Dissertation

Does Character Matter?: The Role of Grit and Resilience in Predicting Academic Success

by

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Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Psychology
Hofstra University
Hempstead, N.Y. 11549
October 7, 2015
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Acknowledgements

To Lola, the best sponsor I could have asked for, thank you. You have made this process such a joy. I am so grateful to have had your guidance and will be eternally grateful for your real world advice. Your wise words will always stay with me. To Kim, thank you for taking me under your wing from day one. You are one of the kindest people I have ever met and I am so thankful to have had the opportunity to learn from you over the past four years. The experiences you have provided me with are moments and lessons I will take with me and be able to use throughout my career. To Bob, thank you for being a part of this special day. Your guidance and feedback have been priceless throughout this process. To Karen, I am so appreciative to have been able to spend my internship year with you. Being able to watch you work with your students and colleagues was a privilege. You are an exemplary school psychologist and professional and I could only hope to be as good as you one day. To Paul, your assistance in every aspect of my time during this program, from classes to internship, and clinic work to statistics has been invaluable. You are always so full of knowledge and I am so thankful that you are always ready and willing to share. Lessons you have taught me will stay with me forever. I am forever indebted to you all for the invaluable guidance, advice, and support you have all provided me with. Thank you.

To my incredible classmates, I am so lucky to have had you with me during the past four years. You are all brilliant, funny, talented, and incredible people to be around and I have learned something from each and everyone one you. This experience would not have been the same without you guys. I could not have handpicked a more amazing group of people to share this experience with. A very special thank you to my lifelong
friends Cheray, Anna, and Alyssa, I am so incredibly grateful for you all and to have gone through this crazy experience with you guys by my side each step of the way. I could not have made it without you.

To my friends and family, thank you for your unwavering support and understanding during the past four years. I know I have gone MIA at times, but I always knew that you would all be there for me to vent to when things were particularly stressful or to rescue me from textbooks for a night out. To Andy, thank you for being so supportive over the past year and a half, even when my mini breakdowns turn me into a crazy person.

And last, but certainly not least, thank you to my parents. Dad, thank you for your constant encouragement and calming words. I know this has always been a team effort, but I'm going to take the credit this time, with of course a little bit for you. Thank you for being my best friend and teaching me so many important life lessons. Mom, there aren't words to express my gratitude for all you have done for me, not just over the past four years, but throughout my life. Thank you for supporting me in every way a person can be supported. You are my inspiration and rock. I would be nowhere with you.
Abstract

The importance of intelligence and cognitive factors in measuring academic success has been well documented (Bridgeman, McCamlry-Jenkins, & Ervin, 2000; Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008; Mathiasen, 1984; Mouw & Khanna, 1993; Neisser et al., 1996; Noble & Sawyer, 2002; Poropat, 2009; Richardson & Abraham, 2009; Robbins et al., 2004). The same is true for the Big Five trait of Conscientiousness (Chamorro-Premuzic & Furnham, 2003; Kappe & van der Flier, 2012; O’Connor & Paunonen, 2007; Poropat, 2009; Richardson & Abraham, 2009; Richardson, Abraham, & Bond, 2012). The goal of this study is to refine knowledge about which personality traits make an individual successful in the college environment by examining new personality constructs beyond those discussed in the Five Factor Model. O’Connor and Paunonen (2007) show that the narrower facets tend to be able to explain more variance than broad traits. This can be explained by the fact that broad traits previously studied may encompass too much and be lacking in subtlety and nuance.

Grit and resilience are two personality traits that have been shown to predict success in many domains of life. The present study hypothesized that grit and resilience have independent and incremental predictive validity in college cumulative GPA and freshmen retention, over and above that of traditional predictors, which include intelligence, SAT scores, and high school GPA, and that grit and resilience are compensatory traits. It was also hypothesized that grit and resilience, as well as intelligence, high school GPA, and SAT scores, would be correlated with senior year college GPA and freshmen retention. Demographic variables were also investigated in order to determine if they play a role in grit, GPA, and retention. Participants were recruited from Hofstra University. Participants are either in the current freshman or
senior classes at the university. The number of participants that completed some portion of this study and were included in at least one analysis was 235. Eight four seniors and eighty three freshmen completed the study in full. All participants were asked to complete a variety of self-report measures including a background questionnaire, the Grit-S Scale, and the Connor-Davidson Resilience Scale as well as take a test of cognitive ability called the Wonderlic Cognitive Ability Pretest. They were also asked to give consent for the researcher to collect data from their school records, which included high school GPA, SAT scores, current cumulative GPA, and retention. Data analysis included bivariate correlations, multiple regressions, and an ANOVA in order to determine the relationship of all predictor variables (HS GPA, SAT, Intelligence, Grit, Resilience) to the dependent variables (GPA or retention), determine incremental predictive validity of grit and resilience, and determine whether grit and resilience are compensatory, respectively.

The results of this study both support previous findings and contribute new knowledge to the literature. Consistent with previous findings, the correlations between intelligence, high school GPA, and SAT scores and senior year GPA were all found to be significant. Previous findings that intelligence, high school GPA, and SAT scores are correlated with one another, that high school GPA is the strongest predictor of college GPA, and that grit is important for students in highly rigorous and competitive environments were also corroborated.

The current study also contributed to the research in new ways. Although the role of grit in predicting retention has been studied in the past, this study was able to show that grit can be an important predictor for retention in a more generalized population.
Results of this study show that grit is correlated with and predictive of freshmen year retention, as well as a compensatory trait when predicting retention for students who do not perform as well as their peers on the SATs. This study also found that resilience is a compensatory trait for seniors that did not perform as well as their peers on the SATs. Just as grit helps seniors with high SAT scores stand out from their non-gritty peers, resilience helps lower achieving students make up the achievement gap.

The purpose of this study was to be able to more accurately identify what makes a student successful at the tertiary level of education, specifically investigating the role of grit and resilience in predicting GPA and retention in undergraduate students at a private university. Implications of the results, limitations of the present study, and directions for future research are discussed.
College admissions have become increasingly competitive over the years while the college degree has become more and more important in getting a job in today's workforce. In spite of the importance of obtaining a college degree, institutions across the country are seeing a large number of students drop out before they are able to complete their degree. Attrition rate estimates are currently standing at about 21-30% nationally (Ackerman, Kanfer, & Beier, 2013). The National Center for Educational Statistics (2014) reports that the retention rate at 4-year institutions for first time undergraduates for the 2011-2012 academic year was 78.8%, which puts attrition at 21.2%. The rate of retention for all institutions nationally, including public, non-profit, for-profit, two year, and four year colleges and universities is 70.3%, which means the attrition rate is at almost 30% for the 2011-2012 academic year (National Center for Educational Statistics, 2014). Based on these estimates, more than a quarter of students do not return to school after their first year. Six year graduation rates paint an even grimmer picture. The six-year graduation rate for first-time, full-time undergraduate students who began to pursue a degree at a four-year institution in the fall of 2006 was 59% (National Center for Educational Statistics, 2013). When a student drops out, it becomes an issue for all parties involved, including the student, parents, and the university. This begs the question; how can we amend the selection process and/or improve retention at universities to help lower attrition rates? Ackerman et al. (2013) discuss this issue in terms of signal detection. They state that universities must decrease false alarms (students that are not appropriate choices for the university to accept) and
increase hits (students that are able to complete a degree within certain time constraints).

In order to do this we must find out what makes a student succeed in college.

**Intelligence and Traditional Predictors of Academic Performance**

There is a vast amount of research in the area of predicting academic success. A good portion of this research has shown the importance of intelligence in predicting achievement and overall positive life outcome (Duckworth, Peterson, Matthews, & Kelly, 2007; Gottfredson, 1997; Hartigan & Wigdor, 1989; Strenze, 2007). Intelligence can be defined as "the ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, and to overcome obstacles by taking thought" (Neisser et al., 1996, p.77).

Over the past century, there have been many different conceptualizations of intelligence. These include the idea that there are multiple types of intelligence, which was put forth by both Gardner (1985) and Spearman (1985). Howard Gardner believed that a person could be intelligent in many different ways, not just in the ways that get you through school, such as linguistic, spatial, and mathematical abilities. His theory of intelligence allows for other areas of intelligence as well. For example, those that have a proclivity for music through singing or playing an instrument are musically intelligent and people who have a knack for athletics would have bodily-kinesthetic intelligence (Gardner, 1985). Another theorist, Robert Sternberg, proposed a tri-archic theory of intelligence with three fundamental aspects of intelligence which are analytic, creative, and practical intelligence (Sternberg, 1985). He believed that viewing intelligence in this way would give one a broader understanding of what the composition of intelligence is. However, the modern paradigm for intelligence and intelligence testing has its beginnings
in the work of Binet and Simon (1905/1961). They devised a test to be given to children with the goal of predicting academic success or failure. This test included measures of higher order mental abilities such as memory, reasoning, attention, and thinking while at the same time separating out influences such as previous instruction and socioeconomic status. Since then, psychometric tests and instruments have been used for a wide variety of purposes such as selection, diagnosis, and evaluation, and have played a large role in these processes in western society.

For our purposes, intelligence or ‘g’ can be defined as “a highly general information-processing capacity that facilitates reasoning, problem solving, decision making, and other higher order thinking skills” (Gottfredson, 1997, p 81). As previously noted, intelligence tests were originally created by Binet to predict whether a student was able to succeed in school. Because intelligence tests were historically used to differentiate who would and who would not succeed in a classroom environment, it only makes sense that intelligence would be able to predict academic performance. And intelligence tests do in fact predict just that. The correlation between intelligence scores and grades in school is approximately ($r = .50$), which means that they account for about 25% of the overall variance in school performance (Neisser et al., 1996).

There have been multiple meta-analyses conducted on the subject of intelligence predicting academic success. One such meta-analysis conducted by Poropat (2009) found that the correlation between intelligence and academic performance, as measured by GPA, is .25. It is important to note that educational level was used as a moderator for this study. The correlation between these two variables decreased as level of education increased. In another study, Richardson, Abraham, and Bond (2012), found measures of
intelligence to have only had small positive correlation with college GPA ($r = .20$). These findings are evidence for a restriction of range at the college level, which will be discussed in more detail later.

**SAT/High School GPA and Academic Performance**

In the United States, the SATs (originally Scholastic Aptitude Test, later changed to Scholastic Assessment Test, currently used as an acronym that does not stand for anything), has played a huge role in the college selection process. The SAT was created by Carl Brigham in 1926 as a way to measure students' cognitive ability. During the 1920s, college was attended mostly by students coming from a privileged upbringing. Brigham's intention in creating the SAT was to create an equal opportunity for higher education for those students coming from different socioeconomic backgrounds by measuring their cognitive ability (Barnes, 2002). Students could be assessed based on their innate ability instead of their economic status. Brigham's goal was very similar to Binet's, which was to separate out environmental influences in order to predict one's ability to succeed in an academic environment. The SAT has historically been composed of two sections, Math and Verbal, each with a high score of 800 points for a total possible score of 1600 points. In 2005, the new SAT I introduced a writing section, also with a high score of 800 points, which required students to complete an essay and answer questions relating to appropriate usage of grammar.

It is logical that because Brigham and Binet had similar intentions in creating their tests, that these tests would be associated with each other. Frey and Detterman (2004) set out to see if they could create an equation to predict IQ from SAT scores based on this premise. They used the National Longitudinal Survey of Youth 1979 (NLSY79)
to obtain SAT scores and scores from the Armed Services Vocational Aptitude Battery
(ASVAB), a standard measure of aptitude used by the United States military. Using
these measures, they found that SAT scores and cognitive ability are significantly
correlated ($r = .82$, $p < .001$). SATs have even been used to estimate intelligence in some
studies where time and resources are limited (Frey & Detterman, 2004). Research has
also been done to see if SAT scores have a similar or unique amount of predictive
validity as measures of cognitive ability. Because they are so closely correlated, it is
possible that these variables could be redundant. In order to address this question, Coyle
and Pillow (2008) examined whether standardized entrance exams, such as the SAT,
would predict college GPA after removing g-loading from the test. Results showed
strong, significant correlations ($r = .90$) between $g$ and SAT suggesting that they are
strongly related (Coyle & Pillow), which is consistent with Frey and Detterman's
findings. There were also moderately significant paths from SAT unique variance to
GPA ($r = .28$), which suggest that a portion of the predictive validity of the SAT can be
attributed to non-$g$ factors (Coyle & Pillow). Taken together, these results indicate that
while the SAT is highly $g$-loaded, and therefore related to IQ (Frey & Detterman, 2004),
the SAT also predicts GPA from non-$g$ factors. This is important research, especially
considering that SAT scores are used heavily in admission decisions and are supposed to
be able to tease out which students will be able to succeed in a college environment. This
research shows us that SATs can add predictive power to admissions decisions over and
above intelligence. On their own, it has been found that admissions exams such as the
SATs and the American College Testing (ACTs) exams, have been shown to be
correlated with Freshman Year GPA ($r = .26 - .35$: Bridgeman, McCamlry-Jenkins, & Ervin, 2000; Kobrin et al., 2008; Noble & Sawyer, 2002).

It is said that the best predictor of future behavior is past behavior. For our purposes, past academic performance is represented by high school GPA. High school GPA is also a variable often used in both in admissions decisions and in research to predict academic success. Richardson, Abraham, and Bond (2012) conducted a meta-analysis in order to determine the best predictors of college GPA. Their review will be discussed in more detail later. One of their findings was that high school GPA has a medium positive correlation with college GPA. High school GPA has been shown to be a stronger predictor of university GPA than SAT or ACT scores (Richardson, Abraham, & Bond, 2012).

In regression analyses run in a meta-analysis, high school GPA and SAT/ACT scores collectively explained 22% of the variance in GPA (Richardson, Abraham, & Bond, 2012). All three traditional predictors of academic success, including intelligence, SAT and/or ACT scores, and high school GPA, have been found to explain independent variation in GPA (Bridgeman et al., 2004) and they collectively account for about 25% of the variance in academic achievement (Mathiasen, 1984; Mouw & Khanna, 1993; Richardson & Abraham, 2009; Robbins et al., 2004) leaving a lot of unexplained variance.

This leads us to another question. What about the other 75% of variance unaccounted for by intelligence and other traditional predictors such as standardized achievement tests and high school GPA? What else could contribute to achievement and academic success other than cognitive measures? And what can account for individual
differences in people with similar IQ scores? In Terman's classic study on gifted
individuals, it was noted that there was only a five point IQ difference between the least
and most accomplished person in the study (Terman & Oden, 1947). Terman and Oden
(1947) stated that more predictive than IQ were non-cognitive qualities like perseverance,
confidence, and integration toward goals in this group of gifted individuals.

Non-Cognitive Variables and Academic Performance

As noted above, universities only select students within a restricted upper band of
SAT and ACT scores, which naturally reduces variation in intelligence scores and SAT
and ACT scores. As a result, at the tertiary level, intelligence and other traditional
predictors of academic performance lose their predictive power (Chamorro-Premuzic &
Furnham, 2005; O'Connor & Paunonen, 2007; Richardson, Abraham, & Bond, 2012).
The correlation declines from .60 at the elementary level, to .50 at the secondary level, to
.40 at the undergraduate level, and .30 at the graduate level (Kappe & Flier, 2012). This
pattern has been explained by range restriction because as students get older and enter
into higher levels of education, they are already selected based on intelligence and
entrance exam scores. Therefore, there is a need to find other factors, such as personality
measures, that are important to the prediction of GPA and academic achievement at
higher levels of education.

There has been a good deal of research on non-cognitive factors, like personality,
in predicting academic success. Early research on the link between personality and
achievement was very shaky and found variable results, which led to the conclusion that
personality was unrelated to performance (Poropat, 2009). However, in the 1980s the
Five Factor Model of personality became very popular and was heavily researched
(Digman, 1997; McCrae & Costa, 1987). It is now one of the most prevalent comprehensive theories used in the literature to understand personality. The value of the Five Factor Model was that it diminished the chaos seen in different personality dimensions and allowed researchers to focus on the five major dimensions that the theory proposes. These five dimensions are Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Using this theoretical model, it was found that personality measures, specifically Conscientiousness, were in fact linked to work performance (Barrick & Mount, 1991). With this finding, the flood gates opened and researchers began using the Five Factor Model to predict all types of performance.

Over the years, the Big Five trait of Conscientiousness has been the most consistently linked with academic success and can account for variance over and above that of cognitive measures (Chamorro-Premuzic & Furnham, 2003; Kappe & van der Flier, 2012; O’Conner & Paunonen, 2007; Poropat, 2009; Richardson & Abraham, 2009; Richardson, Abraham, & Bond, 2012). There are many theories as to why this is the case. One theory is that conscientiousness is closely related to motivation, which has been shown to be important in various types of performance. People high in conscientiousness tend to put forth effort into their work, are hardworking, organized, and tend to be ambitious (Chamorro-Premuzic & Furnham). Many studies and meta-analyses support this conclusion. One such study was conducted by Chamorro-Premuzic and Furnham (2003). They carried out a three year longitudinal study to investigate which personality traits were the best predictors of academic success. Their results show that conscientiousness was a significant correlate of academic performance ($r = .33-.39, \ p < .01$). They also found the conscientiousness was negatively correlated with absenteeism
(r = -.24), a behavior that is also negatively correlated with academic achievement. Big Five personality traits were also entered into a regression model and were able to account for an additional 10% of variance in academic performance over and above tutor's predictions of grades and ABIs (Academic Behavior Indicators) such as absenteeism. These results support previous studies findings that personality traits (specifically conscientiousness) show incremental and predictive validity when looking at academic performance (Chamorro-Premuzic & Furnham).

Another study conducted by Kappe and van de Flier (2012) cited range restriction as a problem, stating that others have found that intelligence has not been a great predictor of academic success in the post-secondary setting. Correlations between intelligence scores and academic achievement decrease as students’ age increase (Chamorro-Premuzic & Furnham, 2005). Kappe and van der Flier aimed to investigate the predictive validity of intelligence and personality factors on multiple predictors of academic achievement. They found that intelligence showed small correlations with academic performance in postsecondary education (as expected because of range of restriction). Conscientiousness showed large correlations with the 5 specific academic measures of achievement; specifically conscientiousness was correlated with GPA (r = .47, p < .01). They also found that conscientiousness was able to explain additional variance above and beyond intelligence. These results also support previous findings that personality is an important predictor in academic achievement in college.

Richardson, Abraham, and Bond (2012) conducted a meta-analysis and reviewed many additional correlates of tertiary GPA other than the traditional measures used such as intelligence, SAT, ACT, and high school GPA. Included in this review were the broad
dimensions of the five-factor model amongst 38 other non-cognitive constructs such as motivational factors and self-regulated learning strategies. Results showed that traditional predictors of college GPA had positive medium-sized correlates with GPA. Once again, Conscientiousness showed the strongest correlation with GPA of the Big Five Factors with a small to medium correlation. Conscientiousness was found to be an individually significant predictor of GPA in regressions controlling for high school GPA and standardized entrance exams such as the SAT and ACT. These results support previous meta-analysis conclusions in that conscientiousness was the strongest personality correlate and predictor of tertiary GPA (Richardson, Abraham, & Bond).

Another meta-analysis on the subject of predicting academic success was conducted by Poropat (2009). His review focused on the personality-academic performance relationships, specifically those studies that investigated the Five Factor Model, at the tertiary level of education. Results showed that average relationship between Conscientiousness and academic performance had a medium effect size \( d = .46 \) and that Agreeableness \( d = .14 \) and Openness \( d = .24 \) had small effect sizes. In terms of GPA, the \( d \) for Conscientiousness "represents an increase of .31 GPA points, which means that students who are low in conscientiousness are twice as likely to fail" (Poropat, 2009, p. 328). This is clearly a practically significant outcome, therefore the idea that Five Factor Model (FFM) dimensions are associated with academic performance have been confirmed with this meta-analysis. Further analyses of the relationship between personality and academic performance were also conducted. When controlling for secondary GPA, Conscientiousness \( r_{\text{partial}} = .17 \) was the only FFM dimension that added to the predictability of tertiary GPA. Conscientiousness added a bit more to the
prediction of college GPA than intelligence, once again confirming that it is an important predictive variable of academic performance.

Lastly, O'Connor and Paunonen (2007) conducted a review of the literature and meta-analysis that focused on the prediction of post-secondary academic performance on the basis of Big Five personality dimensions. Their review states, as all other previous literature on the topic does, that Conscientiousness has been the most consistently linked Big Five trait to academic success. It has been found to be positively correlated with GPA. Conscientiousness is also linked to more narrow measures of success such as final grades in courses, essays, or thesis research grades. Results of the meta-analysis show that the mean population correlation between Conscientiousness and academic performance is $r = .24$. After conducting hierarchical regressions, results show that Big Five traits, specifically Conscientiousness, were able to predict academic performance above and beyond that of cognitive ability.

Overall, after reviewing this literature, we can say that Conscientiousness has an average correlation with academic success of, $r = .24$, with a range from, $r = .12 - .36$ (O’Connor & Paunonen, 2007). O’Connor and Paunonen also looked at research that conducted analyses with more narrow personality traits in relation to academic performance. In particular, the Conscientiousness facets of dutifulness ($r = .38$), achievement-striving ($r = .35$), and self-discipline ($r = .22$) have been the strongest and most consistent predictors of academic success and were shown to have an even stronger correlation with academic success than Conscientiousness at times (O’Connor & Paunonen, 2007).
Although studies surrounding the Big Five have dominated the research, there are investigations that have been done to evaluate other non-cognitive or personality measures to explain academic success. Once such study conducted by Ackerman et al. (2013) examined trait complexes in tandem with traditional predictors in Science, Technology, Engineering, and Mathematics (STEM) majors at Georgia Tech. Trait complexes in this study were composed of motivation, personality, self-concept, and other related measures. They found that trait complexes were independent and incremental predictors of both academic achievement and STEM persistence and accounted for 5-8% of the variance (Ackerman et al., 2013).

Another study conducted by Grigorenko and colleagues (2009) examined aspects of Self-Regulated Learning (SRL), which were defined as traits such as academic motivation and academic self-efficacy as well as academic locus of control. This study was conducted in one of the country's premier private secondary schools, Choate Rosemary Hall, with both their Icahn scholars, who are from disadvantaged backgrounds and are awarded scholarships to the school, as well as with the school's general population. Results showed that the best independent predictor of high school GPA was the student's middle school GPA. However when self-regulated learning (SRL) self-reports were added to the admissions process, SRL's increased the predictive validity of standardized tests and middle school GPA. Specifically, SRL indicators like academic self-efficacy explained an additional 9.6% of the variance above that of SSAT indicators (high school admissions exam) for Icahn scholars and 10% of the variance of the general population of the school (Grigorenko et al., 2009).
These types of studies that look into more narrow constructs than the Big Five as well as those that move away from the Five Factor Model in general are needed in the research (O’Conner & Paunonen, 2007). In their meta-analysis, O’Conner & Paunonen discussed guidelines for future examination of the relationship between personality and academic success. They suggest using narrower constructs which may be better predictors of scholastic achievement than the Big Five. The reason being that those personality constructs may be too broad and lacking in nuance and subtlety. They also suggest using other measures that are not included in the Five Factor model. One problem in the literature is that research linking the Five Factor Model and academic success has saturated the field, which excludes other important theoretical models or different personality domains. Thus, different, new, and narrower constructs should be investigated. O'Conner & Paunonen also recommend using specific measures of academic achievement beyond GPA, such as individual course grades and individual test grades. They also suggest examining both direct and incremental predictive validity of the constructs being examined. The goal of this study is to pick up the line of research here by using different personality constructs, other than the Big Five dimensions, in order to increase our knowledge about what exactly can predict academic success in college.

**Grit**

With these recommendations in mind, there have been other personality constructs that have started to make headway in the field. One such construct is grit which is defined as 'perseverance and passion towards long term goals' (Duckworth, Peterson, Matthews, & Kelly, 2007, p.1087). “Grit entails working strenuously toward
challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress. The gritty individual approaches achievement as a marathon; his or her advantage is stamina.” (Duckworth et al., p.1088). Angela Duckworth has pioneered the research in this field. In the development of the Grit Scale, Duckworth and Quinn (2009) found that factor analysis identified two distinct dimensions of grit. The first is consistency of interest and the second is perseverance of effort. Grit has been shown to overlap with aspects of Conscientiousness, but differs in that grit puts an emphasis on persistence in the long term, whereas the self-control aspect of Conscientiousness emphasizes impulses control in the moment. It was found that the correlation between grit and Conscientiousness is $r = .77$ (Duckworth et al.).

Duckworth, Peterson, Matthews and Kelly (2007) published a series of studies looking at the impact of grit on success across multiple settings. In their first study, they examined the relationship of age and education with grit. Results showed that more educated people were higher in grit than their same age peers with less education. However, the individuals lowest in grit were those that had only completed some college. When education was controlled for, grit increased monotonically with age (Duckworth et al., 2007). The purpose of the second study was to see if grit would retain these relationships when other personality traits like Conscientiousness were controlled for. Results showed that grit has incremental predictive validity for education and age over and above Conscientiousness and other Big Five traits. Duckworth et al. also investigated if grit predicted few career changes. Similar results were found. Grit had incremental predictive validity for the amount of career changes over time over and above age, Conscientiousness, and other Big Five traits (Duckworth et al.). These results
showed that the grittier the individual, the less career changes they had and the longer they stayed with a job.

The third study in the series tested whether grit was correlated with GPA in undergraduates at the University of Pennsylvania. They found that gritty students had higher GPAs than their less gritty counterparts ($r = .25, p < .01$). Another finding of this study is that grit was correlated with lower SAT scores. One possible explanation for this finding is that among high achieving Ivy League undergraduate students, those who are less academically able compensate by working harder (Duckworth et al., 2007).

Study four investigated the relationship between grit and the retention rate of cadets at the United States Military Academy (USMA) at West Point after the rigorous summer training program and after the first year. They found that grit was the best predictor of completion of the intensive summer training program. However, grit was not found to be the best predictor of first year GPA among cadets, instead self-control was a better predictor (Duckworth et al., 2007).

The goal of another study working with the military was to assess the quality of grit as a predictor of performance and retention among first year cadets at the USMA beyond what the Whole Candidate Score (WCS) is capable of (Maddi, Matthews, Kelly, Villarreal, & White, 2012). The WCS is a measure of high school performance that includes GPA, class rank, measures of leadership, and physical fitness that is already used by the military for selection of cadets. Results showed that Cadet Performance Scores (CPS), a measure of performance after the first year of training were positively correlated with grit. Regression analysis showed that WCS, hardiness, and grit were all significant predictors of retention after the first year. Grit was the most important of these
variables in predicting retention, with those cadets who were retained being twice as likely to have higher grit scores than those who failed to complete the first year. Regression analyses were also run with the same variables in relation with CPS scores. All three variables were shown to be significantly associated with CPS scores, however grit did not show unique predictive variance in CPS scores, whereas WCS and hardiness did. Although grit was the most important predictor for retention of cadets at USMA, it was not significant in the prediction of performance in this domain (Maddi et al.).

In a related study, Duckworth et al. (2007) once again checked for the incremental predictive validity of grit over and above that of Conscientiousness. Grit was found to have incremental predictive validity over and beyond Conscientiousness for predicting attrition of the summer program at West Point (Duckworth et al.). This is strong evidence for the importance of persistence of effort and grit in achieving a goal.

It is important to note that in the studies involving students at the University of Pennsylvania and the United States Military Academy at West Point, Duckworth and her colleagues had access to a very large subject pool. As the number of participants in a study increases, the probability of finding statistical significance in your results also increases. The current study does not have access to the same types of numbers as these studies did and will be conducted on a smaller scale. These populations also represent highly competitive environments. A goal of this study is to determine whether grit will have the same significance in a general population.

In the last study in the article by Duckworth and colleagues (2007), researchers investigated the effect of grit in participants at the Scripps National Spelling Bee. It was found that participants higher in grit perform better at the national spelling bee and that
grit explained unique variance in performance in the 2006 Scripps National Spelling Bee (Duckworth et al.). A similar study specifically investigated the effect of deliberate practice, defined as effortful and focused activities designed to improve some aspect of performance, on participants' ranking in the Scripps National Spelling Bee. Solitary deliberate practice has been proven to be more effective than alternative preparation activities however, this type of preparation is the most effortful and least enjoyable in which to partake. Therefore, it was hypothesized that participants with more grit would engage in more deliberate practice and therefore place higher in the competition. As expected, results from this study showed that time spent in deliberate practice predicted performance in the competition. Interestingly, more experienced competitors spend more time engaging in deliberate practice than novice spellers. Once again, grit was found to predict performance in the National Spelling Bee. The amount of time spent in deliberate practice mediated the effect of grit on spelling performance, meaning that grittier spellers engaged in more deliberate practice and placed higher than their less gritty counterparts. (Duckworth, Kirby, Tsukayama, Bernstein, & Ericsson, 2011).

Because grit represents one's perseverance and passion toward a distant goal, one would expect that individuals high in grit would persist longer in various types of situations and scenarios. Eskreis-Winkler, Duckworth, Shulman, and Beal (2014) conducted a series of studies looking at the importance of grit in predicting retention across multiple life domains. Investigators assessed the predictive validity of grit for retention in the military, workplace, marriage, and school alongside traditional predictors of retention for each life domain.
The first study measured retention in an Army Special Operations Forces (ARSOF) selection course. Despite the stringent entrance requirements of the physically demanding 24-day course, about half of the candidates voluntarily withdraw prior to completion. Along with grit, traditional measures of retention including intelligence, physical fitness, and years of schooling were measured prior to the start of the course. Results showed that "Candidates one standard deviation higher in grit had a 32% higher odds of completing ARSOF selection." (Eskreis-Winkler et al., 2014, p.6). Grit, general intelligence, and physical fitness all explained unique variance of retention, however, when all other variables were controlled for, grit continued to contribute significantly to retention over and above the army's traditional predictors (Eskreis-Winkler et al.). Once again, this is a highly competitive and specialized arena in which grit plays an important role in retention. A goal of this study is to determine if grit will have the same importance in the role of retention in a less competitive and intense environment.

The investigators also examined the predictive validity of grit for graduation in Chicago Public Schools. As with previous studies, all other known predictors of school retention were held constant. These included demographic variables such as race, gender, socioeconomic status, as well as individual differences such as intelligence, personality traits and standardized achievement scores. Similar analyses were run and once again, with all other variables controlled for, grit remained a significant predictor of graduation (Eskreis-Winkler et al., 2014).

Though research on grit has been limited to date due to the fact that it is a fairly new construct, these studies have shown the value of grit and its importance in many domains, and specifically shows the value in predicting academic achievement and
retention. Duckworth et al. (2007) show the potential of grit as an achievement predictor with the results from their studies of students at the University of Pennsylvania and army cadets at West Point. Eskreis-Winkler et al. (2014) showed that grit is important predictor of retention in secondary school. One of the goals of this study will be to broaden the generalizability of these results by using a college population more closely reflecting the national average and expanding retention data to the tertiary level.

**Resilience**

Another personality construct in the research on predicting academic success is resilience. Resilience has been defined as the process of, capacity for, or outcome of successful adaptation despite challenging or threatening circumstances (Martin & Marsh, 2006). Resilience has been studied for many decades and the field has gone through changes. The field of research on resilience emerged out of years of studies focused on identifying risk factors in individuals that led to negative life outcomes (Mulloy, 2011). Many of these studies showed that while individuals had experienced the same risk factors, some suffered and others were able to transcend the adverse circumstances (Rutter, 1985). This led to investigation of protective factors that helped people to overcome obstacles in their lives, which later became known as resilience. Positive psychology provided a great forum for this type of research, which advocates a broad view of the complexity of human behavior, including positive adaptation and growth (Campbell-Sills, Cohan, & Stein, 2006; Richardson, Neiger, Jensen, & Kumpfer, 1990). What is it that gives some individuals the ability to maintain a healthy state, and maybe even become more capable, in spite of having faced adversity, stressors, or life changes?
This led to the identification of resilient qualities of an individual, or protective factors, which was studied in survivors of trauma. Some of these qualities and protective factors include high self-efficacy, sense of mastery, self-discipline, tolerance, faith, good problem solving skills, being achievement oriented, internal locus of control, having good support systems, etc. (Garmezy, 1991; Rutter, 1985; Werner & Smith, 1992). The more of these traits an individual has, the more resilient they may be (Richardson, 2002). Over time these traits were seen to fall into one of three categories that include personal attributes of the individual, family characteristics and support, and aspects of the wider community (Garmezy; Luther, Cicchetti, & Becker, 2000; Richardson et al., 1990).

In a second wave of research, resilience started to be seen as a dynamic process rather than simply a set of protective factors. Therefore, empirical work has been more focused on the underlying protective processes, trying to understand how these factors contribute to positive outcomes (Luthar et al., 2000). More than a simple recovery from stress, resilience can be defined as positive growth or adaptation following periods of homeostatic disruption (Richardson, 2002). This was originally thought to be an extraordinary capability, but now research has shown that is more the norm than the exception when people are exposed to disadvantaged situations (Masten, 2001). Because most research is focused on disadvantaged population, we still know little about the resilience in the general population. It is possible that resilience is just as helpful in recovering from everyday stressors, not just traumatic ones. In this way it can be viewed as the ability to maintain a healthy state and stable levels of physical and psychological functioning (Campbell-Sills et al., 2006). A goal of this study is to investigate the role
of resilience in overcoming low-level, everyday stressors, specifically in the academic domain.

Because of the breadth of the field, there have been many criticisms concerning the construct of resilience. Luthar and colleagues (2000) discuss criticisms in the field and address possible solutions or discuss arguments against these criticisms. The first criticism is in regards to the fact that there is little consensus on the definition of resilience and a wide variation of the operationalization and measurement of the construct as well as confusion regarding what constitutes a trauma or life challenge. Luthar and colleagues make the argument that diversity is necessary in a field of research in order to cover every aspect and line of inquiry. What is necessary in future literature is proper specification and operational definitions of terms. Another common criticism of the field is the multidimensional nature of resilience. Just because an individual shows resilience in one area of his or her life after dealing with adversity, does not mean that he or she is fairing just as well in all other domains. However, it is unrealistic to expect, even from 'normal' individuals, that all domains of life would progress or react in the same way. Luthar and colleagues do mention that many researchers are moving in the right direction by specifying areas of resilience such as educational resilience (Wang et al., 1994). This is the domain that we will delve into farther. For the full critical evaluation of the field see Luthar, Cicchetti, and Becker (2000).

*Academic Resilience*

Educational resiliency is defined as the ability of students to succeed academically, despite difficult and challenging life circumstances and risk factors that prevent them from succeeding (Wang, Haertel, & Walberg, 1997). As in the research of
resilience in general, resilience studied specifically in the schools have also focused on
disadvantaged or disenfranchised populations. Mulloy (2011) studied resilience
processes in an urban public school composed primarily of low-income African
American students. They studied risk and protective factors of twelve children in the
school through qualitative interviews. Participants named factors from their personal
lives, at school, and within the community (Muolly, 2011; for a review of the literature
investigating resilience in underrepresented minorities, specifically African American
males, see Kim & Hargrove, 2013).

However, the idea of resilience being beneficial in the academic environment is
relevant to all students who may experience difficulty, not just those that are
disenfranchised. Martin and Marsh have done a series of studies involving academic
resilience and academic buoyancy. As previously stated, academic resilience is defined
as the ability to succeed in the academic environment despite challenging life
circumstances and risk factors (Martin & Marsh, 2009). They defined academic
buoyancy as a "students’ ability to successfully deal with academic setbacks and
challenges that are typical of the ordinary course of school life (e.g., isolated or patches
of poor grades or performance, competing deadlines, exam pressure, difficult
schoolwork, daily pressures, threats to confidence)" (Martin & Marsh, 2006, p. 54;
Martin & Marsh, 2008). They attempt to research the under recognized idea of everyday
resilience. They state that academic buoyancy is more relevant in attenuating minor
adversity and low-level negative outcomes such as anxiety, failure avoidance, and
uncertain control. On the other hand, academic resilience is more important for
mitigating major adversity and more serious negative outcomes such as self-handicapping
and disengagement. Martin and Marsh state that academic buoyancy differs from academic resilience in that resilience is seen as a response to an acute or chronic trauma that is seen as a major detriment to the developmental process, whereas buoyancy refers to a response to setbacks, challenges, and pressures that are typical in the ordinary course of everyday life. When investigating academic resilience, the populations that tends to be focused on include ethnic populations in difficult life circumstances, chronic underachievers, and students with learning disabilities. In other words, populations that are at-risk in some way. Academic buoyancy can refer to the general population, since everyone deals with the difficulties of everyday life. By studying buoyancy one is not confined to the relatively few students who experience extreme adversity, but can include all those that still experience problematic challenges (Martin & Marsh).

Despite resilience and buoyancy being described as distinct constructs, they are actually quite similar. The psychological, school and engagement, and peer and family factors that lead to academically resilient people and students also predict peoples' academic buoyancy. Specifically, these factors include locus of control, academic engagement, self-efficacy, and positive teacher-student relationship (Martin & Marsh, 2008). In the studies conducted by Martin and Marsh, the construct of academic buoyancy is parallel to the construct of resilience being utilized in the current study, in that the current study seeks to investigate the everyday challenges that college students may encounter. In a college environment there are many possible low level stressors such as evaluative stress, test anxiety, social stress, adjusting to living on one's own, and balancing work and social responsibilities that could have an effect on a students' academic success.
Many studies have focused on what factors contribute to a student's capacity to effectively manage academic setbacks and obstacles. However, few have taken the next step to show what they call product outcomes. For example, few studies have been done to specifically investigate whether academic resilience contributes to better educational outcome in terms of grades or GPA. Overall, there has been little work done specifically in the domain of academic resilience. One study investigated resiliency and its effect in primary school children taking high stakes exams in England. Resiliency was found to be positively correlated with performance on high stakes test in primary school and negatively correlated with test anxiety (Putwain, Nicholson, Connors, & Woods, 2013). Another study investigated whether a resilient personality is associated with academic achievement after controlling for other measures such as cognitive ability, socioeconomic status, and externalizing problems. First graders who scored below the median on a test of literacy skills were chosen as participants for this study. Students' resilient personality was rated by their teachers. The investigators found that their construct of resilient personality predicted 1st grade concurrent and future math and reading achievement above and beyond the effects of cognitive ability, economic hardship, and externalizing problems (Kwok, Nughes, & Luo, 2007).

For the purposes of this study, the level of protective factors shown to increase the chances of positive adaption, or resilience in participants, will be investigated. These traits will be examined using the Connor Davidson Resilience Scale-25 (CD-RISC; Connor & Davidson, 2003) whose questions span the three domains of protective factors mentioned in the literature including personal attributes, familial characteristics and support, and characteristics of the wider community. The factors of the CD-RISC
include personal competence, tenacity, tolerance of negative affect, positive acceptance of change, secure relationships, strengthening effects of stress, control, and spirituality. This study will also focus on the general population that deals with everyday, low-level stressors, not students specifically at-risk.

Resilience and Intelligence and Personality

Rutter (2007) discusses studies that find that resilience is not related to IQ. Collishaw and colleagues (2007) found that resilience was not a function of higher IQ, Jaffee and colleagues (2007) found no association between IQ and resilience, and DuMont and colleagues (2007) also found cognitive ability was not significantly correlated with resilience. Although many studies have found high cognitive ability to be associated with favorable psychological outcomes overall, and that resilience is also predictive of positive life outcomes, the two are not correlated with each other. It stands to reason that resilience would then be able to predict variance not accounted for in college GPA by IQ and other cognitive measures.

As previously discussed throughout this review, researchers have established the link between adaptive personality processes, such as Conscientiousness, and academic achievement (Chamorro-Premuzic & Furnham, 2003; Kappe & van der Flier, 2012; O’Conner & Paunonen, 2007; Poropat, 2009; Richardson & Abraham, 2009; Richardson, Abraham, & Bond, 2012). Students who display positive personality characteristics such as adaptability, conscientiousness, and positive emotionality are likely to better cope with stressors in the classroom and persevere when faced with obstacles, and therefore achieve at a higher level in the classroom.
Campbell-Sills and colleagues (2006) investigated the relationship of resilience to personality traits and coping styles in college students. A secondary goal was to provide evidence for the construct validity of the CD-RISC. Results showed that resilience had statistically significant and salient negative relationship with Neuroticism ($r = -.65, p < .001$) and significant and salient positive relationships Extraversion ($r = .61, p < .001$), and Conscientiousness ($r = .46, p < .001$) factors of the Five Factor Model. All three of these factors also contributed significantly to the prediction of resilience. These relationships make sense in that those low in Neuroticism are thought to be well adjusted, emotionally stable, and able to cope with stress (Costa & McCrae, 1992). Extraverted individuals tend to have a positive affective style and ability to have close interpersonal relationships, which are both important factors in predicting resilience. The hard-working style of Conscientious people may help people to more effectively use problem solving approaches in a difficult situation, allowing them to effectively cope and move on.

**Current Study**

The present study aimed to follow the recommendations of O’Connor and Paunonen, which include predicting academic success from constructs other than the Big Five as well as using more narrow constructs. The importance of intelligence and cognitive factors in measuring academic success has been well documented (Bridgeman, McCamlry-Jenkins, & Ervin, 2000; Kobrin et al., 2008; Mathiasen, 1984; Mouw & Khanna, 1993; Neisser et al., 1996; Noble & Sawyer, 2002; Poropat, 2009; Richardson & Abraham, 2009; Robbins et al., 2004). The same is true for the Big Five trait of Conscientiousness (Chamorro-Premuzic & Furnham, 2003; Kappe & van der Flier, 2012;
O’Conner & Paunonen, 2007; Poropat, 2009; Richardson & Abraham, 2009; Richardson, Abraham, & Bond, 2012). The goal of this study was to refine our knowledge about what personality traits make an individual successful in the college environment by examining new personality constructs beyond those discussed in the Five Factor Model, which has saturated the literature. O’Connor and Paunonen (2007) show that the narrower facets tend to be able to explain more variance than broad traits. This can be explained by the fact that traits that encompass too much may be lacking in subtlety and nuance.

Grit and resilience are two personality traits that have been shown to predict success in many domains of life. The present study will determine whether grit and resilience have independent and incremental predictive validity in college cumulative GPA and retention, over and above that of traditional predictors, which include intelligence, SAT scores, and high school GPA. Much of the previous research done in the college setting has used first semester college GPA as their outcome variable, which includes only four to six classes during a time of transition (Duckworth et al., 2007; Engels, 2013; Maddi et al, 2012). This study will use senior year GPA, which encompasses four years’ worth of grades and a much more stable and accurate measure of what a student is capable of. The population at Hofstra University is much more akin to an average population than previous studies. For example, Duckworth et al. (2007), Duckworth et al. (2011), and Maddi et al. (2012) used populations such as students at the Ivy League school University of Pennsylvania, Scripps National Spelling Bee participants, and USMA cadets, respectively. These populations are highly competitive and represent a restriction of range in terms of cognitive ability. The research done in the
field of resilience has been focused on disadvantaged populations (Kim & Hargrove, 2013; Kwok et al., 2007; Mulloy, 2011; Putwain et al., 2013; Shetgiri et al., 2009). The Hofstra student body is much more representative of the average population. This will most likely lead to more generalizable results.

The purpose of this study is to be able to more accurately identify what makes a student successful at the tertiary level of education, specifically investigating the role of grit and resilience in predicting GPA and retention in undergraduate students at a private university.

**Hypothesis 1:** All predictor variables (intelligence as measured by the WPT-Q, HS GPA, SATs, and grit as measured by the Grit-S scale) will have a significant positive relationship with cumulative college GPA of seniors, $p < .05$.

**Hypothesis 2:** Grit, as measured by the Grit-S scale, will have incremental predictive validity, when traditional predictors such as intelligence, as measured by WPT-Q, SATs, and HS GPA are held constant, in predicting cumulative college GPA of seniors.

**Hypothesis 3:** Those who are above the median in grit scores, as measured by Grit-S scale, and fall below the median on SAT scores will have significantly higher cumulative college senior GPA than those who are below the median in grit and fall above the median on SAT scores. (Grit is compensatory in senior GPA)

**Hypothesis 4:** Those who are high in grit, as measure by the Grit-S scale, are more likely to be retained at Hofstra University. Intelligence, as measured by the WPT-Q, HS GPA, and SAT scores will also have a significant positive relationship with retention of freshmen, $p < .05$. 
Hypothesis 5: Grit, as measured by the Grit-S scale, will have unique predictive validity in retention of freshmen at Hofstra University, over and above intelligence as measured by the WPT-Q, HS GPA, and SAT scores.

Hypothesis 6: Those who are above the median in grit scores, as measured by the Grit-S scale, and fall below the median on SAT scores will be more likely to be retained than those who are below the median in grit, as measured by the Grit-S scale, and fall above the median on SAT scores. (Grit is compensatory in retention of freshmen)

Research Questions:

1. What is the role of resilience in predicting retention and GPA?
2. Does gender play a role in "grittiness"?
3. What is the role of other demographic variables, such as gender, age, race, financial status, and whether students are registered with the office of Student Disability Services, in relation to GPA and retention?
Chapter 2

Methods

Participants

To address the first three hypotheses, participants were current Hofstra seniors during the 2014-2015 academic year. The number of participants needed is 85 or greater. An $n$ of this approximate size has been used by previous researchers in this field of study (e.g. Engels, 2013). It is also the suggested number of participants needed to obtain a medium population effect size, power = .8, $\alpha < .05$ (Cohen, 1992).

To address the fourth through sixth hypotheses, participants were freshmen entering Hofstra University for the 2014-2015 academic year. As previously mentioned, the number of participants needed is 85 or greater as suggested by Cohen (1992) in order to obtain a medium effect size and has also been used by previous researchers (e.g. Engels, 2013). This means that two separate groups of 85 participants or more were recruited.

Participants were recruited from the Hofstra University student body. Specifically, freshmen were recruited using the Hofstra University research pool. Students taking Introduction to Psychology need to complete a research requirement. Completing this survey helped them to meet that requirement. Freshmen were also recruited through the School of University Studies (SUS) at Hofstra University. Participants in SUS were recruited via email. The Dean of Students of the School of University Studies (SUS) disseminated an email on the researcher's behalf to current freshmen in the program. The email was sent out three times on a weekly basis during
the fall semester. Upon completion of the survey, participants recruited through SUS were entered in a lottery to win one of three gift cards worth $50.00.

Hofstra seniors were recruited in a variety of ways. The Dean of Students of SUS also reached out to current seniors that went through the program as freshmen. This was done in the same manner as mentioned above. Professors of undergraduate classes were contacted in order to pass along the survey to their senior students. Pizza parties were also held in the student center. Any senior that completed the survey received a slice of pizza. Once again, upon completion of the survey, any participants not receiving research credits for their participation were entered in a lottery to win one of three gift cards worth $50.00.

Descriptive statistics were run once the necessary number of participants were recruited. There was approximately a three-to-one ratio of female (75.2%) to male (24.7%) participants in the total sample. According to their website, the Hofstra student body is closer to a one-to one ratio of female-to-male students, comprised of 53% females (“Hofstra at a Glance,” 2014). It is possible that there is a higher percentage of females in the study due to the fact that participants were more heavily recruited from the psychology department, which is made up of more female students. Freshmen and senior samples, when held separately, remain consistent in terms of gender. When asked about their ethnicity, 62.6% of the total sample identified as Caucasian and 37.4% identified as Non-White, which is consistent with Hofstra enrollment of non-White students at 38% (“Hofstra at a Glance,” 2014). When ethnicity is broken down by class, both freshman and seniors remain relatively consistent at 54.5% and 69.4% Caucasian, respectively. A
breakdown of all demographic information for the total, freshman, and senior samples can be found in Table 1.
Table 1

Demographic Information of the Senior, Freshmen, and Total Samples

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Senior Sample</th>
<th>Freshman Sample</th>
<th>Total Sample</th>
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<tbody>
<tr>
<td></td>
<td>Percentage</td>
<td>Percentage</td>
<td>Percentage</td>
</tr>
<tr>
<td>Gender</td>
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<tr>
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<tr>
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</tr>
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<td>Age</td>
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</table>

1 \( n = 124 \)
2 \( n = 110 \)
3 \( n = 235 \)
At the start of the survey, participants were asked to sign informed consent for participation in the study. A copy of the informed consent form can be found in Appendix A.

**Measures**

**Background Questionnaire.** This questionnaire asked participants their age, class standing, gender, race, and annual family income. Participants were also asked if they took the SAT, to gauge whether or not their scores could be included in final data analyses, and what they scored on the SAT. SAT scores will also be collected from university records to ensure accuracy. However, since SATs are not used in the admissions process for students applying to SUS, those scores are not in university records. Therefore, any SUS student participating will provide SAT scores through self-report. A copy of this questionnaire can be found in Appendix B.

**Wonderlic Cognitive Ability Pretest.** The Wonderlic Cognitive Ability Pretest is a timed measure of general mental ability. Administration of the test lasts 8 minutes. During this time, the examinee is asked to complete as many of 30 questions as possible. Items on the WPT-Q vary in content and include analogies, analysis of geometric figures, definitions, judgment, direction following using clerical items, spatial relations, etc. Items are presented in multiple choice format, each item having between three and five response options, depending on the item type. The test is scored using classical test theory (i.e. number of question answered correctly), then a regression formula is applied to convert the number correct to the Wonderlic Classic Cognitive Ability Test (WPT) scale. WPT-Q scores range between 5 and 35. The WPT-Q has demonstrated good levels of reliability, with internal consistency estimates of .81 (Wonderlic Liberty, IL).
According to Hunter (1989), extremely high correlations indicate very good convergent validity with the WPT ($r = .96$), which is a measure of intelligence that has demonstrated high correlations with other well established measures of cognitive ability, such as the Wechsler Adult Intelligence Scale ($r = .97$). Through their Research Donation Program, Wonderlic, Inc. offers to provide test materials free of charge to doctoral students conducting their thesis or dissertation to encourage and facilitate independent research. In exchange, researchers are asked to administer additional Wonderlic content to facilitate the company’s research and improvement of its measures. A copy of the Wonderlic Cognitive Ability Pretest is not available due to copyright issues. The Research Donation Program can be contacted to obtain a link to test.

**Grit-S Scale.** The Grit-S Scale was developed by Duckworth & Quinn (2009). It is composed of 8 items intended to measure the two components of grit which are Perseverance of Effort (*I finish whatever I begin*) and Consistency of Interests (*Setbacks don't discourage me*). It is a 5-point Likert type scale ranging from 1 (*Very much like me*) to 5 (*Not like me at all*). An individual's score is calculated by averaging the item responses. Four of the items are reverse scored. The Grit-S scale displays acceptable internal consistency, with alphas ranging from .73 to .83 (Duckworth & Quinn, 2009). The Persistence of Effort and Consistency of Interest factors had alphas of .78 and .79, respectively (Duckworth and Quinn, 2009). These ratings were computed using a sample of Ivy League undergraduate students. Internal consistency for the Grit-S scale in this study for the freshman and senior samples were both good at .75 and .82, respectively. Convergent validity between grit and Conscientiousness, as measured by the Big Five Inventory (John & Srivastavas, 1999), has been confirmed ($r = .77$, $p < .001$) in a
population of adults aged 25 and older, which is significantly stronger than between grit and any of the other Big Five Factors (Duckworth & Quinn, 2009). Grit has been found to have incremental predictive validity over and beyond Conscientiousness in predicting level of education (Duckworth & Quinn, 2009). In a hierarchical regression, grit was a significant predictor of educational accomplishment beyond the Big Five Factors (including Conscientiousness) and age (Duckworth & Quinn, 2009). Permission for use of the Grit-S was received from Angela Duckworth, Ph.D., scale creator, via e-mail, dated July 15, 2014. A copy of the scale can be found in Appendix C.

**Connor Davidson Resilience Scale-25.** The Connor-Davidson scale (CD-RISC; Connor & Davidson, 2003) is a scale that measures the ability to cope with adversity. It is comprised of 25 items, all of which are rated on a 5 point scale from 0 (rarely true) to 4 (true nearly all of the time). Items include "I am able to adapt when changes occur", "Having to cope with stress will make me stronger" and "I feel in control of my life." Higher scores reflect greater resilience. The CD-RISC showed good levels of reliability with internal consistency estimates as measured by Cronbach's alpha at .89 (Connor & Davidson, 2003). Internal consistency for the CD-RISC scale in this study for the freshman and senior samples were both good at .94 and .91, respectively. Connor and Davidson (2003) demonstrate convergent validity of the CD-RISC with a positive correlation with hardiness ($r = .83, p < .001$). The CD-RISC also showed significant negative correlations with the Perceived Stress Scale ($r = -.76, p < .001$) and Sheehan Stress Vulnerability Scale ($r = -.32, p < .0001$), indicating that higher levels of resilience corresponded with less perceived stress and lower levels of perceived stress vulnerability.
respectively (Connor & Davidson, 2003). A copy of the CD-RISC can be found in Appendix D.

**High School GPA, SATs, Cumulative College GPA, and Retention.** In order to get the most accurate information, High School GPA, Cumulative College GPA, SAT scores, and whether or not students were retained after their first year was obtained from Hofstra University records via Department of Institutional Research after permission was received from the participants via signed informed consent form. The consent form required participants to provide their student identification numbers and sign electronically by typing in their full name. These records were kept confidential by using student identification numbers. All identifying information was held separately from survey responses once the necessary information was received.

The SAT is an internationally recognized and considered the gold standard of college admissions exams. It is a standardized, paper-and-pencil test that contains three subject sections: Critical Reading, Writing, and Mathematics. Each section is scored on a 200-to-800-point scale, which then produces a total score between 600 and 2400 points. As previously noted, SAT scores were obtained via self report from students in the SUS program in the background questionnaire. All other students' SAT scores were obtained from Hofstra University records using the method stated above to ensure accuracy.

The current version of the SAT, which was first used in March of 2005, demonstrates very high reliability. Between January 2013 and December 2013, each SAT section showed very high reliability coefficients (Critical Reading: .91 - .93; Mathematics: .92 - .94; Writing Composite with Essay: .88 - .92; College Board, 2013). The current SAT has also shown very high convergent validity ($r = .95 - .97$) with the
previous version the SAT I (Kobrin et al., 2008). The current SAT exhibits moderate predictive validity of college Freshman Year GPA (Kobrin et al.). Correlations between SAT scores and FYGPA are as follows: Critical Reading = .29, Mathematics = .26, Writing = .33, Combined score = .35 (Kobrin et al.). When adjusted for range restriction, these correlations increase to .48, .47, .51, and .53, respectively (Kobrin et al.).

Cumulative college GPA and high school GPA consist of the weighted average of course grades received by each participant during their college career and high school career, respectively. The number of courses included in each individual’s GPA score varies depending on number of credits attempted each semester. GPA scores range from 0.0 to 4.0. Using cumulative college GPA from students' senior year as an outcome variable will give us a more accurate and stable measure of their achievement in college then using first semester freshman GPA, which only includes approximately four or five course grades. These two variables were obtained from the Department of Institutional Research.

Retention data was also collected at the end of the academic year using the same method. Student identification numbers were sent to the university to collect this data. Once the data was received, student identification numbers were held separately. This data will be dummy coded (Retained = 1, Not Retained = 0).

Procedure

Freshman and seniors at Hofstra University during the 2014-2015 academic year were recruited using the methods delineated above. Data collection took place in multiple parts. First, using the Qualtrics computer program, which was used to create the
online survey, participants were asked to fill out informed consent, to complete the Wonderlic Cognitive Ability Pretest and their Motivational Scale (given via link embedded in the survey), and all self-report measures previously mentioned, which includes the background questionnaire, the Grit-S scale, and Connor Davidson Resilience Scale. The online survey took participants no longer than 30 minutes to complete.

Once a month, Wonderlic, Inc. was contacted in order to obtain scores on the intelligence test taken by participants during the survey. Scores were matched using student identification numbers.

After the necessary number of participants completed all aspects of the survey, Hofstra University was contacted to complete data collection. Having signed informed consent prior to beginning the survey, the researcher was allowed confidential access to university records via Department of Institutional Research by using student identification numbers. Student identification numbers were given to the university in order to obtain High School GPA, SAT, and Cumulative College GPA for seniors participating in the study. For freshmen participating in the study, data collected included High School GPA, College GPA, SAT scores, and retention status. Once the necessary data from university records was collected, any identifying information was removed. Identifying information was not used in data analysis. Those students who participated and fully completed the survey were entered in a lottery to win one of three $50.00 gift cards.

**Statistical Analyses**
Simple zero-order Pearson's correlations were used to measure the individual relationship between all of predictor variables (HS GPA, SAT, Intelligence, Grit, Resilience) and the dependent variables (Cumulative College GPA or Retention).

A hierarchical regression analysis was used to explore the relationship between the predictor variables and dependent variables and to determine if grit has incremental predictive validity over and above that of cognitive measures in predicting college GPA and retention. Variables were entered in four separate steps to predict cumulative college GPA, allowing all cognitive measures to be controlled for. Step 1 through 3 included measures of intelligence obtained from the Wonderlic Cognitive Ability Pretest, HS GPA, and SAT scores, respectively. Entered into Step 4 were participants' grit scores. This hierarchal regression model was repeated for prediction of retention.

Lastly, in order to determine whether grit is compensatory, a median split was performed for variables including grit and SAT scores. New variables were created based on the median. All subjects falling above the median in each of these variables were coded as 1 and all the subjects falling below the median on each of these variables were coded as 0. Once these new variables were created, they were used to run an analysis of variance (ANOVA). Simple main effects will be examined. Once again, this analysis will be used for both outcome variables, GPA and retention.
Chapter 3

Results

The aim of the present study was to determine the role grit plays in predicting academic success in college, specifically if grit is capable of predicting cumulative GPA and retention, over and above that of traditional predictors, which include intelligence, SAT scores, and high school GPA. This study was also interested in whether grit is a compensatory trait. Additionally, the role of resilience as a predictor of college success was investigated. Demographic variables such as gender, age, race, financial status, and disability status were also investigated to determine if they play a role in predicting "grittiness", GPA, and retention.

As participants were recruited, all measures were reviewed for completeness upon receipt. Between November 5\textsuperscript{th} 2014 and April 28\textsuperscript{th}, 2015, the online survey was started 147 times by seniors; approximately 124 seniors completed some component of the survey. Upon review of all survey components, including completion of the WPT-Q, 84 seniors completed the survey in full. Therefore, data from 124 seniors were used for analysis in at least one hypothesis, while data from 84 seniors were used to analyze all hypotheses.

During the same time span, the online survey was started 137 times by freshmen; approximately 110 freshmen completed some component of the survey. Upon review of all survey components, including completion of the WPT-Q, 83 freshmen completed the survey in full. Therefore, data from 110 freshmen were used for analysis in at least one hypothesis, while data from 83 freshmen were used to analyze all hypotheses.
To analyze research questions, all 235 participants that completed the demographic questionnaire were included in the analysis. Any research question using retention as an outcome variable were analyzed using the 110 freshmen participants.

SAT scores were not able to be provided by the university for some of the participants, as they were either part of the School of University Studies which does not use SAT scores for admissions decisions, or the student did not submit them to the university. The students' whose SAT scores were not provided by the university were obtained via self-report from the background questionnaire. Mayer and colleagues (2007) and Kuncel, Crede, and Thomas (2005) discuss the accuracy of self-report of SAT scores. While they both caution the use of self-report to systematic over-reporting and motivated distortion bias, Mayer and colleagues (2007) also provided a method in which to determine under what criteria it would be acceptable to use self-report. Kuncel and colleagues (2005) found that of their participants, 12% under-reported, 36% accurately reported, and 55% over reported their SAT scores suggesting an over reporting bias. They also found the correlation between actual and reported SAT scores to be $r = .82$, which suggests that self-report validity is high (Kuncel, Crede, & Thomas, 2005). Mayer and colleagues (2007) also found that students overestimated their SAT scores with 10% of his sample under reporting, 51% reporting accurately, and 39% over reporting. The correlation between self-report and actual SAT scores was also $r = .82$.

According to Mayer and colleagues (2007), in order to determine if self-report scores are viable, both bias and validity scores must be determined. Bias scores can be determined by the difference between over- and under-estimators. Validity scores can be determined by the strength of correlation between reported and actual SAT scores. If
there is high validity, scores can be used as covariates or to separate students into groups because all students are distorting scores in a similar way. If it is determined that there is low bias and high validity, scores can be used because they are considered accurate (Mayers et al., 2007).

In the current study, bias and validity scores were calculated for both senior and freshmen samples. For the senior sample, 44% under reported, 27.8% were accurate, and 27.8% over reported their SAT scores. The difference between under- and over-estimators was approximately 17%, which is much lower than previous studies. The correlation between self-reported SAT scores and university reported SAT scores was $r = .77, p <.001$, indicating a high validity. Because there is a low bias and high validity, these self-reports can be considered accurate.

For the freshmen sample, 39.7% under reported, 38.5% were accurate, and 21.8% over reported their SAT scores. The difference between under- and over-estimators was approximately 18%, which is much lower than previous studies. The correlation between self-reported SAT scores and university reported SAT scores was $r = .88, p <.001$, indicating a high validity. Because there is a low bias and high validity, these self-reports can be considered accurate.

See Table 2 and 3 for the means, standard deviations, and actual and potential ranges of the independent (i.e. WPT-Q, HS GPA, SAT score, Grit-S, CD-RISC-25) and dependent (i.e. College GPA, retention) variables for the senior and freshman samples, respectively.
### Table 2

**Descriptive Statistics of the Independent and Dependent Variables in Senior Sample**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Actual Range</th>
<th>Potential Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPT-Q</td>
<td>25.02</td>
<td>4.23</td>
<td>14-35</td>
<td>5-35</td>
</tr>
<tr>
<td>HSGPA</td>
<td>3.64</td>
<td>0.58</td>
<td>2.41-5.47</td>
<td>0.00-5.50</td>
</tr>
<tr>
<td>SAT Combined</td>
<td>1695.30</td>
<td>212.31</td>
<td>980-2260</td>
<td>600-2400</td>
</tr>
<tr>
<td>Grit-S</td>
<td>2.57</td>
<td>0.35</td>
<td>1.63-3.50</td>
<td>1-5</td>
</tr>
<tr>
<td>CD-RISC-25</td>
<td>71.27</td>
<td>12.89</td>
<td>27-98</td>
<td>0-100</td>
</tr>
<tr>
<td>College GPA</td>
<td>3.39</td>
<td>0.44</td>
<td>2.09-4.00</td>
<td>0.00-4.00</td>
</tr>
</tbody>
</table>

*Note. WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; Grit-S = Grit Short Scale; CD-RISC-25 = Connor Davidson Resilience Scale-25; College GPA = Spring 2015 GPA*
Table 3

*Descriptive Statistics of the Independent and Dependent Variable in Freshmen Sample*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Actual Range</th>
<th>Potential Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPT-Q</td>
<td>23.95</td>
<td>4.64</td>
<td>13-35</td>
<td>5-35</td>
</tr>
<tr>
<td>HSGPA</td>
<td>3.56</td>
<td>.51</td>
<td>2.31-5.00</td>
<td>0.00-5.50</td>
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<tr>
<td>SAT Combined</td>
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<td>200.21</td>
<td>900-2080</td>
<td>600-2400</td>
</tr>
<tr>
<td>Grit-S</td>
<td>2.60</td>
<td>.40</td>
<td>1.13-4.50</td>
<td>1-5</td>
</tr>
<tr>
<td>CD-RISC-25</td>
<td>69.77</td>
<td>16.08</td>
<td>27-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Retention</td>
<td>N/A</td>
<td>N/A</td>
<td>0/1</td>
<td>N/Y</td>
</tr>
</tbody>
</table>

*Note.* WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; Grit-S = Grit Short Scale; CD-RISC-25 = Connor Davidson Resilience Scale-25; Retention = Freshman Year Retention Rates as of September 2015
Hypotheses

In hypothesis one, it was stated that all predictor variables including intelligence, high school GPA, SAT scores, and grit would have a significant positive relationship with cumulative college GPA of seniors at the .05 level of significance. Bivariate correlations were used to measure these individual relationships. Intelligence, high school GPA, and SAT scores were all found to be significantly correlated with senior year cumulative college GPA with correlation of $r = .44$, $r = .55$, and $r = .31$, $p < .001$. However, grit was not found to be significant correlated with senior year cumulative college GPA, $r = -.06$. Therefore, this hypothesis was partially supported. Bivariate correlations were calculated among all variables to assess the relationships among each other. These correlations can be found in Table 4. Other correlations among variables will be discussed later.
Table 4

Correlations Among Independent and Dependent Variables in the Senior Sample

<table>
<thead>
<tr>
<th></th>
<th>WPT-Q</th>
<th>HSGPA</th>
<th>SAT Combined</th>
<th>Grit-S</th>
<th>CD-RISC-25</th>
<th>College GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPT-Q</td>
<td>1.00</td>
<td>.44***</td>
<td>.47***</td>
<td>-.17</td>
<td>.11</td>
<td>.44***</td>
</tr>
<tr>
<td>HSGPA</td>
<td>.44***</td>
<td>1.00</td>
<td>.50***</td>
<td>-.08</td>
<td>.08</td>
<td>.55***</td>
</tr>
<tr>
<td>SAT Combined</td>
<td>.47***</td>
<td>.50***</td>
<td>1.00</td>
<td>-.15</td>
<td>.07</td>
<td>.31***</td>
</tr>
<tr>
<td>Grit-S</td>
<td>-.17</td>
<td>-.08</td>
<td>-.15</td>
<td>1.00</td>
<td>-.07</td>
<td>-.06</td>
</tr>
<tr>
<td>CD-RISC-25</td>
<td>.11</td>
<td>.08</td>
<td>.07</td>
<td>-.07</td>
<td>1.00</td>
<td>.01</td>
</tr>
<tr>
<td>College GPA</td>
<td>.44***</td>
<td>.55***</td>
<td>.31***</td>
<td>-.06</td>
<td>.01</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note.* WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; Grit-S = Grit Short Scale; CD-RISC-25 = Connor Davidson Resilience Scale-25; College GPA = Spring 2015 GPA

*p < .05  **p < .01  ***p < .001
Hypothesis two proposed that grit would have incremental predictive validity, when traditional predictors such as intelligence, HS GPA, and SAT scores are held constant, in predicting cumulative college GPA of seniors. A hierarchical regression analysis was used to explore the relationship between the predictor variables and dependent variables and to determine if grit has incremental predictive validity over and above that of cognitive measures in predicting college GPA. Variables were entered in four separate steps to predict cumulative college GPA, allowing all cognitive measures to be controlled for. Step 1 through 3 included measures of intelligence obtained from the Wonderlic Cognitive Ability Pretest, HS GPA, and SAT scores, respectively. Entered into Step 4 were participants' grit scores. Contrary to hypothesis two, grit did not significantly increase the variance accounted for in college GPA when intelligence, high school GPA, and SAT scores were controlled for ($\Delta r^2 = .01$, $\Delta F = 1.12$). Therefore this hypothesis was not supported. However, within this model, intelligence was found to significantly predict college GPA, $p < .05$, and high school GPA was found to have incremental predictive validity in predicting senior year college GPA when intelligence was held constant, $p < .001$. The results are displayed in Table 5.
Table 5

Regression Model of Grit Predicting Senior Year GPA, Controlling for Intelligence, High School GPA, and SAT scores

<table>
<thead>
<tr>
<th>Model</th>
<th>$r^2$</th>
<th>$\Delta r^2$</th>
<th>$\Delta F$</th>
<th>B</th>
<th>SEb</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>.18</td>
<td>.18</td>
<td>16.76</td>
<td>.04</td>
<td>.01</td>
<td>.42</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>WPT-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td>.32</td>
<td>.14</td>
<td>15.89</td>
<td>.02</td>
<td>.01</td>
<td>.24</td>
<td>.03*</td>
</tr>
<tr>
<td>WPT-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.29</td>
<td>.07</td>
<td>.42</td>
<td>&lt;.001***</td>
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<tr>
<td>HSGPA</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 3</td>
<td>.32</td>
<td>.00</td>
<td>.14</td>
<td>.02</td>
<td>.01</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.28</td>
<td>.08</td>
<td>.40</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>HSGPA</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT Combined</td>
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<td>.00</td>
<td>.05</td>
<td>.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 4</td>
<td>.33</td>
<td>.01</td>
<td>1.12</td>
<td>.02</td>
<td>.01</td>
<td>.23</td>
<td>.05*</td>
</tr>
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<td>WPT-Q</td>
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<tr>
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<td>SAT Combined</td>
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<td>.06</td>
<td>.61</td>
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<td>Grit-S</td>
<td>.11</td>
<td>.10</td>
<td>.29</td>
<td></td>
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</tr>
</tbody>
</table>

Note. WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; Grit-S = Grit Short Scale; College GPA = Spring 2015 GPA

*p < .05  **p < .01  ***p < .001
In hypothesis three it was stated that seniors who are above the median in grit and fall below the median on SAT scores would have significantly higher cumulative college senior GPA than seniors who are below the median in grit and fall above the median on SAT scores, making grit a compensatory trait. A median split was performed for total grit scores and SAT scores. New variables were created based on the median. All participants falling above the median in each of these variables were coded as 1 and all the participants falling below the median on each of these variables were coded as 0. These variables were used to run a Two-Way analysis of variance (ANOVA). The main effect of grit was not statistically significant, $F (1, 124) = .04, p = .85, \eta^2 = 0.0$. These results suggest that seniors who score above the median on grit ($M = 3.37, SD = .46$), do not have significantly higher college GPAs then seniors whose score below the median on grit ($M = 3.41, SD = .41$). The main effect of SAT scores was statistically significant, $F (1, 124) = 15.74, p = .00, \eta^2 = .12$. These results suggest that seniors who scored above the median on SAT scores, have significantly higher college GPAs ($M = 3.55, SD = .34$) then seniors whose score below the median on SAT ($M = 3.22, SD = .47$). The results can be found in Table 6 and are depicted graphically in Figure 1.
Table 6

*Analysis of Variance of College GPA of Seniors by SAT Score and Grit*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grit</td>
<td>1</td>
<td>.01</td>
<td>.01</td>
<td>.04</td>
<td>.85</td>
<td>.00</td>
</tr>
<tr>
<td>SAT Combined</td>
<td>1</td>
<td>2.67</td>
<td>2.67</td>
<td>15.74</td>
<td>.00***</td>
<td>.12</td>
</tr>
<tr>
<td>Grit x SAT Combined</td>
<td>1</td>
<td>.07</td>
<td>.07</td>
<td>.40</td>
<td>.53</td>
<td>.00</td>
</tr>
<tr>
<td>Error</td>
<td>120</td>
<td>20.37</td>
<td>.17</td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>124</td>
<td>1445.85</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*p < .05 **p < .01 ***p < .001
Figure 1. Line graph showing estimated marginal means of college GPA.
In hypothesis four, it was stated that all predictor variables including intelligence, high school GPA, SAT scores, and grit would have a significant positive relationship with retention status of freshmen at the .05 level of significance. Bivariate correlations were used to measure these individual relationships. High school GPA and grit were found to be significantly correlated with freshmen retention with correlations of $r = .24, p < .001$ and $r = .25, p < .01$. However, intelligence and SAT scores were not found to be significant correlated with freshmen retention, $r = .10$ and $r = .18$. Therefore, this hypothesis was partially supported. Bivariate correlations were calculated between all variables to assess the relationships among each other. These correlations can be found in Table 7. Other correlations among variables will be further discussed later.
Table 7

Correlations Among Independent and Dependent Variables in the Freshmen Sample

<table>
<thead>
<tr>
<th></th>
<th>WPT-Q</th>
<th>HSGPA</th>
<th>SAT Combined</th>
<th>Grit-S</th>
<th>CD-RISC-25</th>
<th>Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPT-Q</td>
<td>1.00</td>
<td>.28***</td>
<td>.43***</td>
<td>-.17</td>
<td>-.05</td>
<td>.10</td>
</tr>
<tr>
<td>HSGPA</td>
<td>.28***</td>
<td>1.00</td>
<td>.54***</td>
<td>.02</td>
<td>.02</td>
<td>.24***</td>
</tr>
<tr>
<td>SAT Combined</td>
<td>.43***</td>
<td>.54***</td>
<td>1.00</td>
<td>-.07</td>
<td>-.06</td>
<td>.18</td>
</tr>
<tr>
<td>Grit-S</td>
<td>-.17</td>
<td>.02</td>
<td>-.07</td>
<td>1.00</td>
<td>.02</td>
<td>.25**</td>
</tr>
<tr>
<td>CD-RISC-25</td>
<td>-.05</td>
<td>.02</td>
<td>-.06</td>
<td>.02</td>
<td>1.00</td>
<td>-.05</td>
</tr>
<tr>
<td>Retention</td>
<td>.010</td>
<td>.24**</td>
<td>.18</td>
<td>.25**</td>
<td>-.05</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note. WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; Grit-S = Grit Short Scale; CD-RISC-25 = Connor Davidson Resilience Scale-25; Retention = Retention in Freshmen as of September 2015

*p < .05  **p < .01  ***p < .001
In hypothesis five it was proposed that grit would have incremental predictive validity, when traditional predictors such as intelligence, HS GPA, and SAT scores are held constant, in predicting retention status of freshmen. A hierarchical regression analysis was used to explore the relationship between the predictor variables and dependent variables and to determine if grit has incremental predictive validity over and above that of cognitive measures in predicting college GPA. Variables were entered in four separate steps to predict cumulative college GPA, allowing all cognitive measures to be controlled for. Step 1 through 3 included measures of intelligence obtained from the Wonderlic Cognitive Ability Pretest, HS GPA, and SAT scores, respectively. Entered into Step 4 were participants' grit scores. As predicted, grit significantly increased the variance accounted for in freshmen retention when intelligence, high school GPA, and SAT scores were controlled for ($\Delta r^2 = .05$, $\Delta F = 4.61$). Therefore this hypothesis was supported. The results are displayed in Table 8.
Table 8

*Regression Model of Grit Predicting Freshmen Retention, Controlling for Intelligence, High School GPA, and SAT scores*

<table>
<thead>
<tr>
<th>Model</th>
<th>$r^2$</th>
<th>$\Delta r^2$</th>
<th>$\Delta F$</th>
<th>B</th>
<th>SEb</th>
<th>$\beta$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.01</td>
<td>.76</td>
<td>.01</td>
<td>.01</td>
<td>.10</td>
<td>.39</td>
</tr>
<tr>
<td></td>
<td>WPT-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td>.07</td>
<td>.06</td>
<td>5.13</td>
<td>.00</td>
<td>.01</td>
<td>.02</td>
<td>.89</td>
</tr>
<tr>
<td></td>
<td>WPT-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSGPA</td>
<td></td>
<td></td>
<td>.17</td>
<td>.08</td>
<td>.25</td>
<td>.03*</td>
</tr>
<tr>
<td>Model 3</td>
<td>.07</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.01</td>
<td>.02</td>
<td>.90</td>
</tr>
<tr>
<td></td>
<td>WPT-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSGPA</td>
<td></td>
<td></td>
<td>.17</td>
<td>.09</td>
<td>.25</td>
<td>.05*</td>
</tr>
<tr>
<td></td>
<td>SAT Combined</td>
<td></td>
<td></td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.98</td>
</tr>
<tr>
<td>Model 4</td>
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<td>4.61</td>
<td>.00</td>
<td>.01</td>
<td>.04</td>
<td>.72</td>
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<tr>
<td></td>
<td>WPT-Q</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSGPA</td>
<td></td>
<td></td>
<td>.14</td>
<td>.08</td>
<td>.21</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>SAT Combined</td>
<td></td>
<td></td>
<td>.00</td>
<td>.00</td>
<td>.06</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>Grit-S</td>
<td></td>
<td></td>
<td>.22</td>
<td>.10</td>
<td>.23</td>
<td>.04*</td>
</tr>
</tbody>
</table>

*Note. WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; Grit-S = Grit Short Scale*

*p < .05 **p < .01 ***p < .001*
In hypothesis six it was stated that freshmen who are above the median in grit and fall below the median on SAT scores would be more likely to be retained than freshmen who are below the median in grit and fall above the median on SAT scores, making grit a compensatory trait. A median split was performed for total grit scores and SAT scores. New variables were created based on the median. All participants falling above the median in each of these variables were coded as 1 and all the participants falling below the median on each of these variables were coded as 0. These variables were used to run a Two-Way analysis of variance (ANOVA). The main effect of grit was statistically significant, $F (1, 109) = 8.37, p = .01, \eta^2 = .07$. These results suggest that freshmen who score above the median on grit ($M = .93, SD = .27$), are significantly more likely to be retained after their freshmen year than those who score below the median on grit ($M = .74, SD = .45$). The main effect of SAT scores was not statistically significant, $F (1, 109) = 1.36, p = .25, \eta^2 = .05$. The results can be found in Table 9.
Table 9

*Analysis of Variance of Retention of Freshmen by SAT Score and Grit*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1</td>
<td>.98</td>
<td>.98</td>
<td>8.37</td>
<td>.01**</td>
<td>.07</td>
</tr>
<tr>
<td>SAT Combined</td>
<td>1</td>
<td>.16</td>
<td>.16</td>
<td>1.36</td>
<td>.25</td>
<td>.01</td>
</tr>
<tr>
<td>Grit x SAT Combined</td>
<td>1</td>
<td>.34</td>
<td>.34</td>
<td>2.92</td>
<td>.09</td>
<td>.03</td>
</tr>
<tr>
<td>Error</td>
<td>105</td>
<td>12.33</td>
<td>.12</td>
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<tr>
<td>Total</td>
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<td>93.00</td>
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</tbody>
</table>

*p < .05  **p < .01  ***p < .001
Figure 1. Line graph showing estimated marginal means of freshmen retention.
Research Questions

The same analyses run to determine the role of grit in academic success were used to determine the role of resilience in academic success. There was no significant correlation was found between resilience and senior year college GPA, \( r = .01 \). There was no significant correlation was found between resilience and retention after freshmen year, \( r = -.05 \). Refer to Table 4 and Table 7 for full list of results.

A hierarchical linear regression was used to determine if resilience has incremental predictive validity above and beyond intelligence, HS GPA, and SAT scores when predicting senior year college GPA. According to the model, resilience did not significantly increase the variance accounted for in senior year college GPA when intelligence, high school GPA, and SAT scores were controlled for (\( \Delta r^2 = .00, \Delta F = .11 \)). Therefore this hypothesis was not supported. However, within this model, high school GPA was found to have incremental predictive validity when predicting senior year college GPA when intelligence was held constant, \( p < .001 \). The results are displayed in Table 10.
Table 10

*Regression Model of Resilience Predicting Senior GPA, Controlling for Intelligence, High School GPA, and SAT scores*

<table>
<thead>
<tr>
<th>Model</th>
<th>$r^2$</th>
<th>$\Delta r^2$</th>
<th>$\Delta F$</th>
<th>B</th>
<th>SEb</th>
<th>$\beta$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.18</td>
<td>16.79</td>
<td>.04</td>
<td>.01</td>
<td>.42</td>
<td>&lt;.001***</td>
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<tr>
<td>WPT-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
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<td>15.89</td>
<td>.02</td>
<td>.01</td>
<td>.24</td>
<td>.03*</td>
</tr>
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</tr>
<tr>
<td>HSGPA</td>
<td>.29</td>
<td>.07</td>
<td>.42</td>
<td>&lt;.001***</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Model 3</td>
<td>.32</td>
<td>.00</td>
<td>.14</td>
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<td>.01</td>
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<td>.05*</td>
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<tr>
<td>WPT-Q</td>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
<td>HSGPA</td>
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<td>.08</td>
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<td>.03</td>
<td>.74</td>
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<td></td>
</tr>
</tbody>
</table>

*Note.* WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; CD-RISC-25 = Connor Davidson Resilience Scale-25; College GPA = Spring 2015 GPA

*p < .05 **p < .01 ***p < .001
Another regression was run to determine if resilience predicts retention after the freshmen year above and beyond intelligence, HS GPA, and SAT scores. According to the model, resilience did not significantly increase the variance accounted for in freshmen retention when intelligence, high school GPA, and SAT scores were controlled for ($\Delta r^2 = .01$, $\Delta F = .85$). Therefore this hypothesis was not supported. The only variable that accounted for some portion of freshmen retention in this model was HS GPA, $p < .05$. Results can be found in Table 11.
Table 11

*Regression Model of Resilience Freshman Retention, Controlling for Intelligence, High School GPA, and SAT scores*

<table>
<thead>
<tr>
<th>Model</th>
<th>$r^2$</th>
<th>$\Delta r^2$</th>
<th>$\Delta F$</th>
<th>B</th>
<th>SEb</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
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<td>.01</td>
<td>.01</td>
<td>.10</td>
<td>.37</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>3.63</td>
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<td>.01</td>
<td>.04</td>
<td>.71</td>
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</tr>
<tr>
<td>HSGPA</td>
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<td></td>
<td></td>
<td>.15</td>
<td>.08</td>
<td>.21</td>
<td>.06</td>
</tr>
<tr>
<td>Model 3</td>
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<td>.00</td>
<td>.18</td>
<td>.01</td>
<td>.01</td>
<td>.06</td>
<td>.62</td>
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</tr>
<tr>
<td>HSGPA</td>
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<td></td>
<td></td>
<td>.16</td>
<td>.09</td>
<td>.24</td>
<td>.06</td>
</tr>
<tr>
<td>SAT Combined</td>
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<td></td>
<td></td>
<td>.00</td>
<td>.00</td>
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<td>.67</td>
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<tr>
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<td>.85</td>
<td>.00</td>
<td>.01</td>
<td>.06</td>
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<td></td>
</tr>
<tr>
<td>HSGPA</td>
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<td>.18</td>
<td>.09</td>
<td>.26</td>
<td>.05*</td>
</tr>
<tr>
<td>SAT Combined</td>
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<td>.00</td>
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<td>.58</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>-.00</td>
<td>.00</td>
<td>-.10</td>
<td>.36</td>
</tr>
</tbody>
</table>

*Note.* WPT-Q = Wonderlic Cognitive Ability Pretest; HSGPA = High School GPA; CD-RISC-25 = Connor Davidson Resilience Scale-25

*p < .05 **p < .01 ***p < .001
Two-Way ANOVAs were run in order to determine if resilience is a compensatory trait. For the senior sample, it was investigated whether those who fall above the median on resilience and below the median on SAT scores would have higher college GPAs than those seniors who scored below the median on resilience and above the median on SAT scores. As previously noted, median splits were performed on total resilience scores and SAT scores. New variables were created where those falling above the mean were coded as 1 and those falling below the mean were coded as 0 and these variables were used to run a Two-Way ANOVA. The main effect of resilience was not statistically significant, $F(1, 124) = 1.13, p = .29, \eta^2 = .01$. These results suggest that seniors who score above the median on resilience ($M = 3.42, SD = .44$), do not have significantly higher college GPAs then seniors whose score below the median on resilience ($M = 3.34, SD = .46$). The main effect of SAT scores was statistically significant, $F(1, 124) = 20.75, p = .00, \eta^2 = .15$. These results suggest that seniors who scored above the median on SAT scores ($M = 3.55, SD = .34$), have significantly higher college GPAs then seniors whose score below the median on SAT ($M = 3.22, SD = .47$). The results can be found in Table 12.
Table 12

Analysis of Variance of College GPA of Seniors by SAT Score and Resilience

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resilience</td>
<td>1</td>
<td>.19</td>
<td>.19</td>
<td>1.13</td>
<td>.29</td>
<td>.01</td>
</tr>
<tr>
<td>SAT Combined</td>
<td>1</td>
<td>3.48</td>
<td>3.48</td>
<td>20.75</td>
<td>.00***</td>
<td>.15</td>
</tr>
<tr>
<td>Resilience x SAT Combined</td>
<td>1</td>
<td>.11</td>
<td>.11</td>
<td>.66</td>
<td>.42</td>
<td>.01</td>
</tr>
<tr>
<td>Error</td>
<td>120</td>
<td>20.16</td>
<td>.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>124</td>
<td>1445.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*p < .05  **p < .01  ***p < .001
Figure 3. Line graph showing estimated marginal means of college GPA.
For the freshmen sample, it was investigated whether those who fall above the median on resilience and below the median on SAT scores would be more likely to be retained than those freshmen who scored below the median on resilience and above the median on SAT scores. The main effect of resilience was not statistically significant, $F(1, 106) = .54, p = .46, \eta^2 = .01$. These results suggest that freshmen who score above the median on resilience ($M = .88, SD = .32$) are not more likely to be retained than freshmen whose score below the median on resilience ($M = .83, SD = .38$). The results can be found in Table 13.
Table 13

*Analysis of Variance of Retention of Freshmen by SAT Score and Resilience*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resilience</td>
<td>3</td>
<td>.07</td>
<td>.07</td>
<td>.54</td>
<td>.46</td>
<td>.01</td>
</tr>
<tr>
<td>SAT Combined</td>
<td>1</td>
<td>.02</td>
<td>.02</td>
<td>.16</td>
<td>.69</td>
<td>.00</td>
</tr>
<tr>
<td>Resilience x SAT Combined</td>
<td>1</td>
<td>.00</td>
<td>.00</td>
<td>.02</td>
<td>.89</td>
<td>.00</td>
</tr>
<tr>
<td>Error</td>
<td>102</td>
<td>12.79</td>
<td>.13</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>91.00</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*p < .05  **p < .01  ***p < .001
Whether gender and other demographic variables played a role in "grittiness" was also investigated. An independent samples T-Test \((t (230) = -1.04, p = .94)\) was run and men \((M = 2.54, SD = .37)\) were not found to score differently on measures of grit then women \((M = 2.60, SD = .38)\). An independent samples T-Test \((t (230) = .18, p = .67)\) was also run to determine if being registered with the schools Office of Disability Services impacted grit. There was no statistically significant difference found between students registered with Office of Disability Services \((M = 2.57, SD = .49)\) and students not registered with the Office of Disability Services \((M = 2.58, SD = .38)\).

One-Way ANOVAs were conducted to compare the effect of age, ethnicity, and financial status on grit. Students of different ages \((F (7, 218) = 1.43, p = .20)\), ethnicities \((F (6, 226) = .67, p = .67)\), and financial statuses \((F (5, 225) = .44, p = .82)\), were not found to score differently on measures of grit.

Whether demographic variables played a role in GPA was investigated. An independent samples T-Test \((t (232) = .94, p = .33)\) was run and men \((M = 3.15, SD = .53)\) were not found to have significantly different GPAs then women \((M = 3.26, SD = .59)\). An independent samples T-Test \((t (233) = .16, p = .69)\) was also run to determine if being registered with the schools Office of Disability Services impacted GPA. There was no statistically significant difference found between students registered with Office of Disability Services \((M = 3.26, SD = .61)\) and students not registered with the Office of Disability Services \((M = 3.23, SD = .58)\). One-Way ANOVAs were conducted to compare the effect of age, ethnicity, and financial status on GPA. Students of different ages \((F (7, 220) = 4.02, p = .00)\) were found to have significantly differently GPAs. Post hoc comparisons using the Tukey HSD test indicated that the mean score for 17 \((M =
2.47, SD = 1.39) and 18 year old students (M = 3.11, SD = .61) had significantly different GPAs from 21 (M = 3.38, SD = .44) and 22 (M = 3.38, SD = .44) year old students.

Students of different ethnicities (F (6, 228) = 4.48, p = .00) were found to have significantly differently GPAs. Post hoc comparisons using the Tukey HSD test indicated that the mean score for students who identified as Caucasian, Non-Hispanic (M = 3.32, SD = .49) had significantly different GPAs from students who identified as Asian/Pacific Islander (M = 2.91, SD = .88) and Other (M = 2.71, SD = .73).

Additionally, students who identified as Caucasian, Hispanic Descent (M = 3.53, SD = .38) had significantly different GPAs from students who identified as Other (M = 2.71, SD = .73). Students of different financial statuses (F (5, 227) = 4.67, p = .00) were found to have significantly differently GPAs. Post hoc comparisons using the Tukey HSD test indicated that the mean score for students reporting their family income to be $50,000 or less (M = 3.03, SD = .69) and between $50,000-$75,000 (M = 3.06, SD = .66) had significantly different GPAs from students reporting their annual family income to be between $100,000-$150,000 (M = 3.50, SD = .41).

Whether demographic variables played a role in retention was also investigated. An independent samples T-Test (t (107) = -.55, p = .29) was run and men (M = .82, SD = .39) were not found to be more or less likely to be retained then women (M = .86, SD = .35). One-Way ANOVAs were conducted to compare the effect of age, ethnicity, and financial status on retention. Age (F (5, 103) = .74, p = .60), ethnicity (F (6, 103) = 1.39, p = .23), and financial status (F (5, 104) = 1.05, p = .39), of students were not found to impact retention. It should be noted that an independent samples T-Test was not able to be run to determine if being registered with the schools Office of Disability Services
impacted retention as there were no students that reported that they were registered with Office of Disability Services and did not return to Hofstra after their freshmen year.

**Additional Findings**

There are some additional correlations of note. First, as noted in Tables 4 and 7 there are other correlations amongst variables that have not already been mentioned that are important to discuss. In the senior sample, intelligence as measured by the WPT-Q was also significantly correlated with HS GPA and SATs, \( r = .44 \) and \( r = .47, p < .001 \) respectively. High school GPA was significantly correlated with SAT scores, \( r = .50, p < .001 \). In the freshmen sample, similar results were found as intelligence was significantly correlated with HS GPA and SATs, \( r = .28 \) and \( r = .43, p < .001 \) respectively, and HS GPA was significantly correlated with SAT scores, \( r = .54, p < .001 \). The correlations found between intelligence and SAT scores replicate previous findings (Frey & Detterman, 2004).
College admissions have become increasingly competitive over the years and the college degree has become more and more important in getting a job in today's workforce. Despite the increasing importance of the college degree, retention is a major problem for universities nationwide. The National Center for Educational Statistics (2014) reports that the retention rate at 4-year institutions for first time undergraduates for the 2011-2012 academic year was 78.8%, which puts attrition at 21.2%. The rate of retention for all institutions nationally, including public, non-profit, for-profit, two year, and four year colleges and universities is 70.3%, which means the attrition rate is at almost 30% for the 2011-2012 academic year (National Center for Educational Statistics, 2014). Based on these estimates, more than a quarter of undergraduate students do not return to school after their first year. When a student drops out, it has a great affect for all parties involved including the student, parents, and the university. This begs the question; how can we amend the selection process and/or improve retention at universities to lower attrition rates? In order for universities to improve their admissions decision process and target appropriate assistance for those who would benefit from it most, we must find out what makes a student successful in college.

The purpose of the present study was to determine the role grit and resilience play in predicting academic success in college, specifically if grit and/or resilience would be capable of predicting cumulative GPA in seniors and retention status in freshmen, over and above that of traditional predictors such as intelligence, SAT scores, and high school GPA. This study also investigated whether grit and resilience are compensatory traits. Additionally, demographic variables such as gender, age, race, financial status, and
disability status were investigated to determine if they play a role in predicting grit, GPA, and retention.

Findings

Hypotheses looking at the effect of grit on senior year GPA were partially supported. Significant positive moderate correlations were found between intelligence, high school GPA, and SAT scores and senior year GPA. All three of these relationships are supported by previous research (Intelligence: Poropat, 2009; HS GPA: Richardson, et al., 2012; SATs: Bridgeman, McCamlry-Jenkins, & Ervin, 2000; Kobrin et al., 2008; Noble & Sawyer, 2002). However, grit was not found to be significantly correlated with senior year GPA. While grit was not found to have incremental predictive validity over intelligence, high school GPA, and SAT scores, there are other important findings to note. It was found that high school GPA predicts senior year GPA over and above intelligence, and SAT scores do not add predictive value above and beyond intelligence and high school GPA. These findings speak to the importance of high school GPA as a predictor of success, which has been affirmed by previous research (Richardson, Abraham, & Bond, 2012). It is also possible that this speaks to the process of admissions at Hofstra University in that the admission committee may put more weight on high school GPA than SAT scores when making admissions decisions.

It is possible that the first two hypotheses were not supported because grit may already be accounted for in variables such high school GPA and SATs scores. For example, students high in grit may spend long hours studying for the SATs or spend more hours each semester doing readings, homework, and studying for exams leading to higher SAT scores or HS GPA because they are gritty. As a result, some results in this study
may be non-significant. Another possibility is that the current study was conducted on a much smaller scale than previous studies looking at the role of grit. Although this study was open to all freshmen and seniors at Hofstra University, only 235 students participated. Angela Duckworth and other researchers were able to gain access to thousands of undergraduate students when conducting their research.

Although grit was not found to be a compensatory trait for seniors with lower SAT scores, the trend depicted that grit may help those who score high on SAT scores stand out from their peers that are not gritty. While this was not a statistically significant finding, this may have clinically significant results. Previous research conducted with grit has been studied in highly competitive arenas such as the United States Military Academy, Princeton University, and the Scripps National Spelling Bee. Current findings, along with previous research that found grit to be predictive of academic success (Duckwork et al., 2007), suggest that grit is more important in predicting college GPA for those in rigorous and highly competitive environments. Additionally, seniors who scored high on SATs were found to have significantly higher senior year GPA, which replicates previous findings (Bridgeman, McCamlry-Jenkins, & Ervin, 2000; Kobrin et al., 2008; Noble & Sawyer, 2002).

Hypotheses looking at the effect of grit on retention after the freshmen year were supported. Significant correlations were found between high school GPA and grit and freshmen retention status. Grit was found to account for a significant amount of variance in freshmen retention when controlling for intelligence, HS GPA, and SAT scores. Another interesting finding from the regression model of the freshmen sample was that traditional predictors accounted for very little variance in freshmen retention overall. The
only variable that accounted for some variance of freshmen retention was HS GPA, which lends even more support to the findings of Richardson, Abraham, and Bond (2012) that HS GPA is the strongest predictor of college success. Grit was found to be a compensatory trait for freshmen retention, suggesting that those students with high grit and lower SAT scores were more likely to stay in college after their freshmen year than their less gritty peers.

Angela Duckworth defines grit as ‘perseverance and passion towards long term goals’ (Duckworth, et al., 2007, p.1087). There are two distinct parts to the concept of grit, which are consistency of interest and the perseverance of effort. The behavioral nature of retention touches upon both of these distinct parts. The theory that gritty students both stick to their goals and persevere in the long term makes sense since retention is a variable measured over the course of a year instead of weeks or months. The idea of stamina is key to grit, therefore it is important to measure variables that encompass a goal that is truly long term, such as staying in school after a full year, or performing well in school over the course of a college career. This may help to account for the significant findings of hypotheses four through six, which measures these variables with a behavioral measure of academic success after a full year. These findings also replicate the results of previous research (Duckworth et al., 2007; Maddi et al., 2012; Eskreis-Winkler et al., 2014).

The first research question of this study addressed the role of resilience in academic success. Resilience was not found to be correlated with senior year GPA or to have incremental predictive validity over and above intelligence, high school GPA, and SAT scores. One possible reason for these non-significant results may be because
intelligence and college GPA have been shown to be correlated (Poropat, 2009), however, resilience and intelligence have not been found to be correlated (Rutter, 2007; Collishaw et al., 2007; Jaffee et al., 2007; Dumont et al, 2007), making these two constructs divergent. Although results were not statistically significant, resilience was found to be a compensatory trait. There was a .14 difference in senior year GPA between seniors with low SAT scores and low resilience and low SAT scores and high resilience, indicating that resilience does make a difference for students with low SAT scores, helping them to bounce back from stressors that they may encounter in college. Just as grit plays an important role for predicting college GPA in students that score above the mean, resilience plays an important role for predicting college GPA in students falling below the mean on SAT scores who may face more academic obstacles and setbacks throughout their time spent in college.

Resilience was not found to be correlated with retention after the freshmen year, did not account for variance in freshmen retention after controlling for intelligence, high school GPA, and SAT scores, and was not a compensatory trait for retention. Possible explanations as to why this research question was not supported include financial hardship, general unhappiness with the school, feeling disconnected to the student body, or feeling homesick if a student has gone away to school.

Demographic variables were investigated to determine if they have an effect on grit, GPA, and retention. Despite previous findings that older people are more gritty (Duckworth et al., 2007), age was not found to predict "grittiness" in this study. This may be because the sample size of this study was significantly smaller than what was used in previous studies. It is also possible the difference in age between a freshmen and senior
student is not different enough to make an impact on the level of grit as seen in previous studies. Gender, ethnicity, disability status, and financial status were not found to impact grit. The current study had considerably more female and Caucasian participants, as well as a notable minority of people registered with the Office of Disability Services. It is possible that with a more even distribution across gender, ethnicity, and disability status these results may differ. Once again, it is also possible that there were no significant findings due to the smaller sample size.

Gender and disability status were not found to impact senior year GPA. However, age did significantly predict GPA, specifically 17 and 18 years old students had significantly lower GPAs than 21 and 22 year old students. This indicates that GPA increases over the course of a college career. This may be because when a student is entering their freshman year, they are dealing with substantial transitions including navigating a new social environment, living on their own for the first time, high academic expectations, increased freedom, in addition to many other factors. This suggests that students need time to adjust to their new environment; and as they adjust, their academic performance improves.

Financial status was also found to impact GPA. Students reporting a lower family income had lower GPAs than those students reporting a higher family income. There are many possible reasons for this finding. It is possible that those students coming from families with higher annual income were provided with more opportunities to improve their education, such as tutors and private help. It also stands to reason that their families are more highly educated since they are making more money, making it possible and therefore more likely to be able to assist their children with academic work. Furthermore,
it is possible that those students of lesser financial means have confounding life challenges and additional worries or responsibilities while they are attending school. For example, if a student is working to support themselves while attending college, that student may have less time to devote to class related activities such as studying, homework, and reading than their classmates who do not work.

Lastly, ethnicity was also found to have an impact on GPA. Students who identified as Caucasian had significantly higher GPAs then those identifying as Asian/Pacific Islander and Other. One possible explanation for this finding is that Caucasians are the dominant culture and students of Asian descent may be having a more difficult time adjusting to the demands of college. None of the demographic variables predicted freshmen retention status.

Limitations

The first limitation of this study that has been mentioned throughout this section is the small sample size utilized. Previous researchers in the field have had access to entire undergraduate classes at the University of Pennsylvania and United States Military Academy (Duckworth et al., 2007; Maddi et al., 2012). These samples included thousands of students, while the current study only had a total sample size of 235 students, 124 of which were seniors and 110 of which were freshmen. As sample size increases, the likelihood of finding significance also increases. It is possible that if the entire freshmen and senior class were questioned, more significant results would have been found.

Another concern regarding the current study is in regard to human error. The study was conducted online and therefore the researcher was not available to answer
questions or review answers in order to ensure all questions were thoroughly answered and fully understood. As such, it is possible that participants may have answered questions incorrectly or misunderstood questions they read since clarification of any questions in real time was not an option.

Students were also asked to indicate their student ID number in order to obtain information from the university. If a student is typing quickly and not reviewing their responses, it is possible that they incorrectly entered their personal information, which would lead to obtaining information about an incorrect student. Human error may also have come into play when entering numbers into the computer for analysis. Although we cannot know if the possibility for human error made an impact on the results of this study, it is important that the possibility itself be acknowledged.

While this was a longitudinal study conducted over the course of a year, it was also a cross-sectional study in that freshmen and seniors samples were looked at separately. This study did not follow freshmen across their college career, therefore it was not possible to account for differences between the freshmen and senior samples. For example, seniors had a higher average SAT score than freshmen. It is not possible to determine whether these differences in SAT scores are due to level of grit in students that left school before reaching their senior year, or for other reasons such as finances.

**Strengths**

One strength of this study is that it is a longitudinal study and conducted over the course of a year. Grit is defined by stamina, thus it is important that a study interested in
grit be conducted over the course of a long period of time. Cognitive ability was also measured in many different ways, making this study very comprehensive.

Another strength of this study is that GPA was not the only outcome investigated. It is possible that measures such as high school GPA or SATs may be confounded when looking at the incremental predictability of grit. For example, those who are high in grit may spend a longer amount of time engaging in tasks that might be considered tedious such as studying, rote memorization, or extensive readings, that are beneficial in obtaining high GPAs or SAT scores. Therefore, those who are high in grit may also have higher SAT scores or high school GPA because they are gritty. As a result, grit may already be accounted for within other measures, rendering some results in this study non-significant and underscoring a need for other variables to measure the importance of grit. However, this would not be the case for behavioral measures such as retention, which was also an outcome variable investigated in this study.

**Future Research**

There are many possible avenues for future research. One of the findings of this study is that grit is important for highly competitive environments; however no study has of yet directly compared universities or educational programs of different rigor. This comparison may help to further clarify when and where grit is of importance. It may also be interesting to look at grit across different majors to find out if grit is more important for a specific major, or if students in a particular major are more likely to be gritty.

Future research should also be conducted longitudinally with students entering college in their freshmen year in order to follow them through graduation. This model
would be able to definitively show whether the grittiest students entering into college in their freshman year are the ones that also make it to graduation day.

Another interesting direction for future research is to measure grit, resilience, or other personality traits not only through self report, but also teacher, parent, and/or peer report as well. This would allow investigator's to determine whether a person's own perception matters more or less than the impressions of those around them as well as if ratings are consistent across people. It would be interesting to investigate whether grit and/or resilience are teachable traits.

The current study also had a disproportionate amount of female and Caucasian participants. Demographic results may differ with a more even distribution of participants in terms of gender and ethnicity. Future studies should aim to recruit a more diverse sample to increase generalizability.

**Conclusions and Implications**

In summary, the results of this study both support previous findings and contribute new knowledge to the literature. Consistent with previous findings, the correlations among intelligence, high school GPA, and SAT scores and senior year GPA were all found to be significant. Previous findings that intelligence, high school GPA, and SAT scores are correlated with one another, that high school GPA is the strongest predictor of college GPA, and that grit is important for students in highly rigorous and competitive environments were also corroborated.

The results of the current study also contributed to the research in new ways. Although the role of grit in predicting retention has been investigated in the past, this study was able to show that grit can be an important predictor for retention in a more
generalized population. Results of this study show that grit is correlated with and is predictive of freshmen year retention, as well as a compensatory trait for students who do not perform as well as their peers on the SATs. This study also found that resilience is a compensatory trait for seniors that did not perform as well as their peers on the SATs. Just as grit helps seniors with high SAT scores stand out from their non-gritty peers, resilience helps lower achieving students make up the achievement gap. It was also found that older students, students who reported a higher family annual income, and students who identified as Caucasian, have higher GPAs.

This study began with the question; how can we amend the selection process of universities? Attrition is a problem that plagues students, families, and universities around the United States. Results from this study show that a students' GPA and SAT scores are not the only important factors when making a determination about whether that student would be a good candidate for admission to college. This study has shown that grit is predictive of freshmen retention rates, making it an important addition to college admissions processes for universities across the country. High schools may also want to put these findings to use by identifying students at-risk for dropping out and intervene proactively by providing them with extra support. These support systems may include a student mentor, extra after school support, and teaching them the importance of grit and resilience in reaching their long term goals.

Grit and resilience are two examples of character traits that contribute to academic success. The importance of character as a whole can be taught and modeled early on in order to help youngsters be prepared for challenges and adversities they will encounter throughout their life. There are currently many character education programs that help to
instill important values in children, such as Second Step and Character Counts. Results of the current study indicate the need for continued character education throughout the school system and in the home in order to prepare children for success.
References

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Appendix A

Informed Consent

Dear Participant,

The following research study about achievement is being conducted at the Hofstra University Department of Psychology by Danielle Arouty, M.S., under the supervision of Lola D. Nouryan, Ph.D.

As a participant you will be asked to complete a brief survey answering some questions about personal characteristics. In addition, items included in your academic records, such as high school GPA, college GPA, and retention information are of relevance to this study. As such, it is requested that your permission is given to obtain high school GPA, college GPA, and retention status from Hofstra University records. This information will be collected in a confidential manner through the use of student identification numbers (your 700 number). Once the information has been submitted to the researcher, your scores will no longer be associated with either your name or 700 number. The results of the study will add to our knowledge about what leads individuals to meet various achievements and will help to inform educators in the future.

Your participation is voluntary. You are free to withdraw from this study at any anytime without penalty. There are no anticipated risks to participation. Your responses to the activities and on the questionnaires will be kept confidential. None of your personal responses will be released to anyone. It will take approximately 30 minutes to complete the study.

You are welcome to contact the investigator, Danielle Arouty, at darout1@pride.hofstra.edu with any questions about this project. You may also contact the Doctoral Project Sponsor, Lola Nouryan, Ph.D., at Lola.D.Nouryan@hofstra.edu. The investigator will be available to answer further questions if needed.

Thank you for your time and participation.

Sincerely,
Danielle Arouty, M.S.

I agree to participate in this research. I further consent to my pre-college test scores (i.e. SAT) and high school and college GPA being obtained from Hofstra University records for the purposes of this research.

Name/Electronic Signature: __________________________________________

700#: _______________________  Date: ________________________
Appendix B

Background Questions

What is your sex?

__Male
__Female
__Prefer not to say

What is your age in years?

What class are you in?

__Freshman
__Sophomore
__Junior
__Senior

Which ethnicity do you most identify with?

__Caucasian, Non-Hispanic, Latino, or Spanish Origin
__Asian/Pacific Islander
__Black/African American
__Hispanic, Latino, or Spanish Origin
__Native American
__Caucasian/Hispanic, Latino, or Spanish Origin
__Multi-Ethnic

Did you take the SAT prior to college admission?

What was your SAT Combined score (out of 2400)? If you took the SAT more than one time, please answer with your highest combined score. If you are unsure or do not remember, please consult your records for accuracy.

Are you registered for services through Services for Student with Disabilities?

__Yes
__No
What is your estimated annual family income?

__$50,000 or less
__$50,000-$75,000
__$75,000-$100,000
__$100,000-$150,000
__$150,000-$200,000
__$200,000 or more
Appendix C

Short Grit Scale

Directions for taking the Grit Scale: 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!

1. New ideas and projects sometimes distract me from previous ones.*
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

2. Setbacks don’t discourage me.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

3. I have been obsessed with a certain idea or project for a short time but later lost interest.*
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

4. I am a hard worker.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

5. I often set a goal but later choose to pursue a different one.*
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all
6. I have difficulty maintaining my focus on projects that take more than a few months to complete.*
   _ Very much like me
   _ Mostly like me
   _ Somewhat like me
   _ Not much like me
   _ Not like me at all

7. I finish whatever I begin.
   _ Very much like me
   _ Mostly like me
   _ Somewhat like me
   _ Not much like me
   _ Not like me at all

8. I am diligent.
   _ Very much like me
   _ Mostly like me
   _ Somewhat like me
   _ Not much like me
   _ Not like me at all
Appendix D

Connor-Davidson Resilience Scale 25 (CD-RISC-25)

For copyright reasons, this scale could not be reproduced here.
Appendix E

Debriefing Information

What Predicts Academic Success?
Principal Investigator: Danielle Arouty, M.S.

Thank you for your participation in this study! For the past century, researchers in educational psychology have been fascinated with what predicts successful achievement, especially with regard to academic performance. It may seem obvious that an individual’s intelligence and other traditional predictors, such as high school GPA and SAT scores, would play a big role in how well they do in the classroom-and this is true! However, it has become clear that intelligence and traditional cognitive predictors are not the only factors that predict academic success at the college level.

Within the last 30 years, researchers have also become interested in the way different personality characteristics influence achievement. The most universal model of personality is the Big Five (Openness, Conscientiousness, Extroversion, Agreeableness, Neuroticism). Multiple studies have shown that Conscientiousness has been most consistently related to academic achievement: the higher one’s level of Conscientiousness, the more likely they are to succeed. However, research regarding Conscientiousness has saturated the field. We are now interested in refining our knowledge about what type of personality characteristics predict success in college. A fairly new construct, called “Grit” described as “perseverance and passion for long-term goals” is related to Conscientiousness, but is considered different in that it focuses on long-term stamina. Resilience has also been shown to predict multiple types of positive life outcomes, including academic success. Little research has been done in the general population regarding resilience, as it is typically studied in disadvantaged population that have been through significant trauma or stressors. Here we are interested in more 'everyday' stressors that college students encounter such as evaluative stress, test anxiety, social stress, adjusting to living on one's own, and balancing work and social responsibilities. In this study, we will use your responses to the activities and questionnaires to explore potential patterns of cognitive ability and personality characteristics that predict college GPA and retention.

After completing difficult cognitive tasks or questionnaires that require self-reflection, you might feel frustrated or upset. If you would like to speak to a counselor about any distress you may have experienced as a result of this experiment, or for any other reason, contact Hofstra University Student Counseling Services. It is located in the Saltzman Community Services Center, which is on the south side of Hempstead Turnpike, at the Oak Street entrance. For more information about Counseling Services, feel free to call (516) 463-6791. They are there to help!

Again, thank you for your time and effort. If you have any questions or comments about this study, please feel free to contact Danielle Arouty at darout1@pride.hofstra.edu.