

THE RELATIONSHIP BETWEEN GRIT AND ACADEMIC, MILITARY AND PHYSICAL PERFORMANCE
AT THE UNITED STATES MILITARY ACADEMY

BY

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Submitted to the graduate program in Educational Leadership and Policy Studies and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Education.

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September 4, 2012

ABSTRACT

Perseverance (persistence) is a personality trait that has been historically measured through the presentation of difficult or impossible tasks and then observations made as to how long an individual continues to attempt to solve the problem or complete the task. The determination of perseverance was then made after the attempt but there were few reliable methods to predict the level of perseverance before the effort was given. This study seeks to assess whether perseverance can be discerned during the admissions process and utilizes the recently developed and validated Grit Scale, a 12-question instrument that measures trait-level perseverance and passion for long-term goals. The Grit Scale was given to the United States Military Academy class of 2008 (N= 968) during initial summer training and the graduation outcomes were collected four years later. Controlling for gender and ethnicity, Grit demonstrated a statistically significant relationship with academic achievement, as measured by cumulative grade point average at graduation. In comparison with other traditional admissions predictors (SAT scores and High School Rank), Grit's impact on the variability of grade point averages was again significant, however, not as powerful a predictor as the traditional predictors. Grit was, however, better at predicting higher achievement in the Academy-specific outcomes of military and physical performance scores. Thus, Grit should be considered a complementary predictor of academic achievement with the traditional predictors of SAT scores and high school rank to provide a more detailed profile of admissions candidates.

ACKNOWLEDGMENTS

I would like to thank and recognize the support of Dr. Susan Twombly for her guidance and just as importantly, her patience, in the development and completion of this study. I also thank Dr. Lisa Wolf-Wendel for guiding me through some of the intricacies of the data analysis and also the members of my committee, Drs. Dongbin Kim, Marlesa Roney and Meagan Patterson for their service to this accomplishment.

I most respectfully acknowledge and thank the Grit research team of Dr. Angela Duckworth, Dr. Mike Matthews, Dr. Chris Peterson and Mr. Dennis Kelly for their collection of this data in the Summer of 2004 and subsequent permission to use the data for this study. I especially thank Mike Matthews for initially exposing me to this research and generating excitement about this topic.

My sincere thanks and love go to my wife, Sharon, whose own persistence and support towards this effort never wavered and continued to run the family the way a good Army wife just knows how to do. Finally, my thanks to all of the members of the study sample who have since graduated from the Military Academy and are now serving our great nation as officers in the United States Army. Our gratification for your service will never equal your sacrifices and for that I am humbled and thankful.

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Chapter 1: Introduction

In my experience as a coach of collegiate boxing clubs, I observe elite athletes who are filled with potential and natural talent. However, during competitions, these naturally talented athletes are often defeated by less talented athletes who dominate through a perceivable greater effort. From this observation, it is easy to conclude that the amount of effort in training is a significant factor in determining the winner. In common parlance, these hard-working, dedicated, persistent athletes might be deemed to be more “gritty” than their opponents; more likely to “work strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress” (Duckworth, Kelly, Matthews & Peterson, 2007, 1008). In practices that I lead, I am often able to predict success in an upcoming bout or season by the amount of effort and dedication each athlete demonstrates when coupled with the level of talent the athlete possesses.

In athletics, this concept is easily understood and recognized. It can also be seen in many other environments; the individual who works the hardest in developing new or existing skills or capabilities typically realizes the greatest success (Ericsson, Krampe and Tesch-Romer, 1993). It is a message parents deliver to children, coaches to athletes, teachers to students and mentors to mentees. Malcolm Gladwell (2008) speaks of this concept in his book Outliers through an illustration of the persistent efforts of high achievers. He explains that it takes 10,000 hours of practice to fully master a skill and be considered an expert. Peter Dinklage (2005) references a 10-year rule while explaining that perseverance may be more critical than talent in accomplishment of significant objectives. Renowned leadership and business author Jim Collins (2001), in Good to Great, discusses “professional will” and “workmanlike diligence”

as attributes for successful chief executive officers. So, in current popular literature and research studies, the concept of perseverance is getting more attention and being seen as more important in achieving success.

I am certainly a believer, as I have seen it firsthand, as already described. However, there is a limitation in that I cannot easily discern whether someone is persistent until I have observed them. I can't simply look at them while shaking hands upon first meeting and know that this athlete is going to work and persist long enough to be successful. Typically, the conclusive evidence that effort and perseverance pays off is assessed after effort is expended and the success achieved, or conversely, failure is realized. As a coach, I have limited time and resources to put into an athlete who desires to compete at an elite level so I must carefully select those athletes who have both the talent and perseverance to work hard to achieve the greatest results. Unfortunately, I sometimes identify an athlete with talent and then work to develop his or her skills only to watch effort diminish over time until the athlete quits the sport or only maintains a recreational approach. Should I have put more resources into a different athlete that might have been more dedicated and surpassed the achievement of the one I chose? How do I know which athlete is prepared to put forth the greatest effort and take the greatest advantage of the resources I have to offer? Why can't I know during that initial handshake whether this athlete has what it takes to be the best?

This personal illustration about athletics is synonymous with difficult decisions that all organizations must make about individuals and their potential for development and success. In higher education, admission decisions are typically made based on merit, i.e., high school performance and standardized test scores (Baird, 1985). These are demonstrations of a

student's potential to matriculate successfully towards graduation in a reasonable amount of time. The admissions process is an inexact science; a prediction is made based on known and trusted predictors that forecast an outcome. Jacques Steinberg (2002) in The Gatekeepers wrote about the admissions process at a highly selective university and detailed the significant level of subjectivity in admissions decisions. Despite metrics, experience, and trends, the outcomes are not perfectly aligned with the inputs; admitted students who demonstrated potential do fail to succeed for a variety of reasons. Attrition is expected, although it is difficult to identify who among the incoming freshman class will not make it. If you agree with Ericsson, Krampe and Tesch-Romer (1993) that perseverance is a critical element in success for an individual, then it follows that a predictor of perseverance might be helpful in making admissions decisions or resource allocation decisions for other industries. An instrument that provides some predictive ability to identify these "gritty" individuals would be helpful in making those decisions.

The Grit Scale

Such a measure was developed by a research team led by Angela Duckworth at the University of Pennsylvania. In an examination of the psychological construct of perseverance as a predictor, Duckworth, Peterson, Matthews and Kelly (2007) developed the construct of grit and an instrument to measure it. They defined grit as "trait-level perseverance and passion for long-term goals" (2007, p 1087 & 2009, p 166). They explain that 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... the gritty individual stays the course" (2007, 1088). This link between achievement

and grit is a significant element of their work; they believe that grit is both essential to achievement and can be used to predict achievement. In order to measure grit, they created the Grit Scale and conducted several studies to examine the predictive nature of this instrument and concept (2005, 2006, 2007). In one, they demonstrated that grit predicted retention during the rigorous summer training for new cadets at the United States Military Academy; new cadets who scored one standard deviation higher than the mean grit score were sixty percent more likely to complete the summer training. This predicted retention better than the Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004) which resulted in fifty percent greater likelihood to complete summer training for those scoring one standard deviation above the BSCS mean (Duckworth, et al, 2007). Another study, in which the researchers collected data on Scripps National Spelling Bee participants, showed grit and age to be positive predictors of advancement to the final round (Duckworth, et al, 2007).

Purpose of the Study

Building upon this initial success in the use of grit as a predictor, the overall purpose of my study is to determine whether there is a relationship between the Grit Scale score and achievement measured at graduation. In an era of declining available resources, selection or promotion of organizational members can be enhanced through the use of a predictor that indicates the perseverance or doggedness of a potential employee, especially if a positive relationship to achievement is demonstrated. Grit could be used as an admissions data point, especially if a positive relationship can be demonstrated between extant admissions indicators (SAT, ACT, GPA) and graduation outcomes. I have personally observed Army Reserve Officer Training Corps (ROTC) freshmen who arrive on campus with four-year scholarships that were

awarded based on typical selection criteria, only to find the environment too challenging and quit the ROTC program or leave school altogether. The scholarship is not transferred to a more deserving, and gritty, candidate and the valuable resource is lost to our program. Knowing the perseverance of a potential candidate would be invaluable in the selection process and also assist cadre members in determining an individualized development plan for each cadet. The same is true for employee training programs; individualized developmental programs based on the known capabilities of the employee are more efficient and likely, less costly. The grit scale is an easily administered and scored instrument and enhances assessment about an individual. In fact, Baird (1985) conducted an extensive study that demonstrated that college grades and test scores are not the best predictors for adult achievement once entering the work force; this lends credence to the idea that other predictors besides the traditional ones do exist and can be trusted.

To better understand the relationship between grit and potential for achievement, I examined the Grit Scale scores from a large student sample at a highly selective and rigorous academic institution and compared those scores to graduation outcomes that were measured four years after the initial grit scores were collected. More specifically, using data collected at the United States Military Academy, I examined whether grit scale scores accurately predict cadet achievement as measured by several standard and academy-specific graduation outcomes. Next, I examined whether grit scale scores accurately predict achievement, as measured by the same graduation outcomes, as well as or better than traditional predictors, to include high school rank, SAT and academy-specific candidate scores (academic, military, physical performance).

The Importance of this Study at the United States Military Academy

The importance of this study is to assess whether a relationship exists between Grit Scale scores and graduation outcomes and provide additional credence to the use of the Grit Scale as a potential admissions predictor. The United States Military Academy is highly selective in admissions and extremely rigorous in academics as well as physical and military preparation for commissioning as an officer in the United States Army. The admission process is one that requires a certain amount of grit, or perseverance, to complete. It typically starts during the high school junior year with an initial application and ends with an offer of admission in the spring of the senior year; however, some applicants are notified within days of reporting for summer military training. In the interim, the candidate is required to undergo the typical standardized testing and many will take the test several times. Candidates must undergo interviews with either an academy admissions officer or an admissions liaison officer (academy graduates that volunteer around the country to assist with the interviews). Each candidate must apply for a congressional nomination or be eligible for Presidential or Vice Presidential nominations; these are normally provided to prior enlisted soldiers or children of military veterans. The nomination process typically requires an application, essay and interview with the candidate's congressional representative and is also extremely competitive as each congressional office is only allocated a specific number of nominations. Candidates must also complete physical performance testing to determine if the applicant meets the physical or athletic standards required of a cadet. Once a candidate is deemed qualified, he or she must then complete an extensive medical examination and records review with the Department of Defense Medical Examination Review Board. This board ensures that the candidate is healthy

enough to withstand the rigors of the Academy physical training program and meets the physical commissioning requirements of the Army. All of these steps must be taken to be eligible for an offer of admission. Admission to the Academy is a difficult process that requires not only high achievement in high school but also great perseverance to complete the entire process. It is likely that the candidates that complete the process have greater persistence and might score higher on the Grit Scale than counterparts at other institutions; therein lies a potential research thread that still needs to be considered.

The Academy annually receives over 10,000 applications for approximately 1300 slots. The Class of 2015 reports 13,954 applicant files started of which only 1,261 were actually admitted. About 300 candidates annually are offered slots at the Academy Preparatory School and others are encouraged to find similar programs around the country. Some candidates attend another college for a year or two and seek admission multiple times. This is an extremely competitive admissions process that must discern between high numbers of valedictorians, salutatorians, national merit scholars, team captains, Eagle Scouts, class presidents, school newspaper editors and other recognizable high school and community achievements to include traditional indicators like SAT and ACT scores and high school grade point average and rank. Despite all these achievements, each entering class still graduates less than 1000 and sometimes less than 900 new 2nd Lieutenants. The Academy is federally-funded and provides complete tuition, room and board for each cadet. A recent Army Times report indicated that each West Point graduate costs taxpayers \$141,536 (2010). With this level of expenditure, admissions decisions need to be accurate and select those that are best qualified but also will persist to graduation. Of the 1,261 cadets who were admitted into the Class of

2015, twice that number was fully qualified. Grit can be used as an admissions data point that provides more insight into a candidate's likelihood of graduating, thereby filtering out those who historically might not. It might predict not only retention but also achievement. If available and shown to be valid, it would certainly be prudent for admissions professionals and even employers to use this new tool to predict the future behavior of students or employees.

Another viable reason to conduct this study at the Military Academy is that the curriculum is more structured and standardized than other institutions. The Academy has a core course requirement that every cadet must complete. All cadets complete 26 common core courses, an information technology course, a three course engineering sequence and a major that is typically six courses. The only real variation for cadets in the course of study is choice of foreign language, a core history sequence, the engineering sequence and major (Academic Program, 2012). At most institutions, it may be possible to choose easier courses to increase grade point average. However, at the Academy, there is much less choice and therefore less potential variability in grade point average caused by course choice or rigor. This makes the Academy a good place to study the ability of the Grit Scale to predict achievement.

It is important to note that the concepts of perseverance and persistence are similar and the terms are used interchangeably throughout the literature. In fact, historically, there are more references to the concept of enduring and working towards the achievement of a goal over time as persistence. However, in higher education literature, the term persistence is often used to describe whether a student returns to school from one year to the next and continues towards graduation. Though a related concept, academic persistence does not fully capture the full meaning of persistence as measured by the Grit Scale. Therefore, references to persistence

have been changed to perseverance to avoid confusion, except when directly quoting a researcher or in the titles of other scales that measure persistence (perseverance).

Outline

This study is divided into four additional sections. First, in a review of the literature, I present the background on the development of the concept of perseverance as a measurable personality trait and also summaries of several psychological constructs that are closely related to grit and perseverance. Second, I describe how the data was collected and provide greater detail in the study questions and the variables. Following that, the results of the analysis will be provided and then I will conclude with a discussion of those results, limitations of my study and recommend areas that need further investigation.

Chapter 2: Literature Review

In a review of the literature, it is clear that perseverance (persistence) has been a topic of much inquiry but is also seen as just one component of an individual's personality. Other components like intelligence, morality and behavioral influences on personality have been studied in much greater depth. This review seeks to determine the historical basis of understanding about perseverance, identify the most closely related personality constructs and provide a solid description of the Grit Scale and the initial studies completed by the primary research team.

Early Theories of perseverance

In an interesting argument in his book, *Hereditary Genius*, Francis Galton (1892), proposed that an individual's natural abilities are inherited and that it is possible to produce a race of gifted men through "judicious marriages" (p. 1). This position was gained through a study of the characteristics of some of the most successful and famous men of the previous two hundred years. He described physical prowess and mental power as among the most important traits and indicated they are related to an individual's ability. However, it is not ability alone that ensures success for eminent men but "ability combined with zeal and capacity for hard labour" (p. 38). Although researchers today would not agree with Galton's position that all traits that make up eminent men or leaders are wholly inherited, herein is a very early reference to the importance of perseverance or, as he phrased it, zeal and capacity. Researchers since then have described perseverance as either an observed behavior or as a personality trait.

Definitions of perseverance over the last century indicate common ideas and themes about perseverance. In 1908, McDougall defined perseverance as purposive behavior and, in 1912, Fernald stated, “the success or failure of individuals depends largely on the ability to endure and to continue to strive for the sake of achievement, in spite of fatigue and discouragement (p. 331).” Supporting this definition was Haggerty’s study (1921) of the traits of successful men which indicated they were persistent and industrious. David Ryans (1938, p. 71) described perseverance as the “capacity for continued release of energy” and a year later, in a review of the early measurements of perseverance, also described the “continuation of directed response” as the “functioning of will” (1939, p. 715). In 1949, Hebb described perseverance as goal-directed action. Hans Eysenck, who is noted for his work in intelligence and personality, also believed that perseverance was a human trait that helped compose an individual’s personality (1953). In a 1962 study, Feather described the level of a person’s perseverance as the amount of unrestricted time spent and the number of attempts towards solving an insolvable problem. Thus the history of research regarding perseverance is rich and diverse, although the density of research is not comparable to the work on personality, intelligence and other behavioral or psychological constructs. In fact, prominent current researchers believe that the body of research has left us with “no single tradition of theoretical and empirical work that is dominant regarding persistence” (Peterson & Seligman, 2004, p. 231). Taken collectively, the historical view of perseverance is that it is a human trait and based on individual variables and situations. Peterson and Seligman (2004) define persistence as “voluntary continuation of a goal-directed action in spite of obstacles, difficulties, or discouragement.” (p. 229). Although it should be noted that Peterson and Seligman don’t refer

to persistence as a trait, but instead as a character strength and also use the terms persistence and perseverance interchangeably. These authors are today among the leading researchers on perseverance as well as leaders in the modern view of personality as a collection of character strengths. Their work has directly influenced the work on grit and the way it measures perseverance.

Although not a focus of this research and therefore not dealt with in any detail, it should be noted that perseverance is described as primarily a human strength. Jaynes (1976) suggests that most animals don't persist longer than 20 minutes at a task. Several studies on animal perseverance have been done using rats (Eisenberger, Carlson, & Frank, 1979; Eisenberger, Myers & Kaplan, 1973; Inglis & Shepherd, 1994) and gerbils (Forkman, 1996) and the findings indicate that observable perseverance is primarily during food gathering. B.F. Skinner (2005), in his landmark studies on operant conditioning using rats and pigeons, clearly showed that an animal's perseverance for any task was impacted more by the level of hunger satisfaction than any desire to persist and overcome a problem or presented task. Thus, I will, focus my discussions on perseverance to the human condition.

In his on-line blog, Frontal Cortex, Jonah Lehrer (2011) makes interesting observations after reviewing the Grit research by Angela Duckworth. He believes there are two takeaways from this research. This first is that the measurement of talent and the causes of talent do not match. Measures of talent tend to be short duration and easily scored events like an achievement test or a physical test (running, lifting, swimming, etc.). However, real talent is about sustained performance and most instruments don't measure that. He provides the example of the National Football League combine and its inability to accurately predict success

in professional football. It takes deliberate practice to develop talent and observations over time to judge that talent. He concludes that “we need a test that measures how likely people are to show up, not just how they perform once there” (Lehrer, March 14, 2011). A good example is the career of Jerry Rice, considered by many to be the greatest receiver in NFL history. Rice played football at a small program, Mississippi Valley State University and set several NCAA records. However, his combine 40-yard dash was considered slow at 4.71 seconds. Therefore he was passed up by most NFL teams in the draft but, once taken, set most NFL receiving records. Most attributed his success to his legendary off-season workouts that exceeded that of all his counterparts. It could be said that Jerry Rice had the most grit and, when combined with his physical talents, the greatest success.

Lehrer’s second takeaway in his review of the Grit research was that “non-cognitive” skills like grit and self-control better explain variations of achievement and that this is a growing movement in how we consider the factors behind individual success. He closes with the statement, “our most important talent is having a talent for working hard, for practicing even when practice isn’t fun. It’s about putting in the hours when we’d rather be watching TV, or drilling ourselves with notecards filled with obscure words instead of getting quizzed by a friend. Success is never easy. That’s why talent requires grit.” (Lehrer, March 14, 2011) Jonah Lehrer represents the growing movement toward a new understanding of the individual variables that facilitate and predict success.

The remainder of this literature review will be organized around those theoretical constructs to which perseverance is most closely related and then review the development of the Grit scale and Grit research. Each of these related theoretical constructs can be studied in

considerable depth, but that is not the intent. Instead, it is to highlight the modern belief that there exist relationships between perseverance and similar personality constructs and that perseverance does not work alone in its impact on task accomplishment or goal achievement.

Self-Control

The landmark study by Walter Mischel and colleagues that resulted in the 1972 article, *Cognitive and Attentional Mechanisms in Delay of Gratification*, highlights well the simple relationship between perseverance and self-control. In that study, preschoolers were presented, using marshmallows and pretzels, options for immediate reward or waiting for a preferred reward. Though the findings inform more about the variables that impact a person's ability to delay self-gratification, they also provide information about how difficult it may be to persist in order to achieve a greater goal. Mischel focused on the amount of cognitive avoidance needed to get children to delay receipt of a desired award. The study made its link to perseverance through a reference to William James' (1890) belief that "the essential achievement of the will" requires one to focus attention on the task in order to continue towards its completion. Mischel disagreed and instead declared that effective self-control and realization of the goal was better served by "transforming the difficult into the easy, the aversive into the pleasant, the boring into the interesting, while still maintaining the task-required (reward-contingent) activity" (1972, p. 215-216). Thus, what we know about self-control can be informative on the development of strategies to better persist to complete tasks or reach desired goals.

In a more current examination of self-control, four major domains of self-control were identified; controlling thoughts, emotions, impulses, and performance (Baumeister, Stillwell,

Heatherton, 1994). This led to findings that linked achievement and task performance. It was proposed that people with high self-control would earn better grades because they are better at getting tasks done on time (Tangney, Baumeister & Boone, 2004). A 1995 study found that children with higher self-regulation earned better grades in a computer course (Feldman, Martinez-Pons & Shaham). Wolfe and Johnson (1995) found that self-control was the only one of 32 personality variables that significantly predicted grade point average for college students. More recently, in 2007, Baumeister, Vohs and Tice stated that a lack of self-control may be due to a “lack of persistence and various failures at task performance” (p. 352).

Prior to the development of the Grit research, Duckworth and Seligman looked at self-control, which they also referred to as self-discipline and its relationship to IQ and academic performance. In 2005, they measured self-discipline using self-report, parent and teacher report, and monetary choice questionnaires to predict final grades, school attendance, standardized achievement test scores and selection into a competitive high school program. Their sample consisted of 140 eighth graders. Overall, self-discipline predicted academic performance more robustly than did IQ. It also predicted which students would improve grades over the course of the school year, whereas IQ did not. Self-Discipline accounted for more than twice as much variance as IQ in final grades, high school selection, school attendance, hours spent in homework, hours spent watching television and the time of day beginning homework (Duckworth & Seligman, 2005).

In a second study that pre-dates the development of the Grit scale, the authors used several measures (self-report, teacher and parent report, and delay gratification measures) to determine that girls consistently earned higher grades on report cards due to greater self-

discipline. In contrast, girls were slightly better on an achievement test and poorer on an IQ test. In this study, the authors again considered self-discipline and self-control as interchangeable terms, thereby alluding to the future relationship between self-control and grit, and defined both as “the ability to suppress prepotent responses in the service of a higher goal and further specifying that such a choice is not automatic but rather requires conscious effort.” (199) The authors believed that report cards are a reflection of self-discipline in that they represent the ability to study for exams, complete homework assignments and long-term projects on time and prep for class discussion – all tasks that require effort sustained over time. Achievement tests require effort for a few hours and IQ tests less than an hour. Therefore, self-discipline becomes most evident in report card grades (Duckworth & Seligman, 2006). Thus, two major concepts are introduced in their work – self-discipline/self-control can predict academic achievement (assuming achievement is measured by grades and other long-term activities) and self-discipline/self-control may be a complementary predictor of achievement with SAT/ACT. Given the close relationship between perseverance and self-control/self-discipline, those same concepts likely pertain to both.

In order to consider that relationship, the Grit research team (Duckworth, Peterson, Matthews & Kelly, 2007) included the Brief Self-Control Scale (Tangney, Baumeister & Boone, 2004) in a study that examined retention at the Military Academy in the Class of 2008. They found that grit was related to self control ($r = 0.63, p < .001$) but that grit better predicted completion of summer training. However, when comparing academic performance at the end of the first-year, self-control was a better predictor (self control $r = .13, p < .001$; grit $r = .06, p < .05$). Duckworth, et al, recognized the relationships between self-control and perseverance

but also concluded that the difference between the two was that earning good grades was the result of long-term regulation of temptations towards divergent behavior whereas completion of summer training required a “different kind of fortitude” (p. 1096). Self-control enabled cadets to handle the rigors over time and did not push them towards resignation, whereas, perseverance enabled cadets to survive during six-weeks of grueling physical and mental fatigue which pushed many to quit and attain a degree at another, less rigorous, institution. Thus, the two theories are closely related and both deserve continued examination.

Self-Efficacy

In their discussion of perseverance, Peterson and Seligman (2004), made an interesting comment about quitting. They stated that quitting has two sources. One is related to the concept that perseverance relies on self-control or self-regulation and when energy is depleted by the long-term regulation of these, quitting often occurs. The second reason for quitting is related to a loss of self-esteem which causes people to withdraw or lose belief in the ability to complete a task. When someone realizes a failure on a private or public task, they may lose intrinsic motivation or become too embarrassed to continue. Perseverance requires overcoming a natural tendency to quit when the body or mind is exhausted, the task seems too difficult or we become afraid of public failure in the face of continuing a task that may not be achieved. Thus, self-esteem and self-efficacy are closely related to perseverance and grit.

Several studies lend credence to the idea that perseverance is related to the perceived ability to accomplish a task. Janoff-Bulman and Brickman (1982) concluded that those who expect to succeed are generally more persistent. In 1983, Starnes and Zinser found that people persisted longer at solving problems when they had been told that the problems were difficult

as opposed to easy. The problem solvers were less threatened by failure on difficult tasks and continued to work on them without fear of embarrassment, whereas if the tasks were described as easy, there was more reluctance to begin for fear of being unable to complete the task. Similar findings were presented by Frankel and Snyder (1978) when subjects withdrew after initial failure on tasks that were described as only moderately difficult due to fear of humiliation. These same subjects persisted longer, even after an initial failure, if the task was presented as extremely difficult. Meyer (1987) reported corresponding findings in that people who persevere expect that the perseverance will be rewarded with the outcome they seek, i.e., successful completion of the task. Meyer also found that, in general, subjects who perceived themselves to have high ability persisted longer on both easy and difficult tasks. In addition to having positive self-efficacy, being observed may have an impact on perseverance. Geen (1981) found that the presence of an observer led to longer perseverance if initial outcomes were successful but not if there was initial failure. The prospect of flattery is just as powerful as the fear of humiliation and can impact a person's perseverance towards task or goal attainment. Finally, related to this study about perseverance and academic achievement, Multon, Brown and Lent (1991) found that a significant positive relationship existed between self-efficacy and perseverance on academic tasks. Thus, self-efficacy and perseverance are related theories and may combine as indicators or variables in an individual's ability to accomplish a desired task or goal.

Measurement of Perseverance

The earliest measures of perseverance were task-oriented studies in which participants were provided tasks or problems with varying degrees of difficulty and then observed to see

how long they would continue towards completion (Cleeton & Knight, 1924; Morgan & Hall, 1926; Wang, 1932). This provided insight into an individual's willingness to keep trying to solve what were often impossible tasks and also introduced a relationship with ability, which Ryans (1939) pointed out is easy to confuse with perseverance. These early studies were then augmented by research on whether certain rewards were required to persist or the presence of an observer or the personal stake in the completion of a task. These theories were discussed in the Self-Control and Self-Efficacy sections. As perseverance began to be thought of as a personality construct, the effort shifted to identifying its place as a personality trait along with intelligence, achievement orientation and others. Nygard (1977) attempted to discern a clear relationship between global intelligence and perseverance but was unable to do so. Atkinson and Litwin (1960) found that motivation towards achievement predicted greater perseverance and that failure avoidance reduces perseverance. Individuals with perceptions of high autonomy showed perseverance in the face of failure (Koestner & Zuckerman, 1994). High emotional control was found to possibly lead to greater perseverance (Zaleski, 1988). Hardiness, which is sometimes defined as "a resistance resource in the encounter of stressful life events" (Kobasa, Maddi & Kahn, 1982, p. 169) was shown to predict perseverance (Wiebe, 1991). Type -A personality type was linked to perseverance (Strube & Boland, 1986) and procrastinators reported an inability to persist (Ferrari, 1993). As relationships began to be realized, there became a desire to measure perseverance directly. Though not numerous, perseverance scales began to be developed. In 1971, the Perseverance Subscale of the Survey of Work Values questioned whether an employee should continue to work and do a good job even the supervisor was not around (Wollack, Goodale, Wijting & Smith, 1971). Lufi & Cohen

(1987) developed the Persistence Scale for Children which consisted of 40 items and was given to 322 Israeli children aged seven to thirteen. This scale was later used by McGiboney and Carter (1993) on 50 high school children in the DeKalb, Georgia, school system in an attempt to correlate perseverance with other personality traits. The Adult Inventory of Procrastination (McCown, Johnson & Petzel, 1989) includes items related to perseverance. In Ferrari's 1993 study, he used this instrument to measure cognitive perseverance as a factor in understanding procrastination. Other instruments with subscales that attempted to relationally or directly measure perseverance are the Persistence Subscale of the Tridimensional Personality Questionnaire (Cloninger, Przybeck, & Svrakic, 1991), Persistence subscale of the self-control scale (Tangney, Baumeister & Boone, 2004) and Persistence Subscale of the State Self-Control Scale (Twenge, Tice & Harter, 2001).

Development of the Grit Scale

The study of personality development has a long and rich history that includes theories from such esteemed scientists as Freud, Jung, Adler, Skinner, Bandura, Mischel, Rogers, Maslow and Eysenck. A cursory look at the index of any introductory psychology textbook will provide this same list; in fact, that is exactly where my list came from (Weiten, 2007). However, recent researchers have added to these well-known explanations with the construct of character strengths as the basis for personality. Donald Clifton and the Gallup Organization collected data for 30 years and developed 34 signature strengths (2001/2006). Among those related to perseverance are the strengths of Achiever, Discipline and Responsibility. Achiever explains drive and "an internal fire that brings the energy needed to work long hours without burning out" (p. 27). Discipline explains a focus on timelines and deadlines and "an instinctive method

for maintaining progress and productivity in the face of life's many distractions" (p. 45). Finally, Responsibility describes taking ownership of that to which one has committed and the "emotional bond of following through to completion" (p. 62).

In even more recent research stemming from the emergence of positive psychology, which includes the study of positive individual traits (Seligman & Csikszentmihalyi, 2000), Christopher Peterson and Martin Seligman (2007) developed a similar theory to that of the Gallup Organization that breaks down personality into 6 virtues and 24 character strengths. They described virtues as "core characteristics valued by moral philosophers and religious thinkers" (p. 13). These include wisdom, courage, humanity, justice, temperance and transcendence. They then break down these virtues into character strengths or "psychological ingredients" that make up each virtue (p. 13). The character strength of persistence is found within the virtue of courage which is defined as "the exercise of will to accomplish goals in the face of opposition, either external or internal (p. 199) and consists of the related strengths of bravery, persistence, integrity and vitality. The authors then continue to break-down each strength by definition and criterion. Persistence (perseverance) is described by Peterson and Seligman as:

Finishing what one has started, keeping on despite obstacles, taking care of business, achieving closure, staying on task, getting it off one's desk and out the door – all refer to the strength of character we identify as persistence, perseverance and industriousness. Not as flashy a strength as bravery, persistence nonetheless shares with it the mustering of will to perform in the face of contrary impulses. Here it is not the fear that threatens action but

boredom, tedium, frustration, and difficulty, on the one hand, and the temptation to do something easier and perhaps more pleasurable, on the other (p. 202).

With that definition and the theoretical foundation provided by the authors, a research team then set out to determine a method to measure perseverance in individuals.

Using the work by Peterson and Seligman (2004) as a foundation and building on her earlier research on self-discipline, Angela Duckworth began an effort to “capture the attitudes and behaviors characteristic of high-achieving individuals” consistently found in successful professionals (Duckworth, et al, 2007, 1090). The grit scale was originally 27 items that they believed held face validity for both adults and adolescents and consisted of questions with responses on a five-point scale that went from descriptions “not at all like me” to “very much like me.” Eventually, the scale was reduced to 17 items and then 12 which were grouped by the two factors of consistency of interests and perseverance of effort. These two factors were correlated at $r = .45$ and deemed acceptable. Duckworth, et al, reported that the final 12-item scale demonstrated an internal consistency of .85 for all 12 items, .84 for the factor of consistency of interests and .78 for perseverance of effort. This 12-item grit scale was used in surveys presented to the United States Military Academy Class of 2008 during Cadet Basic Training in the summer of 2004 as well as other initial studies that led to the determination of validity of the scale. The initial six studies reported in 2007 using the Grit scale were the following: Adults aged 25 and older that compared grit and levels of education; Adults aged 25 and older comparing grit and an inventory that measured the Big 5 factors of personality (John & Srivastave, 1999); Ivy League undergraduates that compared grit and grade point average;

West Point cadets that compared grit and attrition rates in Cadet Basic Training in 2004; West Point cadets that compared grit and attrition rates in Cadet Basic Training in 2006; and 2005 Scripps National Spelling Bee finalists that compared grit and placement in the final round of competition. The data for this study is the same as that collected and used in the fourth study above, West Point cadets in Cadet Basic Training in 2004. In 2008, the collection of graduation outcomes was added to that data set and make up the key variables examined in this study.

Initial Grit Studies (all studies reported in Duckworth, Peterson, Matthews & Kelly, 2007)

Study 1: The research team collected data using a link on the Authentic Happiness website (www.authentichappiness.org) and invited adult participants to complete the Grit Scale survey and provide information about educational attainment. After a year, Duckworth, et al, examined the data provided by 1545 respondents aged 25 and older (M = 45 years; 73% women, 27% men). Their findings indicated that more-educated adults scored higher on the Grit Scale than less-educated adults of equal age. This supports the notion that grit may increase as we age and that experiences are a factor in that growth and also that grit is useful in completing higher levels of education. A reported limitation is the social desirability bias since the Grit Scale is a self-report instrument and they did not compare grit with any other traits, thereby introducing the potential for observed positive associations.

Study 2: The second study also examined educational attainment and age but included control variables from the Big Five factors of personality (John & Srivastave, 1999) to determine whether grit provided incremental predictive validity over and beyond the Big Five traits. Grit was related to conscientiousness ($r=.77, p<.001$) much more than the other traits of neuroticism ($r=-.38, p<.001$), agreeableness ($r=.24, p<.001$), extraversion ($r=.22, p<.001$), and

openness to experience ($r=.14$, $p<.001$). They also concluded that individuals completing only some college were lower in grit than those who fully completed a degree program, although those that completed an Associates or Graduate degree were higher in grit than those with a Bachelor's degree. I believe that the finding regarding an Associate's degree likely relates to the fact that many who earn this degree do so while also working or fulfilling other obligations whereas the student working towards a Bachelor's degree may have less other obligations and can be more focused on the attainment of the degree without other distractions.

Study 3: After establishing relationships between grit, age and educational attainment, the Duckworth research team sought to determine if grit can predict undergraduate cumulative grade point averages at a selective institution, University of Pennsylvania. 139 undergraduates (69% women, 31% men) majoring in Psychology participated in the study. The team concluded that "gritty students outperformed their less gritty peers." (p. 1093) The relationship between grit scores and GPA was reported as $r=.25$, $p<.001$ and between SAT and GPA was $r=.30$, $p<.001$. This was the first study to show a similar relationship to academic performance by a traditional predictor (SAT) and the Grit Scale score. The researchers also noted that grit was associated with lower SAT scores ($r=-.20$, $p<.001$) and addressed the possibility that smarter students might be lower in grit while those with lower SAT scores work harder to achieve successful performance in college.

Study 4: The research team used the 2004 data at the Military Academy to examine whether grit scores could predict retention during Cadet Basic Training, the initial six weeks of military training in the summer before the first academic term. The team discovered that cadets scoring more than one standard deviation above the norm were 60% more likely to

complete summer training. This was in comparison to the self-control score (Tangney, Baumeister, & Boone, 2004) in which those one standard deviation above the norm were 50% more likely to persist. An Academy-specific admissions measure, Whole Candidate Score (derived from a combination of weighted measures like SAT, high school rank, leadership scores, community engagement scores and physical scores), did not predict summer retention. However, Whole Candidate Score was the best predictor for first-year grade point average and first-year military performance scores.

Study 5: This next study included the Big Five personality factor of conscientiousness to the previous study to predict retention during Cadet Basic Training. Grit and conscientiousness were strongly related ($r=.64$, $p<.001$) but grit ($\beta=.31$, $p<.02$) predicted summer retention better than conscientiousness ($\beta=-.17$, ns).

Study 6: 175 of 273 finalists in the 2005 Scripps National Spelling Bee participated in a study to determine if grit can predict success in this competition, measured by reaching the final round. Mean age of participants was 13.20 years of age and the gender ratio was 48% female to 52% male. The participants took three measures, the Grit Scale, the Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004) and Similarities Subtest of the Wechsler Intelligence Scale for Children-III (Wechsler, 1991). Using ordinal regression models, grit and age predicted advancement to higher rounds in the spelling bee. Verbal IQ also predicted placement in the final round but grit and verbal IQ were not closely related ($r=.02$, ns). The researchers concluded that children who scored higher in grit worked harder and longer than their peers and therefore performed better at the competition.

After completing these six studies, the research team concluded that achievement is driven by a combination of talent and effort. To be successful, talent must be present or be able to be developed; duration and direction of effort is crucial to maximizing that talent. Additionally, it is not enough to just work harder, but to do so without switching objectives. Thus, grit is best utilized when focused on an attainable goal and the commitment to that goal is unwavering. Hence, the Grit Scale can be used to provide some prediction of achievement based on an expected consistency of interest and perseverance of effort.

Chapter 3: Methodology

Upon arrival at the Military Academy at the beginning of June each year, cadets are quickly introduced to academy and military life during a six-week period known as Cadet Basic Training, also referred to as Beast Barracks because of the difficulty of the training. In addition to being taught how to stand at attention, salute, march in formation, scale walls and clear obstacles, fire individual weapons and the varied assortment of military skills, cadets are also given several surveys and assessments to determine demographics, high school activities, previous leadership roles and class placements as well as capture entering attitudes about gender, diversity and other social topics. In 2004, for the first time, this data collection included the Grit Scale to determine the grit, or perseverance, of the freshman class. These data were collected from the 1235 members of the United States Military Academy class of 2008 during the first week of Cadet Basic Training in which several surveys and academic placement tests are given to the cadets. As described above, the Grit Scale was included in a very large survey and not given as a stand-alone instrument. Cadets were informed that some of the data in the large survey would be used to better understand the composition of the class and may be used for future research. In addition to the Grit Scale, the Brief Self-Control Scale (Tangney, Baumeister & Boone, 2004), of which grit was shown to be related to ($r=.63$, $p < .001$) was included in the data collection.

As previously described, an initial study (Duckworth, Peterson, Matthews & Kelly, 2007) that utilized both scales was completed using the initial data from the 2004 survey. The demographics of this study are the same as those which I will report later. In this study, Grit predicted retention better through the difficult summer training period than self-control and an

academy-specific admissions indicator, Whole Candidate Score, which is a score derived from a formula that includes a combination of high school rank, verbal and math SAT scores, candidate leadership score and a physical aptitude exam score (USMA admissions handout, 2011).

Following this report, the grit researchers continued to examine grit in several different studies with a variety of subject samples to include another Academy class and Scripps National Spelling Bee finalists. Prior to this initial grit study at West Point, the researchers also looked at adults aged 25 and older (data collected via the website www.authentic happiness.org) in two studies and a sample of University of Pennsylvania undergraduates. Each of these six studies was reported in the 2007 article published in the Journal of Personality and Social Psychology (Duckworth, et al).

Study Questions

My examination of grit is, therefore, an extension of the original study. Where the researchers were interested in using grit to predict completion or attrition of Cadet Basic Training and later first-year achievement, my intent was to, using the same participant sample, determine whether grit can predict achievement four years later as measured by graduation outcomes. My research questions are:

1. Do Grit Scale scores predict cadet achievement as measured by several standard and academy-specific graduation outcomes?
2. Do Grit Scale scores predict achievement, as measured by standard and academy-specific graduation outcomes, as well as or better than traditional predictors?

The independent variables in this study were Grit Scale scores, SAT scores, and high school rank. These independent variables will be commonly referred to as predictors. The Grit Scale is

scored on a scale of 1 to 5 and the responses consist of *very much like me*, *mostly like me*, *somewhat like me*, *not much like me* and *not like me at all*. Half of the questions were reverse scored such that *not like me at all* is worth 5 points whereas on the other half it is only worth one point. The Scale and scoring rules can be seen in Appendix A.

Grit Scale validation

The initial grit study reported by the Duckworth research team (2007) had as a primary purpose the development and validation of the Grit Scale. An initial pool of 27 items was created based on the attitudes and behaviors characteristic of their definition of grit. Using item-total correlations, internal reliability coefficients, redundancy, and simplicity of vocabulary, they eliminated 10 items then used an exploratory factor analysis to develop a two-factor oblique solution with promax rotation. The two factors were consistency of interests and perseverance of effort and each included 6 items and the factors were correlated at $r = .45$. In a test of integrity, confirmatory factor analysis was utilized and resulted in a comparative fit index = .83 and root mean square error of approximation = .11. The final Grit Scale had high internal consistency ($\alpha = .85$). The consistency of interest factor had internal consistency of .84 and the persistence of effort factor demonstrated internal consistency of .78. This first study determined that grit was able to predict educational attainment in adults as well as an observed relationship with age (Duckworth, et al, 2007). The second grit study continued the validation of the scale and confirmed the relationships between grit, educational attainment and age as well as demonstrated incremental predictive validity over the Big Five Inventory (John & Srivastava, 1999). These studies are described in more detail in the literature review.

Dependent Variables

The dependent variables in this study were graduation outcomes and include cumulative grade point average as well as academy-specific academic, physical and military performance scores. Academic performance score cumulative (APSC) is similar to cumulative grade point average except that military science and physical education grades are not included in the APSC. Military science and physical education grades are included in the cumulative grade point average. Physical performance score cumulative (PPSC) is a collection of physical education class grades as well as graded performance on the annual Army Physical Fitness Test, Indoor Obstacle Course Test and performance in intramural and club sport activities. Military performance scores cumulative (MPSC) are made up of military science course scores and graded performance in leadership positions. All dependent variables will be commonly referred to as achievement indicators or indicators.

The primary focus was to determine the impact of grit in explaining differences in GPA since it is the only finding that is potentially generalizable outside of an academy-like environment; however, I believe that it is also informative for the Military Academy to determine the impact of grit in explaining the differences in the academy measures as well.

Control Variables

The inclusion of gender and ethnicity as control variables stemmed from the literature explaining the impact that both have in predicting academic performance. On a general basis, Astin (1993) and Jacobs (1996) found gender to predict satisfaction, grade point average, degree completion, career choice and earnings. Regarding gender, it is often reported that girls graduate from high school with higher overall GPA than males (Perkins, Kleiner, Roey, & Brown,

2004). Several studies report that women continue to outperform men on grades in college (Kimball, 1989; Willingham & Cole, 1997) despite underperforming on standardized test scores (Stricker, Rock & Burton, 1991). In 2005, Conger and Long examined why men were underperforming on grades when they performed better than women on standardized test scores. Other studies show that outcomes may be partially accounted for by gender differences in course selection (Young, 1994; Conger & Long, 2005; McCornack & McLeod, 1998).

A study by Sax & Harper (2005) examined 42 college outcomes to discern differences attributable to gender (N = 17,637 at 204 four year colleges and universities). Among those outcomes, they found that women's college grades that are higher than men's can be predicted by higher grades in high school. However, this effect is suppressed by the men's higher SAT scores and confidence in scholarly abilities; in other words, the differential between the prediction for men and women would be even greater were it not for the suppressive effect of SAT and confidence. They also found that women's higher stress levels fuel commitment towards academic performance and result in higher grades. This increased stress level may be attributable to stereotype threat in which female students feel judged based on gender instead of performance and either succumb to the judgments and perform as expected or work harder to overcome the stereotype (Spencer, Steele & Quinn, 1999). A significant stereotype that women are presented with is that they are less capable in mathematics and related subjects (Spencer, Steele & Quinn, 1999; Eccles, Jacobs, & Harold, 1990). This is supported by Kimball's (1989) findings that males performed better in college level calculus and analytical geometry courses. However, it should be noted that Kimball also found there were no gender differences

in other, less advanced math courses. This particular finding was supported by Hyde, Fennema & Lamon (1990) who reported that women perform as well as men except when the test material is increasingly advanced; then they often perform worse. Thus, there does appear to be differences in math achievement that is impacted by gender. This is important for this study because math, science and engineering are major components of the Military Academy curriculum.

Stereotype threat is not just a gender issue but also one that impacts students of color. Brown and Lee (2005) report on a variation called stigma consciousness and found that black and Hispanic academically stigmatized students who had high awareness of the stigma, or stereotype, had lower grade point averages in college coursework than those that had low awareness. They also report similar findings for women who have high awareness of stigma consciousness. Whether the cadets in this study were stigmatized is unknown, but it is prudent to assume the possibility that varying levels of stigma, as well as common stereotypes about race, gender and academic ability were present.

Vars & Bowen (1988), in examining achievement as impacted by both gender and race, report that women typically earn grades 0.07 points higher than men of the same race and that African-Americans on average have lower GPA than Caucasian students. More specifically for students of color, Allen and Haniff (1991) stated that college race is the second strongest single predictor of academic performance and gender is also strongly predictive of grades. Supporting these findings is an examination of high school grades by the National Assessment of Educational Progress that reports the trend in grade point average by race and gender. In a survey of 2005 grades, the report, which is representative of this study's population, indicates

that Asian/Pacific Islander students averaged a 3.16 grade point average, white students averaged 3.05, Hispanic students averaged 2.82 and African-American students averaged a 2.69 grade point average. Reporting by gender, female students averaged a 3.09 and males averaged a 2.86 grade point (Shettle, Roey, Mordica, Perkins, Nord, Teodorovic, Brown, Lyons, Averett, & Kastberg, 2007). Regarding Native American students, a report by Kerbo (1981) indicated that race, next to high school grade point average, was the second strongest predictor of college grade point average. Thus, differences in academic achievement are related to ethnicity at the high school level and these differences can be expected to carry over to college level performance.

Another theoretical concept regarding performance related to both gender and ethnicity is outcome expectations; women and students of color in engineering programs anticipate increased benefits upon degree attainment and this strongly influences their effort in coursework (Hackett, Betz, Casas and Rocha-Singh, 1992). The amount of engineering coursework at the Military Academy is significant for all cadets, not just engineering majors. All cadets choose an engineering track (mechanical, systems, electrical, civil, engineering management, nuclear) and are required to complete a three-course sequence. Though not discussed in the literature, it is possible to theorize that female cadets and cadets of color work harder towards admission and then degree attainment at the Military Academy knowing that the Army pay and promotion system provides equal compensation regardless of gender or ethnicity; pay is based on rank and not position and promotions are centrally managed and time-in-service based. For example, all officers in a year group are considered for promotion at the same time throughout their careers; lieutenants are promoted to captain at 3.5 years,

captains to major at 10 years, and so on. This equity is desirable and may influence students to aspire to military service and work harder to be successful at the Academy.

Given this review of the literature regarding the impact gender and ethnicity potentially have on college grade point averages, as well as a review of the data collected in this study, gender and ethnicity were included as control variables to better determine the role grit, SAT and high school rank play in explaining academic achievement at the Military Academy. It should be noted that age was also considered, however, there was not the requisite variability to include since over 82% of the cadet population is either 17 or 18 at the time of data collections.

Analyzing the Data

The data were collected by members of the research team employed by the U. S. Military Academy; specifically, data were collected and managed by Mr. Dennis Kelly, who worked in the Academy's institutional research branch, and Dr. Mike Matthews, Professor and Engineering Psychology Program Chair in the Department of Behavioral Sciences and Leadership. Mr. Kelly recoded the data as appropriate and provided the database to me. Dr. Angela Duckworth, the principal investigator for previous Grit Scale studies, provided verbal approval through Dr. Matthews for my use of the database.

The design of this study was an ex post facto design since I am simply examining the relationship between the variables following the treatment (Shavelson, 1996). It is impossible for me to determine causality so therefore this is of correlational design. My intent was to demonstrate the ability to predict achievement based on a naturally occurring relationship between the measured grit of a cadet and his or her achievement at the end of four years.

Following standard data analysis protocol, descriptive statistics were run to determine the amount of variability that exists for the independent and dependent variables. Following that analysis, the first question was addressed; controlling for age, gender and ethnicity, what is the relationship between each of the independent variables and the dependent variables? A correlation matrix was created to examine the existing relationships. In regards to the second question, whether grit scores accurately predict achievement as well as or better than traditional predictors, regression equations were utilized to examine the relationships between the variables. For example, the relationship between grit (a predictor) and cumulative GPA (an indicator) can be compared to the relationship between SAT (a predictor) and cumulative GPA (an indicator). In other words, it is a comparison between achievement predictors and achievement indicators to determine if one predictor is more accurate than the other in predicting achievement as measured by the same indicator. I ran the regression equations using Enter methodology and initially included the control variables, gender and ethnicity, to determine their impact on the variability of the dependent variable, cumulative grade point averages. I then incrementally added SAT Verbal and Math scores and high school rank to assess the added beta and finally added grit to see its impact.

This study was an examination of the relationship between scores on the Grit Scale and performance at the Military Academy. It was not my intent to compare its effectiveness as a predictor versus other psychological constructs. The original grit research team, led by Dr. Duckworth, has already begun an examination of those concepts. This study was intended to determine how well grit predicts academic achievement using a large sample of students at a highly selective and rigorous university. I expected, given a review of the literature and related

grit studies, that high grit scores would predict greater achievement among West Point cadets in the class of 2008.

Chapter 4: Data Analysis

As discussed in previous chapters, the purpose of this study is to determine if a relationship exists between the Grit Scale scores and measures of achievement at graduation. Using the United States Military Academy Class of 2008 as the sample population, Grit Scales scores were collected as part of a larger survey. The scores were calculated in accordance with procedures created by the Grit Scale development team and included as part of the overall data set collected and held by the research team that was present at the Academy. The two research questions are:

Using data collected at the United States Military Academy, and controlling for gender and ethnicity:

1. Do Grit Scale scores predict cadet achievement as measured by several standard and academy-specific graduation outcomes?
2. Do Grit Scale scores predict achievement, as measured by standard and academy-specific graduation outcomes, as well as or better than traditional predictors?

The variables of interest are defined as predictor and criterion variables. I also considered three control variables but eliminated one (age) since there was a lack of variance in the ages of the sample. The predictor variables and their associated acronyms are:

Predictor Variables

Acronyms

Grit Scores as measured by the Grit Scale

grit

SAT – Verbal

SAT V

SAT – Math

SAT M

High School Rank

HSR

The majority of cadets reported both SAT and ACT scores, however, 66 cadets reported only ACT scores. In order to include them in the analysis, their ACT scores were converted to SAT scores using a simple conversion chart (Grove, 2012). Only reported and converted SAT scores were used in this analysis. Additionally, recognizing some of the limitations in high school rank data (NACAC, 2007), the Academy uses a formula that takes into account high school class standing and the high school class size: $\text{High School Rank} = [(2 \times \text{HS standing}) - 1] / (2 \times \text{Class Size})$.

There were several criterion variables available, also referred to earlier as achievement indicators. The Academy assesses cadet performance using the traditional indicator of cumulative quality (grade) point average, but also uses internal performance indicators that represent specific areas of cadet development, i.e., academic, military and physical performance (APSC, MPSC, PPSC). The Academy also combines the three performance scores to create a cadet performance score cumulative (CPSC) that then drives order of merit listing. The only relationship that has real applicability outside of the Academy is that between grit scores and cumulative quality point average. However, I have examined the relationships with the academy-specific indicators as well for anyone who is considering other developmental programs or additional admissions criteria. Therefore, the criterion (achievement indicator) variables considered herein are:

Criterion Variables	<u>Acronyms</u>
Cumulative Quality Point Average Spring 2008	CQPA 082
USMA specific criterion variables	
Academic Performance Score Cumulative Spring 2008	APSC 082
Military Performance Score Cumulative Spring 2008	MPSC 082

Physical Performance Score Cumulative Spring 2008

PPSC 082

Cadet Performance Score Cumulative Spring 2008

CPSC 082

The following are the control variables that were considered in this study:

Control Variables

Gender and Ethnicity

(Age was eliminated due to the lack of variance in the sample, which is traditional college ages of 17-23 and over 82% in the ages of 18 or 19.)

Demographics

The Academy typically admits 1200-1300 cadets each year. During Cadet Basic Training when the survey was administered, the cadet population was 1223. Over the course of the four years, it is expected that some attrition occurs and for the Class of 2008, the graduation size was 970. The mean age for the class was 18 (age = 18.73) with the youngest and oldest cadet ages 17 and 23. The gender and ethnicity of the entering and graduating class (complete data that includes grit score and cumulative grade point average) is shown in the table below and indicates consistencies in both even after four years of attrition:

Sample size	Total	Gender	Ethnicity
N ₁ – Entering Class	1223	Male – 1029 (84.1%) Female – 194 (15.9%)	Caucasian – 942 (77%) Asian – 94 (7.7%) Hispanic – 76 (6.2%) Black – 71 (5.8%) American Indian – 14 (1.1%) Other – 15 (1.2%) Unknown/not reported – 11 (0.90%)
N ₂ – Graduation and complete data	968*	Male – 823 (85%) Female – 145 (15%)	Caucasian – 751 (77.6%) Asian – 67 (6.9%) Hispanic – 60 (6.2%) Black – 57 (5.9%) American Indian – 14 (1.4%) Other – 11 (1.1%) Unknown/not reported – 8 (0.80%)

*968 graduates also had completed the Grit Scale during Cadet Basic Training while 2 did not. Therefore, those 2 were excluded from further analysis.

Given the change in population size from cadet basic training until graduation, the sample size for this study is the 968 cadets who have completed the Grit Scale and graduated with a recorded cumulative grade point average

Descriptive Statistics for Predictor Variables, Graduates

Predictor	N	Minimum	Maximum	Mean	Std. Dev.
Grit*	968	2.15	4.95	3.8971	.45787
SAT V	968	360	800	628.01	74.432
SAT M	968	370	800	642.40	67.950
HSR	968	1	350	45.35	57.643

*Grit Scale scores are recorded on a 5 point scale.

The national means for SAT scores in 2003, the most likely scores used for Fall 2004 admissions, are 519 for SAT M and 507 for SAT V. Thus, it is easy to see that the mean SAT scores for the Academy class are significantly greater than the national averages. However, they do follow the trend of higher math scores than verbal (CEEB, 2004).

Grit can be further broken down by both gender and ethnicity to get a better understanding of the class composition as well as the reasons for including both as control variables.

Grit broken down by Gender

Gender	N	Mean	Std. Dev.
Female	145	3.9115	.46388
Male	823	3.8946	.45704
Total	968	3.8971	.45787

Female cadets scored higher, on average, than their male counterparts upon entering the Military Academy. This not necessarily surprising given some of the literature on self-discipline and gender (Duckworth & Seligman, 2005; 2006; Conger & Long, 2005) that indicates that women are more self-disciplined than men and as a result get better grades in coursework,

which has shown to be a better indicator of discipline and perseverance than standardized tests, of which men typically perform better.

Grit broken down by Ethnicity

Gender	N	Mean	Std. Dev.
Black	57	3.8400	.49423
Caucasian	751	3.9105	.45545
Asian	67	3.7830	.49150
American Indian	14	3.8701	.45717
Hispanic	60	3.9240	.44019
Other	11	3.8960	.32070
Unknown	8	3.8500	.39461
Total	968	3.8971	.45787

The only two groups that score above the mean grit score are Caucasian and Hispanic cadets with Hispanic cadets having the highest mean grit scores. This may partially be explained by sample size when comparing Caucasian and Hispanic scores but it is possible there are other factors as well. Of note, Asian cadets had the lowest grit scores but the highest cumulative grade point averages, seen in another table. Each of these raises interesting questions that deserve additional examination but will not be addressed as part of this study.

Descriptive Statistics for Criterion Variables, Graduates

Criterion	N	Minimum	Maximum	Mean	Std. Dev.
CQPA 082	968	1.985	4.127	3.05603	.470315
APSC 082	968	1.920	4.158	3.04510	.488589
MPSC 082	968	1.525	4.137	3.07620	.400347
PPSC 082	968	2.008	3.986	3.06336	.349738
CPSC 082	968	1.534	3.799	2.80258	.399847

Academy specific performance measures (APSC, MPSC, PPSC, & CPSC) are graded on a 4.0 scale just like quality (grade) point average. Cadets are given grades for performance in these areas.

Since cumulative quality point average is the criterion of which this study is most

interested, the following table breaks down the averages by gender and ethnicity. Again, the inclusion of this data is to better inform the composition of this class and also provide credence to the inclusion of gender and ethnicity as control variables.

Cumulative Quality Point Average (CQPA 082) broken down by Gender

Gender	N	Mean	Std. Dev.
Female	145	3.02677	.435248
Male	823	3.06118	.476289
Total	968	3.05603	.470315

Male cadets score higher than female cadets on cumulative quality point average.

Sample size may certainly be a factor when considering the fact that women are outperforming men on college campuses today (Conger & Long, 2005) and therefore one might expect it to be the same here. However, the percentage of men to women (85% to 15%) is drastically different than the typical college campus in the Fall of 2004 which is roughly 45% male and 55% female (CIRP, 2004). Another potential factor may be the number of engineering, math and science course in which men tend to perform better (Conger & Long, 2005). Again, these are questions worth examining but outside the scope of this study.

Cumulative Quality Point Average broken down by Ethnicity

Gender	N	Mean	Std. Dev.
Black	57	2.6675	.342782
Caucasian	751	3.08505	.468772
Asian	67	3.20925	.462552
American Indian	14	3.08129	.329660
Hispanic	60	2.97362	.425416
Other	11	2.76018	.544237
Unknown	8	2.79563	.295883
Total	968	3.05603	.470315

Asian cadets have the highest grades followed by Caucasian and American Indian cadets and these are the three groups to score above the class mean. Of note, Hispanic cadets, who

scored above the mean for grit scores are well below the mean for grades and Asian cadets scored well below the mean for grit but are the top group for grades. This might raise the question of whether there is an inverse relationship, but the trend does not hold across the sample. Future research of this sample should be considered to determine the impact of ethnicity and grades at the Military Academy.

Correlations

Correlation analysis was conducted to identify potential multicollinearity between predictor variables.

Correlation between predictor variables

		Grit	SAT V	SAT M	HSR
Grit	Pearson	1	.058	-.061	-.088**
	Sig (2-tailed)		.070	.059	.006
	N	968	968	968	968
SAT V	Pearson	.058	1	.440**	-.185**
	Sig (2-tailed)	.070		.000	.000
	N	968	968	968	968
SAT M	Pearson	-.061	.440**	1	-.182**
	Sig (2-tailed)	.059	.000		.000
	N	968	968	968	968
HSR	Pearson	-.088**	-.185**	-.182**	1
	Sig (2-tailed)	.006	.000	.000	
	N	968	968	968	968

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

As expected, a stronger relationship exists between SAT M and SAT V ($r = .440, p < .001$) than with any other predictor variable. However, this correlation analysis confirms that none of the predictor variables are too closely correlated (collinearity) to each as to prevent inferences from being made about the relative contribution of each in the regression models to follow and, as such, each will be entered.

Since I am most concerned about the relationship between the predictor variables and the cumulative quality (grade) point average, I separated the data analysis accordingly for easier viewing. Thus, the correlation between CQPA 082 and the predictor variable is seen in this table.

		Predictors			
		Grit	SAT V	SAT M	HSR
CQPA 082	Pearson	.101**	.409**	.497**	-.363**
	Sig (2-tailed)	.002	.000	.000	.000
	N	968	968	968	968

** Correlation is significant at the 0.01 level (2-tailed)

Since SAT and High School Rank are variables that have been shown to have success in predicting academic achievement [Cohn, E., Cohn, S., Balch, D. & Bradley, J. (2004); Barron, J. & Norman, M.F. (1992); Betts, J.R. & Morrell, D. (1999)], it stands to reason that they would correlate strongly with the cumulative quality point average upon graduation. But even so, those relationships can only be described as moderate. The correlation between Grit and CQPA is much weaker but still statistically significant.

The relationships between the predictor variables and the academy-specific achievement indicators (criterion) is now reported in the next table.

		Grit	SAT V	SAT M	HSR
APSC 082	Pearson	.097**	.411**	.500**	-.366**
	Sig (2-tailed)	.003	.000	.000	.000
	N	968	968	968	968
MPSC	Pearson	.218**	.170**	.169**	-.235**
	Sig (2-tailed)	.000	.000	.000	.000
	N	968	968	968	968
PPSC	Pearson	.154**	.035	.084**	-.054
	Sig (2-tailed)	.000	.282	.009	.092
	N	968	968	968	968
CPSC	Pearson	.169**	.338**	.404**	-.335**
	Sig (2-tailed)	.000	.000	.000	.000
	N	968	968	968	968

** Correlation is significant at the 0.01 level (2-tailed)

Of importance in this table is the identification of significant relationships between the predictor variables and the criterion, or achievement, indicators. The SAT scores have the strongest relationships with the academic performance scores (APSC). Grit has the strongest relationship with the military performance score and its weakest relationship is with the academic performance score. Thus, it appears that grit is a complementary measure with the traditional admissions predictors of SAT and high school rank.

Regression Equations

In order to determine the impact each predictor has in explaining the variability of the criterion, cumulative quality point average (CQPA 082), I ran the regression model in three steps. The first step included only the control variables, ethnicity and gender. Ethnicity was broken out into separate variables of Caucasian, Black, Hispanic, Asian, American Indian, Other and Unknown. The second step added the traditional predictor variables of SAT-V, SAT-M and High School Rank and the final step added grit to the model. The results are presented here step by step in order to show the changes in the model and ultimately the impact that grit and the other predictors have in explaining the variability of cumulative quality (grade) point average (CQPA 082), the achievement indicator of interest.

Step 1:

Control Variables: Ethnicity and Gender

Criterion: Cumulative Quality Point Average at graduation (CQPA 082)

Methodology: Enter

Adjusted R Square = .053; $F(7,960) = 8.680$ $p < .0005$

Variable	Beta	p
Caucasian	.289*	p=.019
Black	-.047	p=.533
Hispanic	.109	p=.156
Asian	.243*	p=.003
American Indian	.082	p=.081
Unknown	-.056	p=.075
Gender	-.008	p=.808

Approximately 5% of the variance is accounted for using just the control variables of ethnicity and gender. It should be noted however, that the ethnicities of Caucasian and Asian, are significant at the $p < .05$ level; these two races also account for the highest mean grade point averages. Also, gender does not have a significant impact on the mode. Given these results, it is expected that the predictor variables of interest (SAT, high school rank and grit) will have a larger impact on the cumulative quality point average.

Step 2:

Traditional Predictor Variables & Control Variables: SAT-V, SAT-M, High School Rank, Ethnicity and Gender

Criterion: Cumulative Quality Point Average at graduation (CPQA 082)

Methodology: Enter

Adjusted R Square = .366 $F(10,957) = 56.909$ $p < .0005$

Variable	Beta	p
Caucasian	.258*	p=.011
Black	.045	p=.465
Hispanic	.137*	p=.030
Asian	.161*	p=.015
American Indian	.099*	p=.010
Gender	-.040	p=.136
SAT-V	.183*	p<.0005
SAT-M	.357*	p<.0005
HSR	-.256*	p<.0005

When including the traditional predictor variables, approximately one-third of the variability in the cumulative quality point average at graduation is explained in this model. Each

of the three predictor variables has a statistically significant impact on the variability of the cumulative quality point average as do several of the ethnicity variables. SAT M is shown to be a better predictor of academic achievement than SAT V or High School Rank. This is likely due to the preponderance of higher SAT-M scores within the class and the fact that the Military Academy is touted as an engineering school and therefore attracts cadets that are better suited for the rigorous math, science and engineering course that make up a large part of the academy curriculum.

Step 3:

Grit Scale Scores included with Traditional Predictor Variables & Control Variables:

Grit, SAT-V, SAT-M, High School Rank, Ethnicity and Gender

Criterion: Cumulative Quality Point Average at graduation (CQPA 082)

Methodology: Enter

Adjusted R Square = .373 F(11,956) = 53.377 p<.0005

Variable	Beta	p
Caucasian	.259*	p=.010
Black	.049	p=.427
Hispanic	.136*	p=.030
Asian	.166*	p=.012
American Indian	.100*	p=.009
Unknown	.014	p=.683
Gender	-.040	p=.126
SAT-V	.176*	p<.0005
SAT-M	.367*	p<.0005
HSR	-.248*	p<.0005
Grit	.088*	p=.001

When including grit scores with the traditional predictor variables and control variables, the overall beta increases only slightly (.007) in explaining the variability in cumulative quality point average. Each of the predictor variables remains statistically significant and grit is significant at the .005 level. Again, several ethnicity variable are also significant. SAT M is

shown to be the best predictor of academic achievement as compared to Grit and the other traditional indicators. This is not surprising as in previous studies by Duckworth, et al, (2007), higher GPAs were predicted better by SAT than Grit at the University of Pennsylvania.

With the addition of gender and ethnicity, the adjusted R Square only increases slightly. Each of the predictor variables performs similarly in the regression model. Again, the traditional admissions indicators, SAT and High School Rank, have a greater impact than grit in explaining the variability of cumulative quality point average at graduation for West Point cadets.

The previous models were run in order to determine how well grit predicts academic achievement in comparison with common and traditional predictors most often used in admissions decisions. By focusing on the criterion of cumulative quality point average, also commonly referred to as cumulative grade point average, the intent is to make some generalization about the utilization of grit as a predictor of academic achievement at a selective four-year institution. As seen, grit can be used to modestly predict academic achievement but is not as strong a predictor as the much-utilized SAT measures and high school rank, both of which are certainly representative of academic achievement in high school.

Academy-Specific performance indicators

Due to the particular needs of the U.S. Army, West Point does evaluate and rank its cadets in more than just academic achievement; it also uses physical and military evaluations and calculates related performance scores. Thus, it is informative to assess the predictive nature of Grit in these other distinctive performance areas, even though the findings will not be generalizable to other institutions. I will not repeat this exercise for the variable of APSC 082

(academic performance score cumulative) since it is largely made up of academic grade point average and therefore will have similar results as those for cumulative quality point average.

In this next model, I include the variables of gender and ethnicity.

Predictors: Grit, SAT V, SAT M, High School Rank

Control Variables: Gender & Ethnicity

Criterion: MPSC 082 (Military Performance Score Cumulative)

Methodology: Enter

Adjusted R Square = .130; $F(11,956) = 14.172$ $p < 0.0005$

Predictor Variable	Beta	p
Grit	.203*	$p < .0005$
SAT V	.062	$p = .072$
SAT M	.085*	$p = .018$
HSR	-.187*	$p < .0005$
Gender	.020	$p = .527$
Caucasian	.296*	$p = .013$
Black	.064	$p = .381$
Hispanic	.125	$p = .090$
Asian	.223*	$p = .004$
American Indian	.114*	$p = .012$
Unknown	.063	$p = .112$

In terms of predicting military performance scores, this model explains approximately 13% of the variability in the military performance score cumulative. However, unlike academic achievement where SAT and High School Rank are the best predictors, grit appears to slightly better predict achievement in military performance than high school rank and more significantly predict better than SAT scores. The military performance score cumulative is made up of military science courses and leadership grades based on performance in military training or in a cadet leadership position. A grade of A+ through F can be given to a cadet based on overall impression of performance. There are no points or score-based measurements used to assess military performance or leadership. Instead, cadet cadre and active duty military cadre

make subjective assessments based on observations of performance. It is possible that the characteristics that make up a “gritty” individual may be readily apparent while observing performance on a difficult training mission; the harder a cadet tries to be successful may certainly influence a subjective evaluation of his or her overall military performance. Despite this potential limitation in assessment, grit is still a valuable predictor in military performance.

The next USMA specific criterion to be considered is the physical performance score.

Predictors: Grit, SAT V, SAT M, High School Rank
Control Variables: Gender & Ethnicity
Criterion: PPSC 082 (Physical Performance Score Cumulative)
 Methodology: Enter

Adjusted R Square = .040; F(11,956) = 4.619 p<0.0005

Predictor Variable	Beta	p
Grit	.157*	p<.0005
SAT V	-.043	p=.231
SAT M	.102*	p=.007
HSR	-.022	p=.499
Gender	-.054	p=.096
Caucasian	.361*	p=.004
Black	.129	p=.091
Hispanic	.167*	p=.032
Asian	.201*	p=.013
American Indian	.070	p=.139
Unknown	.056	p=.176

This set of predictor variables explains approximately 4% of the variance in physical performance. However, like military performance, another non-academic achievement measure, grit still predicts better than its traditional academic prediction partners. The components of the physical performance score are grades in physical education courses as well as grades on physical fitness tests. Many physical education courses have a theoretical component and therefore some academic rigor. The Army Physical Fitness Test is an

assessment of overall fitness in three events, 2-minute push-up, 2-minute sit-up and 2-mile run. Repetitions and run times correlate to scores in a table that range from 0-100; a maximum score is a 300 and also correlates to a grade of A+. Similarly, the Indoor Obstacle Course Test is measured by time and also converted to a letter grade with corresponding quality points. Hence, the physical performance score cumulative is an accumulation of letter grades that make up a cumulative quality point average but only for selected physical events as describe. Thus, grit is a significant predictor of physical performance and therefore very useful for admissions personnel to make difficult decisions on candidates that may be similar in academic performance but score differently on the requisite admissions physical performance events.

The last USMA specific criterion is the Cadet Performance Score Cumulative (CPSC 082). This score is a combination of academic, military and physical performance across the entire four years of a cadet’s experience and is used to create the order of merit list that ranks all cadets for the purposes of ordering the selection of branch, dates for officer training and first military unit of assignment. Given that the Academy weights academic performance greater than the other two, the expectation is that the traditional academic predictors of SAT and High School rank will better predict performance in this category. This model was run in a similar pattern as the previous ones.

Predictors: Grit, SAT V, SAT M, High School Rank

Control Variables: Gender & Ethnicity

Criterion: CPSC 082 (Cadet Performance Score Cumulative)

Methodology: Enter

Adjusted R Square = .293; $F(11,956) = 37.386$ $p < 0.0005$

Predictor Variable	Beta	p
Grit	.156*	$p < 0.0005$
SAT V	.132*	$p < 0.0005$

SAT M	.291*	p<0.0005
HSR	-.236*	p<0.0005
Gender	-.030	p=.281
Caucasian	.336*	p=.002
Black	.078	p=.235
Hispanic	.162*	p=.015
Asian	.223*	p=.001
American Indian	.118*	p=.004
Unknown	.041	p=.249

As seen in the results of the model above, the included predictors and control variables are able to explain approximately 29.3% of the variance in overall cadet performance scores.

As expected, given the additional weight towards academic performance in CPSC, SAT M appears to be the best predictor followed by High School Rank and then Grit. However, as previously seen, all the criterion variables have a significant relationship with the cadet performance score cumulative and therefore may be used as predictors in admissions decision.

Attrition Data

West Point also captures attrition data and codes 14 reasons for loss. These reasons vary from resignation or separation for honor, motivation, misconduct, medical and academic and military development deficiencies. The two reasons for loss that may most likely be explained by the amount of Grit a cadet possesses are coded as “resigned motivation” and “resigned new cadet training.” It may be interesting to identify whether cadets who resign for these two reasons scored lower in Grit than their peers who continued to graduation.

<u>Reason for loss</u>	<u>Grit Mean</u>	<u>N</u>	<u>Std. Dev.</u>
Resigned new cadet training	3.6273	71	.48878
Resigned motivation	3.8539	112	.51509
Class of 2008 (minus losses)	3.8971	968	.45787

Of additional interest is the examination of the characteristics of all cadets who did not graduate. Below is a chart that summarized those characteristics

Descriptive Statistics for Cadets who did not Graduate

Predictor	N	Min.	Max	Non-Grad Mean	Non-Grad SD	Grad Mean	Grad SD
Grit*	250	2.35	5.00	3.8081	.49013	3.8971	.45787
SAT V	253	440	800	625.55	74.814	628.01	74.432
SAT M	253	460	800	641.46	71.358	642.40	67.950
HSR	253	1	438	56.97	71.426	45.35	57.643

A cursory examination of these data shows the differences between the descriptives of non-graduates and graduates. Further study of these data may indicate that Grit is an effective predictor of attrition of either new cadets during the summer training or any cadet that decides to voluntarily leave during the ensuing academic years and before graduation. This may identify a more effective utilization of Grit as an admissions measure for a selective institution. These data are presented only for consideration for future study and are not meant to be considered part of this study.

Chapter 5: Conclusions

Introduction

This study examines the ability of one measure, Grit, to explain variability in another, cumulative grade point average. It is a very traditional design and includes data collected only at two times, cadet basic training and graduation. Additionally, this study is very specific in that, with the exception of cumulative grade point average, it also considers other graduation outcomes that only exist at the Military Academy. Therefore it certainly has several limitations, which will be discussed later. Nonetheless, this study's intent was to examine whether grit scale scores could be used to predict academic achievement and the analysis provided a useful response to that query.

Research Objectives: Summary of Findings and Conclusions

Two questions were examined in this study: Do grit scale scores predict academic achievement as measured by cumulative grade point average and do grit scale scores predict as well as or better than traditional admissions predictors? Previous studies using grit (Duckworth, et al, 2007) indicated that SAT slightly predicted academic performance better than scores from the Grit Scale. The grit data collected at the United States Military Academy during cadet basic training in the summer of 2004 that was then compared to the graduation outcomes for those same students in 2008 indicates that there does exist a significant relationship between the grit scale scores and cadet cumulative grade point average. That relationship, though statistically significant, is not particularly strong and, therefore, not a good stand-alone measurement of academic achievement. It remains clear that other predictors like standardized achievement scores and high school rank also provide legitimate explanations for cumulative grade point

average. Therefore, the Grit Scale should be used in conjunction with existing indicators to strengthen overall confidence in admission decisions.

Regarding the second question about how well grit compares to traditional admissions predictors, the regression analysis does indicate that grit provides a statistically significant explanation for the variability in cumulative grade point averages. However, once again, SAT scores and high school rank also provide viable predictions for success and in fact, explain a greater portion of the variability than grit does. The control variables of gender and ethnicity do not provide statistically significant explanations for the variability in cumulative quality point averages, though the literature leads to a prediction that achievement by women would likely be underpredicted. The effect of gender was not significant and therefore not a predictor for success at the Military academy.

However, Grit Scale scores are a stronger predictor of military and physical performance scores. Since athletic prowess is often about honing skills over time with repetition and consistent effort, it stands to reason that higher levels of grit would predict increased performance in physical performance events. Also, military performance at the Academy is primarily a subjective assessment which is easily swayed by observations of commitment and effort; it is easy to see how cadets who typically work harder on challenging missions might be graded higher.

The Academy values performance across several domains and seeks to create an Army leader that is measured by more than grade point average. It needs leaders who are adaptive, committed and dedicated and able to persevere over time to accomplish difficult and complex missions. Recent operations in Iraq and Afghanistan are excellent examples of the current need

for “gritty” individuals who stay the course to accomplish an objective. Therefore, Grit is an extremely useful measure for the Academy in its selection of cadets and future leaders of the U.S. Army. The simplest implementation is to include the Grit Scale as part of an admissions application packet. However, the scale is only accurate if the respondent answers truthfully; a young candidate with dreams of attending the Academy might be tempted to answer in a manner that is deemed desirable and render the data inaccurate. An alternate method might be to include the survey as part of the required interview in a setting in which the Academy representative can either reinforce the importance of answering truthfully or discern the answers from interview questions. Nonetheless, if an accurate score can be collected, the Grit Score will provide Academy admissions a very useful measure to make a confident decision about an applicant. For institutions other than the Academy, given that grit, combined with traditional indicators, explains about a third of academic achievement, the Grit Scale is likely useful for institutions that seek to develop students holistically and use several measures to confirm that achievement.

Limitations

As the primary grit researchers, Duckworth and her team list several limitations in using the Grit Scale (2007). I will list the appropriate ones since this study is an extension of their work and some of the same limitations apply. The first is the use of a self-report measure that is “particularly vulnerable to social desirability bias” (2007, p.1099). Even with the promise of anonymity and the spreading of the questions throughout a large survey, participants may still answer in the manner that portrays how dedicated to achieving a long-term goal they want to be and not actually are. However, in previous studies, Duckworth, et al (2007), controlled for

other factors that also used self-report measures when comparing impact of grit on other types of achievement and argued that strong correlations would provide credence to their conclusions and limit the social desirability bias.

Another reported limitation is that the Grit scale requires reflection on past behavior to predict future actions. They believe that this brings into question the concept of grit as a personality trait; instead it may simply be a measure of past behavior. They do not attempt to counter this as it was out of scope of their research and begs much larger theoretical questions.

Their last related limitation is that their findings do not explain fully the relationships between grit and other closely related concepts like self-control, optimistic explanatory style (Seligman & Schulman, 1986) and self-efficacy. They recommend future research to better discern between these potentially complementary explanations.

A specific limitation of this study is that it was not a pre-test/post-test design. Grit scores were not collected at graduation. Though they were not necessary to conduct this study, it would have been informative to compare the means of grit scores at graduation with the graduation outcomes as well as the grit score as a freshman compared to the grit score as a graduating senior. This is not necessarily a limitation if you believe that grit is a stable personality factor that does not change much over time, but for those that believe that personality can change, it will be informative to determine if grit increases over time and what types of experiences might cause the increase, or even potential decreases. This ties into other potential limitations and requires additional research to confirm whether grit changes over time.

Another limitation of this study is lack of variability in age of participants. Though my question and sample was appropriately limited to cadets at the United States Military Academy, it raises questions about the generalizability to campuses or organizations that might have less traditionally-aged students or employees. Finally, this study sought to determine whether grit can predict academic achievement; however, academic achievement was defined only as cumulative grade point average and did not take into account any differences between the rigors of the different academic programs. A more detailed analysis might include the determination of the means of academic majors and attempt to normalize those to control for consistent differences between certain majors. Having stated that, it also must be understood that the Military Academy has a very defined and directed core course load, or general education requirements, which every cadet must take. So, the impact of choice of majors may actually have less impact than at other institutions where the general education requirements are less defined or non-existent.

Recommendations for future research

A pre-test/post-test examination of grit scores would be useful to provide insight on whether grit scores can change over time. It is easy to posit that successful completion of a rigorous academic course of study combined with stressful military training and demanding physical activity would lead to greater confidence and therefore increased likelihood of more persistent behavior over time. However, if grit is considered a personality construct, then it may not be very malleable. Opinions differ on how much personality traits change as we age, so it is of value to determine if grit can increase or decrease over time. This concept certainly

brings into play the close relationship that perseverance has with self-efficacy and ability so those factors would have to be considered as part of the research.

If it can be demonstrated that grit scores can increase over time or as the result of demanding experiences, then the next step would be to determine what types of activities do, in fact, increase grit scores. A very simple analysis that I can complete given my position as a boxing coach would be to sample the grit scores of freshman boxers at the beginning of the year and the end of the year and compare to see if change occurred. Additionally, for those boxers who participate for four years, a longitudinal review might provide insight into whether grit increases incrementally or drastically over time. For example, does one year of boxing cause drastic increases with little change over the remaining three years or does the grit score increase a little each year? Does success create greater increase? What are the grit scores of the athletes who quit the sport? Is quitting caused by a lack of grit or by a lack of success or perceived ability?

Beyond boxing or other sports-related activities, what are the other campus activities that might have positive impact on Grit Scale scores or be explained better by examining grit scores? Regarding academic ventures, it might be interesting to determine if participation in Honors programs or specific academic majors cause significant increases in Grit Scale scores. Regarding grit-based predictions, are there differences between perseverance levels of out-of-state students that remain on campus following freshman year as compared to those that choose to transfer to a campus that is closer to home? Do stop-outs or drop-outs have lower grit scores? There are several questions that can be addressed with the appropriate experimental design. Many of these may also begin to discern the differences between the

related theories of self-control and self-efficacy as well as bring to light social or economic variables that may also impact Grit Scale scores.

As alluded to in Chapter 4, Grit appears to have potential as a predictor of attrition. New cadets who resigned during difficult summer training had a mean Grit score of 3.6273. Cadets who resigned later during the following academic years and reported a lack of motivation as the reason for leaving had a mean Grit Score of 3.8539 and the mean Grit Score for all cadets that entered in 2004 but did not graduate with the Class of 2008 had a mean Grit Score of 3.8081. Each of these are lower than the mean Grit Score of cadets who graduated in 2008 (Grit = 3.8971). This may be an area where grit provides real value to admissions officers; the ability to predict with confidence applicants that are more likely to persist to graduation.

Contribution to Knowledge

The contribution of this research, given the stated limitations, is more evidence that the Grit Scale does, with some level of accuracy, predict academic achievement and that it can be combined with, and not replace, existing traditional admissions predictors to make better admissions decisions. Additionally, this study indicates that there are other types of achievement that the Grit Scale might measure as well or better than existing predictors. It also highlights several areas of potential research to better understand the impact of Grit and how best to measure it. Thus, the research landscape is fertile given that the Grit Scale was developed fewer than 10 years ago and there are still few grit-specific studies that are completed and reported.

Appendix 1: 12-Item Grit Scale

Directions for taking the Grit Scale: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

1. I have overcome setbacks to conquer an important challenge.
 - Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all

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

3. My interests change from year to year.
 - Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all

4. Setbacks don't discourage me.
 - Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all

5. 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

6. I am a hard worker.
- Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all
7. 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
8. 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
9. I finish whatever I begin.
- Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all
10. I have achieved a goal that took years of work.
- Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all
11. I become interested in new pursuits every few months.
- Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all

12. I am diligent.

- Very much like me
 - Mostly like me
 - Somewhat like me
 - Not much like me
 - Not like me at all
-

Scoring:

For questions 1,4,6,9,10 and 12 assign the following points:

- 5 = Very much like me
- 4 = Mostly like me
- 3 = Somewhat like me
- 2 = Not much like me
- 1 = Not like me at all

For questions 2,3,5,7,8 and 11 assign the following points:

- 1 = Very much like me
- 2 = Mostly like me
- 3 = Somewhat like me
- 4 = Not much like me
- 5 = Not like me at all

Add all the points and divide by 12.

The Maximum score on this scale is 5 (extremely gritty) and the lowest score on this scale is 1 (not at all gritty).

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