

ABSTRACT

Title of thesis: A REPLICATION AND EXTENSION OF PSYCHOMETRIC RESEARCH ON THE GRIT SCALE

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“Grit,” a “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087), is important for academic success, but the field has not fully explored how grit functions as a distinct construct within the motivational literature or across ethnically and socioeconomically diverse samples.

This pilot study replicated and extended Duckworth’s seminal grit studies (e.g., Duckworth et al., 2007; Duckworth & Quinn, 2009) by examining grit’s psychometric properties, its relation to other predictors of achievement, and its predictive validity, above related constructs and demographics, for literacy achievement among 33 low-income, ethnic minority high school students. Participants completed online questionnaires assessing their grit, engagement, stress, conscientiousness, and self-control, and took a brief reading assessment. Results suggest that grit may function differently in low-income minority students facing barriers to long-term academic achievement, and that grit’s relation to student achievement may not be as clear-cut as what has previously been claimed.

A REPLICATION AND EXTENSION OF PSYCHOMETRIC RESEARCH ON THE
GRIT SCALE

by

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TABLE OF CONTENTS

List of Tables.....	iv
List of Figures.....	v
Chapter 1: Introduction.....	1
Current Study.....	2
Chapter 2: A Review of the Literature.....	3
Psychoeducational Factors and Academic Success.....	3
Understanding Academic Success within a Motivational Framework.....	3
Grit.....	5
Definition of the construct.....	5
Development of the Grit Scale.....	7
Preliminary psychometric assessments of the Grit Scale.....	8
Grit and convergent validity variables.....	11
Ethnic Minority Student Grit	12
Ecological Risk Factors.....	12
Psychoeducational Protective Factors.....	14
Limitations in the Grit Research.....	14
Grit in Diverse Student Populations.....	14
Distinction of Grit from Other Constructs.....	16
Hypotheses.....	19
Chapter 3: Methods.....	22
Sample.....	22
Procedures.....	24
Measures.....	26
Demographic information.....	26
Psychoeducational Variables.....	26
Grit.....	26
Conscientiousness.....	27
Engagement.....	27
Self-control.....	28
Stress.....	29
Achievement.....	29
Analysis.....	30
Chapter 4: Results.....	36
Psychometric Properties of the Short Grit Scale.....	36
Grit's Relation to Stress and to Psychoeducational Predictors of Achievement...38	
Grit's Relation to Academic Achievement and Power to Predict Academic Outcomes..41	
Chapter 5: Discussion.....	48
Psychometric Functioning of Grit in Minority, Low-Income High School Students.....	48

Age-Related Grit Differences.....	49
Convergent and Discriminant Evidence for Grit’s Construct Validity.....	50
Grit’s Relation to, and Power to Predict, Achievement Outcomes.....	53
Limitations.....	55
Appendix.....	58
References.....	59

LIST OF TABLES

Table 1. Comparison of items in Short Grit Scale, Brief Self-Control Scale, and Conscientiousness subscale of the Big Five Inventory.....	18
Table 2. Psychometric properties of the major study variables.....	32
Table 3. Short Grit full-scale and individual item descriptives.....	37
Table 4. Factor loadings for exploratory factor analysis with direct oblimin rotation of Grit Scale.....	39
Table 5. Factor loadings for two-factor extraction with direct oblimin rotation of Grit Scale.....	39
Table 6. Factor loadings for one-factor extraction of Grit Scale.....	40
Table 7. Correlations between grit, stress, and psychoeducational factor scales.....	42

LIST OF FIGURES

Figure 1. Results of a two-way ANOVA representing interaction effects of grit and stress on literacy achievement.....	45
Figure 2. Results of a two-way ANOVA representing interaction effects of grit and stress on GPA.....	46

Chapter 1: Introduction

“Grit” is becoming a buzzword in scholarly and popular education circles. The term grit appears on parenting blogs (e.g., Carter, 2013) and in *New York Times* best-selling books on education reform (e.g., Tough, 2012). It has appeared on the lips of everyone from an Ivy League researcher recently given a MacArthur Genius Award for grit research (Hanford, 2012) to elementary school principals (e.g., Hoerr, 2012). Defined as a “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087), grit joins a collection of psychoeducational factors (e.g., engagement, self-control) predicting academic success. Early research concludes that grit is essential for success, and a movement has followed to develop and fund interventions that foster grit in students of all ages (e.g., Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2011; Shechtman, DeBarger, Dornsife, Rosier, & Yarnall, 2013). Some educators even recommend deliberately exposing students to failure, in order to help them foster the grit necessary to overcome obstacles (i.e., Hoerr, 2012; Olszewski-Kubilius, 2012).

Grit research has, however, gotten ahead of itself. The field has not yet established adequate psychometric validity of grit as a distinct measure within the motivational literature or across diverse samples. Construct validity needs to be improved via further convergent and discriminant evidence, using a broader range of comparison measures. The generalizability of validity and internal consistency statistics across samples can be improved by reaching past middle- and upper-class, older students to include younger ethnic minority students with more socioeconomic diversity. Specifically, students who experience the double jeopardy of ecological obstacles to

school success (e.g., stress, poverty) *and* minority status (Natriello, McDill, & Pallas, 1990) may be most in need of resilience factors such as grit. We do not yet know, however, if these students display grit differently than more advantaged samples, or if grit is a protective factor for them. Therefore, it is important to assess how grit functions and relates to academic achievement in a more diverse, economically disadvantaged student sample.

Current Study

The current study replicated and extended Duckworth's seminal grit studies (e.g., Duckworth et al., 2007; Duckworth & Quinn, 2009). Specifically, I examined (1) the psychometric properties of the Short Grit Scale, (2) grit's relation to other psychoeducational predictors of achievement, and to stress, and (3) grit's ability to explain unique variance in academic achievement outcomes, over and above other psychoeducational factors. Results suggest that grit may function differently in low-income, minority students facing barriers to long-term academic achievement, and that grit's relation to student achievement may not be as clear-cut as what has previously been claimed. However, results are tentative due to the current study's small sample size.

Chapter 2: A Review of the Literature

Psychoeducational Factors and Academic Success

Although IQ has long been a popular predictor of academic achievement (see Kaufman & Lichtenberger, 2005, for review), the past 15 years have shown an explosion of scholarly interest in character-based “noncognitive” or “psychoeducational” predictors of school success. These factors give rise to effortful, goal-oriented behaviors that facilitate school achievement in diverse groups of students (e.g., Kahn, 2013; Tough, 2012), have a motivational basis (Appleton, Christenson, & Furlong, 2008; Liem & Martin, 2012; Park, Holloway, Arendtsz, Bempechat, & Li, 2012; Pintrich & DeGroot, 1990), and are paths to academic resilience for at-risk students (e.g., Dennis, Phinney, & Chuateco, 2005; Ream & Rumberger, 2008). The predictors include self-control (Tangney, Baumeister, & Boone, 2004), conscientiousness (e.g., Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011; Corker, Oswald, & Donnellan, 2012; Richardson & Abraham, 2009; Trautwein, Lüdtke, Roberts, Schnyder, & Niggli, 2009), and engagement (e.g., Appleton et al., 2008; Christenson, Reschly, & Wylie, 2012; Park et al., 2012), among others. Grit, another goal-oriented characteristic, may support student success in a similar way, although neither the links between grit and other psychoeducational factors, nor the functioning of grit in disadvantaged minority student samples, has been fully examined.

Understanding Academic Success within a Motivational Framework

It is important to include a brief overview of motivation here so that we have a theoretical framework within which to consider grit’s influence on academic achievement. Motivational theory provides a multidimensional framework that is crucial

to understanding student academic behaviors (see Wentzel & Wigfield, 2009; Wigfield & Wentzel, 2007, for reviews). “Motivational theories,” explains Paul Pintrich, “are concerned with the energization and direction of behavior” (2003, p. 669). Although Duckworth and colleagues do not directly link grit to motivation, they encapsulate that same energy and focus when defining grit: “Grit entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress” (2007, pp. 1087-1088).

Motivation is the “why am I doing this?” of any behavior, the answer to which justifies deliberate investment of time, effort, and talents to one activity over another (Maehr & Meyer, 1997). It embodies “individuals’ energy and drive to learn, work effectively, and achieve to their potential” (Liem & Martin, 2012, p. 3). Motivation includes emotional (i.e., Appleton et al., 2008), cognitive (i.e., Wigfield & Eccles, 2000; Liem & Martin, 2012), and behavioral components, which all interact to develop long-lasting academic behaviors (Wentzel, 1998).

Motivation has been called an “academic enabler” (DiPerna, Volpe, & Elliott, 2001) in that it promotes behaviors such as staying on task and using self-control when studying (Pintrich & DeGroot, 1990), persistence and homework completion (e.g., Liem & Martin, 2012), class participation (e.g., Ryan & Deci, 2000), and school attendance (Green, Liem, Martin, Colmar, Marsh, & McInerney, 2012), all of which correlate with higher grades or GPA (e.g., Miserandino, 1996; Richardson & Abraham, 2009).

Motivation is also closely connected to the construct of engagement, an active emotional, cognitive, psychological, or behavioral involvement in learning (Appleton et al., 2008; Park et al., 2012). Although not explicitly theorized as a motivational construct, grit’s

definition has the necessary components to fall under the umbrella of motivation. It involves the emotion of “passion,” the cognitive beliefs and values that align with setting “long-term goals,” and the goal-pursuit behavior of “perseverance” (Duckworth et al., 2007, p. 1087). Preliminary research suggests that it too may enable academic behaviors (Duckworth et al., 2007).

Grit

Definition of the construct. Grit is the newest construct to join the collection of psychoeducational promoters of school achievement. Angela Lee Duckworth and her team of researchers at the University of Pennsylvania first became interested in the concept of grit during a series of interviews with professionals about leadership in a variety of fields. Over and over again, terms like tenacity, ambition, and perseverance were mentioned as intrinsic qualities of the top performers, so researchers proposed a new term, *grit*, to encapsulate what all of these characteristics seemed to have in common: sustained commitment to ambitions (Duckworth et al., 2007). They set out to discover if grit further explained why people of the same intelligence had different achievement outcomes (Duckworth et al., 2007).

Drawing from the qualitative studies of trait theorists such as William James, Francis Galton, and James Cattell, Duckworth and colleagues made a theoretical argument for how grit reflects the common traits of commitment, perseverance, and deliberate practice associated with society’s most successful individuals (Duckworth et al., 2007). They nest grit within the Big Five model of personality traits, which is useful in conceptualizing qualities (e.g., conscientiousness) that predict both vocational and educational achievement. Preliminary research suggests that, similar to other personality

traits (McCrae et al., 1999; Srivastava, John, Gosling, & Potter, 2003), grit matures systematically with age and changing life responsibilities (Duckworth et al., 2007). In a sample of high-achieving middle- and high school students (58% White, 20% Black, 16% Asian), however, grit scores remained stable over one year ($r = .68$; Duckworth & Quinn, 2009). Preliminary findings suggest that grit does not function differently in male vs. female children, adolescents, or adults (Duckworth & Quinn, 2009), although two poster presentations unaffiliated with Duckworth's research team found that 4th-8th grade girls had significantly higher grit scores than their male classmates (Rojas, Reser, Usher, & Toland, 2012; Rojas & Usher, 2012).

Grit has two core components: consistency of interests and perseverance of effort (Duckworth et al., 2007). Consistency of interests can be understood as constant effort toward and interest in a single goal, or “purposeful, continuous commitment to certain types of activities versus sporadic efforts in diverse areas” (Willingham, 1985, p. 213, as cited in Robertson-Kraft & Duckworth, 2013, p. 10). Perseverance of effort can be explained as strenuous and unwavering commitment to a goal in the face of challenges, repeated failures, setbacks, absence of positive feedback, and disappointments. “The gritty individual,” Duckworth and colleagues explain, “approaches achievement as a marathon; his or her advantage is stamina” (2007, p. 1088).

It is this long-term stamina and pinpoint focus, Duckworth argues, that distinguishes grit from other factors within the motivational framework. While motivation helps individuals work hard and complete their everyday academic responsibilities, it does not necessarily help individuals pursue “personally valued goals over the course of *months and years*” (Duckworth & Eskreis-Winkler, 2013, Measuring

Individual Differences in Grit section, para. 2). Additionally, having motivation requires a belief in the feasibility of attaining one's chosen goal (e.g., Wigfield & Eccles, 2000). This implies that motivated students will set a goal that is neither too easy nor too hard in order to experience success and obtain positive feedback that fuels a sense of competence and subsequently more motivation (e.g., Ryan & Deci, 2000). In contrast, "individuals high in grit deliberately set for themselves extremely long-term objectives and do not swerve from them—even in the absence of positive feedback" (Duckworth et al., 2007, p. 1089). Grit, thus, may build upon existing motivational theory by further identifying within the pool of motivated students the especially dedicated individuals who will mostly likely reach the highest pinnacles of success over time, amid the most daunting obstacles.

It must be noted at this point that grit has been theorized as a stable trait, but it can (and should) also be conceptualized as a dynamic state. Personality research shows that traits such as curiosity (Kashdan & Steger, 2007) and anxiety (Spielberger, 2010) also have state-like components. In other words, while an individual may maintain a stable mean score on a trait from one year to the next, s/he may vary on her average level of that trait from day to day, in response to her mood and situational factors. Likewise, grit as it applies to academic achievement may be situational, subject-specific, or influenced by students' variable beliefs, values, and emotions. The sole published grit-fostering intervention (Duckworth et al., 2011) suggests that grit is dynamic and malleable, but more research needs to be done to confirm the state-like side of grit.

Development of the Grit Scale. Duckworth and colleagues intended the 12-item Grit Scale (Grit-O; Duckworth et al., 2007) and the 8-item Short Grit Scale (Grit-S;

Duckworth & Quinn, 2009) to produce valid scores for both adults and adolescents, to have a low likelihood of ceiling effects in high-achieving populations, and to have face validity in a wide variety of achievement domains. They carried out a series of psychometric studies to assess grit's factor structure, its functioning within a variety of high-achieving, largely Caucasian student populations, and its relationship with achievement, IQ, and two traditional psychoeducational predictors of success: conscientiousness and self-control.

The researchers first confirmed the psychometric soundness of the Grit-O in a large, educationally diverse sample of adults ($N = 1,545$; $M = 45$) recruited from the researchers' website. They then shortened the scale after analyzing the adult data as well as data obtained from five distinct samples of children, adolescents, and adults. In the 12-item scale, the items loaded onto the two-factor theoretical structure of a) consistency of interests and b) perseverance of effort, and the factors were moderately intercorrelated ($r = .45$). The researchers removed the two items in each factor with the weakest correlations with outcome variables, which resulted in the 8-item Grit-S. The 12-item scale had high internal consistency ($\alpha = .85$), and the 8-item scale showed acceptable internal consistency (ranging from .73-.83 across the non-adult samples).

Preliminary psychometric assessments of the Grit Scale. Adult grit, measured by both versions of the scale, had positive correlations with educational attainment and age. Grit accounted for 4.8% of the variance in educational attainment after controlling for age. In another adult sample ($N = 706$) where all participants had at least some college education, grit showed a moderately strong, positive correlation with conscientiousness ($r = .77$). No additional demographic information was provided about the participants.

In a sample of 139 undergraduate psychology students from the University of Pennsylvania (69% female; no other demographic data reported), grit had a moderately weak, positive correlation with GPA and accounted for 6.8% of its variance. In a sample of 1,218 freshman West Point cadets (84% male; 77% Caucasian), grit scores had a moderately strong, positive relation to self-control ($r = .63$). Grit was a better predictor of completion of summer basic training than both self-control and a composite measure of previous high school achievement. Contrary to expectations, both self-control and grit showed rather weak correlations with GPA ($r = .13$ and $.06$, respectively). The researchers justified the contradictory findings by claiming that surviving the intensity of summer training requires more long-term commitment and perseverance, while achievement during the first academic year only requires shorter-term, task-to-task self-discipline. A similar sample of 1,308 cadets revealed a comparable correlation between grit and conscientiousness ($r = .64$), and grit once again predicted completion of summer training better than either conscientiousness or previous achievement.

In two samples of child and adolescent finalists in the 2005 Scripps National Spelling Bee ($N = 175$ and 190 ; ages 7-15), grit predicted advancement to higher rounds of the competition better than both self-control and conscientiousness. Grit did not, however, predict advancement any better than verbal IQ, after controlling for participant age. Hours of weekend studying and overall prior spelling practice mediated the relationship between grit and final round achieved, which suggests that grit may promote achievement by giving rise to academic behaviors. No other demographic information was provided for this sample.

Most relevant for the current study, grit was tested in two diverse student samples. One study included a more ethnically- (only 58% White) and economically-diverse (18% received free or reduced-price lunch), high-achieving middle and high school student sample (Duckworth & Quinn, 2009). Grit scores showed good test-retest reliability one year later ($r = .68$), and baseline grit showed a positive correlation with GPA ($r = .30$) and negative correlation with TV watching ($r = -.24$) one year later. Although the researchers confirmed that the scale produced internally reliable scores ($\alpha = .82$ and $.84$), they did not evaluate the scale's factor structure or correlations with other motivational variables, which is necessary to fully understand the mechanisms promoting achievement in diverse populations. Neither did they report on whether any differences were found between racial groups.

The other study, a large sample of high school juniors ($N = 4,813$) in the Chicago Public School District (Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014), improved upon the Duckworth and Quinn study by examining grit's relation to achievement in a majority-minority sample (45% Hispanic, 43% African American, 6% White, and 5% Asian) and by comparing grit to other psychoeducational supports relevant to school success. Scores from a simplified 4-item grit scale ($M = 3.89$, $SD = .89$) correlated with standardized achievement test scores (a composite of reading and math performance; $r = .15$). Scores also had moderate correlations with academic conscientiousness ($r = .49$) and school motivation ($r = .49$), and predicted high school graduation more than a year later ($OR = 1.48$). Being female and being African American were weakly correlated with having more grit ($r = .14$ and $.07$, respectively, $p < .001$), while being Hispanic was weakly correlated with having less grit ($r = -.08$, $p < .001$). Finally, when controlling for

demographic and motivational variables, grit still added unique power to predict graduation ($OR = 1.21, p < .001$). The current study builds on this preliminary research by more rigorously testing grit's psychometrics in a low-income minority sample, and by using full scales of multiple psychoeducational factors to test grit's uniqueness as a construct.

Grit and convergent validity variables. Research shows positive relations between grit and self-control, and negative relations between grit and behaviors that signal a lack of self-control, such as TV watching instead of doing homework (Duckworth et al., 2007; Duckworth & Quinn, 2009; Rojas et al., 2012). Self-control is the ability to resist impulsive thoughts, emotions, and actions, and to re-route those instincts into more strategic and goal-oriented behaviors (Tangney et al., 2004). Ample research has established self-control's concurrent relation to academic success (e.g., Tangney et al., 2004; Wolfe & Johnson, 1995) as well as its causal influence on academic success across the lifespan (e.g., Duckworth, Tsukayama, & May, 2010; Shoda, Michel, & Peake, 1990). Grit and self-control are similar in that they both add unique prediction of achievement outcomes above and beyond what is predicted by IQ (Duckworth et al., 2007; Duckworth & Quinn, 2009; Duckworth & Seligman, 2005). Additionally, both self-control and grit enable students to persevere in their work even without intrinsic interest or reward (Duckworth et al., 2007, 2010), because students are able to focus on long- rather than short-term gratification (Wong & Csikszentmihalyi, 1991).

Grit also has strong relations with, but is a better predictor of achievement than, conscientiousness (Duckworth et al., 2007; Duckworth & Quinn, 2009).

Conscientiousness, one of the traditional "Big Five" personality traits (John & Srivastava,

1999), describes individuals who tend to be dependable, task-oriented, organized, efficient in their work, self-controlled, and who have a will to achieve (Digman, 1989; Duckworth et al., 2007; Wolfe & Johnson, 1995). Conscientiousness is a reliable predictor of academic performance from middle school (i.e., Trautwein et al., 2009) through college (Nofle & Robins, 2007; O'Connor & Paunonen, 2007), even after controlling for factors such as previous achievement (Richardson & Abraham, 2009) and IQ (Corker et al., 2012; Poropat, 2009).

Duckworth and colleagues argue that grit differs from both conscientiousness and self-control because grit taps into more long-term perseverance (the “marathon” Duckworth describes, 2007, p. 1088), whereas conscientiousness and self-control reflect commitment to nothing more than finishing the task at hand and overcoming “hourly temptations” (Galton, 1892, as cited in Duckworth et al., 2007). Likewise, grit is distinct from conscientiousness and self-control in that grit suggests constant, unwavering vocational interest while a conscientious or self-controlled individual may hop from interest to interest and shift careers often.

Ethnic Minority Student Grit

Ecological Risk Factors

School persistence and completion are particularly challenging – and grit potentially a protective academic enabler – for ethnic minority students living in poverty (Natriello et al., 1990; Tough, 2012). As of 2009, rates of high school dropout for both minority and low-income students were more than double that of Caucasian and higher-income students (Chapman, Laird, Ifill, & KewalRamani, 2011). Many poverty-related stressors have been linked to academic underachievement and perpetuation of the

achievement gap, including but not restricted to low SES (Annie E. Casey Foundation, 2013; Evans & Rosenbaum, 2008; Reardon, 2011), high mobility (Sandstrom & Huerta, 2013), low parental education levels (Clotfelter, Ladd, & Vigdor, 2009; Davis-Kean, 2005), lack of parent academic involvement and support (Hoover-Dempsey et al., 2001; Jimerson, Egeland, Sroufe, & Carlson, 2000; Stright & Neitzel, 2003), and living in homes or neighborhoods with high rates of violence, gang activity, and substance use (Anda et al., 2006; Ander, Cook, Ludwig, & Pollack, 2009). Minority status itself can also negatively affect academic achievement, since minorities in the U.S. are more likely to be exposed to these risks and to attend under-resourced, less academically rigorous schools (e.g., Sirin, 2005).

Motivational processes play a mediating role in the link between ecological risks and the likelihood that disadvantaged students will give up on challenges in school or on their academic goals all together rather than persevering (Choy, 2001; Rumberger, 2004; Tough, 2012). Low-income students are less likely to feel a sense of belonging in or engagement with school (e.g., Willms, 2003), and instances of low motivation and disengagement have been reported as precursors to failure and dropout (e.g., Finn & Rock, 1997; Rumberger, 2004; Stewart, 2006). Additionally, for low-income minority students who are or will be the first in their families to pursue post-secondary education, these risk processes are even more salient and have long-term consequences for academic goal attainment (Burrus et al., 2013; Nunez, Cuccaro-Alamin, & Carroll, 1998). Low-income students who complete high school and continue on to be first-generation college students are more than four times more likely to drop out within the first year than their higher-income classmates whose parents attended college (Engle & Tinto, 2008).

Without psychoeducational protections like grit and engagement, it may become increasingly difficult for students to negotiate the demands of school as they proceed through the grades (e.g., Roderick, 2006).

Psychoeducational Protective Factors

Fortunately, psychoeducational factors supporting school achievement in the face of risks and obstacles are plastic, responsive to intervention, and capable of change (e.g., Yeager & Walton, 2011; Farrington et al., 2012). Supportive teacher and peer relationships can promote students' motivation for academic goals even in the face of ecological risks (Deci, 1992; Moran, Bundick, Malin, & Reilly, 2012; Wentzel, 1998), and engagement-boosting interventions can help high-poverty minority high school students stay on track to graduate (Connell, Halpern-Felsher, Clifford, Crichlow, & Usinger, 1995; Ream & Rumberger, 2008). Academic goal-setting interventions have successfully increased persistence among ethnically diverse middle school students, with effects lasting at least several months (Duckworth et al., 2011), and encouraging students to identify a purpose for their classwork can boost achievement, even in tedious and boring classes (i.e., Yeager et al., 2013). It seems promising that grit could play a similar beneficial role.

Limitations of the Grit Research

Grit in Diverse Student Populations

The current research suggests that, at least among high-achieving students, grit strengthens resilience in the face of the stress, fatigue, and temptation to give up that comes with academic challenges (i.e., Duckworth et al., 2007; Duckworth & Quinn, 2009). However, grit has barely been studied as a potential resilience process that could

be promoted in disadvantaged students (e.g., those who face combined risks of poverty, minority status, low parental education levels, and first-generation college student status). For instance, existing research has not adequately assessed grit's factor structure and its functioning across different ethnic groups, although grit scores have shown good to excellent internal consistency ($\alpha = .73 - .85$) and have been reliably linked to achievement outcomes across a variety of samples, including adults, high-achieving Caucasian college undergraduates, and ethnically diverse middle and high school students (Duckworth et al., 2007; Duckworth & Quinn, 2009).

Only three studies have tested grit in student populations that are ethnically diverse, explicitly identified as low-income, and without a history of high achievement, two of which were only reported in conference presentations. In two samples of over 2,400 4th-8th graders (52% and 56% White, respectively; 30-89% of students eligible for free lunch), grit scores correlated with student-reported self-efficacy, self-regulation, effort in and enjoyment of math and reading (Rojas et al., 2012; Rojas & Usher, 2012). No differences were found between ethnic groups, but the factor structure of grit differed from the theorized model. Note that the grit items were different from those in the original grit measure so it is difficult to attribute the difference in factor structure to item differences or to the diverse sample. Additionally, we cannot confirm that the lack of ethnic differences in grit is representative of what would be found using the original scale items.

In a smaller study of urban, African American male first-generation college students (Strayhorn, 2014), grit predicted first-year college grades even after controlling for prior achievement and intelligence. Contrary to previous research, grit showed

positive correlations with the intelligence measure ($r = .23$), which suggests that grit may function differently in minority populations with first-generation college-student status.

The nature of disadvantaged minority students' academic obstacles are qualitatively different from those of Caucasian students who have had more economic advantages, especially if they are first-generation college-going students (Choy, 2001; Engle & Tinto, 2008). Different obstacles may subsequently render different protective factors more or less beneficial. Previous research shows that a context of poverty and its related stressors (i.e., lack of family support for learning, neighborhood violence) can make students susceptible to lower levels of school motivation and engagement (Stewart, 2006; Cooper & Crosnoe, 2007). This might suggest that students facing these stressors will have less grit as well. Other research, however, suggests that levels of motivation, engagement, and academic persistence vary widely within samples of ecologically disadvantaged, stressed students (e.g., Waxman, Gray, & Padrón, 2002), suggesting that perseverance over obstacles cannot be easily predicted by economic status alone. Educational reformers, policymakers, and even the Gates Foundation have put resources behind interventions to increase grit in disadvantaged students as a way to shrink the achievement gap (e.g., Duckworth et al., 2011; Hanford, 2012; Tough, 2012). It is crucial to assess whether grit is indeed related to these students' achievement and beneficial for their academic outcomes in ways similar to what has been seen with Caucasian students.

Distinction of Grit from Other Constructs

The scant research comparing grit to other motivational or psychoeducational constructs sends mixed messages about grit's distinction from them. For instance, there is much overlap in what is measured by the Short Grit Scale and what is measured by Big

Five Conscientiousness and the Brief Self-Control Scale (e.g., Duckworth et al., 2007; Duckworth & Quinn, 2009; see Table 1 for comparison of scale items). Additionally, the very small amount of unique achievement variance that grit accounted for in previous studies fails to provide a compelling argument for why grit should be considered a superior predictor of achievement.

Grit and engagement have both been independently linked to positive academic outcomes (Duckworth et al., 2007; Finn & Rock, 1997; Park et al., 2012; Sciarra & Seirup, 2008), and perseverance has been strongly linked to engagement in adult samples (Peterson, Ruch, Beermann, Park, & Seligman, 2007; Von Culin, Tsukayama, & Duckworth, 2014). Grit and engagement have not, however, been tested together in minority adolescents facing poverty-related obstacles to school achievement. In a field already crowded with overlapping and often poorly differentiated psychoeducational constructs (Appleton et al., 2008), testing the concurrent relations between all of these constructs in the current validation study is an important initial step toward further clarifying whether grit is a unique construct in disadvantaged minority populations. Results will have implications for identifying which protective factors are most promising and thus most deserving of research and intervention focus.

Table 1

Comparison of Items in Short Grit Scale, Brief Self-Control Scale, and Conscientiousness subscale of the Big Five Inventory

Scale Items			
Short Grit Scale (Grit-S) ^a	Brief Self-Control Scale (BSCS) ^b	Big Five Inventory, Conscientiousness subscale (BFI-C) ^c	Thematic Overlap ^d
1. New ideas and projects sometimes distract me from previous ones.	1. I am good at resisting temptation.	I am someone who...	Distraction OR trouble concentrating OR difficulty maintaining focus
2. Setbacks don't discourage me.	2. I have a hard time breaking bad habits.	1. Does a thorough job.	
3. I have been obsessed with a certain idea or project for a short time but later lost interest.	3. I am lazy.	2. Can be somewhat careless.	Lazy vs. hard worker
4. I am a hard worker.	4. I say inappropriate things.	3. Is a reliable worker.	
5. I often set a goal but later choose to pursue a different one.	5. I do certain things that are bad for me, if they are fun.	4. Tends to be disorganized.	Perseverance OR finishing what is begun
6. I have difficulty maintaining my focus on projects that take more than a few months to complete.	6. I refuse things that are bad for me.	5. Tends to be lazy.	
7. I finish whatever I begin.	7. I wish I had more self-discipline.	6. Perseveres until the task is finished.	Pursuing long-term goals OR following through on plans vs. abandoning goals
8. I am diligent.	8. People would say that I have iron self-discipline.	7. Does things efficiently.	
	9. Pleasure and fun sometimes keep me from getting work done.	8. Makes plans and follows through with them.	
	10. I have trouble concentrating.	9. Is easily distracted.	
	11. I am able to work effectively toward long-term goals.		
	12. Sometimes I can't stop myself from doing something, even if I know it is wrong.		
	13. I often act without thinking through all the alternatives.		

^aAdapted from Duckworth & Quinn, 2009.

^bAdapted from Tangney et al., 2004.

^cAdapted from John, Donahue, & Kentle, 1991.

^dDeveloped by the current study author.

Hypotheses

In summary, psychoeducational factors similar to grit (e.g., self-control, engagement) have long served a protective role in the educational success of both high-achieving and at-risk students, across ethnic backgrounds. Grit shows promise as a comparable academic enabler to these other constructs. It deserves more attention, however, among low-income, first-generation college-going, ethnic minority students, who possibly face the most daunting levels of educational obstacles (Burrus et al., 2013) and who could benefit most from the perseverance than grit provides. Given the demand to find tools to close the achievement gap, the current study aims to answer three questions:

1. How does grit function, in an ethnic minority, low-income student population?
2. How is grit similar to and distinct from other psychoeducational predictors of achievement in a minority, low-income student population?
3. Is grit a meaningful predictor of school grades and literacy in a minority, low-income student population, over and above demographic and other psychoeducational factors?

Results will address a notable hole in the existing literature—insufficient knowledge about the psychometric properties of the grit construct in ethnically and socioeconomically diverse populations. It will also serve as a stepping stone to longitudinal studies of grit’s usefulness as a predictor of college achievement for minority, first-generation college-attending students.

Regarding question 1, I hypothesize that the mean and standard deviation of the current sample’s grit scores will resemble the scores found in Duckworth and Quinn’s

(2009) high-achieving middle- and high-school sample ($M = 3.40$, $SD = .80$). This is the only other sample of diverse adolescents who completed the full grit scale. At least a portion of the students (18%) were identified as low-income, and their description as “high-achieving” suggests a similar academic work ethic to the current sample, who have committed to their academic futures by joining a pre-college prep program. I also hypothesize that, as in nearly all previous studies, Short Grit Scale items will fit the theorized two-factor structure, and the items will show good to excellent internal consistency, with Cronbach alphas between .73 - .85 both for the full grit scale and for the two individual factors. Finally, I will explore racial, gender, and age differences without making specific predictions, because previous grit studies have given inadequate exploration of demographic differences and because research on other motivational constructs provides conflicting findings about racial differences.

Regarding question 2, I hypothesize that grit and engagement will have a positive relation, as they are two psychoeducational constructs that both involve an emotional component (passion or interest), that both stem from a motivational framework, and that both relate to achievement outcomes. Additionally, I hypothesize that grit will have strong positive relations with the constructs of self-control and conscientiousness, as in Duckworth’s previous research with older students. If results show similar correlations to what has been found in these high-achieving, primarily white samples, it suggests that grit and other motivational constructs function similarly across ethnic and socioeconomic groups, but that grit overlaps too much with conscientiousness and self-control to be considered a meaningfully distinct construct. Finally, I hypothesize that grit will have a

negative relation with perceived stress because of stress's negative influence on disadvantaged minority student achievement.

Regarding question 3, I hypothesize that, in accordance with previous studies, grit will show a positive relation with achievement measures. I also hypothesize that grit will predict achievement above and beyond demographic factors, and equally as well as other psychoeducational factors. If these hypotheses are confirmed, it will provide initial evidence of grit's utility as a predictor of academic success among low-income, minority students and will confirm the value of moving forward with grit research and interventions within this population.

Chapter 3: Methods

Sample

Study participants included 33 students enrolled in the University of Maryland's Pre-College Program, part of the federally-funded Upward Bound program that provides academic enrichment, college preparation, and career counseling services to high school students whose families either meet the Federal Poverty Level (FPL) criteria for low-income status or who are first-generation college-going students (i.e., they will be the first generation in their families to attend college). For six weeks in the summer, students in ninth through 12th grades live in dormitories on campus and engage in a rigorous daily schedule of academic classes, career counseling sessions, standardized test prep, tutoring, extracurricular activities, and mock job and college admissions interviews. The summer session ends with a college tour for which students must fundraise their own travel expenses. Students in the Upward Bound program at the University of Maryland struggle with obstacles to higher education including but not limited to difficulty paying for college admission applications, tuition, and fees; lack of knowledge of the college and financial aid application processes; not having a role model at home who completed college; and trouble reconciling various self-identities (i.e., as an ethnic minority and a scholar; M. Malcolm, personal communication, February 15, 2014).

Recruited by Upward Bound from six high schools in the surrounding metropolitan area, interested students must submit an application stating their interest in the program and their desire to pursue higher education. They are selected for the program based on the strength of their applications (i.e., letters of recommendation and personal essay), their commitment to staying in the Upward Bound program for the

duration of their high school careers, and their parents' commitment to supporting them through the program and to providing volunteer hours for the program. Students generally begin Upward Bound when they are in ninth grade and remain in it until they graduate from high school, although a small number of graduated seniors are awarded internships to spend their last summer before college working with the program. In addition to the six-week summer session, Upward Bound students attend Saturday Academy twice monthly during the school year.

The current sample consisted of students 14 – 18 years old, whose mean age was 15.8 years ($SD = .99$; 72.7% female). With the exception of one student entering ninth grade and one student entering college at the end of the summer, the rest of the sample was evenly distributed across 10th, 11th, and 12th grades. One hundred percent of the sample identified as an ethnic minority (69.7% Black, 18.2% Latina(o), 12.1% Native American, multiethnic, or Caribbean), and 87.5% were US-born, with the remaining four students born in various African countries. Sixty-four percent of students were first-generation U.S. citizens. Eighty-two percent of students reported receiving either free or reduced-price lunch at school (a proxy for income), and 60.6% of students were participating in the program for the first time. On average, students knew of just one family member that had obtained any type of college degree.

A group informed consent process took place in June of 2014 on the University of Maryland campus, during the Pre-College program's mandatory summer orientation for all Upward Bound students and parents, and all of the roughly 40 staff members for the summer program. Upward Bound administrators allowed me to give a 5-minute recruitment presentation including an overview of the study's purpose, potential benefits

and risks, activities expected of participants, and student incentives for participating (certificate of participation and entry into a Visa gift card raffle). Consent forms were passed out to parents in small groups after the presentation. With the exception of one 18-year-old student who consented herself, parents gave informed consent for their children who were minors.

Due to the small number of parents available to consent their children after the orientation, the final sample was limited to 33 students. While the program leader was committed to a strong recruitment plan at orientation, the chaotic orientation process and the paperwork required for parents to complete left little time or attention for this study's consent form completion. I attempted to continue recruitment for several additional weeks, speaking individually with students during weekly dormitory check-ins. I also enlisted the help of Upward Bound counselors to distribute consent forms to interested students who had not yet received a form or had forgotten to bring a copy home to their parents. Despite multiple attempts, I no longer had a good opportunity to conduct a direct consent process with the parents once orientation was over.

Procedures

Data collection procedures consisted of two parts: (a) a 10- to 15-minute, 91-item online questionnaire, which students completed on iPads loaned from Upward Bound, and (b) a three-minute assessment of silent reading fluency and comprehension, administered in group paper-and-pencil format. The survey was accessed individually via the Qualtrics.com secure online survey platform. Students were given the iPads with the survey website pre-loaded, and instructed that the survey would likely take between 10 and 15 minutes. They were told that they could skip any questions they were not

comfortable answering, or ask me questions at any time during the survey. They were told that, once they pressed the final Submit button on the survey, they would be entered into a drawing for one of three \$25 Visa gift cards. See the measures section for a full description of the scales and items included in the survey. All students received a University of Maryland certificate of participation and were entered into the drawing at the end of their participation.

Each participant completed the online survey during one evening study hall period. There was not enough private space available for survey completion, and participating students were in multiple locations at the start of the study halls (i.e., dorm rooms, outdoor courtyards, library, recreation rooms). Therefore, student completion of surveys was not standardized and often interrupted by distractions from other students not involved in the research. Nearly half of the students took the survey while sitting in groups of four to six participants at tables in a large residence hall recreation room. The others completed the survey on couches in the residence hall lobby, outside on courtyard benches (where the most distractions occurred), in a library computer lab, and inside a dormitory resident assistant's office. I remained with students in all locations to monitor the use of the iPads, to answer questions, and to discourage interruptions or re-direct participating students who began to compare answers. Students were offered light refreshments before starting the survey.

Administration of the reading assessment occurred in quiet empty classrooms next door to where each student had his or her afternoon group counseling session. Students were taken from their sessions and brought to the classroom, in groups of one to four depending on how many participants were part of each counseling session. There were no

other adults or students in the classrooms during the assessment, and each student was seated at a separate desk and given a pencil and test booklet. I administered the assessment aloud, according to standardized instructions (see Group Administration instructions in Appendix), starting with two sample questions. Students then completed a series of practice questions and I reviewed the answers. Students were given the opportunity at that point to ask any final questions. Then, the students were instructed that they would have three minutes to answer as many questions inside the test booklet as possible. The timer began, and students worked quietly and independently in their test booklets. At the end of the three minutes, I collected pencils and test booklets from the students and allowed them to return to their counseling sessions. Two students were absent during the original assessment day and completed their TOSRECs in the outdoor courtyard of their dorms along with their surveys.

Measures

Demographic information. The demographic portion of the survey included questions about the students' (a) age, (b) gender, (c) race/ethnicity, (d) parents' native country, (e) students' native country, (f) grade level in school, (g) number of years in Upward Bound, (h) free or reduced-price lunch status (i.e., proxy for income), (i) family members in household, and (j) whether other family members had graduated from a 2- or 4-year college.

Psychoeducational variables.

Grit. Grit was assessed with the Short Grit Scale (Grit-S; Duckworth & Quinn, 2009). Students rated how much four statements about their consistency of interests (i.e., "I often set a goal but later choose to pursue a different one.") and four statements about

their perseverance of effort (i.e., “I finish whatever I begin.”) described them, on a 5-point scale (1 = Not like me at all, 5 = Very much like me). Grit-S scores have shown good to excellent internal consistency and validity for predicting achievement outcomes in many samples of primarily Caucasian adults and college students (Duckworth et al., 2007), a few samples of ethnically diverse middle and high school students (Duckworth & Quinn, 2009), and Black male first-generation college students (Strayhorn, 2014).

Conscientiousness. Conscientiousness was assessed with the conscientiousness subscale from the 44-item Big Five Inventory (BFI; John, Donahue, & Kentle, 1991). Students rated how much they agreed with 9 items about themselves (e.g., “I pay attention to details.”) using a 5-point Likert scale (1 = disagree strongly, 5 = agree strongly). The BFI has been used in a wide range of studies on adults as young as 21 years old. Scores from each of the trait scales show excellent internal consistency and test-retest reliability, and are predictive of important life outcomes such as academic performance (e.g., Benet-Martínez & John, 1998).

Engagement. Cognitive and psychological engagement was assessed using the Student Engagement Instrument (SEI; Appleton, Christenson, Kim, & Reschly, 2006). This 35-item self-report questionnaire includes three cognitive engagement subscales (i.e., Control and Relevance of School Work, 9 items; Future Goals and Aspirations, 5 items; Extrinsic Motivation, 2 items) and three psychological engagement subscales (Teacher-Student Relationships, 9 items; Peer Support for Learning, 6 items; Family Support for Learning, 4 items). Students rated how much they agreed with statements about their cognitive engagement, or their valuing of school and sense of its importance (e.g., “What I’m learning in my classes will be important in my future.”). They also rated

their agreement with statements about their psychological engagement, or how much belonging and support they felt at school (e.g., “I feel safe at school.”) on a 4-point scale (1 = Strongly Disagree, 4 = Strongly Agree). This study included 5 of the original 6 subscales; I did not include the Extrinsic Motivation subscale because it has questionable factor integrity (Appleton et al., 2006; Betts, Appleton, Reschly, Christenson, & Huebner, 2010). The SEI has produced reliable and valid scores that correlate in expected ways with achievement and conduct problems among diverse, urban, low-income middle and high school students (Fredericks et al., 2011).

Emotional engagement was assessed with 5 items from the emotional engagement subscale of the Engagement versus Disaffection with Learning – Student Report scale (EvsD; Skinner, Furrer, Marchand, & Kindermann, 2008). Students rated how true five statements about their interest and enjoyment of school (e.g., “I enjoy learning new things in class.”) were on a 4-point scale (1 = not at all true, 4 = very true). EvsD scores obtained from ethnically and geographically diverse populations of middle school students have shown construct validity and adequate internal consistency. The scale has also been used with high school students (Fredericks et al., 2011).

Self-control. Self-control was assessed using the self-report Brief Self-Control Scale (BSCS; Tangney et al., 2004). Students rated how much 13 statements (“I am good at resisting temptation.”) sounded like them, on a 5-point scale (1 = Not at all, 5 = Very much). This scale has produced highly reliable and stable scores that correlate with GPA in moderately diverse college samples (Tangney et al., 2004) and in high-achieving high school samples (e.g., MacCann & Roberts, 2010).

Stress. Student stress was assessed using the Perceived Stress Scale - 10-item Version (PSS-10; Cohen, Kamarck, & Mermelstein, 1983). Students rated how often they felt or thought 10 different ways in the past month (e.g., “In the last month, how often have you found that you could not cope with all the things that you had to do?”), on a 5-point scale (1 = Never, 5 = Very often). The only stress measures designed for non-adult samples are life event scales, which do not tap into the subjective, emotional experience of stress. Therefore, I chose the PSS-10, which is suitable for non-clinical populations with at least a junior high school vocabulary level. Scores from the original 14-item version of the PSS show negative correlations with well-being among African American and Black Caribbean adolescents in the U.S. (e.g., Rose, Joe, Shields, & Caldwell, 2014), and scores from a shortened version of the scale show good internal consistency and correlate with multiple mental health outcomes in diverse high school samples (e.g., Suldo, Shaunessy, & Hardesty, 2008; Suldo & Shaunessy-Dedrick, 2013).

Achievement. High school achievement was assessed by asking students, “What is your current weighted GPA?” The Upward Bound program administrator recommended this specific wording in order to distinguish between the two versions of GPA that students receive on their transcripts. Students were given an open-ended text box in which to report their GPA; all but one student reported a face-valid GPA score to one or two decimal places. One student left the answer blank. A few students asked me during the survey to confirm that they should put their weighted, not their unweighted, GPA. Others asked for clarification on whether they should report their GPA from the end of the recent school year. Thus, there may have been some confusion as to how to report GPA.

Literacy skills as an achievement outcome variable was assessed via the Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner, Torgeson, Rashotte, & Pearson, 2010), which tests students' silent reading fluency (speed), decoding skill (accuracy), and comprehension. This measure was used in addition to GPA because literacy is foundational to overall school achievement. Students had three minutes to silently read as many individual sentences as possible and decide if each sentence was true or false (e.g., "A tortoise is faster than a greyhound."). Students entering ninth or 10th grade in Fall 2014 were administered the ninth grade version of the assessment, and students entering 11th and 12th grade or entering college were administered the 10th-12th grade version. All students were administered Form O, as this form was developed for use at any time of the year. This study used the TOSREC index score, which is the standardized score ($M = 100$, $SD = 15$) used for comparison of test-takers' performance with that of a nationally-representative sample of 3,523 individuals. The TOSREC has strong convergent validity (correlation coefficients $\geq .70$) with other standardized measures of reading fluency and comprehension (e.g., WJIII; Wagner et al., 2010).

Analysis

I first computed summary scores for all psychoeducational and stress scales, and obtained summary descriptive statistics for all demographic, academic, and psychoeducational variables (see Table 2 for psychometric properties of all variables). From a developmental standpoint, ages 14-16 are considered mid-adolescence, while ages 17-19 are considered late adolescence (Barrett, 1996). However, my small sample size precluded me from having adequate analytic power to detect any existing differences when age was categorized in this way. Therefore, age was coded as a dichotomous

categorical variable of 14 - 15 or 16 – 18, groupings that allowed for adequate power. Ethnicity was coded into three groups: Black/African American, Latina(o), and Other (i.e., multiethnic). Generational status was coded as either first-generation (at least one parent not born in the US) or more than first-generation (both parents born in the US). Students' tallies of whether different family members had graduated from college were coded in several different ways for analytic purposes. If a student responded that (s)he was unsure, it was counted as a No. First, a dichotomous variable was created, dividing students into those with no family members having completed either a two- or four-year degree vs. those with at least one college-graduated family member. Next, tallies were summed into a total score of how many family members had graduated from a two- or four-year college. Finally, students were divided into four groups: (1) no family member had graduated from college, (2) family members graduated from two-year college only, (3) family members graduated from four-year college only, and (4) multiple family members graduated from both two- and four-year colleges. For the final demographic variable of interest, income, students were grouped into two categories to distinguish level of poverty within this low-income sample: lower income (free lunch at school), and higher income (reduced- or full-price lunch at school).

Table 2

Psychometric Properties of the Major Study Variables

Variable	M	SD	α	Range		Skew
				Potential	Actual	
Psychoeducational Grit	3.22	.50	.56	1 – 5	2.13 – 4.38	.07
Perseverance of Effort	3.68	.58	.49	1 – 5	2.25 – 4.50	-.88
Consistency of Interests	2.75	.66	.47	1 – 5	1.50 – 4.75	.39
Conscientiousness	3.60	.60	.75	1 – 5	2.44 – 4.44	-.44
Self-Control	43.30	7.21	.70	13 – 65	26 – 58	-.16
Cognitive Engagement	22.64	2.12	.65	7.50 – 28.00	19.00 – 27.50	.23
Psychological Engagement	19.37	2.14	.79	6.33 – 25.33	14.33 – 24.33	.16
Emotional Engagement	3.18	.45	.64	1 – 4	2 – 4	-.27
Perceived Stress	21.00	6.51	.84	0 – 40	8 – 34	.18
Achievement GPA	3.40	.55	–	–	2.08 – 4.22	-.66
TOSREC Index Score	94.67	12.56	–	55 – 145	61 – 114	-.68

Note. $N = 33$ for all variables, except GPA, where $N = 32$.

Negatively-worded grit, conscientiousness, and self-control items were reverse-scored according to original instrument scoring protocol so that higher summary scores for these scales reflected higher levels of the respective construct. Positively-worded stress items were also reverse-scored according to the scale developers' protocol so that a higher stress summary score reflected higher levels of stress. Summary scores for the five cognitive and psychological engagement subscales, perceived stress, and self-control were computed by summing the individual scale items. Summary scores for grit, each of the grit subscale factors (Perseverance of Effort and Consistency of Interests), conscientiousness, and emotional engagement were created by calculating the mean of the individual scale items. An overall mean psychological engagement summary score was created from the three psychological engagement subscales, and an overall mean cognitive engagement summary score was created from the two cognitive engagement subscales. Finally, a mean overall engagement score was created by averaging the cognitive and psychological engagement summary scores. Note that I used a simple data imputation procedure to calculate summary scores so that if the case was missing no more than 20% of the summary score items, then a summary score was computed. If more than 20% of the items were missing, then the case had a missing summary score. Note that only one case was missing 20% or more of the items necessary to compute a Perceived Stress summary score. No other cases were missing more than 20% of the data needed to compute summary scores for any other variables.

To investigate the first research question, *How does grit function, in an ethnic minority, low-income student population?*, I explored the mean, standard deviation, distribution, and internal consistency of total grit scores. To optimize internal consistency

estimates in this small data set, I imputed the series mean for one missing data point for Item 6 of the Short Grit Scale, which one participant had skipped. Exploratory factor analysis was then run to examine the factor structure of the Short Grit Scale, using principal axis factoring extraction, with direct oblimin rotation and eigenvalues greater than 1.00 as the fit criterion. I examined corrected item-total correlations, amount of total score variance explained, and primary factor and off-factor loadings to determine whether grit scores from ethnic minority, low-income students retained the internal consistency, fit integrity and factor loadings of the theorized two-factor model. Finally, I compared grit means by a variety of demographic factors, including gender, race/ethnicity, age group, grade level, income, US citizen generational status, and whether or not they had any college-graduate role models in their family.

To investigate the second research question, *How is grit similar to and distinct from other psychoeducational predictors of achievement in a minority, low-income student population?*, I computed bivariate correlations between grit and conscientiousness, self-control, and the various engagement summary scores. The goal was to examine convergent and discriminant evidence of the construct validity of grit. I also ran bivariate correlations between grit and perceived stress.

To examine the final research question, *Is grit a meaningful predictor of school grades and literacy in a minority, low-income student population, over and above demographic and other psychoeducational factors?*, I ran bivariate correlations to assess if grit was associated with GPA or with literacy achievement. I then ran a series of hierarchical linear regressions to determine if grit accounted for unique variance in a linear model of concurrent academic achievement. In Step 1, I regressed TOSREC index

scores on a set of demographic variables (i.e., age, gender, race/ethnicity, generational status, income, number of college-graduate role models in the family, and number of years in Upward Bound). In Step 2, I added the psychoeducational correlates (i.e., conscientiousness, self-control, emotional engagement, cognitive & psychological engagement) and stress. Finally, in Step 3, I added total grit scores.

Chapter 4: Results

Psychometric Properties of the Short Grit Scale

The goal of the psychometric analyses was to test how the construct of grit functions in an ethnic minority, low-income student population. I hypothesized that mean grit score and standard deviation would be most similar to Duckworth and Quinn's (2009) sample of high-achieving, ethnically diverse middle and high school students ($M = 3.40$, $SD = .80$). I also hypothesized that grit items would fit a two-factor structure and would have good to excellent internal reliability coefficients (Cronbach alphas between .73 - .85). Results did not support these two hypotheses.

Contrary to prediction, grit scores were lower ($M = 3.22$) and variance smaller ($SD = .50$) than in the previous comparison sample. The distributions of both individual items and mean scores resembled normal curves with no outliers, and a possible second mode around the total grit score of 2.63. See Table 3 for descriptives of individual item and full-scale distributions. Note that the distribution of grit scores most closely resembled the scores of a national sample of adults aged 25 - 44 ($M = 3.20$, $SD = .75$; Duckworth & Quinn, 2009).

Contrary to prediction, the items of both the full scale ($\alpha = .56$) and the subscale factors ($\alpha = .47$ for Consistency of Interests; $\alpha = .49$ for Perseverance of Effort) had very low internal consistency. Furthermore, only two of the eight items in the full grit scale reached the minimum corrected item-total correlation of .40 necessary to assert that variance in scores reliably represents variance in the underlying construct of grit.

Table 3

Short Grit Full-Scale and Individual Item Descriptives

Item	Range	Mean	SD	Median	n
1. New ideas and projects sometimes distract me from previous ones.	4	3.15	.83	3.00	33
2. Setbacks don't discourage me.	4	3.00	1.09	3.00	33
3. I have been obsessed with a certain idea or project for a short time but later lost interest.	4	3.30	1.19	3.00	33
4. I am a hard worker.	2	4.15	.80	4.00	33
5. I often set a goal but later choose to pursue a different one.	4	3.33	.96	3.00	33
6. I have difficulty maintaining my focus on projects that take more than a few months to complete.	4	3.22	1.24	3.00	32
7. I finish whatever I begin.	3	3.64	.96	4.00	33
8. I am diligent.	3	3.94	.83	4.00	33
Short Grit Scale (Grit-S)	2.25	3.22	.50	3.25	33

Contrary to expectations, the grit scale items best fit a three-factor structure explaining 62.2% of the variance in scores. However, the factors were not robust: Factor 1 included three items, and Factors 2 and 3 included just two items each. One item cross-loaded onto Factors 1 and 2, and one item failed to load with enough magnitude (at least .4) onto any one primary factor. Forcing a two-factor structure did not improve the structural integrity: the set of items accounted for just 47% of the variance in grit scores, and while Factor 1 included three items with primary loadings of at least .4, Factor 2

included just one strongly-loaded item. A forced one-factor structure, using principal components analysis extraction, showed the most robust factor structure: six of the eight grit items had loadings greater than .40. This unidimensional structure, however, only accounted for 30.5% of the variance in total grit scores. See Tables 4 - 6 for factor loadings of the exploratory, two-factor, and one-factor extraction analyses.

Grit differed by age, $t(31) = -3.66, p = .001$, but not by gender or by ethnicity. Older students (ages 16-18) reported being grittier than younger students (ages 14-15). Similarly, grit differed by grade level in school, $F(4, 28) = 3.42, p = .02$, with 11th and 12th graders and students going into college having more grit than ninth or 10th graders. Grit did not differ by number of family members who graduated from a 2- or 4-year college. Grit also did not differ by US citizen generational status or by whether students received free lunch at school vs. paid a reduced or full price for lunch.

Grit's Relation to Stress and to Psychoeducational Predictors of Achievement

Table 7 presents correlations between grit, stress, and all psychoeducational variables. The goal of running these correlations was to test if grit is similar to or distinct from other psychoeducational predictors of achievement in a minority, low-income student population. I hypothesized that grit would have a positive relation with engagement, strong positive relations with self-control and conscientiousness, and a negative relation with stress. Although results failed to reach statistical significance because of the small sample size, the magnitude and direction of correlations aligned with the majority of these hypotheses.

Table 4

Factor Loadings for Exploratory Factor Analysis With Direct Oblimin Rotation of Grit Scale

Scale Item	Factor 1	Factor 2	Factor 3
I am a hard worker.	.90	.41	.10
I finish whatever I begin.	.61	-.14	-.00
I am diligent.	.54	.00	-.11
I often set a goal but later choose to pursue a different one. ^a	.35	-.09	.07
Setbacks don't discourage me.	.03	.68	-.00
I have difficulty maintaining my focus on projects that take more than a few months to complete. ^a	.38	-.39	.07
New ideas and new projects sometimes distract me from previous ones. ^a	-.16	.01	.80
I have been obsessed with a certain idea or project for a short time but later lost interest. ^a	.25	-.03	.42

Note. Factor loadings > .40 are in boldface.

^aItem was reverse-scored.

Table 5

Factor Loadings for Two-Factor Extraction With Direct Oblimin Rotation of Grit Scale

Scale Item	Factor 1	Factor 2
I am a hard worker.	.94	.34
I finish whatever I begin.	.59	-.16
I am diligent.	.50	.02
I have been obsessed with a certain idea or project for a short time but later lost interest. ^a	.40	-.02
I often set a goal but later choose to pursue a different one. ^a	.31	-.17
New ideas and new projects sometimes distract me from previous ones. ^a	.16	.02
Setbacks don't discourage me.	.09	.66
I have difficulty maintaining my focus on projects that take more than a few months to complete. ^a	.37	-.47

Note. Factor loadings > .40 are in boldface.

^aItem was reverse-scored.

Table 6

Factor Loadings for One-Factor Extraction of Grit Scale

Scale Item	Factor Loadings
I am a hard worker.	.75
I finish whatever I begin.	.73
I am diligent.	.62
I have difficulty maintaining my focus on projects that take more than a few months to complete. ^a	.59
I have been obsessed with a certain idea or project for a short time but later lost interest. ^a	-.56
I often set a goal but later choose to pursue a different one. ^a	-.48
New ideas and new projects sometimes distract me from previous ones. ^a	-.23
Setbacks don't discourage me.	-.15

Note. Factor loadings > .40 are in boldface.

^aItem was reverse-scored.

In accordance with previous research, grit had a positive and strong correlation with conscientiousness, but contrary to previous studies had only a weak positive correlation with self-control. Both Consistency of Interests and Perseverance of Effort subscales, however, had moderate positive relations with conscientiousness. Although not statistically significant, grit did show weak to moderate positive relations with cognitive, psychological, and emotional engagement scales. Additionally, grit showed a weak negative correlation with stress, although it was not statistically significant. I am not aware of any adolescent-aged norm samples for the 10-item stress scale, but it is important to note that the current sample exhibited much higher stress ($M = 21.00$, $SD = 6.51$) than young adults over 21 ($M = 14.20$, $SD = 6.20$) and Black adults ($M = 14.70$, $SD = 7.20$) in nationally-representative norm samples for the scale (Cohen & Williamson, 1988). Even after removing the 6 highest stress scores driving a bimodal distribution, the mean perceived stress score remained high.

Grit's Relation to Academic Achievement and Power to Predict Academic

Outcomes

The goal of the bivariate correlation and hierarchical regression analyses was to test if grit is a meaningful predictor of school grades and literacy in a minority, low-income student population, over and above demographic and other psychoeducational factors. I hypothesized that grit would show a positive relation with both outcome measures, and that grit's individual predictive power (measured by unstandardized beta coefficients) would be greater than that of demographic predictors and equal to that of psychoeducational predictors. Results partially supported these hypotheses: grit was

Table 7

Correlations between Grit, Stress, and Psychoeducational Factor Scales

	1	2	3	4	5	6	7	8	7	8
1. Grit	–									
2. Consistency of Interests	.82***	–								
3. Perseverance of Effort	.77***	.26	–							
4. Conscientiousness	0.65***	.52**	.51**	–						
5. Self-Control	0.37*	.39*	.16	0.51**	–					
6. Emotional Engagement	0.30	.00	.50**	0.18	-0.02	–				
7. Cognitive Engagement	0.22	.06	.32	0.38*	-0.05	0.39*	–			
8. Psychological Engagement	0.17	.10	.18	0.29	0.17	0.29	0.33	–		
9. Overall Engagement ^a	0.24	.10	.31	0.41*	0.08	0.42*	0.81***	0.82***	–	
10. Perceived Stress ^b	-0.17	-.27	.00	-0.28	-0.42*	-0.02	0.04	-0.28	-0.15	–

N = 33 for all bivariate pairs except for perceived stress pairs.

^aOverall engagement was computed by taking the mean of the cognitive and psychological engagement summary scores.

^b*N* = 32

p* < .05, *p* < .01, ****p* < .001

related to GPA in the expected direction but to literacy in the opposite direction. Grit did not, however, predict achievement when controlling for other factors.

Initial exploration of achievement in this sample, prior to running the planned analyses, revealed that mean TOSREC index scores did not differ based on whether students took the ninth or the 10th – 12th grade version of the assessment. Students' index scores ranged from 61 – 114, but the mean score for the sample fell within the Average performance range ($M = 94.67$, $SD = 12.56$), with less than a quarter of students performing below the average range. Weighted GPA scores suggested high achievement in this sample ($M = 3.40$, $SD = .55$), with 75% of students having earned at least a 3.0 in the previous school year.

While not statistically significant, grit correlated with GPA in the expected direction and in a magnitude similar to previous research ($r = .25$, $p = .164$). The Perseverance of Effort subscale of grit also showed a statistically significant, moderate positive relation with GPA ($r = .42$, $p = .017$). Contrary to expectations, however, grit demonstrated a negative relation with the TOSREC ($r = -.37$, $p = .036$). Note that GPA and literacy scores did not show a positive correlation. A visual inspection of the individual data points revealed that levels of reported GPA did not correspond to similar levels of TOSREC scores (i.e., a reported low GPA of 2.20 with an above-average TOSREC Index score of 114). A scatterplot of the two achievement measures confirmed that high and low scores on the measures did not correspond or change together in any systematic way. Scatterplots of grit and TOSREC score, and grit and GPA, were created to investigate these relations more thoroughly. A visual inspection of both scatterplots indicated that several low scores on both GPA and TOSREC, although not statistical outliers, could have heavily influenced the correlations with grit. However, after removing the three lowest outliers

from the GPA data and the lowest outlier from the TOSREC data, grit still related negatively to TOSREC and still had a non-significant relation with GPA.

A lowess (or locally weighted least squares) smooth line is a non-parametric fit curve that illustrates the estimated linear trend of data based on nearest-neighbor data point values rather than sample means, therefore it is less influenced by outlying data points (Harring, 2014). A lowess smooth fitted to the scatterplot of grit and GPA suggested that the relation between these two variables might not be linear, which could possibly explain the non-significant correlation. I then split GPA scores into three groups (lowest, middle, and highest third) and re-ran correlations between each GPA level and grit scores. Although the analyses did not have enough power to detect any statistical significance, the magnitudes of correlations were very different for these groups. For those in the top third of GPA scores (the highest achievers, earning GPAs between 3.71 and 4.22), grit showed a weak positive correlation, but for the other GPA groups the relation with grit was negative. Grit was functioning differently within different subgroups of the sample.

The interaction of stress and grit may help to demystify the surprising negative relation between grit and TOSREC, and the non-significant relation between grit and GPA. First, a two-way ANOVA was run, with three categories of grit (low, moderate, and high) and three categories of stress (low, moderate, and high) used as the interaction term; mean TOSREC index score was used as the dependent variable. Although the analysis did not have enough power to be statistically significant, a visual inspection of the results suggested that students with low and moderate grit performed very similarly regardless of level of perceived stress. However, at the highest level of grit, students experiencing moderate stress performed better on the TOSREC

than students experiencing either low or high stress (see Figure 1). Next, another two-way ANOVA was run, again with categorical grit and stress as the interaction term, but with mean GPA as the dependent variable. There was a significant main effect of stress on GPA, $F(2) = 6.23, p = .007$. Students experiencing moderate stress had significantly higher GPAs than those experiencing low stress. Additionally, there was a marginally significant interaction of stress and grit on GPA, $F(4) = 2.25, p = .097$. The highest level of grit seemed to support high GPA scores for students with low and moderate stress, but not for students with the highest level of stress (see Figure 2).

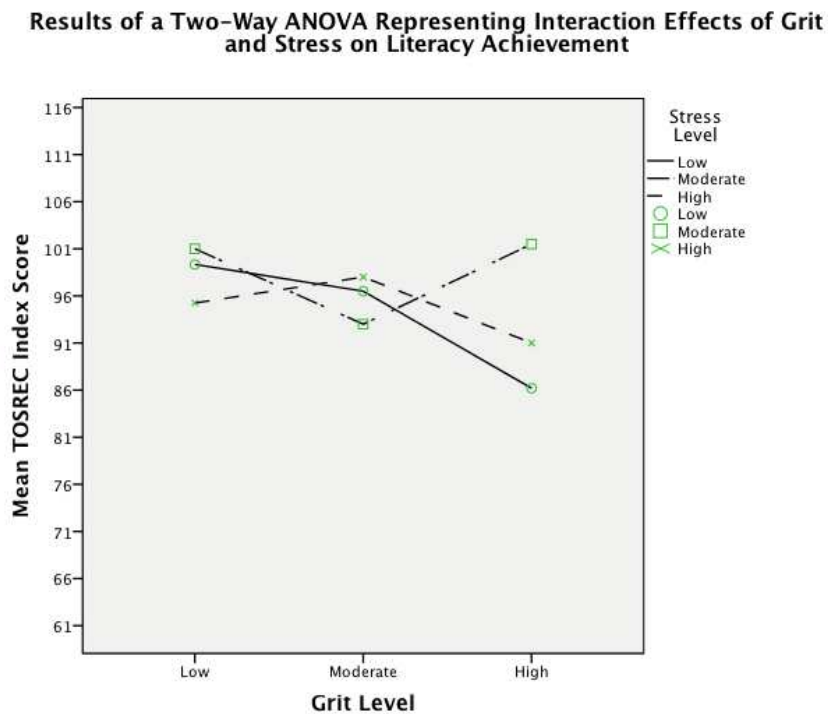


Figure 1. Stress levels categorized as low (scores between 8.00 – 17.00), moderate (scores between 17.01 – 24.00), and high (scores between 24.01 – 34.00). Grit levels categorized as low (scores between 2.13 – 2.88), moderate (scores between 2.89 – 3.38), and high (scores between 3.39 – 4.38).

Results of Two-Way ANOVA Representing Interaction Effects of Grit and Stress on GPA

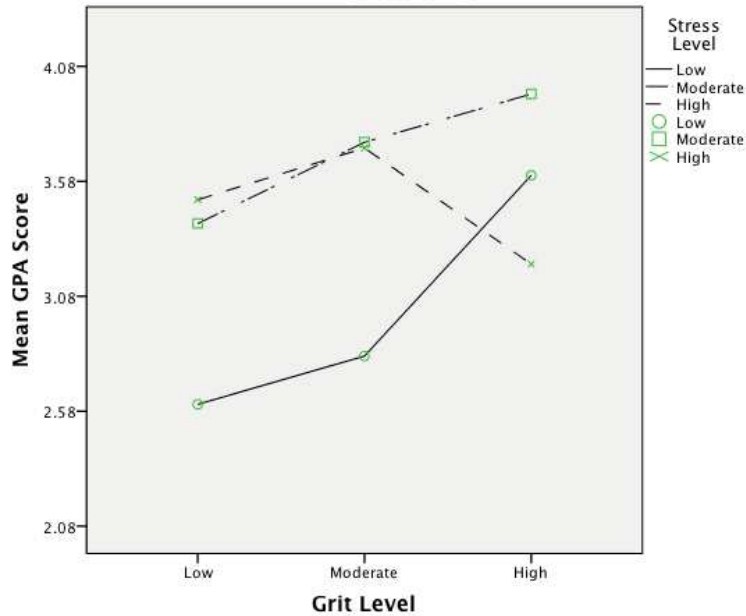


Figure 2. Stress levels categorized as low (scores between 8.00 – 17.00), moderate (scores between 17.01 – 24.00), and high (scores between 24.01 – 34.00). Grit levels categorized as low (scores between 2.13 – 2.88), moderate (scores between 2.89 – 3.38), and high (scores between 3.39 – 4.38).

In Step 1 of the hierarchical linear regression model, I regressed TOSREC index scores on a set of demographic variables (age, gender, race/ethnicity, generational status as a U.S. citizen, income, number of college-graduate role models in the family, and number of years in Upward Bound). In Step 2, I added the psychoeducational correlates (conscientiousness, self-control, emotional engagement, and combined cognitive and psychological engagement) and stress to Model 1. Finally, in Step 3, I added total grit scores to Model 2. I did not use GPA as an outcome variable in the model because the initial correlational analyses suggested that it may not have been a valid measure of student achievement in this sample.

Model 1 was marginally significant, $F(7,19) = 2.53, p = .051$. The full set of demographic variables explained 48.3% of the variance in TOSREC index scores. Both gender ($\beta = 9.09, p = .048$) and number of years in Upward Bound ($\beta = -4.92, p = .018$) were significant individual predictors of literacy skills. Additionally, age ($\beta = 9.09, p = .048$) and income level ($\beta = 7.30, p = .055$) were marginally significant predictors of literacy skills. These results suggest that students who were older, were females, and whose families had higher incomes were more likely to have higher literacy skills. Students who had fewer years of experience in Upward Bound also were more likely to have higher literacy skills.

Contrary to expectations, neither the addition of psychoeducational and stress variables in Model 2, nor the addition of grit in Model 3, added a significant amount of explanatory power to the prediction of literacy skills. Replacing the grit total score with the Perseverance of Effort subscale score in Model 3 did not significantly change model results, nor did re-running the models with GPA added as a control to Model 1. A reduced model including only the four significant or marginally significant demographic variables from Model 1 and grit did not explain a significant amount of variance in TOSREC index scores.

Discussion

Psychometric Functioning of Grit in Minority, Low-Income High School Students

All of the findings from this study must be considered tentative because of small sample size and low statistical power. Summary statistics for the Short Grit Scale in this sample suggest that grit among minority, low-income high school students with first-generation college-student status may differ from what was previously found in Duckworth's validation studies, but it may still have relevance for academic attitudes and outcomes in this population. On average, summary scores were lower and less widely dispersed than in previous studies with primarily Caucasian, high-achieving, ecologically advantaged students. We can perhaps interpret these findings from two different perspectives. From a socio-cultural perspective, the experiences of poverty, violence, and messages of low academic expectations for ethnic minority students in the U.S. can lead to feelings of alienation, low engagement or motivation, and ultimately low achievement (e.g., Wigfield & Wentzel, 2007). These feelings can be exacerbated by inadequate home and community support of long-term academic success among first-generation college-attending students (e.g., Choy, 2001). While the current sample's engagement scores were similar to or in some cases higher than scores in previous middle and high school student samples (e.g., Reschly, Huebner, Appleton, & Antaramian, 2008; Skinner et al., 2008), their grit scores were lower. This could possibly reflect the influence of academic barriers, but this is only speculation since students did not report on their perceived academic barriers. From a developmental perspective, the adolescent period marks a significant dip in conscientious traits and goal-pursuit behaviors (Soto, John, Gosling, & Potter, 2011). Lower grit scores in this

adolescents-only sample may have captured this normative developmental trend in a way that previous studies combining child and adolescent samples (Duckworth & Quinn, 2009) could not.

The poor internal consistency and unstable factor structure of grit scores in the current study also may suggest that grit functions differently in minority, low-income high schoolers with first-generation college-student status. The relatively stronger structure of the forced one-factor analysis suggests that grit may be a one- rather than a multi-dimensional construct in low-income minority students. Conversely, the low internal consistency coefficients, poor fit integrity and messy factor loadings across analyses may reflect more measurement error than true construct variance. I cannot necessarily conclude, however, that grit is not a relevant construct among low-income, minority high school students, nor that it does not function as in other populations. First, since reliability is directly related to the number of items included in a scale (DeVellis, 2003), the 8-item Short Grit Scale may have been too short a scale to reliably capture response variance. The 12-item original Grit Scale (Grit-O; Duckworth et al., 2007) or even a longer grit scale could possibly provide scores with better internal consistency in this sample. Second, my sample size makes all conclusions tentative. Scale measurement experts (e.g., DeVellis, 2003) recommend sample sizes of 5 to 10 subjects per scale item to maximize the likelihood of obtaining valid and generalizable factor analytic solutions. With just over 4 subjects per grit item in the current study, it is not surprising that an enduring factor pattern could not be identified.

Age-Related Grit Differences

The current study – one of the first to directly assess age-based differences in grit – suggests that grit may not differ by gender, ethnic group, or other demographic variables, but it

may differ by age. The finding that older students (ages 16-18) had more grit than younger students (ages 14-15) might suggest that grit grows with age, supporting the theory that it is a character trait rather than a state (i.e., John & Srivastava, 1999). On the contrary, an explanation supporting grit's classification as a state may be that, because they will transition to college sooner and their academic performance has more immediate consequences for college admissions, persisting through school is more important for the older students in this sample of students already motivated to obtain higher education. In fact, older students may be more highly stressed about leaving high school and moving on to college, which can spur achievement behaviors if paired with academic motivation and self-efficacy beliefs (LePine, LePine, & Jackson, 2004). Intervention effects of the Upward Bound program were not likely responsible for this age difference in grit, since older students were *not* more likely to have spent more years in Upward Bound. Research should be conducted using a longitudinal analysis of within-student change in grit over the course of high school, to confirm whether grit truly does increase with age.

Convergent and Discriminant Evidence for Grit's Construct Validity

This study found a strong positive correlation of grit and grit's two subscale factors with conscientiousness, which supports previous research on the relation of these two psychoeducational factors. Duckworth and colleagues interpreted the high correlation coefficients of grit with conscientiousness ($r = .77$; Duckworth et al., 2007; Duckworth & Quinn, 2009) as strong convergent evidence for the validity of grit. They did not, however, consider the implications of these findings for discriminating between the two constructs. In the current sample, forty-two percent of the shared variance between grit and conscientiousness was

explained by the same underlying construct. Based on Campbell & Fiske's (1959) discussion of convergent and discriminant validation, this magnitude of shared variance suggests that grit and conscientiousness may overlap too much to represent meaningfully distinct constructs in this low-income, ethnic minority high school sample. Neither grit nor conscientiousness was a significant predictor of literacy skills in the current study's regression models, which may suggest that other traditional predictors such as good classroom instruction or cognitive ability (Foorman & Torgeson, 2001) are still the most reliable predictors of literacy achievement. Future studies with larger sample sizes should compare the relative predictive power of these two constructs with instructional quality and cognitive ability to determine whether or not this is true.

Contrary to previous research, however, the current study found a weaker but still positive correlation between grit and self-control, which suggests that these two psychoeducational factors may be unique constructs and might add their own unique influences to students' achievement trajectories. Von Culin et al. (2014) found that an orientation to seek out pleasure (the opposite of self-control) showed a negative and weak correlation with grit, but the correlation was primarily driven by its relation with the Consistency of Interests subscale. In the current sample, too, self-control was related to Consistency of Interests but not to Perseverance of Effort (see Table 7). Among low-income, ethnic minority high school students facing barriers to long-term school achievement, grit assessment may be a valuable addition to assessments of self-control because it might provide unique information about students' perseverance through obstacles, a phenomenon of concern and interest to those attempting to fix the dropout crisis (e.g., Tough, 2012) and narrow the achievement gap (e.g., Shechtman et al., 2013).

The high perceived stress scores in this sample suggest that low-income, first-generation college-going ethnic minority students may experience relatively more stress than their Caucasian, more ecologically advantaged counterparts. Moreover, results suggest that those with more stress also have less grit. However, the relation between low-income, ethnic minority student stress and grit cannot fully be understood in such a small sample of students, and the two-way ANOVA analyses from the current study suggest that the interplay between stress and grit is more complex than what could be captured by simple correlations. Future research should use a larger sample, as well as a comprehensive measure of stress that has been previously validated with low-income, ecologically disadvantaged adolescent samples. More research can help better understand how grit relates to different levels and types of stress.

Finally, grit showed positive (although not statistically significant) relations with all types of academic engagement, suggesting that the “passion” in the definition of grit and the “active involvement” with learning in many definitions of engagement (e.g., Appleton et al., 2008; Park et al., 2012) may be related phenomena in low-income, minority high school students. While the weak to moderate magnitudes of correlation between engagement and grit show that these two constructs are not one and the same, they suggest that students who are interested in school are also more likely to show grit. Results align with previous research on the links between students’ school-related emotions and their effort on difficult schoolwork (e.g., Goodenow, 1992). Emotional engagement also showed a statistically significant, moderate positive correlation with the Perseverance of Effort subscale. Perhaps students similar to those in the current study who enjoy and feel interested in school are more likely to persist in their work even if their interests often change. As was suggested with conscientiousness, future research should compare the

relative predictive power of both grit and various types of engagement to determine which is more important to understanding student success.

Grit's Relation to, and Power to Predict, Achievement Outcomes

The negative relation between grit and literacy scores was inconsistent with previous findings of positive correlations between grit and other achievement measures (i.e., math and reading standardized tests; Eskreis-Winkler et al., 2014). It may be that as students perform better on the TOSREC reading assessment, they find reading to be easier and easier or have stronger reading skills, which means that they do not need as much grit in order to succeed. While some educators believe that this is the case (e.g., Hoerr, 2012), the relationship between strength of literacy ability and grit has not been systematically tested. Alternatively, low-income ethnic minority students facing ecological barriers to achievement and with relatively weaker literacy skills may invoke grit more as a compensatory mechanism to help them persevere through their reading work when it becomes challenging. If this is the case, grit could be used simply to maintain an adequate level of literacy skills rather than to reach higher levels of proficiency. None of these possible explanations can be confirmed, however, with such a small sample and such a preliminary exploration of the link between grit and literacy skills.

It is interesting that Perseverance of Effort, but not Consistency of Interest or the full grit scale score, correlated significantly with student GPA. Current methods of calculating high school GPA and the competitive nature of college admissions may require students to participate and persist in a variety of courses and activities, instead of choosing a solitary focus of interest to pursue deeply. This could possibly explain the nature of GPA's relation to grit. Another explanation is that grit as a construct may only be supportive of GPA scores in high-achieving

students; grit and GPA showed a positive correlation only for students with GPAs higher than 3.70. For a construct developed out of academically elite student samples (e.g., West Point cadets, University of Pennsylvania undergrads), it may be that grit is not as relevant for non-academically elite students.

GPA and TOSREC literacy measures did not correlate. This may be due to the fact that GPA captures a much wider snapshot of students' learning and achievement in school (e.g., Kuncel, Credé, & Thomas, 2005) beyond their performance on a concrete reading task. In fact, GPA may not be a meaningful measure of achievement at all when compared to more skill-based measures, because the factors and grades that go into calculating GPA vary widely across schools and even across classrooms, making comparisons between students ill-advised. Finally, retrospective self-report from students may be a less accurate method of obtaining GPA scores because students either deliberately or accidentally misreport their GPA (e.g., Kuncel et al., 2005).

The inconclusive regression results, although also susceptible to the low power of the analyses, suggest that a linear model may not be best for understanding the relationship between grit, psychoeducational factors, and achievement in this sample of students. Neither grit, engagement, self-control, nor conscientiousness played an influential role in predicting literacy skills. Rather, these skills were best predicted by several traditional demographic predictors of achievement: being a female, being an older student (between 16 – 18), and being from a higher-income family. This finding aligns with previous research on how reading skills grow over time and are stronger among higher-income students (Ryan, Fauth, & Brooks-Gunn, 2006; Stanovich, 1986). Finally, having less experience in Upward Bound also predicted literacy. This last finding

could be interpreted as students being more enthusiastic and motivated to do well in a novel environment (e.g., Kashdan & Silvia, 2009).

As seen in the two-way ANOVA results (see Figures 1 and 2), stress may complicate the relation between grit and achievement outcomes. One interpretation of the results is that grit may be most protective at moderate levels of stress but may be a less effective psychoeducational support at high levels of stress, while at low levels of stress, there are no perceived obstacles necessary for grit to combat. Another interpretation is that grittier students may be protected from feeling high levels of stress. This is the first study to look specifically at the grit and achievement relationship within a low-income, ecologically-stressed minority student population striving to be among the first in their family to obtain higher education. It is crucial that researchers next investigate (a) the nature of these students' stress, (b) the nature of the relationship between stress, grit, and achievement, and (c) whether deliberate attempts to improve grit would be helpful, unnecessary, or detrimental to these students.

Limitations

The largest limitation of this study was its very small sample size, which greatly limits the ability to detect significant results, to confidently draw inferences about the findings, or to claim that the sample adequately represents the psychoeducational and achievement characteristics of disadvantaged U.S. minority, high school students with first-generation college-student status. The nature of the student sample itself also contributes to limitations on the inferences that can be made about disadvantaged minority adolescent grit and achievement. This sample of students – already motivated to pursue college and exposed to a number of

supports from the Upward Bound program in that pursuit – may be more unique and elite than the average minority high school student growing up in poverty.

This study should be replicated with a larger sample, and an *a priori* power analysis should be computed to determine the sample size needed to detect effects with adequate power. Ideas for obtaining larger samples include (1) partnering with multiple schools or programs serving these adolescents, (2) developing back-up recruitment plans with school or program administrators which will allow for obtaining the required sample size even if the initial recruitment plan fails, (3) building school- or program-level incentives into the study design to enhance likelihood of recruitment cooperation, and (4) waiving parental consent and allowing students to consent themselves. Despite limited confidence in the findings, however, it seems that grit may function differently in economically and ethnically diverse students, and that it may not be a blanket solution to the achievement gap and dropout crisis. Rather, grit's benefits may vary based on individual characteristics or school and community contexts.

Another important limitation was the speed with which students completed the 91-item survey, which calls into question the validity of students' answers. The survey completion time (between 10 and 15 minutes) was very short for such a long survey, which suggests that students may have rushed through the survey, did not fully read questions, or did not respond thoughtfully. The lack of quiet, private space for students to complete their surveys also may have compromised the integrity of survey responses. For instance, four participants incorrectly answered the validity question embedded discreetly in the middle of the survey, suggesting that they may not have read items carefully or simply responded without caring for the accuracy of their responses. A recommendation for future research includes ensuring that a designated space

is reserved for data collection, enlisting help from school or program administrators upfront to make all students readily available during those times, and using standardized administration procedures.

One minor limitation was that the wording of several psychological engagement items may have limited generalizability of engagement scores to students' overall academic experiences. Students may have interpreted the questions as referring to the Upward Bound summer program specifically rather than to their high school experience. If students have qualitatively different experiences in the Upward Bound program than in their high schools, their engagement scores here may not be representative of both environments. Another minor limitation was the use of GPA as an outcome measure. The accuracy of the GPA scores cannot be confirmed, since students may have been confused about or forgot their GPA scores, or may have deliberately misreported their GPA. For future studies, obtaining GPA via school records would eliminate this threat to validity. Moreover, using a more reliable outcome measure of achievement all together may be beneficial. Finally, the fact that all data (except TOSREC scores) were obtained via student self-report threatened the validity of the data. A multi-source, multi-method approach (e.g., report from students, teachers, and observers) to data collection is recommended for future studies.

APPENDIX

Group Administration Instructions for the Test of Silent Reading Efficiency and Comprehension (TOSREC)

Group Administration

For your convenience, the following instructions are also provided in Appendix A. Please photocopy these instructions for your use while administering the test.

Before testing begins, be sure that all respondents have a pencil or pen to use to complete the test. Pass out the Student Response Booklets. Make sure that the side with the identifying information and sample items is facing up. Say, Do not open your booklet or turn the page until I tell you to. Write your name on the booklet with today's date. Then say, I want you to read some sentences and decide whether the answer is "yes" or "no." Let's try some for practice.

Sample Sentences: Say, Look at Sample Sentence A. It says, "A cow is an animal." Is that true? Because the answer is "yes," you would circle "yes" in the box. Now look at Sample Sentence B. It says, "A fish lives on land." Is that true? Because the answer is "no," you would circle "no" in the box.

Practice Sentences: Say, Now let's try the practice sentences. Draw a circle around the correct answer for each sentence starting at Practice Sentence 1. Stop at the bottom of the page. Work as fast as you can without making mistakes. Go ahead.

6

When students finish the practice sentences, say, Let's check your answers.

Grades 1-3

P1 is No.
P2 is Yes.
P3 is No.
P4 is Yes.
P5 is Yes.

Any questions?

Grades 4-6

P1 is No.
P2 is Yes.
P3 is No.
P4 is Yes.
P5 is Yes.
P6 is No.
P7 is Yes.
P8 is No.
P9 is No.
P10 is Yes.

Any questions?

Grades 7-12

P1 is No.
P2 is Yes.
P3 is No.
P4 is Yes.
P5 is Yes.
P6 is No.
P7 is Yes.
P8 is No.
P9 is No.
P10 is Yes.
P11 is No.
P12 is No.
P13 is Yes.
P14 is Yes.
P15 is No.

Any questions?

Test Items: Now say to the students, When I tell you to begin, I want you to turn the page. Start at the top of the page. Read each sentence silently. Circle "yes" if the sentence is true and "no" if it is not true. Do as many as you can until I tell you to stop. If you finish the first page, go to the next page and keep going in this booklet until I tell you to stop. You will have 3 minutes. Work as fast as you can without making mistakes. Ready? Begin.

When the 3 minutes are up, say to the students, Close your booklet. I will come around and collect all the booklets.

From Test of silent reading efficiency and comprehension (examiner's manual), by R. K. Wagner, J. Torgesen, C. A. Rashotte, & N. Pearson. Copyright 2010 by Pro-Ed.

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