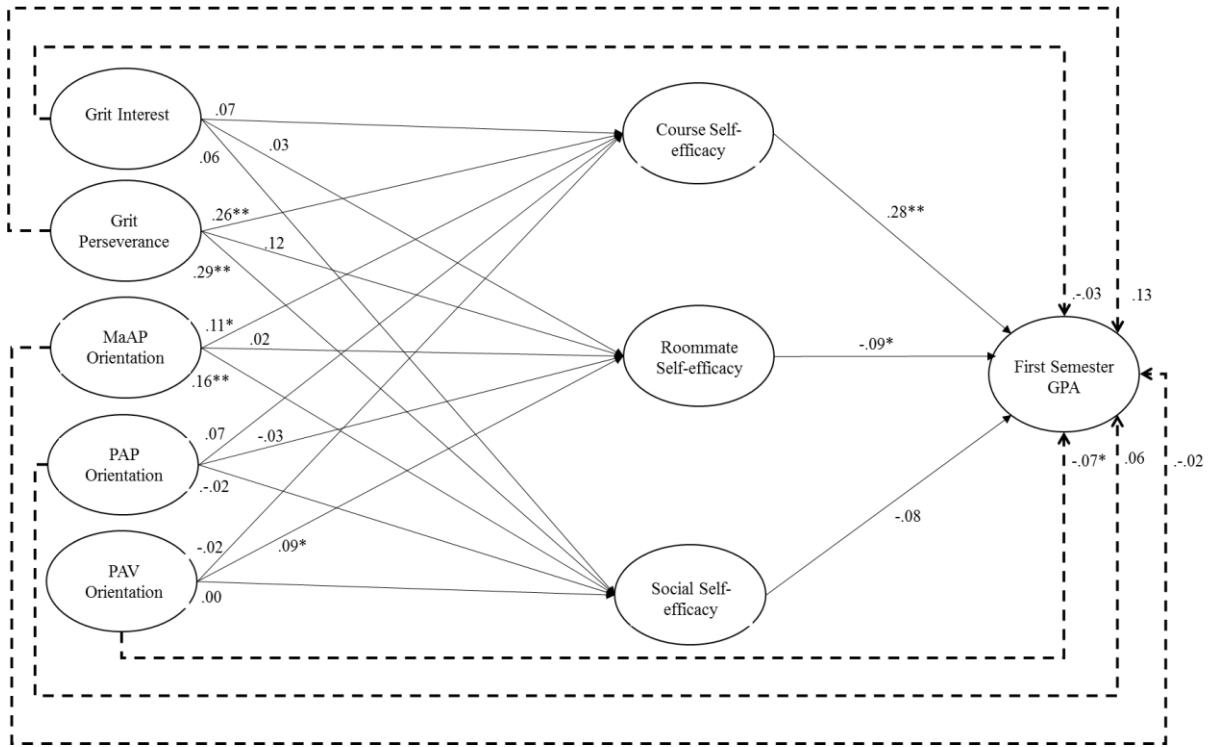


Figure 3 Indirect effects model predicting first semester GPA, * $p < .05$, ** $p < .01$

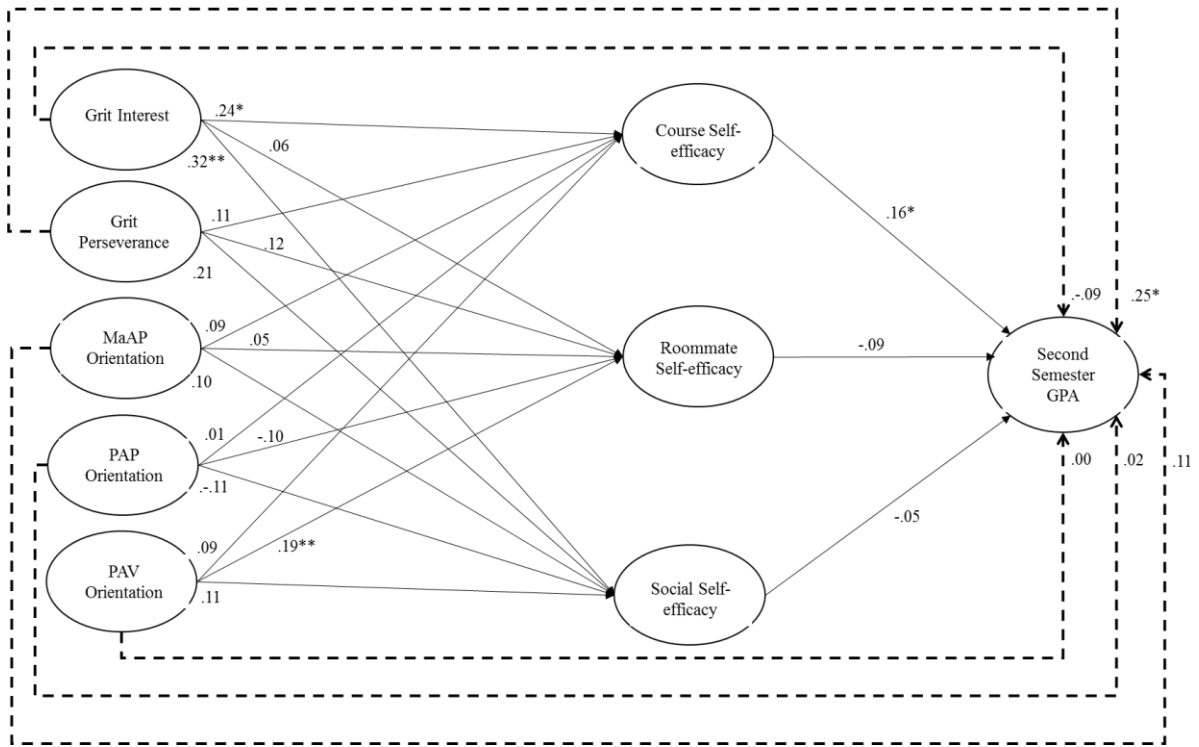


Figure 4 Indirect effects model predicting second semester GPA, * $p < .05$, ** $p < .01$

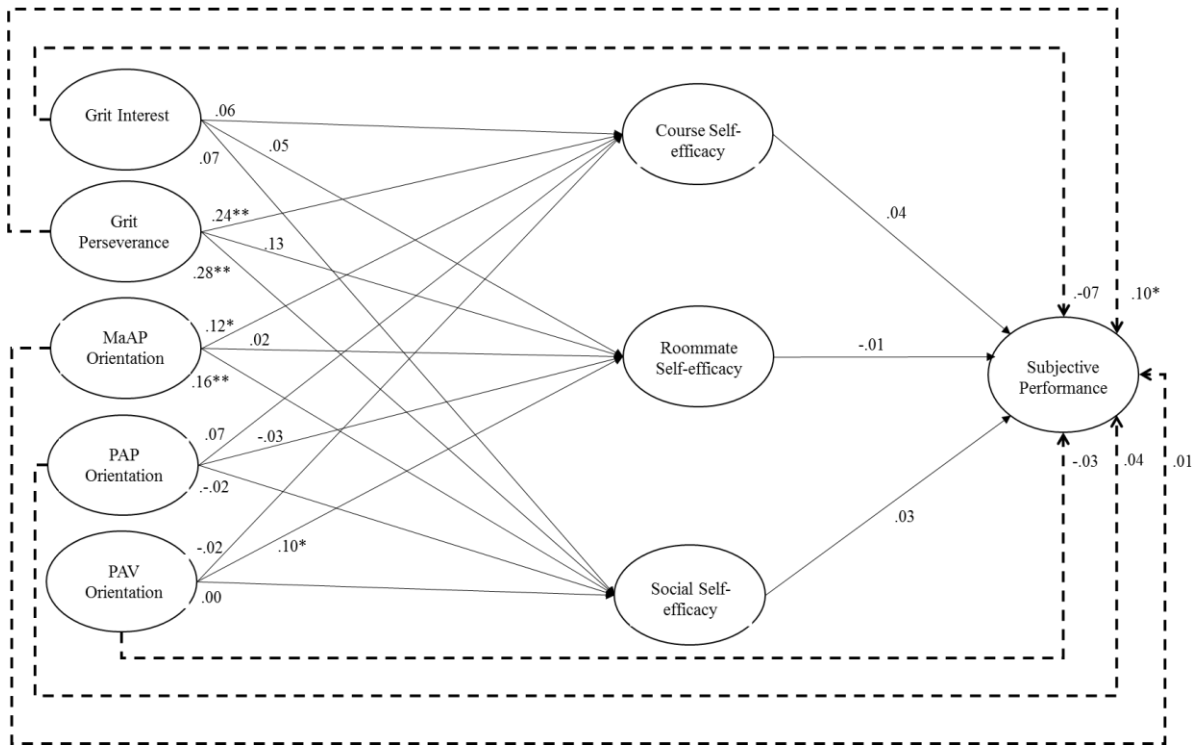


Figure 5 Indirect effects model predicting subjective performance, * $p < .05$, ** $p < .01$

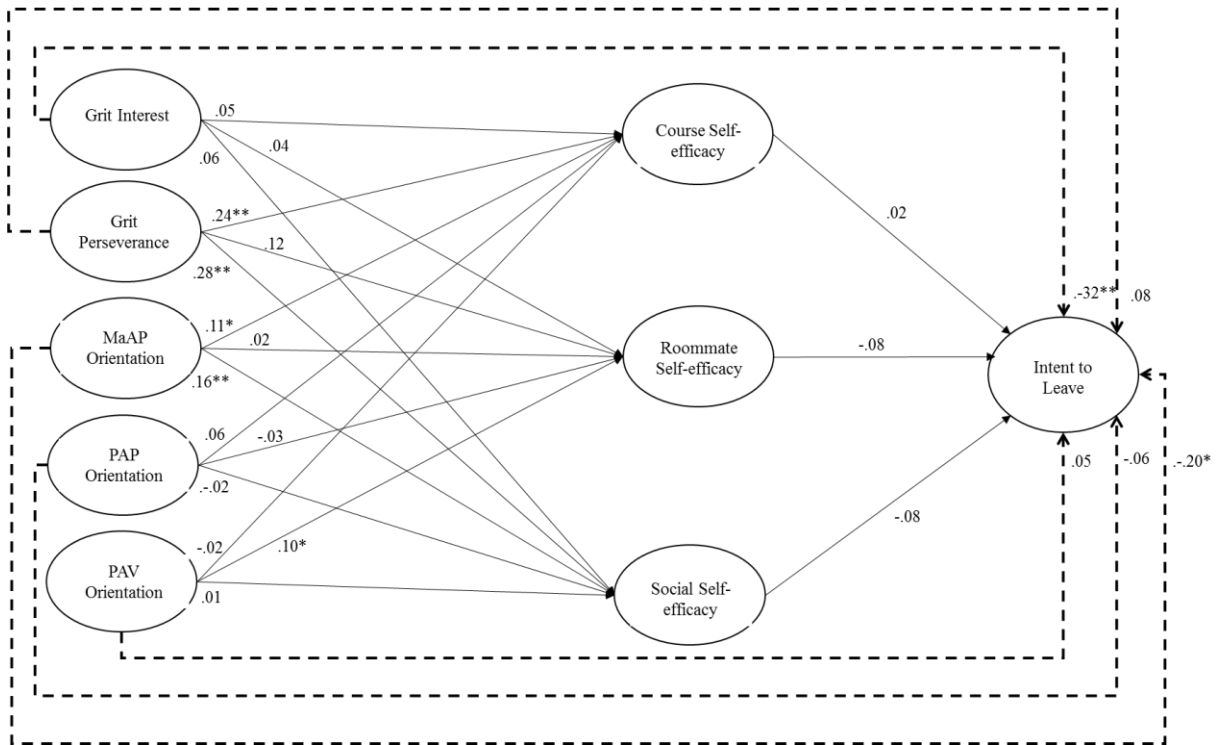


Figure 6 Indirect effects model predicting intent to leave, * $p < .05$, ** $p < .01$

The first model, excluding academic self-efficacy as a mediator, explained approximately 14% of the variance in first semester GPA. When looking at the direct relationships, neither grit-consistency of interest or grit-perseverance of long term goals were directly related to first semester GPA. The only significant direct effect existed between PAV goal orientation and first semester GPA ($\beta = -.07$). From the tests of the first set of indirect effects for first semester GPA, perseverance of long term goals, MaAP goal orientation, and PAV goal orientation were significantly related to course self-efficacy, social self-efficacy, and roommate self-efficacy (see Figure 4). In addition, both course self-efficacy ($\beta = .28$) and roommate self-efficacy ($\beta = -.09$) were significantly related to first semester GPA. For first semester GPA, there were three significant indirect effect relationships. Specifically, there was a significant indirect effect of perseverance of long term goals on first semester GPA through course self-efficacy. There was also a significant indirect effect of MaAP goal orientation on first semester GPA through course self-efficacy. Lastly, there was a significant indirect effect of PAV orientation on first semester GPA through roommate self-efficacy. The overall model, including academic self-efficacy as a mediator, accounted for 18% of the variance in first semester GPA models $F(20, 476) = 6.59, p < .01$; which is a 4% improvement from the first model. Taken together, these results partially support Hypothesis 8.

In the second model, the predictors and covariates only accounted for 10% of the variance in second semester GPA. The model summary, including predictors, covariates, and mediators, explained 11% of the variance in second semester GPA, $F(20, 159) = 2.10, p < .01$. The only direct effect was from grit-perseverance of long term goals. When testing the indirect effects, consistency of interest was related to course self-efficacy (see Figure 5). This suggested there is an indirect effect of consistency of interest on second semester GPA through course self-

efficacy. PAV goal orientation was also related to roommate self-efficacy and social self-efficacy, but neither mediator was related to second semester GPA.

In the third model, the predictors and covariates explained 7% of the variance in subjective academic performance. The variance accounted for by the initial model did not significantly improve with the addition of the mediators; adjusted $R^2=.07$. Academic self-efficacy was not related to subjective performance, which would suggest that in the current sample, there are no indirect effects of the variables on subjective academic performance through academic self-efficacy (see Figure 6). Lastly, the MEDIATE process was used to test the possibility of mediation for intent to leave. Predictors and covariates accounted for 9% of the variance in intent to leave. There were no significant increases to the overall model with the addition of the mediators ($R^2=.09$). Both consistency of interest and MaAP goal orientation were directly related to intent to leave, but none of the academic self-efficacy mediators were associated with intent to leave (see Figure 7). Again, this ruled out the possibility of mediation.

Considered overall, the results of these final indirect effects analyses suggest partial support for Hypothesis 8. In the present sample, the indirect effects are only present for first and second semester GPA. Although it was expected the mediating relationships would occur for all outcomes, these results suggest that academic self-efficacy only mediates the relationship of grit to academic outcomes, as well as the relationship between goal orientation and academic outcomes for first and second semester academic performance.

CHAPTER IV

DISCUSSION

The results of the present study provide insight into the use of non-cognitive factors when predicting outcomes associated with academic performance and retention. This study contributes to the developing knowledge base regarding non-cognitive predictors of student academic performance. Perhaps the most critical finding from the present research is that the relative predictive value of non-cognitive versus cognitive predictors depends on which academic success outcomes are considered and when they are considered in a students' tenure in a college or university program of study. The present findings also suggest that, while non-cognitive predictors do contribute modest statistically significant improvements to the ability to explain academic performance and attrition risk, the most efficient and significant predictor of these outcomes is high school GPA.

In many ways, the present findings are in-line with those of Robbins et al. (2004). For academic achievement, Robbins et al. reported that traditional cognitive factors only accounted for 25% of the variance in academic achievement and only 9% in retention. In the present study, the traditional predictors and covariates together accounted for 35% of the variance in first semester GPA and 23% of variance in second semester GPA. The traditional predictors and covariates only explained 7% of the variance intent to leave, which is slightly lower than what Robbins et al. reported. When comparing the blended models (cognitive and non-cognitive predictors) between the two studies, the results were again similar. In Robbins et al, the blended

model accounted for 34% of GPA variance, whereas the blended model in the present study accounted for 37% of the variance in first semester GPA. When predicting intent to leave using the blended models, the results of the present study were not consistent with the 23% variance reported for retention in Robbins et al. At most, the cognitive and non-cognitive predictors in the present study only significantly accounted for 9% of the variance in intent to leave.

There are at least two possible reasons for the differences observed in the present study compared to the Robbins et al. (2004) research. First, the present study was focused on a small subset of possible non-cognitive predictors (grit, goal orientation, and academic self-efficacy), most of which had not been studied directly along these lines in the past. Robbins et al. employed nine psychosocial and study skills factors (achievement motivation, institutional commitment, academic goals, perceived social support, contextual influences, general self-concept, academic self-efficacy, academic-related skills, and social involvement). Second, there are many reasons students do not return to continue their college-level studies. The weaker influence of cognitive and non-cognitive predictors on attrition risk within the present sample may be a reflection of the real-world challenges faced by many of the students in the participating university. In other words, the relatively weak connection between cognitive and non-cognitive predictors and attrition risk suggests that factors beyond the control of the student dictate intent to leave and ultimately attrition decisions (e.g., money, work schedules, family demands, etc.).

To further illustrate, retention data (whether a student was retained or left the university) was collected for each cohort. The data was analyzed using logistic regression due to the dichotomous outcome, but the results were unclear. To further understand retention in the current sample, independent *t*-tests were conducted comparing those who were retained versus those

who left. Significant differences existed based on gender, high school GPA, ACT scores, first semester GPA, and second semester GPA. The following variables did not meet the corrected significance level, but still warrant further consideration: grit interest, academic self-efficacy (particularly social self-efficacy), extraversion, and emotional stability. In an additional step, the same independent *t*-test was run on sophomores. This analysis identified differences on gender, participation in extracurricular activities, where students resided, educational attainment goals, and use of recreational drugs. Both grit interest and academic self-efficacy were initially significant ($p < .05$), but did not meet corrected significance levels. However, there was simply not enough data on those who left the university to conclusively determine any relationships. Future research is needed in this area to more fully understand why students leave their institutions before completing their degrees and what characteristics and attributes are possessed by students who are more likely to start what they finish in a timely fashion.

Despite these difficulties, the present study indicates that non-cognitive predictors add modest value to predictive models of academic performance and intent to leave. A model based on traditional, cognitive predictors and demographic covariates explained approximately 35% of the variance in first semester GPA, but this was improved to 37% when including non-cognitive predictors. Although the increases in variance are only .02 for first semester GPA and .04 for second semester GPA, these small improvements may have larger practical implications for academic institutions interested in improving predictive power. Digging into the traditional cognitive predictors a bit more deeply, high school GPA was the strongest predictor of first semester GPA; when included with ACT, ACT's influence was non-significant regardless of dimension. This picture was similar when predicting second semester GPA, although for this

later stage outcome, ACT reading did provide significant additional explanatory power over high school GPA.

Interestingly, these results pertaining to cognitive predictors are consistent with newer research that suggests that standardized testing may not help to predict academic performance over and above what is explained by students' high school GPA (Hiss & Franks, 2014). Hiss and Franks (2014) studied 33 colleges across the U.S. that made standardized testing optional. They found that the schools using the optional approach were typically more diverse, and the GPA between students who did and did not complete the standardized tests was only different by an average of .05 points. Further, the difference in persistence in college was only 6% between those who submitted standardized test scores and those who did not. In addition, Hiss and Franks argued that using standardized tests in the admission process may actually be hindering the selection process; holding back students with lower standardized test scores, who really could and potentially would excel if given the opportunity to attend college. Newer research might evaluate the use of optional standardized testing admit decisions with the addition of non-cognitive predictors, to determine what institutions would gain from a 2% or 4% improvement in predictive ability.

Aside from the cognitive, traditional predictors, the non-cognitive factors presented in this study may help to bolster the existing predictive power of standardized tests. Course self-efficacy was a strong predictor of first semester GPA. When focusing on second semester GPA, which may be a more accurate portrayal of academic performance than self-reported or the first semester GPA, perseverance of long term goals demonstrated consistent influence. Theoretically, this relationship makes sense. Students with higher academic self-efficacy have an important level of confidence that helps, particularly in the first semester of college when students deal

with important academic and social transitions. Additionally, a student with a long term mind set is more likely to maintain the routine behaviors needed to achieve personal goals. Both consistency of interest and MaAP goal orientation were influential in predicting intent to leave.

Not all sub-dimensions of the non-cognitive constructs were as valuable in predicting academic performance or intent to leave. The roommate and social self-efficacy sub-dimensions did not provide significant predictive power, beyond first semester GPA. In a similar way, goal orientation did not improve first or second semester GPA, subjective performance, or intent to leave prediction models when cognitive predictors were included. The present findings are in line with the VandeWalle et al. (2001) study, which indicated that MaAP goal orientation was the only type of goal orientation related to exam performance. The present results also demonstrate that PAV goal orientation was negatively related to first semester GPA. However, the current study provides some evidence that PAV goal orientation might affect first semester GPA through academic self-efficacy.

Conversely, the covariates provided additional support for the models. The recurring covariates were sex, ethnicity, participation in extracurricular activities, educational attainment goals, recreational drug use, and openness to experience. If a student responded that they participated in extracurricular activities, they were more likely to have higher academic performance outcomes. Students participating in these activities were also less likely to have intentions for leaving the institution. Furthermore, when students had higher educational attainment goals (i.e., they stated they planned on attaining some graduate school work or a doctoral degree), they were more likely to perform better within the current institution and less likely to have intentions to leave. Recreational drug use and openness had negative implications

for student performance. Although the current study focused mainly on non-cognitive factors, questionnaires assessing these covariates could be useful in future predictive studies.

Additionally, the present study responds to Farrington et al.'s (2012) call for more generalized research on the grit construct. The current results extend Duckworth and colleagues recent research that suggested grit is important in predicting academic outcomes, and generalizes prior findings beyond the focused samples previously used (e.g., military cadets, ivory league students, spelling bee students). Indeed, grit was an effective predictor in all of the academic success outcomes. An important aspect of grit, not yet considered though, was the relationship of grit with other non-cognitive constructs. The results of the present study indicate that grit is related to both goal orientation and academic self-efficacy. Consistency of interest was positively associated with minority ethnic groups, emotional stability, and conscientiousness, but negatively associated with PAV goal orientation. Perseverance of long term goals was positively related to sex, extracurricular activities, extraversion, conscientiousness, and openness to experience. Course self-efficacy also positively related to perseverance of long term goals. Likewise, the grit to academic outcome relationship was mediated by course and social self-efficacy. Recognizing the linkages among these non-cognitive constructs can help to develop better prediction models for higher education and perhaps guide future research.

Academic self-efficacy was another important element of the present study. It was proposed that academic self-efficacy mediated non-cognitive constructs because college academic self-efficacy develops later than grit and goal orientation. The current data demonstrated an indirect effect of perseverance of long term goals and first semester GPA through course self-efficacy. This would suggest that having higher course self-efficacy explains a portion of the positive relationship between perseverance of long term goals and academic

performance. Similar mechanisms of mediation may apply to the MaAP goal orientation and first semester GPA relationship. Course self-efficacy also had an indirect effect on the relationship between consistency of interest and first semester GPA. Students may be more likely to stay consistent with academic goals if they believe they can perform them successfully. Furthermore, the relationship between PAV goal orientation and first semester GPA was also indirectly affected by roommate self-efficacy. A person that takes on a PAV goal orientation may work to avoid negative situations with a roommate, which may result in lower roommate self-efficacy. Lower roommate self-efficacy can lead to more alone time with more time to study. The specific mechanisms that take place during mediation should be evaluated to better understand academic self-efficacy. Since academic self-efficacy is a student's personal belief in their own capabilities, the present study also evaluated the differences between course self-efficacy and subjective performance. Course self-efficacy and subjective performance were strongly positively correlated $r = .44, p < .01$, which makes sense. Although the present study suggested academic self-efficacy as a mediator, future research could consider other possible mediators or moderators within non-cognitive constructs. Academic self-efficacy is an important factor in all academic success outcomes because it is a modifiable trait. Unlike some of the other non-cognitive constructs in the present study, academic self-efficacy can be influenced through well designed interventions, which may be considered useful when identifying high at-risk or high potential students.

Future Research

Building upon the aforementioned recommendations, there are multiple avenues for future researchers. Future research might explore the option of using a blended model approach

to make admission decisions within higher education. Blended model approaches could be empirically validated using a structure similar to Hiss and Franks (2014) study (e.g., optional standardized testing admission procedures). New studies could incorporate the non-cognitive factors presented here, or others that are effective, into the process for admissions. In addition, future research could focus solely on non-cognitive predictors of retention to provide more depth to an area that desperately needs more attention. Although attrition risk was assessed in the current study, the present models are still not accounting for enough of the variance to help predict or guide institutional efforts regarding retention. Researchers might look to extend the comparison of students that are retained versus those that leave the institution.

Researchers might also consider expanding the generalizability of the present results by applying these models to larger and more diverse samples of students. The present study focused on freshmen and sophomores to reduce the potential influence time may have on the predictors. Longitudinal studies that assess how individuals develop key constructs, such as academic self-efficacy, could provide information that could bolster blended models. Although not in the scope of the current study, the data demonstrated significant differences in academic performance for students that had lower grit and academic self-efficacy scores. Future research should not only help to identify at-risk students prior to admission, both cognitively and non-cognitively, but also explore ways of improving academic performance of current at-risk students.

Finally, new research could study academic self-efficacy as a mediator. The present results indicated partial mediation for only first semester GPA, but not for second semester GPA, subjective performance, or intent to leave. Research should explore the conditional factors that make academic self-efficacy more likely to act as a mediator in the academic performance relationship, and expand current results by using different data method collection methods.

Limitations

As with most self-report responses, common method bias may have influenced the results. Although honest responses were encouraged, common method bias is an issue with all self-report questions. The relationships among the non-cognitive factors need to be validated using varying means of data collection, perhaps through teacher observation or parent observation. Also, because the sample was intentionally limited to freshmen and sophomores, the generalizability of results may be limited. Nonetheless, the current results were in line with the meta-analysis conducted by Robbins et al. (2004), which suggests generalizability.

Another potential limitation was the inclusion of only a few non-cognitive factors, although, the decision to use only three non-cognitive factors was guided by the Robbins et al. meta-analysis conducted on a larger set of non-cognitive factors. The results might have been different if more or varied non-cognitive factors were included. Lastly, the potential demographic differences among the sample and the larger institution presents a possible limitation. The present study had a large proportion of female respondents, and few ethnic minorities, but again, the results do generalize to other similar studies (Hiss & Franks, 2014; Robbins et al., 2004; Vandewalle et al., 2001).

CHAPTER V

CONCLUSION

The results of the present study have multiple practical implications for institution's looking to expand beyond traditional predictors of academic performance. The research builds upon prior work (i.e., Robbins et al., 2004) suggesting that non-cognitive factors can be used effectively to predict academic performance outcomes and attrition risk. In addition, the present study demonstrates that the current use of cognitive predictors has limitations. Educational institutions looking to develop stronger admissions models might consider the non-cognitive factors presented here. These measures may allow an institution to assess a student's abilities, while accurately predicting their future performance. Non-cognitive factors may be particularly useful for predicting retention; where cognitive predictors only marginally provide assistance.

Institutions may also want to consider using these non-cognitive factors in training intervention programs for current students. Because grit, goal orientation, and academic self-efficacy were all somewhat associated with academic performance and intent to leave, there are implications for training and development. Lower academic performers may benefit from learning environments that encourage consistency of interest, perseverance of long term goals, MaAP goal orientation, PAP goal orientation, and building academic self-efficacy. As institutions face increasing challenges to retain students and improve academic performance, the models for predicting academic success will need to continually evolve to ensure efficiency and effectiveness. When evaluating the results of the present study, and Robbins et al. (2004),

academic self-efficacy emerged as a dominant predictor. The research on academic self-efficacy suggests that it is a strong non-cognitive factor in academic success outcomes; it has sound theoretical and practical implications. As previously mentioned, academic self-efficacy can help predict high and low at-risk students before admissions to the university. Academic self-efficacy can improve admission decisions, but can also be used to assist in tailored interventions aimed at improving a student's academic confidence. Institutions should strongly consider the use of academic self-efficacy to improve academic success outcomes. Ultimately, the present study demonstrates evidence supporting a blended model approach.

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APPENDIX A
MEASURES

Grit-Original (Grit-O)
(Duckworth et al., 2007)

Instructions: Here are a number of statements that may or may not apply to you. For the most accurate score, when responding, think of how you compare to most people-- not just the people you know well, but most people in the world. There are no right or wrong answers, so just answer honestly.

Scale: 1- Not like me at all, 2- Not much like me, 3- Somewhat like me, 4- Mostly like me, 5- Very much like me

1. I often set a goal but later choose to pursue a different one. (Reverse-scored)
2. New ideas and new projects sometimes distract me from previous ones. (Reverse-scored)
3. I become interested in new pursuits every few months. (Reverse-scored)
4. My interests change from year to year. (Reverse-scored)
5. I have been obsessed with a certain idea or project for a short time but later lost interest. (Reverse-scored)
6. I have difficulty maintaining my focus on projects that take more than a few months to complete. (Reverse-scored)
7. I have achieved a goal that took years of work.
8. I have overcome setbacks to conquer an important challenge.
9. I finish whatever I begin.
10. Setbacks don't discourage me.
11. I am a hard worker.
12. I am diligent.

Achievement Goal Questionnaire-Revised (AGQ-R)
(Adapted from Elliot & Murayama, 2008)
Items 10-12 Omitted from the Present Study

Instructions: Rate the extent to which you agree or disagree with the following statements about yourself.

Scale: 1- Strongly disagree, 2- Moderately disagree, 3- Slightly disagree, 4- Neutral, 5- Slightly agree, 6- Moderately agree, 7- Strongly agree.

1. My aim is to completely master the material presented in this class.
2. I am striving to understand the content of this course as thoroughly as possible.
3. My goal is to learn as much as possible.
4. My aim is to avoid learning less than I possibly could.
5. I am striving to avoid an incomplete understanding of the course material.
6. My goal is to avoid learning less than it is possible to learn.
7. My aim is to perform well relative to other students.
8. I am striving to do well compared to other students.
9. My goal is to perform better than the other students.
10. My aim is to avoid doing worse than other students.
11. I am striving to avoid performing worse than others.
12. My goal is to avoid performing poorly compared to others.

College Self Efficacy Inventory (CSEI)
(Adapted from Solberg et al., 1993)

Totally Unconfident and Totally Confident Response Options were Omitted from the Present Study

Instructions: Think about yourself as a college student. For each statement below, fill in the number that best represents your confidence. How confident are you that you could successfully complete the following tasks (Fill in one choice):

Scale: 0- Totally unconfident, 1- Very unconfident, 2- Unconfident, 3- Somewhat unconfident, 4- Undecided, 5- Somewhat confident, 6- Confident, 7- Very confident, 8- Totally confident

1. Research a term paper.
2. Write course papers.
3. Do well on your exams.
4. Take good class notes.
5. Keep up to date with your schoolwork.
6. Manage time effectively.
7. Understand your textbooks.
8. Get along with roommate(s).
9. Socialize with your roommate(s).
10. Divide space in your apartment/room.
11. Divide chores with your roommates.
12. Participate in class discussions.
13. Ask a question in class.
14. Get a date when you want one.
15. Talk to your professors.
16. Talk to university staff.

17. Ask a professor a question.
18. Make new friends at college.
19. Join a student organization.

50-item International Personality Item Pool Big Five Questionnaire (IPIP) (Goldberg, 1999)

Read each item carefully, and circle the number that represents how accurately the statement describes you.

7 = Completely Accurate							
6 = Very Accurate							
5 = Probably Accurate							
4 = Sometimes Accurate, Sometime Inaccurate							
3 = Probably Inaccurate							
2 = Very Inaccurate							
1 = Completely Inaccurate							

1. Am the life of the party.	1	2	3	4	5	6	7
2. Feel little concern for others. (Reverse-scored)	1	2	3	4	5	6	7
3. Am always prepared.	1	2	3	4	5	6	7
4. Get stressed out easily. (Reverse-scored)	1	2	3	4	5	6	7
5. Have a rich vocabulary.	1	2	3	4	5	6	7
6. Don't talk a lot. (Reverse-scored)	1	2	3	4	5	6	7
7. Am interested in people.	1	2	3	4	5	6	7
8. Leave my belongings around. (Reverse-scored)	1	2	3	4	5	6	7
9. Am relaxed most of the time.	1	2	3	4	5	6	7
10. Have difficulty understanding abstract ideas. (Reverse-scored)	1	2	3	4	5	6	7
11. Feel comfortable around people.	1	2	3	4	5	6	7
12. Insult people. (Reverse-scored)	1	2	3	4	5	6	7
13. Pay attention to details.	1	2	3	4	5	6	7
14. Worry about things. (Reverse-scored)	1	2	3	4	5	6	7
15. Have a vivid imagination.	1	2	3	4	5	6	7
16. Keep in the background. (Reverse-scored)	1	2	3	4	5	6	7
17. Sympathize with others' feelings.	1	2	3	4	5	6	7
18. Make a mess of things. (Reverse-scored)	1	2	3	4	5	6	7
19. Seldom feel blue.	1	2	3	4	5	6	7
20. Am not interested in abstract ideas. (Reverse-scored)	1	2	3	4	5	6	7
21. Start conversations.	1	2	3	4	5	6	7
22. Am not interested in other people's problems. (Reverse-scored)	1	2	3	4	5	6	7
23. Get chores done right away.	1	2	3	4	5	6	7
24. Am easily disturbed. (Reverse-scored)	1	2	3	4	5	6	7
25. Have excellent ideas.	1	2	3	4	5	6	7

Read each item carefully, and circle the number that represents how accurately the statement describes you.

7 = Completely Accurate	_____	_____	_____	_____	_____	_____	_____
6 = Very Accurate	_____	_____	_____	_____	_____	_____	_____
5 = Probably Accurate	_____	_____	_____	_____	_____	_____	_____
4 = Sometimes Accurate, Sometime Inaccurate	_____	_____	_____	_____	_____	_____	_____
3 = Probably Inaccurate	_____	_____	_____	_____	_____	_____	_____
2 = Very Inaccurate	_____	_____	_____	_____	_____	_____	_____
1 = Completely Inaccurate	_____	_____	_____	_____	_____	_____	_____
		↓	↓	↓	↓	↓	↓
26. Have little to say. (Reverse-scored)	1	2	3	4	5	6	7
27. Have a soft heart.	1	2	3	4	5	6	7
28. Often forget to put things back in their proper place. (Reverse-scored)	1	2	3	4	5	6	7
29. Get upset easily. (Reverse-scored)	1	2	3	4	5	6	7
30. Do not have a good imagination. (Reverse-scored)	1	2	3	4	5	6	7
31. Talk to a lot of different people at parties.	1	2	3	4	5	6	7
32. Am not really interested in others. (Reverse-scored)	1	2	3	4	5	6	7
33. Like order.	1	2	3	4	5	6	7
34. Change my mood a lot. (Reverse-scored)	1	2	3	4	5	6	7
35. Am quick to understand things.	1	2	3	4	5	6	7
36. Don't like to draw attention to myself. (Reverse-scored)	1	2	3	4	5	6	7
37. Take time out for others.	1	2	3	4	5	6	7
38. Shirk my duties. (Reverse-scored)	1	2	3	4	5	6	7
39. Have frequent mood swings. (Reverse-scored)	1	2	3	4	5	6	7
40. Use difficult words.	1	2	3	4	5	6	7
41. Don't mind being the center of attention.	1	2	3	4	5	6	7
42. Feel others' emotions.	1	2	3	4	5	6	7
43. Follow a schedule.	1	2	3	4	5	6	7
44. Get irritated easily. (Reverse-scored)	1	2	3	4	5	6	7
45. Spend time reflecting on things.	1	2	3	4	5	6	7
46. Am quiet around strangers. (Reverse-scored)	1	2	3	4	5	6	7
47. Make people feel at ease.	1	2	3	4	5	6	7
48. Am exacting in my work.	1	2	3	4	5	6	7
49. Often feel blue. (Reverse-scored)	1	2	3	4	5	6	7
50. Am full of ideas.	1	2	3	4	5	6	7

Demographic Questions

1. What is your race? Hispanic/Latino, Non-Hispanic/Latino
2. What is your ethnicity? White, African American, Pacific Islander, Asian, Indian American, Arab/Middle Eastern, More than one
3. What year in school are you? Freshman, Sophomore, Junior, Senior
4. How many college credit hours have you completed as of last semester's end?
5. How many course credits are you currently taking (most classes are 3 credits each)?
6. Are you currently employed? No, Yes
7. Is your job off-campus or on-campus? On-campus, Off-campus
8. How many hours per week do you work at your job?
9. What is your marital status? Single, Married, Living as married, Divorced
10. Are you first in your family to go to college? No, Yes
11. Do you participate in any extracurricular activities on campus? No, Yes
12. How many hours per week do you participate in extracurricular activities?
13. Where do you currently live? On-campus, Off-campus.
14. Do you receive financial assistance from the school or state? No, Yes
15. Are you a transfer student into UTC? No, Yes
16. Are you attending UTC as an out of state student? No, Yes
17. Are you a collegiate athlete at UTC? No, Yes
18. Is English the primary language in your home? No, Yes
19. How often do you attend your classes? 1- Never, 2- Very infrequently, 3- Sometimes, 4- Very frequently, 5- Always

20. What level of education do you wish to obtain? 1- Some college, 2- Bachelor's Degree, 3- Some graduate school, 4- Master's Degree, 5- Doctoral Degree

21. How often do you use recreational drugs or alcohol? 1- Never, 2- Very infrequently, 3- Sometimes, 4- Very frequently, 5- Always

Academic Performance

1. Please report your cumulative GPA as of the end of last semester.

2. How would you rate yourself in terms of general academic performance? 1- Below average, 2- About average, 3- Above average, but not top one-third, 4- Top 1/3 of students, 5- Top 10%

3. Where do you usually score on tests in college classes? 1- Below average, 2- About average, 3- Above average, but not top one-third, 4- Top 1/3 of students, 5- Top 10%

4. Generally speaking, how often do you experience difficulty with schoolwork? 1- Never, 2- Very infrequently, 3- Sometimes, 4- Very frequently, 5- Always (Reverse-scored)

Attrition Risk

Instructions: Rate the extent to which you agree or disagree with the following statements about yourself.

Scale: 1- Strongly disagree, 2- Moderately disagree, 3- Slightly disagree, 4- Neutral, 5- Slightly agree, 6- Moderately agree, 7- Strongly agree.

1. I would leave school if I could.

2. I plan on leaving this school.

3. I expect to change schools in the next few months.

4. I will look to change schools very soon.

APPENDIX B
INSTITUTIONAL REVIEW BOARD APPROVAL

MEMORANDUM

TO: Ashley Cooper

IRB # 13-022

Dr. Chris Cunningham

FROM: Lindsay Pardue, Director of Research Integrity

Dr Bart Weathington, IRB Committee Chair

DATE: February 19, 2013

SUBJECT: IRB Application # 13-022: Self-Leadership Training: A Method for Improving Academic Performance and Retention

The IRB Committee Chair has reviewed and approved your application and assigned you the IRB number listed above. You must include the following approval statement on research materials seen by participants and used in research reports:

The Institutional Review Board of the University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 13-022.

Since your project has been deemed exempt, there is no further action needed on this proposal unless there is a significant change in the project that would require a new review. Changes that affect risk to human subjects would necessitate a new application to the IRB committee immediately.

Please remember to contact the IRB Committee immediately and submit a new project proposal for review if significant changes occur in your research design or in any instruments used in conducting the study. You should also contact the IRB Committee immediately if you encounter any adverse effects during your project that pose a risk to your subjects.

For any additional information, please consult our web page <http://www.utc.edu/irb> or email us at: instrb@utc.edu.

Best wishes for a successful research project.

MEMORANDUM

TO: Ashley Cooper IRB # 13-022
Dr. Chris Cunningham

FROM: Lindsay Pardue, Director of Research Integrity
Dr Bart Weathington, IRB Committee Chair

DATE: October 22, 2013

SUBJECT: IRB Application # 13-022: Exploring the Use of Non-Cognitive Factors in Predicting College Academic Outcomes

The Institutional Review Board has reviewed and approved the following changes for the IRB project listed below:

- Research title changed from “Self-Leadership Training: A Method for Improving Academic Performance and Retention” to Exploring the Use of Non-Cognitive Factors in Predicting College Academic Outcomes”
- Inclusion of human subjects as participants, an informed consent form, and a survey/questionnaire for the collection of data
- Additional locations for conducting the research

You must include the following approval statement on research materials seen by participants and used in research reports:

The Institutional Review Board of the University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 13-022.

Please remember that you must complete a Certification for Changes, Annual Review, or Project Termination/Completion Form when the project is completed or provide an annual report if the project takes over one year to complete. The IRB Committee will make every effort to remind you prior to your anniversary date; however, it is your responsibility to ensure that this additional step is satisfied.

Please remember to contact the IRB Committee immediately and submit a new project proposal for review if significant changes occur in your research design or in any instruments used in conducting the study. You should also contact the IRB Committee immediately if you encounter any adverse effects during your project that pose a risk to your subjects.

For any additional information, please consult our web page <http://www.utc.edu/irb> or email instrb@utc.edu

Best wishes for a successful research project.

VITA

Ashley Cooper was born in Raleigh, NC, and raised in Marietta, GA by her father George Cooper. She graduated Magna Cum Laude with a Bachelor of Science degree in Psychology from Kennesaw State University. After working in the corporate psychology and management consulting field, she decided to pursue a graduate degree. Ashley will receive her Master of Science degree in Industrial-Organizational Psychology from the University of Tennessee at Chattanooga in May of 2014. Ashley will start her Doctoral degree in Industrial-Organizational Psychology shortly after graduation.