ABSTRACT

Title of dissertation: CAN GRIT FIX THE ACHIEVEMENT GAP? AN INVESTIGATION OF GRIT'S CONCEPTUAL UNIQUENESS AND PREDICTIVE VALUE IN DIVERSE STUDENT ACHIEVEMENT

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Grit, defined as "perseverance and passion for long-term goals," is considered an important noncognitive factor for promoting academic achievement and closing the racial achievement gap. School-based policy and intervention work, however, is getting ahead of the grit research. Specifically, it is unclear to what extent grit overlaps with existing noncognitive variables as a construct and measure. It is also unclear whether grit predicts later achievement when accounting for other noncognitive variables, and if grit and other

noncognitive variables predict achievement differently for students from different demographic backgrounds.

Using exploratory and confirmatory factor analysis within a self-regulation framework, I evaluated grit's conceptual and operational overlap with similar noncognitive factors of engagement, emotion regulation, and growth mindset in an ethnically diverse 3rd, 4th, and 5th grade student sample ($N = 192$). Using structural equation modeling, I tested if grit predicted literacy achievement 1-3 months later, in a model also adjusting for similar noncognitive factors and for previous (Time 1) literacy achievement. Finally, I compared the predictive model by age, ethnic group, and bilingual status to determine which noncognitive factors predicted literacy outcomes for which groups of students. Results indicated that, among diverse elementary school students, grit and other noncognitive constructs are not lower-order factors of an overarching self-regulation construct. Grit was moderately related to, yet distinct from, growth mindset and emotion regulation, while it overlapped excessively with engagement. Grit and engagement as a joint construct did predict later literacy achievement, but not after controlling for previous literacy achievement. Relations among grit, engagement, and literacy achievement were different for ethnic and linguistic groups, but again these differences were eliminated after controlling for previous literacy achievement.

Research lacks compelling evidence that grit, at least as it is currently measured, is a relevant predictor of diverse students' short-term literacy outcomes. Researchers and educators are thus cautioned against focusing on grit as an assessment or academic intervention tool for improving ethnic minority or bilingual students' reading; a focus on

previous achievement and building literacy skills continues to be best practice for promoting future literacy achievement.

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by

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DEDICATION

To Dr. Colleen O'Neal, my academic advisor, for her guidance in turning my scholarly passion into product, and for her "warm demanding" over the past five years.

To Scott Riley, my husband, for providing support, encouragement and perspective during the most challenging parts of this process.

To Carlene Weston, my mother, for her belief in me and unwavering encouragement.

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Chapter 1: Introduction

Many noncognitive constructs, also known as "socioemotional learning competencies" or "21st century skills" (Duckworth & Yeager, 2015; Zins, Elias, & Greenberg, 2007), are important predictors of children's development and achievement. These constructs may be equally important for economically disadvantaged, ethnic minority children and more privileged, ethnic majority children alike (Becker & Luthar, 2002; Farrington et al., 2012), although researchers point out that they are no substitute for improved societal supports or equitable resources (Duckworth & Yeager, 2015; Tough, 2016). Across ethnic, cultural, and economic lines, constructs such as engagement (Li, 2011), emotion regulation (Elias & Arnold, 2006), and growth mindset (Blackwell, Trzesniewski, & Dweck, 2007) may help differentiate between students who fall behind academically and those who succeed.

Recent research on another noncognitive construct called grit, defined as "perseverance and passion for long-term goals" (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087), suggests it is also related to academic success (Duckworth & Quinn, 2009; Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014). Indeed, excitement has grown among researchers and educators that grit is a key factor in closing the racial and income achievement gaps (Shechtman, DeBarger, Dornsife, Rosier, & Yarnall, 2013), with some school systems adopting grit assessment and intervention on a broad scale (Cohen, 2015). This widespread, indiscriminant adoption of grit as a predictor and facilitator of achievement for diverse groups of children, however, is premature (Credé, Tynan, & Harms, 2016). Three areas of grit research need to be explored before translating grit research further into educational practice. First, the literature lacks clarity

on how grit differs by concept, definition and operational measurement from other similar noncognitive factors related to achievement, such as engagement or growth mindset. Second, only two studies have directly compared grit's predictive power for later achievement to the predictive power of similar noncognitive factors (Muenks, Wigfield, Yang, & O'Neal, 2016; Weston Riley, Boyars, O'Neal, & Wigfield, under review), and these studies suggest grit may not actually be as strong or unique a predictor as initially touted. Third, grit research has focused on a limited range of students (mostly high school or college-aged, Caucasian students from middle- to upper-income families), to the neglect of understanding its construct validity across more diverse and younger groups. Without understanding whether grit is a conceptually unique or statistically powerful predictor of later outcomes for more diverse and younger children, researchers and practitioners cannot determine if new school-based grit interventions are a wise or empirically supported method of combatting the achievement gap or, more simply, promoting all students' learning.

Current Study

The current dissertation study addresses each of these missing pieces of the grit research base and, thus, increases understanding of grit's relevance for intervention research. Working with a sample of ethnically diverse elementary school students and using self-regulation theory as a unifying framework, I investigated the construct and measurement overlap of grit and three similar, well-established noncognitive predictors of achievement: emotion regulation, engagement, and growth mindset. Specifically, I used confirmatory factor analysis to test if a measurement model of all subscales loading onto a latent self-regulation construct would provide a better fit to the data than a model

of all subscales loading onto their respective operationally prescribed factors. I also used structural equation modeling to test grit's unique power to simultaneously predict later achievement relative to these other noncognitive factors and when accounting for previous achievement. Finally, to understand whether the predictive model fit differently for different groups of students, I conducted multi-group comparisons by ethnic group and by age. My results will help clarify whether grit promotion is a worthwhile investment of time and resources, and for which demographic groups of students grit and similar factors are most related to achievement, if at all.

Chapter 2: A Review of the Literature

The Grit Construct – Unique or "Old Wine in New Bottles"?

Angela Duckworth and colleagues defined grit as "perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087). Grit has two core dimensions: *consistency of interests* and *perseverance of effort* (Duckworth et al., 2007). Consistency of interests (hereafter referred to as *interests*) can be understood as constant enthusiasm for and commitment to 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 (hereafter referred to as *perseverance*) can be explained as strenuous and unwavering pursuit of goals in the face of repeated failures, setbacks, and absence of positive feedback. "The gritty individual," Duckworth and colleagues explain, "approaches achievement as a marathon; his or her advantage is stamina" (2007, p. 1088). A gritty person maintains interest in and continues working toward goals "over years despite failure, adversity, and plateaus in progress" (Duckworth et al., 2007, p. 1088), while less gritty people choose to give up. Inspired by the unflagging "stick-to-it-ness" that leaders displayed in climbing the ladder of success in various fields, Duckworth developed the Short Grit Scale (see Table 1 for items) to measure the tendency to pursue long-term goals across various domains (e.g., school, career, interpersonal relationships; Duckworth et al., 2007; Eskreis-Winkler et al., 2014).

Overlap with Personality Variables. Grit originated in the personality literature (e.g., Duckworth et al., 2007; Von Culin, Tsukayama, & Duckworth, 2014). Initially,

researchers attempted to conceptually distinguish grit from the similar personality factors of self-control and conscientiousness. They claimed that what sets grit apart from other personality constructs is (1) the long-term nature of the goal being pursued (reflected in the perseverance subscale), and (2) an individual's unwavering focus on the goal (reflected in the interests subscale; Duckworth et al., 2007; Duckworth & Gross, 2014). While conscientiousness and self-control, for example, help individuals work hard and complete daily responsibilities on a short-term basis, grit helps individuals pursue "personally valued goals over the course of months and years" (Duckworth & Eskreis-Winkler, 2013, Measuring Individual Differences in Grit section, para. 2). Having self-control to withstand "hourly temptations" (Galton, 1892, as cited in Duckworth et al., 2007) is different from the longer-term commitment and discipline embodied in grit's perseverance subscale. Furthermore, grit's interests subscale suggests constant and unwavering attraction to one pursuit, whereas a person can be conscientious or self-controlled and still shift interests often. It is the intensity and duration of perseverance and goal commitment that sets grit apart from these other personality constructs, according to Duckworth and colleagues. They saw value in creating this new construct, believing it might have the power to distinguish among high-achieving individuals with similarly high levels of conscientiousness or self-control, separating otherwise typical high achievers from those exceptional individuals who reach the pinnacles of success (Duckworth et al., 2007).

Despite arguments that grit is distinct from conscientiousness and self-control, moderate to strong relations between the variables in adult and student populations imply significant measure overlap. Among West Point cadets and adults ages 25 and older,

self-reported grit and conscientiousness correlated at r = .64 – .77. Among West Point cadets and National Spelling Bee competitors ages 7 to 15, self-reported grit and self-control correlated at r = .63 – .66 (Duckworth et al., 2007), correlation coefficients high enough to evoke suspicion that grit and self-control are the same constructs (Campbell & Fiske, 1959). Other research suggests a limited ability of grit to predict achievement after adjusting for the contribution of self-control (Stewart, 2015), another reason to doubt grit's measurement uniqueness. Recent research also suggests conceptual redundancy in these three measures. For example, MacCann & Roberts (2010) found correlations from r = .74 to r = .85 between grit's perseverance subscale and an eight-factor measure of Big Five Conscientiousness, its industriousness factor, and its perseverance factor. Similarly, a meta-analysis of 73 studies revealed a population-level estimated correlation of r = .84 between grit and conscientiousness, and a correlation of r = .72 between grit and self-control (Credé et al., 2016).

Grit's definition – "passion and perseverance for long-term goals" – is not well operationalized in the Short Grit Scale (Table 1), which could contribute to this measure overlap. The items of the scale fail to directly assess the specific components that supposedly make grit unique (Duckworth et al., 2007; Duckworth & Gross, 2014): (1) the long-term nature of the goal being pursued, and (2) the supremacy of the goal in the individual's life, which infuses the individual with passion for that goal. There is only a vague allusion in two items to pursuits being long-term (e.g., Item 6, "projects that take more than a few months to complete"), and no mention of goals or projects as supremely important or interesting, let alone evocative of "passion." Aside from definitional mismatch, recent studies suggest psychometric weakness such as the interests subscale's

low Cronbach alphas (Weston Riley et al., under review), the interests subscale's failure to load onto the higher-order grit factor in a confirmatory factor analysis (Datu, Valdez, & King, 2016), and this subscale's weak or nonexistent relations with achievement (e.g., Bowman et al., 2015; Chang, 2014; Muenks et al., 2016). If one of grit's two subscales is operationally weak and practically useless, grit may be no more than "old wine in new bottles" (Credé et al., 2016), a new term for the old concept of self-control.

Overlap with Noncognitive Variables in the Educational Literature. In the field of education policy, grit is treated not so much as a stable personality trait but rather as a malleable and teachable socioemotional skill in schools (e.g., Klein, 2015; Shechtman et al., 2013). Grit's adoption into the educational sphere is somewhat logical, since Duckworth and her research team drew not only from personality measures but also from noncognitive measures of persistence, achievement motivation and goal commitment when developing the Grit Scale (Duckworth et al., 2007). It is unclear, however, how similar the grit measure is to these measures inspiring its creation. If the research comparing grit with conscientiousness and self-control is any indication, educators should be skeptical of grit's uniqueness compared to these other variables. The noncognitive literature is already clogged with a surplus of constructs and measures, some of which are clearly differentiated and others which are not. Several papers on the construct of engagement, for example, are dedicated to this issue, known as the "jingle/jangle problem" (Block, 2000), in which different terms are used for the same construct, or the same term is used for different constructs, causing conceptual haziness (Appleton, Christenson, & Furlong, 2008; Fredricks, Blumenfeld, & Paris, 2004; Reschly & Christenson, 2012). Is grit just a re-packaging of other "socioemotional skills" or

"character traits," similar to how it overlaps with personality variables? Or does grit truly make a unique contribution to the educational literature?

Conceptual haziness can also lead to development of new interventions without understanding if they meaningfully differ from existing interventions, or if they predict success differently for different groups of students or under different conditions (Block, 2000; Stecher & Hamilton, 2014). In the rush to adopt grit interventions, schools may abandon use of established educational measures and interventions (e.g., engagement, emotion regulation) which have empirical evidence of predicting success among all types of students, from high-achieving to at-risk (e.g., Farrington et al., 2012; Yeager & Walton, 2011). It is important to clear up this confusion while grit research is still in its youth, to properly guide future assessment and intervention work with children.

Grit and Noncognitive Factors within a Self-Regulatory Framework. Because grit emerged from the personality literature, no explicit theoretical framework has tied grit to similar noncognitive constructs used commonly in educational research and interventions. How exactly, then, does grit fit theoretically with these other factors in the educational literature? Within the literature on self-regulation and self-regulated learning (e.g., Pintrich, 2000; Schunk & Ertmer, 2000), effort management strategies such as goal-setting, task persistence, and self-monitoring progress toward goals share many similarities with the construct of grit. Self-regulation entails the control of behavioral, emotional, and motivational systems to pursue long-term goals (Duckworth & Carlson, 2013), similar to grit's definition of perseverance and passion for long-term goals. Items on some self-regulated learning scales (Pintrich & DeGroot, 1990; Zimmerman & Pons, 1986) sound very similar to Grit Scale items, and recent research shows moderate to large

Table 1

Short Grit Scale (Grit-S) Items and Adapted Grit-S Items in Current Study

Original Scale Items	Current Study Adapted Items
1. New ideas and projects sometimes distract me from previous ones.[a]	Other things sometimes distract me from what I am already working on in school.[a]
2. Setbacks don't discourage me.	My schoolwork is difficult and makes me want to give up.[b]
3. I have been obsessed with a certain idea or project for a short time but later lost interest.[a]	I get very interested in a new topic in school, but then I quickly get bored with it.[a]
4. I am a hard worker.	I am a hard worker in school.
5. I often set a goal but later choose to pursue a different one.[a]	I often set a goal in school but later give up and choose a different goal.[a]
6. I have difficulty maintaining my focus on projects that take more than a few months to complete.[a]	It's hard to focus on schoolwork that takes a long time to complete.[a]
7. I finish whatever I begin.	I finish whatever I begin in school.
8. I am diligent.	I work steadily in school without giving up.

Note. Original scale items from Duckworth, A. L., & Quinn, P.D. (2009). Development and validation of the Short Grit Scale (Grit-S). *Journal of Personality Assessment, 91*, 166-174. All items rated on a 5-point Likert-type scale, ranging from 1 (Not like me at all) to 5 (Very much like me). Summary scores obtained using mean of item scores.
[a]Items from interests subscale and reverse-scored.
[b]Item reverse-scored.

amounts of construct overlap between grit's subscales and measures of cognitive and behavioral self-regulation (Muenks et al., 2016; Rojas, Reser, Usher, & Toland, 2012). An informal investigation of the grit construct's theory, subscales and individual Grit Scale items further suggests that it shares features with other established constructs such as emotion regulation, engagement, and growth mindset; these shared features will be detailed later. Since reference is made to all four of these constructs within the self-regulation and self-regulated learning literature, either directly or indirectly through discussion of similarly-named constructs (e.g., Pintrich, 2000; Zimmerman, 2008), I propose that grit can be understood in relation to these constructs through a self-regulatory framework.

Like the hype around grit in school systems (e.g., Zernike, 2016), self-regulation has been a popular topic as educators and policy-makers attempt to explain why students succeed academically and remain psychologically well-adjusted despite multiple ecological barriers to achievement (Lengua, 2002; Raver, 2004; Zimmerman, 1994). Self-regulation is defined as "the voluntary control of attentional, emotional, and behavioral impulses in the service of personally valued goals and standards" (Duckworth & Carlson, 2013, p. 209). It is a dynamic set of mindsets, motivations, and habits (Zimmerman, 1994) allowing individuals to ignore distractions, modulate negative emotions, focus attention and delay immediate gratification all in the pursuit of long-term goals (e.g., Mischel & Ayduk, 2002). Self-regulation strategies in school settings predict long-term academic outcomes for diverse groups of students from elementary through high school (Duckworth & Carlson, 2013; Nota, Soresi, & Zimmerman, 2004), and interventions to promote these strategies have been successfully in elementary-aged and younger students

(Mischel et al., 2011; Zimmerman, 2008). Self-regulated learning (SRL), the framework applied to self-regulation within academic contexts, involves four domains – cognition, motivation/affect, behavior, and context (Pintrich, 2000) – and self-regulated students are active participants in their own learning process across these domains (Zimmerman, 2008; Wolters & Hussain, 2015). Each of the social-emotional processes in the current study are important parts of the domain processes and are captured in various measures of academic self-regulation, such as the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich & DeGroot, 1990).

The motivation/affect domain of self-regulation is considered both a component of and a pre-condition for self-regulatory behaviors (Borkowski & Thorpe, 1994). In order for students to be energized and activated toward their goals or tasks, they must have an interest or positive emotion toward the task, or a belief in the task's value. The MSLQ includes items such as "I like what I am learning in this class" and "I think that what I am learning in this class is useful for me to know" to capture the interest and value components of academic self-regulation. To the extent that academic engagement can arise from finding a task intrinsically enjoyable (Skinner, Kindermann, & Furrer, 2009) or meaningful in some way (e.g., Yeager et al., 2014), engagement is important early in the self-regulation process. Additionally, students must believe in their capability to actually attain that goal or complete that task (Zimmerman, 1989), reflected in MSLQ self-efficacy items such as, "I'm certain I can understand the ideas taught in this course." A student is unlikely to maintain focus on a task, especially in the presence of more tempting distractions, if he does not feel confident he can complete the task, and will more likely give up as the task becomes difficult if he believes his performance cannot

improve with effort or practice (Dweck, 1999; Robins & Pals, 2002). In contrast, students who attribute success to effort will remain motivated to work hard and use self-regulation strategies more often (Schunk, 1994; Dweck, 2002). Thus, having a growth mindset is important to practicing self-regulation.

Once a student has established a baseline motivation and positive attitude toward a task, he/she will then self-regulate within the cognitive and behavioral domains, including goal-setting, monitoring progress toward the goal, and sustaining efforts as he/she engages with the task (Pintrich, 2000). Zimmerman (1989) described self-regulated learners as using a variety of active learning strategies (aka behavioral engagement) and setting varied goals for their learning (aka persistence or grit). Motivational/affective processes are still relevant at this time, of course, as students may need to control negative emotions such as frustration when obstacles thwart progress toward the goal and deliberately continually refer to the aspects of the task that initially interested them to stay energized. One dimension of SRL, effort management, sounds especially similar to grit in that it entails working diligently in the face of boring or challenging tasks (Zimmerman & Pons, 1986); this effort is reflected in the MSLQ item, "Even when study materials are dull and uninteresting, I keep working until I finish." Furthermore, a research study has found moderate correlations (r = .45 - .55) between the perseverance subscale of grit and various components of SRL (Wolters & Hussain, 2015), although these authors conceptualized grit as a trait-like precursor to SRL, not a component of SRL itself. Whether grit is a conceptually distinct precursor to self-regulation or a component of self-regulated behavior in the theoretical model could have implications for how strongly it overlaps with the other constructs of self-regulation.

Walter Mischel and colleagues (2011) viewed emotion regulation as a core component of self-regulation. As they observed in their famous "marshmallow studies," delay of gratification and suppression of impulses in favor of long-term goals requires frustration regulation through deliberate strategies such as attentional refocusing and cognitive reappraisal. Mischel and Ayduk (2002) conceptualized self-controlled, grit-like behaviors as the consequence of strong affective self-regulatory abilities. Howse, Calkins, Anastopoulous, Keane, & Shelton (2003) also viewed self-regulated behaviors like perseverance as a consequence of emotional regulation. Therefore, it seems emotion regulation is also an important aspect of SLR.

The multi-dimensional nature of self-regulation allows for comparisons of which components are most predictive of achievement, which can inform hypotheses about which constructs in a comprehensive predictive model might be strongest. There is some evidence that the behavioral components of SRL, such as persistence and effort, may be more valuable predictors of classroom achievement than motivational and affective components, such as engagement or a growth mindset (Pintrich & DeGroot, 1990). Other research has found that persistence and effort alone may not be enough to predict high achievement. For example, Zimmerman and Pons (1986) found that 10th grade students' self-reported answers on a self-regulated learning strategies questionnaire predicted with 93% accuracy which students were in high- vs. low-achievement tracks in high school, yet students who reported frequent use of will power (e.g., "just try harder") when completing work or preparing for tests were much more likely to be in the low-achievement track than students who used more specific learning strategies such as organizing and transforming information (e.g., making an outline) or seeking help from a

teacher or peer. Therefore, simple persistence without a strategy for how to channel that persistence in a strategic way may be counter-productive. Since self-regulated learning is a process more than a solitary skill (Pintrich, 2000), a combination of self-regulatory factors may be necessary to most effectively predict later achievement.

Grit's Relations with Achievement

Early research from Angela Duckworth's lab presented grit as a promising predictor of various measures of current and future achievement among ambitious and high-achieving high school and college-aged students. For example, among ethnically and socioeconomically diverse 7th through 11th graders at a high-achieving public school, self-reported grit scores correlated positively with GPA (r = .32) and negatively with volume of daily TV watching (r = -.22) one year later, after controlling for age (Duckworth & Quinn, 2009). A limitation of this study was that it did not explore ethnic group differences in grit's relations to outcomes. Two studies of incoming college-aged West Point cadets (85% male, 76% Caucasian) revealed that their self-reported grit predicted completion of summer-long basic training (vs. dropout) even after adjusting for self-control, high school rank, and previous SAT scores (Duckworth et al., 2007; Duckworth & Quinn, 2009), although it did not predict the following year's GPA any better than these other predictors. Grit's strength in predicting basic training completion, however, should be considered with a grain of salt, as roughly 95% of candidates are typically retained after West Point summer trainings, making for a much smaller comparison group of dropouts and less accurate results (Credé et al., 2016). A more recent, unpublished study suggested grit might have limited ability to predict

achievement in a unique way from either conscientiousness or self-control, at least among college students (Stewart, 2015).

Longitudinal studies with another high-achieving, but younger (mean age 12-13 years), international student population – competitors in the Scripps National Spelling Bee – revealed that children's self-reported grit correlated weakly with the personality trait of Openness to Experience (r = .17) and that it predicted the final competition round reached one month later after controlling for this personality factor and for age (Duckworth et al., 2007; Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011), but not after controlling for verbal IQ. A unique finding was that the link between grit and spelling bee performance was partially mediated by amount of deliberate solitary spelling practice participants accumulated (Duckworth et al., 2011), supporting the theoretical claim that grit leads to more perseverance on tedious tasks in pursuit of a long-term goal (in this case, spelling bee champion status). A limitation of this study, however, was that demographic details such as ethnic group and socioeconomic status were excluded, making it impossible to determine if the path from grit through deliberate practice to goal attainment held true equally for all students in the study.

The reviewed studies thus far have built the case for grit as an important indicator of later success over and above some personality, demographic, and cognitive variables, but did not include noncognitive variables prevalent in educational research. A few studies *have* included a single noncognitive variable along with grit and personality or demographic factors in a longitudinal predictive design. For example, low-income, primarily Black and Latino high school juniors' responses to an abbreviated 4-item measure of grit had moderate to strong correlations with conscientiousness and school

motivation (r = .49 for both), and predicted graduation from high school the following year (Eskreis-Winkler et al., 2014). Grit remained a significant predictor of later graduation even after controlling for self-reported conscientiousness and motivation; self-reported perceived school safety and perceived support from teachers, parents and peers; previous standardized achievement; gender; ethnicity; and socioeconomic status. In sum, grit added predictive value over and above a brief measure of the noncognitive predictor motivation, as well as demographic variables, personality traits, and school climate factors known to influence achievement.

Other studies have compared multiple noncognitive variables to grit, but in a correlational study with no testing of how these factors work together longitudinally to predict later achievement. For example, in a large study of ethnically diverse (50% White, 30% African American, 9% Hispanic) students in grades 4-8, grit had substantial overlap with measure items representing self-regulatory factors of self-efficacy, self-regulated learning, and enjoyment of (aka emotional engagement with) reading and math (r = .29 - .60; Rojas et al., 2012), with the strongest correlations between grit and self-regulation of reading. This study, while limited in its predictive conclusions, was unique in its use of a relatively younger student sample and in its explicit examination of ethnic group differences in grit levels; no group differences were found. Most recently, a study of ethnically diverse (35.8% minority) students in their junior year at a private high school examined overlap between grit's subscales and measures of cognitive and behavioral self-regulation, behavioral engagement and disaffection (Muenks et al., 2016), as well as the predictive power of these constructs (measured at mid-year) for year-end GPA and grades. Results suggested high overlap among constructs: grit's interests

subscale, behavioral self-regulation and behavioral disaffection together indicated one higher-order construct, and grit's perseverance subscale, cognitive self-regulation and behavioral engagement together indicated a separate higher-order construct. Furthermore, grit was not the strongest predictor of later achievement, but rather behavioral self-regulation, suggesting grit may not be the most important of these noncognitive predictors for various school outcomes.

Grit's purportedly positive relations with achievement in these early studies may have led educational policy-makers and popular media to encourage the implementation of grit assessments and interventions as tools to facilitate achievement (Cohen, 2015; Hoerr, 2013; Shechtman, et al., 2013; Tough, 2012; Zinshteyn, 2015). Yet they have overlooked or did not know about the evidence that grit sometimes does not predict outcomes better than other variables and the lack of research on grit among low-income, ethnic minority and immigrant student populations, who are often the recipients of these interventions. Only one published study has examined grit's relation to academic outcomes within a primarily ethnic minority and low-income student sample (Eskreis-Winkler et al., 2014), but these students were older high schoolers and not in elementary school where grit interventions are being developed. A short-term longitudinal study by the current authors (Weston Riley et al., under review) attempted to address this research gap, exploring grit's factor structure, relations with noncognitive variables, and unique predictive power for students who are traditionally at-risk for underachievement. Using a low-income Latino immigrant elementary school sample and a new teacher-reported version of the Grit Scale in addition to an adapted student self-reported version, the authors found that grit fit the theorized two-factor structure but that grit's interests

subscale had relatively weak psychometrics and few relations to other study variables. Grit's perseverance subscale predicted performance-based and standardized literacy achievement four months later, over and above measures of emotional engagement and persistence, but failed to predict achievement after adjusting for an identical measure of previous literacy achievement. This study was unique in its young, low-income and ethnic minority student sample, its testing of a new cross-informant measure, and its comparison of grit with two other noncognitive measures. It was also unique in its testing of grit's power to predict later achievement after adjusting for prior achievement, something that some other studies attempted to do using similar but not the identical measure of previous achievement (e.g., Duckworth & Quinn, 2009). Since other similar noncognitive factors such as motivation and growth mindset have predicted later achievement even after adjusting for previous achievement (e.g., Blackwell et al., 2007; Meece, Wigfield, & Eccles, 1990), testing if grit too can predict outcomes after this more rigorous analysis method is another way to determine if grit is as important as these more established factors. The preliminary evidence suggested, so far, that grit might fall short.

In summary, the above reviewed literature revealed that grit relates to personality (conscientiousness, self-control) and noncognitive (academic self-regulation, emotional engagement, motivation) factors on a correlational and factor analytic level, and may in fact be just one dimension of a broader construct along with these factors. Nevertheless, grit predicted a range of achievement measures, such as high school graduation, literacy skills, and GPA, over and above these personality and noncognitive constructs, although this finding did not occur in all studies and grit was sometimes weaker than these other predictors. More research is needed as most of the research has been done with high

school and college students from middle-income families; researchers are just beginning to understand the role grit plays in young and diverse children's school achievement. Grit holds some promise in predicting a foundational academic competency among low-income, ethnic minority and immigrant children, but also has limitations when considering the unequal predictive power of its subscales and when adjusting for factors like previous achievement. Before moving forward with assessment and intervention of grit in schools, it is important to further investigate (1) the extent of grit's overlap with other noncognitive factors and (2) grit's unique ability to predict achievement relative to these other factors in a young sample.

Developmental Differences in Grit

No research has explicitly investigated developmental differences in grit, although some inferences can be made about grit in children based on research on grit in older adolescents and adults. In Weston Riley et al. (under review), for example, students rated their grit (and teachers rated these students' grit) similarly to ratings found in other studies of older students and adults, suggesting grit levels are comparable across age groups. This meshes with findings that grit is moderately stable over one year in high school students and over the adult lifespan (Duckworth et al., 2007; Duckworth & Quinn, 2009). However, when teachers rated students in Weston Riley et al. (under review), the correlation between the two grit subscales was much higher than in previous studies. Thus, overall grit levels may be comparable across ages but grit's factor structure may be different in younger students, raising questions about at what age grit's two-factor structure emerges and whether grit can reliably relate to achievement across ages.

Developmental differences in self-regulation can inform hypotheses about age-based differences in grit. Young children (prior to about age 9) hold primarily incremental, effort-based views of achievement (Schunk, 1994), so may exert self-regulated behaviors primarily because they believe they will succeed if they work hard. On the other hand, students are better able to intentionally set goals and regulate behaviors toward those goals as they age (Pintrich & Zusho, 2002); however, the dynamics of beliefs and achievement are too complex and influenced by individual differences to assume a clear increase in self-regulation with age. As students move into later elementary school, messages about the importance of ability as well as peer comparisons of performance become more frequent in school, leading to more entity-based mindsets, whereby students see their performance as more and more reflective of their innate abilities. In the midst of increasing social comparisons and solidifying beliefs that one's performance reflects one's ability, some students increase their perseverance on tasks (performance motivation) while others decrease their effort to avoid failure or negative performance evaluation (avoidance motivation; see Wigfield, Eccles, & Rodriguez, 1998, for brief review). Changes in grit may, similarly, be tied more to individual differences than to systematic changes by age.

Ethnic Group Differences in Grit and Grit's Relation to Achievement

Educators and policy-makers continually call for "resilience factors" like grit to combat the academic challenges of under-privileged ethnic minority students (Green et al., 2008), but this call assumes grit relates to achievement equally among students of different races, ethnic groups, and socioeconomic statuses. Only a few studies have actually examined if the theorized construct of grit holds across ethnic groups, or if there

are ethnic group differences in grit's relations to achievement. In a factor analytic study using self-reported grit scores from Filipino high school and college students (Datu et al., 2016), the interests subscale did not load onto the higher-order grit factor as in other studies, suggesting differences in how this grit construct is conceptualized in a more collectivist culture. Batres (2011), in a dissertation study exploring grit, meaning in life, happiness, and GPA among ninety-six primarily academically at-risk minority high school students in an alternative education program, found mean grit scores similar to high-achieving Caucasian samples, but that student-reported grit and concurrent student-reported GPA did not relate. This finding should not, however, be interpreted as evidence of grit's differential functioning across ethnic groups because of several methodological flaws noted in the limitations section of the paper. These studies are far from evidence of underlying ethnic or socioeconomic differences in how grit functions with achievement.

Cultural dynamics of how different students approach and interact with their learning environments, viewed through a self-regulation lens, might better inform hypotheses about how grit, other noncognitive factors, and achievement relate across diverse student groups. For example, teacher discrimination and lower expectations for ethnic minority students (either explicit or implicit and unconscious) can become a self-fulfilling prophecy, suppressing ethnic minority youths' academic interest, motivation, persistence and achievement. These students may react to discrimination by de-identifying with academics in order to avoid proving the stereotype correct; this is seen especially in adolescence (Graham & Hudley, 2005). Yet other students may work harder to disprove the perceived low expectations; indeed, a strong sense of ethnic identity can buffer against discrimination and support students' persistence and

engagement (Smalls, White, Chavous, & Sellers, 2007). Similarly, the "immigrant paradox" (reviewed by Graham & Hudley, 2005; Stanat & Christensen, 2006) suggests that first-generation immigrant children actually hold more positive views of achievement and perform better than their 2nd and 3rd generation counterparts in US schools, due in part to a stronger sense of ethnic identity. On the other hand, an inverse paradox has been found among African American students, showing higher levels of engagement and self-efficacy but lower achievement scores (Pintrich & Zusho, 2002; Shernoff & Schmidt, 2008).

It is important to keep in mind the great deal of within- group heterogeneity in levels of academic motivation, engagement, and self-regulatory behaviors (Wigfield et al., 2015). It is very difficult to interpret any mean-level differences in constructs like grit in theoretically meaningful or educationally relevant ways, and there is danger in prematurely interpreting group differences as personal failings or deficits among low-income, ethnic minority students who struggle in school and seem disengaged. Wigfield and colleagues (2015) recommended using structural equation modeling to study equivalence and relevance of these self-regulatory and motivational constructs for different cultural groups, which the current study does.

Exploring Conceptual Overlap between Grit and Noncognitive Variables

Engagement

Engagement construct. School engagement is a multidimensional meta-construct (Appleton et al., 2008), broadly defined as active emotional, cognitive, psychological, or behavioral involvement in learning (Appleton et al., 2008; Park, Holloway, Arendtsz, Bempechat, & Li, 2012). Engagement first gained prominence in the dropout literature

(Finn, 1989; Fredricks et al., 2004), but research developed simultaneously across the school reform (National Research Council, 2004) and motivational literatures (Connell & Wellborn, 1991; Skinner, Marchand, Furrer, & Kindermann, 2008). Multiple models of engagement exist, with the most basic models comprised of two engagement facets: affective/emotional and behavioral (Reschly & Christenson, 2012). For example, the Participation-Identification model from the school dropout literature (Finn, 1989) suggested emotional engagement involves a sense of belonging to and identification with school. This emotional engagement leads to behavioral engagement, or participation in the classroom, while the opposite dynamic (lack of belonging leading to lack of participation) can also occur (e.g., Irvin, 2012). More comprehensive models incorporating additional facets of engagement also exist; for example, Reschly & Christenson (2012) propose a Check & Connect dropout model with four facets of engagement. In addition to emotional (identification) and behavioral (participation) dimensions, this model includes cognitive engagement (i.e., a belief in the value of the task or situation) and academic engagement (i.e., a more school-specific type of behavioral participation, such as homework completion or time on task in the classroom). Despite having more dimensions, this engagement model still resembles the Participation-Identification model in process, with internal forms of engagement (affective and cognitive) as precursors to observable forms of engagement (behavioral and academic).

Some models of engagement focus only on the observable aspect and describe a broad array of behaviors representing practically any positive type of interaction with the academic and social aspects of school (e.g., Rumberger & Lim, 2008). Yet other models

focus only on the emotional identification piece of engagement and theorize that this sense of belonging can be manifested both behaviorally and emotionally (e.g., Skinner et al., 2008). Some researchers reclassify identification and belonging as psychological engagement, and reduce emotional or affective engagement to simple feelings of interest or happiness. For example, Christenson, Reschly, & Wylie (2012) utilized a three-dimensional model of engagement, including behavioral, cognitive, and either an emotional or psychological facet used interchangeably. Again, one common theme across models is internal positive feelings of engagement leading to external (behavioral) manifestations of engagement.

Conceptual and item overlap with grit. Within the adult positive psychology literature, grit and its perseverance subscale are theorized to have moderate overlap with engagement (Von Culin et al., 2014), but the relations between engagement and grit have not been systematically tested within the educational literature. Rojas et al. (2012) found in a study of grit among diverse 4th through 8th graders that grit showed moderate concurrent relations with a single item about enjoyment of reading and math. While enjoyment is an important component of emotional engagement in school (Skinner et al., 2008), this single item was far from representative of the entire construct. A full-scale comparison of grit and engagement is warranted to compare how the conceptual constructs and instruments used to measure them overlap.

Per the fundamental model of engagement as comprised of emotional and behavioral components, it seems that grit with its affective (consistency of interests) and behavioral (perseverance of effort) subscales has many theoretical similarities. Skinner and Pitzer (2012) identified *effort*, *goal-directed behaviors* and "*perseverance in the face*

of obstacles and difficulties" (p. 24) – all core components of grit – as characteristic manifestations of behavioral engagement. Similarly, Steinberg, Brown, and Dornbusch (1996) conceptualized a tendency to *persist on work that takes a long time to complete* as one of the key dimensions of emotional engagement. Additionally, Ainley (2012) identified interest (one subscale of grit) as a crucial precursor to both emotional and behavioral engagement. A student's valuing of school as important for his or her future goals (Appleton, Christenson, Kim, & Reschly, 2006), a type of emotional as well as cognitive engagement, often manifests as persistence on difficult academic tasks (Finn and Zimmer, 2012), so it seems grit and engagement can manifest in nearly identical behaviors. Some engagement measures even operationalize the definition of grit (passion and perseverance toward long-term, high-priority goals) better than the Grit Scale itself. For example, the MacArthur School Engagement Measure (SEM; Fredricks, Blumenfeld, Friedel, & Paris, 2005) includes the item, "I feel excited by my work at school," and the Motivation for Reading Questionnaire (MRQ; Wigfield & Guthrie, 1997) includes the item, "If I am reading about an interesting topic I sometimes lose track of time." Both items evoke a passionate involvement with tasks. The Student Engagement Instrument (SEI; Appleton et al., 2006) alludes to supreme long-term goals with the item, "School is important for achieving my future goals." In sum, the long-term effort and persistence in the face of academic obstacles intrinsic to grit's perseverance subscale, and the positive affect of grit's interests subscale, are also found in conceptualizations and measures of engagement.

Engagement and achievement relations in diverse student populations.

Engagement links to positive academic outcomes for all types of students (e.g., Fredricks

et al., 2011; Sciarra & Seirup, 2008), including those at risk for underachievement and dropout due to ecological barriers (e.g., Finn & Rock, 1997; Reschly & Christenson, 2012). Behavioral and emotional engagement, in particular, not only predict achievement but also predict that students have fewer conduct and emotional problems at school (Alexander, Entwisle, & Horsey, 1997; Irvin, 2012). Many studies have found that a composite measure of engagement incorporating both behavioral (e.g., school attendance, homework completion, involvement in extracurricular activities) and emotional components (e.g., belongingness, feelings of interest) are most predictive of success for low-income and ethnic minority students (Connell, Spencer, & Aber, 1994; Rumberger & Rotermund, 2012; Sciarra & Seirup, 2008; Stipek, 2002).

Yet some contradictory findings in the engagement research help make an argument for why engagement is not a universally-relevant construct across diverse student groups, and why grit should be tested as an alternative predictor of achievement. Several studies have found lower rates of engagement among African American students than among White students at the middle and high school levels (e.g., Downey and Pribesh, 2004; Steinberg, Dornbusch, & Brown, 1992; Yair 2000) . Two studies of low-income African American, Latina/o, and White students in sixth, seventh, and eighth grades (Graham, Taylor, & Hudley, 1998) revealed that African American and Latina/o (but not White) boys admired low-achieving classmates more than high- or moderately-achieving classmates. This tendency to devalue academic achievement among minority boys emerged somewhere between 4th and 7th grade, suggesting the middle school transition as a time of decreasing academic value and engagement. Other research showed an inverse relationship between engagement and achievement for low-income,

ethnic minority students. Shernoff and Schmidt (2008) discussed this "engagement-achievement paradox" in a key longitudinal study of 10th and 12th graders, in which an interaction effect of ethnic group by engagement revealed the relations between engagement and achievement differed by ethnic/racial group and SES level. In the full sample, higher levels of emotional (i.e., interest, enjoyment) and behavioral (i.e., task concentration) engagement in class related to higher GPA. For Black, low-income students, however, the inverse relation was found: higher engagement related to lower GPA.

These findings have sometimes been carelessly interpreted as African Americans' lack of value for academic achievement, but are better understood with consideration for contextual factors such as [lack of] opportunities for students to build meaningful relationships in schools (Fredericks et al., 2004; Reschly & Christenson, 2012) or the effects of systemic discrimination linked to classification within a specific racial or ethnic group. From a sociological perspective, the extent to which children, and especially adolescents, choose to engage in school depends upon their understanding of how school achievement fits with their personal and social identities (e.g., "Am I a doer of mathematics?"), and whether achievement is important to students' attainment of later personal and economic or career goals (see Cobb & Hodge, 2011, and Graham & Taylor, 2002, for review). Ethnic minority students, especially African American youth, may not see achievement as a route to success in this way, because they are aware that systemic oppression and discrimination will interfere with their efforts (Cobb & Hodge, 2011). This results in low motivation to be engaged, or as a more extreme cultural ecological hypothesis, in deliberate and oppositional disengagement and apathy as a way to distance

oneself from mainstream values of ambition and hard work (e.g., "burden of acting white;" Fordham & Ogbu, 1986). The power of discrimination to suppress engagement and achievement is also salient for immigrant students. For example, a study of Mexican immigrant middle school students revealed that a lack of school belonging and engagement mediated the relationship between discrimination-related stress and low achievement (Roche & Kuperminc, 2012).

Another explanation is that stereotyping and discrimination result in low expectations of student achievement from teachers and others, expectations perceived by minority students and which can become self-fulfilling prophecies (Graham et al., 1998; Graham & Hudley, 2005). African American students may deliberately invest value in non-academic domains as a way to preserve self-esteem when the academic domain does not provide this type of support (Major, Spencer, Schmader, Wolfe, & Crocker, 1998). Yet another explanation is the disconnect between the mainstream culture of schools and the cultures of many ethnic minority or immigrant students, making it difficult for them to feel a sense of belonging or become interested in school (e.g., Roche & Kuperminc, 2012; Tharp, 1989). Teacher-student racial match (Bingham & Okagaki, 2012) or a student's strong sense of ethnic identity (Okagaki, Frensch, & Dodson, 1996; Thomas, Townsend, & Belgrave, 2003) can buffer against the negative effects of this cultural mismatch and support the positive links between ethnic minority students' engagement and achievement.

Developmental differences in engagement. Student engagement also varies across age. Motivation for and engagement with school declines across the grade levels (Peetsma, Hascher, van der Veen, & Roede, 2005; Wigfield et al., 1998), specifically as

students transition from elementary to middle school (e.g., Anderman & Maehr, 1994). For instance, a longitudinal study of 130 middle-class Caucasian children revealed that enjoyment of school and persistence in class declined substantially from age 9 to age 16, especially in the areas of math, science, and reading (Gottfried, Fleming, & Gottfried, 2001). Self-determination theory (Connell & Wellborn, 1991; Ryan, Connell, & Deci, 1985) posited that this occurs because early adolescents seek the basic needs of autonomy, relatedness, and competence, while the traditional structure of the middle grades classroom provides just the opposite (see Wigfield et al., 1998, for review): greater teacher control over students and fewer opportunities for students to help shape their learning (less autonomy), larger class sizes with fewer opportunities for individualized instruction or building teacher-student relationships (less relatedness), and increasing performance comparisons with peers or ability-based student groupings (threats to feelings of competence). Students at this age may also find non-academic pursuits more appealing, or may be put off by the increasing pressures of academic performance (Wigfield et al., 1998).

At the same time, inter-individual stability plays a strong role in keeping engagement levels steady across ages, with children who begin school more highly engaged than their peers likely to remain more highly engaged later in their school careers (Skinner & Pitzer, 2012). As students face challenging academic material and academic failures in their school careers, a high level of engagement can support persistence while a low level of engagement may allow for giving up (Skinner & Pitzer, 2012), proving a direct link between engagement and grit-like persistence or achievement across ages. We might expect older children, who are more at risk for losing motivation

and engagement, to also have lower achievement, but for the magnitude of relations between engagement and achievement to remain consistent across ages.

Emotion Regulation

Emotion regulation construct. Emotion regulation – also known as affect regulation or emotional control (Cole, Martin, & Dennis, 2004) – is a complex process through which people modulate emotional arousal and expression to function adaptively and pursue goals (Bronson, 2000; Eisenberg et al., 1997; Graziano et al., 2007). Some researchers study emotion regulation as its own construct (e.g., Howse et al., 2003), while others consider it one dimension of a meta-construct like social-emotional competence or self-regulated learning (e.g., Elias & Haynes, 2008; Pintrich, 2000). Successful emotion regulation involves a variety of skills, including the ability to shift attention away or distract oneself from sources of distress or frustration (Eisenberg & Fabes, 1992), or to re-appraise the frustrating situation in a more neutral light (Braet et al., 2014). Poor emotion regulation, on the contrary, involves limited frustration tolerance, increased impulsivity, and aggressive reactions to others (Kusché & Greenberg, 2006), and can interfere with academic and other goal pursuit (Jacobs & Gross, 2014). As Eisenberg and colleagues (2004) note, the key to emotion regulation is not so much the presence of a calm or happy mood but rather the ability to behaviorally manage those not-so-happy emotions of anger, frustration, and fear. The two primary categories of emotion regulation management include antecedent-focused emotion regulation, which aims to ward off the experience of a negative emotion (e.g., distraction, re-appraisal of the situation), and response-focused emotion regulation, which aims to control behavioral

responses to an emotion that has already been elicited (suppression or response modulation; Gross, 2002; Jacobs & Gross, 2014).

Conceptual and item overlap with grit. Only one study has reported on the measure overlap between grit and emotion regulation. Among primarily White, middle-class high schoolers, the Grit Scale scores were not significantly related to scores on a task identifying appropriate emotion regulation strategies for hypothetical situations (r = .13; Ivcevic & Brackett, 2014). While overlap between emotion regulation and grit is not explicit in measure items, it is implicit in the concept of grit and its parallels to emotion regulation theory and experimental paradigms. Many measures of emotion regulation involve a delay of gratification task meant to arouse emotions such as excitement or frustration (e.g., waiting to eat a tasty-looking sweet or play with an attractive toy; Brock et al., 2009; Mischel, 2014), which assess children's successful pursuit of their goal and tolerance of the emotional arousal. Much like children in these delay of gratification paradigms, gritty students successfully pursue their longer-term goals when tasks elicit frustration or when more appealing short-term temptations appear (Duckworth & Gross, 2014). One item in particular on the Grit Scale, "Setbacks don't discourage me," suggests that grit may involve strategies to ward off or cope with negative emotions like discouragement or frustration.

Other emotion regulation instruments measure a resilience or hardiness in the face of stress or challenge, again similar to grit. For instance, Shields' and Cicchetti's (1997) Emotion Regulation Q-Sort includes items such as "Can recover from stress" (p. 908), and Sroufe (1996) explained that young children with well-developed emotion regulation strategies "cope well with high arousal, whether due to *environmental challenge or*

fatigue" (p. 214). Denham and Brown discussed core components of emotion regulation (termed self-management) to include "handling stress, *persevering through obstacles*, and expressing emotions appropriately" (2010, p. 656), while giving up has been identified as indicative of maladaptive or deficient emotion regulation (Braet et al., 2014). The behaviors of gritty students are similarly resilient: they display successful strategies to "maintain effort and interest…despite failure, adversity, and plateaus in progress" (Duckworth et al., 2007, pp. 1087-1088). In fact, experiencing anger in response to failure may actually reflect a belief that the goal is still attainable (vs. experience of sadness, reflecting a belief the goal is lost), thus fueling individuals to put forth even more effort and persistence to capture the goal (Carver & Scheier, 2014).

Aside from management of frustration, goal pursuit is another central theme for both emotion regulation and grit constructs. For example, Eisenberg and colleagues defined emotion regulation as "the ability to inhibit, enhance, maintain, and modulate emotional arousal *to accomplish one's goals*" (1997, p. 642). Additionally, Bronson (2000) discussed the development of emotional regulation as children's increasingly strategic selection of emotion management behaviors to achieve personal and social goals. The ability to voluntarily sustain focus and effort on a task for long periods of time (e.g., Ahadi & Rothbart, 1994; Gumora & Arsenio, 2002) overlaps directly with grit's perseverance subscale. For instance, the Task Orientation subscale of the Revised Dimensions of Temperament Scale (DOTS-R; Windle & Lerner, 1986), a measure of emotion regulation, includes similar items to the Grit Scale such as, "Once I take up something, I stay with it" and "I am hard to distract".

Grit Scale items do not explicitly refer to strategies for managing emotional arousal, whereas emotion regulation questionnaires, such as the Emotions as a Child scales (O'Neal & Magai, 2005), directly assess these strategies (e.g., "When I was angry I would try to get my mind off of it"). It is thus uncertain if grit involves these specific strategies, but the behaviors of children successfully regulating emotions (increased persistence, impulse control, and goal pursuit) appear similar to the behaviors of gritty children. Furthermore, literature supports the importance of emotion management strategies, especially distraction or distancing (e.g., Duckworth, Gendler, & Gross, 2014; Mischel et al., 2011), for task persistence, attainment of long-term goals, and enduring academic achievement (Mischel, Shoda, & Peake, 1988). Thus, emotion regulation should be relevant for grit. The current study examines emotion regulation strategies, which I operationalize as behavioral strategies children employ to manage their emotional experience and expression. These strategies focus on management of anger (i.e., pause anger, anger distract) because anger or frustration is the most salient emotion within grit theory and also relevant within the context of school-based academic challenges.

If anger regulation strategies are a part of grit, then which specific strategies are involved? Both antecedent- and response-focused emotion regulation strategies are commonly used by students in academic contexts, although antecedent-focused regulation is generally less effortful and more effective than response-focused regulation (Duckworth, Gendler, & Gross, 2014). Additionally, there is mixed evidence as to whether response-focused emotion regulation is related to academic achievement, particularly in the early school years (Brock, Rimm-Kaufman, Nathanson, & Grimm,

2009). While grit's perseverance subscale seems akin to response-focused strategies such as suppressing emotions and just "pushing through" negative emotions, grit's interests subscale may represent use of antecedent-focused strategies like generating interest in a task to maintain positivity and ward off frustration. This current study attempts to answer this question by comparing grit to an antecedent-focused strategy (anger distraction) and a response-focused strategy (pausing anger).

Emotion regulation and relations with diverse student achievement.

Researchers have historically studied emotion regulation as a temperament-related predictor of young children's social or psychological functioning (e.g., Braet et al., 2014; Denham, 2007; Eisenberg et al., 1997; Keane & Calkins, 2004; Lougheed & Hollenstein, 2012; Shields & Cicchetti, 1998). More recently, emotion regulation has also been tested as a noncognitive predictor of educational outcomes, with mixed findings (Brock et al., 2009; Gumora & Arsenio, 2002; Howse et al., 2003). The reason for these mixed findings may be linked to whether or not these children actively used regulation strategies, and what kinds they used. For example, use of task persistence as an emotion regulation strategy in school, as well as frustration tolerance, predicted achievement outcomes, while delay of gratification in a non-school setting did not predict achievement.

Few studies have investigated the relations of emotion regulation and achievement within more diverse student populations, such as low-income or ethnic minority students. Those that have used either composite measures of self-regulation or measures of emotionality, neither of which clarifies the specific role of emotion regulation strategies in student success. For example, Elias and Haynes (2008) used a rating scale of social-emotional competence completed by teachers – collapsing

cooperation, assertion, self-control, and emotion regulation into one factor – to predict end-of-year report card grades among primarily African American and low-income third graders. While early social-emotional competence did predict end-of-year reading and math grades (b = .575), the unique contribution of emotion regulation strategies was not examined. Another study of primarily low-income, urban minority kindergarteners found that teacher ratings of students' emotional volatility (but not emotion regulation) predicted standardized achievement tests in first grade, and this relation was mediated by students' ability to attend to classroom tasks (Trentacosta & Izard, 2007). Among economically diverse White and African American kindergarteners, parents reported on children's affect and emotion awareness, but not regulatory ability. This emotion measure predicted concurrent standardized literacy and math scores after adjusting for IQ (R^2 = .22, .33; Graziano et al., 2007) through the mediator of positive academic behaviors (e.g., class participation). One study, with ethnically diverse urban eighth graders (13% low-income; Duckworth & Seligman, 2006), did use the specific emotion regulation strategy of delay of gratification (response modulation) and found that it mediated the relationship between gender and higher GPAs for female students.

It is difficult to estimate if anger regulation relates to achievement similarly across different student groups since the measures used in previous research with minority students did not parse the effects of specific emotion regulation strategies from the effects of other dimensions of self-regulation. Ecological risks associated with poverty and minority status can influence how emotion regulation develops and is expressed (e.g., Raver, 2004), so more research is needed to understand the role of emotion regulation and achievement within at-risk student populations. Given the conceptual similarity

between emotion regulation and grit, these constructs may be equally strong predictors of later achievement, but this has not been tested. Comparing grit's and emotion regulation's unique contributions to White versus non-White student achievement in this study will add needed clarity to the literature.

Developmental differences in emotion regulation. In general, children are better able to self-regulate as they mature and grow older (Pintrich & Zusho, 2002), including an improved ability to show emotional self-control. Behavioral distraction strategies are prevalent from age 6 to adolescence. During middle childhood (roughly ages 9-12), however, there is an increase in cognitive emotion regulation strategies, such as cognitive distraction and delay of gratification, and a decrease in seeking support from adults in favor of self-support and support from peers (see Skinner & Zimmer-Gembeck, 2007, for review). Therefore, older students may have more success with emotion regulation simply because they have a wider repertoire of strategies to use. According to the resource depletion model of self-control (Muraven & Baumeister, 2001), which proposed that the ability to resist temptations and inhibit impulsive behaviors in pursuit of a long-term important goal limits the capacity to exhibit subsequent self-control, younger children have had fewer opportunities to practice self-control and may be more susceptible to depleted resources. For older students with more years of school experience, they might be able to successfully regulate their emotions and behaviors for longer, leading to the hypothesis that older children will have higher levels of emotion regulation and stronger relations between regulation and achievement.

Growth Mindset

Growth mindset construct. Growth mindset, commonly referred to as incremental theory of intelligence (Blackwell et al., 2007; Dweck, 2006, 2012), is the belief that intelligence is malleable and can develop with learning and effort. This belief contrasts with fixed mindset (i.e., entity theory of intelligence), a belief that people have a fixed amount of intellectual ability that cannot be changed. Growth mindset is closely connected to, but not synonymous with, ability beliefs relating to achievement or failure. A student may believe that his level of performance is based on his intelligence or talent (ability belief), or that his performance is based on his effort and hard work (effort belief; Stipek & Gralinski, 1996). A student with a growth mindset, on the other hand, can acknowledge that intelligence influences achievement while still feeling a sense of control over his intelligence and achievement, in that he can improve both through hard work and learning. Growth mindset helps explain students' approaches to school work following difficulty or failure. Students who believe intelligence is malleable and who hold a growth mindset are likely to interpret failure as due to a lack of effort or another temporary modifiable cause. They do not view failure as threatening because they do not view it as a reflection of their inherent ability (Blackwell, 2002; Dweck, 2012). Thus, growth-minded students are more likely to accept mistakes without shame and approach challenging situations as an opportunity to improve (Diseth, Meland, & Breidablik, 2014). Students who believe intelligence is fixed, in contrast, are more likely to interpret failure as a sign that they are not smart, and because they have no hope of improving their intellect or achievement, will avoid situations with a risk of failure (Bandura, 1997).

Having a growth mindset fosters a range of positive academic behaviors, such as higher levels of persistence, performance, and motivation in school, even when failure or challenge is encountered (Cury et al., 2006; Dweck, 2002; Dweck & Leggett, 1988). It seems that a belief in modifiable intelligence sets the stage for students to show persistence and academic tenacity (Dweck, Walton, & Cohen, 2014). On the contrary, a fixed mindset leads students to show less engagement or persistence and perform worse as they attempt to avoid possible failure and negative evaluations of their ability (Pomerantz & Ruble, 1997). The opposite causal relationship may also exist: poor school performance among elementary school children can fuel the development of an entity theory of intelligence (Faria, 1996; Pomerantz & Saxon, 2000) and, in turn, a fixed rather than growth mindset over time.

Conceptual and item overlap with grit. Traditionally, growth mindset has been measured using questionnaires assessing students' beliefs about the malleability of human intelligence (e.g., "You have a certain amount of intelligence, and you really can't do much to change it"; Blackwell, 2002). While these specific measure items do not overlap with the Grit Scale, researchers' theoretical explanations of gritty and growth-oriented student behavior sound quite similar. Students with grit and students with growth mindset respond similarly to challenges, setbacks, and failures – with determination, perseverance, and confidence (King, McInerney, & Watkins, 2012). Dweck explained that students with a growth mindset "tend to seek challenging learning opportunities and show *resilience in the face of setbacks*" (2012, p. 615). Students with a growth mindset approach, rather than give up on, challenges, and *exert effort to overcome difficulty* (Dweck & Leggett, 1988; Robins & Pals, 2002), although Dweck (2015) points

out that growth mindset is not synonymous with effort. These conceptualizations parallel how Duckworth described grit (Duckworth et al., 2007). Additionally, growth-minded students are more likely to *enjoy* challenging academic tasks (Aronson, Fried, & Good, 2002; Blackwell et al., 2007; King et al., 2012; Mueller & Dweck, 1998), just as gritty students demonstrate "passion" for their goals.

Newer measures of growth mindset assess the behaviors arising from students' beliefs about intelligence, such as how students respond to academic failures (Blackwell et al., 2007), rather than just the beliefs themselves. Overlap between growth mindset and grit is clearer in these measures. For example, the Helpless Responses to Failure scale (Blackwell, 2002) asks students to endorse responses to an academic failure scenario, such as "I would work harder in this class from now on" or "I would try not to take this class ever again". The former response, reflecting a growth mindset, aligns with gritty statements on the Grit Scale, such as "I am a hard worker" or "I am diligent." The latter response, reflecting a fixed mindset, aligns with Grit Scale statements representing a lack of grit, such as "I have difficulty maintaining my focus on projects that take more than a few months to complete." In sum, current growth mindset and grit measures seem to similarly tap into students' persistent behaviors in the face of challenge or failures.

Growth mindset and relations to diverse student achievement. The relations of growth mindset and other ability beliefs to achievement have been tested worldwide with students of diverse racial groups and grade levels, from 5th graders in Greece (Gonida, Kiosseoglou, & Leondari, 2006) to French high schoolers (Renaud-Dubé, Guay, Talbot, Taylor, & Koestner, 2015) to low-income African American and Latina/o middle schoolers in New York City (Blackwell et al., 2007). Despite cultural and ethnic group

differences in ability beliefs or attributions for achievement (Okagaki, 2001), which will be discussed below, research on the mindset-achievement link reveals that, overall, endorsing a growth mindset predicts higher achievement, while endorsing a fixed mindset predicts stagnant or declining achievement. For example, students' reported beliefs in the malleability of intelligence showed weak to weak-moderate relations to higher grades (De Castella & Byrne, 2015; Cury et al., 2006; Jones, Wilkins, Long, & Wang, 2012) and likelihood of staying in school (Renaud-Dubé, et al., 2015), with Pearson correlation coefficients ranging from .09 - .29. Other components of growth mindset, such as the belief that effort leads to success or endorsement of positive strategies in response to failure (Jones et al., 2012), also related to school achievement.

Ethnic-group differences in growth mindset. Similar to research trends for the other noncognitive constructs discussed in this paper, there is also limited research examining ethnic or cultural group differences in growth mindset. Eaton and Dembo's (1997) findings that growth mindset predicted cognitive performance well for non-Asian adolescents but not for Asian American students tempers growth mindset's utility as a cross-cultural predictor of achievement. Within the US, understanding of ethnic group differences in growth mindset comes from the literature on stereotype threat (Good, Aronson, & Inzlicht, 2003; Steele & Aronson, 1995). When stereotypes are activated for certain groups, for example when African American students are reminded of the stereotype that their racial group is less intelligent than other groups, this can lead to negative self-evaluations and more of a fixed mindset, including beliefs that performance is only based on ability, one might have low ability, and one cannot do anything to change the performance outcome because of his or her lower ability. Even for ethnic

minority students with more growth-oriented mindsets, implicit stereotypes perpetuated by teachers or other adults can suppress that mindset (see Steele & Aronson, 1995; Wigfield et al., 2015, for review).

Despite the discrimination that might suppress levels of growth mindset among ethnic minority students, the limited available research suggests that growth mindset is still important for ethnic minority achievement, and indeed, it was developed to help close achievement gaps such as those arising from racial discrimination (Dweck, 2015). Among older, low-income, ethnic minority students, growth mindset predicted later outcomes such as standardized test scores and report cards (Romero, Master, Paunesku, Dweck, & Gross, 2014; Stipek & Gralinski, 1996). Hearing praise for effort (vs. praise for intelligence) led ethnically diverse elementary school students to prefer opportunities to learn rather than opportunities to make themselves look smart, to see failure as attributed to low effort instead of low ability, and to persist on challenging tasks after failure (Mueller & Dweck, 1998).

A landmark study by Blackwell and colleagues (2007) with socioeconomically diverse (53% receiving free lunch), ethnic minority 7th graders showed that students' endorsements of an incremental (growth-mindset) theory of intelligence at the start of 7th grade positively predicted math achievement at the end of 8th grade, even after controlling for previous math achievement. Furthermore, students who endorsed an incremental mindset showed an increasing positive trajectory of math performance from grade 7 to 8, while those who endorsed an entity (fixed-mindset) theory showed a flat trajectory (Blackwell et al., 2007). Growth mindset may be uniquely important in explaining achievement variance among students particularly at risk for

underachievement. For example, within a sample of low-income, African American high schoolers about to become first-generation college students (a traditionally high-risk group; Engle & Tinto, 2008), self-reported growth mindset (beliefs in intelligence malleability and positive responses to failure) predicted standardized literacy scores only for students whose parents did not have a college degree (Williams, Ari, & Dortch, 2011).

Interventions to increase growth mindset have resulted in higher levels of classroom engagement and GPAs among low-income, ethnic minority junior high and college students (Aronson, Fried, & Good, 2002; Good, Aronson, & Inzlicht, 2003). Based on their preliminary evidence of growth mindset's prediction of achievement, Blackwell and colleagues (2007) conducted a growth mindset intervention with low-achieving minority 7th graders. Results showed that the downward trajectory of math achievement from 6th to 7th grade did not occur for students receiving the intervention. Good, Aronson, & Inzlicht (2003) found similar intervention effects on standardized math and reading scores for low-income Latina/o, African American, and White 7th graders a year later.

Developmental differences in growth mindset. The influence of growth mindset on achievement is generally indirect, through the mindset's influence on achievement goals, motivation, and perceived self-efficacy (Burnette et al., 2013). Thus, growth mindset may be a weaker predictor than other noncognitive socioemotional variables better able to directly influence academic outcomes, such as grit (e.g., Eskreis-Winkler et al., 2014). This may be related to developmental differences in students' ability to consider intelligence vs. effort attributions for academic success. While, in general,

younger children (preschool through around 2nd or 3rd grade) are more likely to view ability as malleable and achievement as reliant on effort (an incremental mindset), children become increasingly aware of the role of ability in predicting future achievement, increasingly accurate in evaluating their competencies, and increasingly concerned with relative ability and performance compared to peers as they progress into the middle grades (see Dweck, 2002; Wigfield et al., 1998, for reviews). By age 11 or 12, students are keenly aware of the difference between ability and effort and may have more of an entity-based or fixed mindset regarding attributions for achievement (Nicholls, 1978; Dweck, 2002). More importantly, at this age students' mindsets strongly correlate with performance, often with a fixed mindset relating negatively to achievement (Bempechat, London, & Dweck, 1991). Within a group of elementary school students, such as the 3rd through 5th graders in the current study, then, it would not be surprising to see both lower self-ratings of growth mindset and stronger correlations between growth mindset and achievement as grade level increases. Having less of a growth mindset can interfere not only with achievement but also with motivation, engagement, and task persistence as students increasingly avoid tasks requiring effort, believing effort reflects lack of ability (Dweck, 2002). Therefore, growth mindset may have increasing relations not only to achievement but to other socioemotional variables like grit and engagement as children age.

Study Aims

The first aim of this study was to examine the conceptual and measurement overlap between the grit measure and similar measures of engagement, emotion regulation, and growth mindset, within a sample of ethnically diverse elementary school

students from middle- and upper-income communities. Specifically, I intended to test which of two measurement models fit the data better: a model where subscales from all measures loaded onto one overarching meta-construct (i.e., self-regulation), or a model where each measure's subscales loaded onto their respective, theoretically-defined constructs. These four constructs are at least indirectly discussed as components of self-regulated learning (Pintrich, 2000), with perseverance (i.e., grit), participation (i.e., behavioral engagement), and emotion regulation all considered hallmarks of self-regulatory behaviors (e.g., Mischel & Ayduk, 2002). Therefore, I hypothesized that the overarching meta-construct model would provide the best fit to the data.

The second study aim was to explore how grit related to conceptually and operationally similar noncognitive measures of engagement, emotion regulation, and growth mindset in this sample. Based on theory directly linking full-scale grit and its perseverance subscale with engagement (Rojas et al., 2012; Von Culin et al., 2014) and references to perseverance within conceptual definitions of engagement (Finn & Zimmer, 2012; Steinberg et al., 1996), I hypothesized that grit would show moderate to strong relations with emotional and behavioral engagement measures. Based on definitional similarities between grit and emotion regulation, operationalized by some as a strategy used to pursue goals and maintain effort on tasks over a long time despite frustration (Ahadi & Rothbart, 1994; Eisenberg et al., 1997), I hypothesized moderate overlap between grit and the emotion regulation measure. Based on growth mindset's link to academic motivation and performance by mid to late elementary school (see Dweck, 2002, for review), I also hypothesized moderate positive relations between grit and growth mindset.

The third study aim was to examine if students' grit predicted their later reading achievement, after adjusting for the simultaneous predictive contributions of other noncognitive measures, and after adjusting for previous literacy achievement. Specifically, I aimed to test if Time 1 grit was a significant predictor of two types of Time 3 literacy achievement when adjusting for Time 1 engagement, emotion regulation, growth mindset, and the Time 1 literacy achievement measure (the same as the Time 3 measure). Self-regulated learning research might suggest that no single construct would be a unique and meaningful predictor of later achievement because all process components are important (Pintrich, 2000), and that grit-like persistence and effort would not be incrementally predictive (e.g., Zimmerman & Pons, 1986). Based on this, and on the results of my previous study with a different elementary school sample, in which grit's perseverance subscale did not predict later literacy achievement after adjusting for previous achievement (Weston Riley et al., under review), I hypothesized that grit would not significantly predict outcomes when these other noncognitive and achievement measures were all taken into account.

The fourth and final aim was to test if the predictive links in the model of grit and other similar noncognitive variables predicting later literacy achievement differed by age (older vs. younger students) or by ethnic group (White vs. non-White). Based on research showing an increasingly stronger link between attributional mindsets, motivation, and academic performance from younger to older elementary grades and into middle school (e.g., Dweck, 2002; Pintrich & Zusho, 2002), I hypothesized that grit and other noncognitive factors would show a stronger relation with later achievement for older students in the sample. Based on research showing African American youth are rated as

less engaged in class for a variety of reasons, such as lacking a sense of school belonging (Graham & Taylor, 2002), or experiencing systemic oppression or stereotype threat (Murdock, 2009; Steele, 1997), as well as research showing an inverse or "paradoxical" relationship between engagement and achievement among African American (Shernoff & Schmidt, 2008) and immigrant students (Stanat & Christensen, 2006), I hypothesized that the strength of the predictive model, specifically the path from engagement to literacy achievement, would differ for White vs. non-White students in this sample. At the same time, differences might be minimal or uninterpretable in this sample given such heterogeneity within ethnic groups (Wigfield et al., 2015) and mixed findings regarding the link between engagement and achievement for other ethnic minority groups (see Shernoff & Schmidt, 2008, for review).

Chapter 3: Methods

Sample

Study participants consisted of 256 ethnically diverse 3rd, 4th, and 5th grade students from two elementary schools in suburban Maryland neighborhoods serving primarily upper-income families. The majority (62.5%) of students were White, and the remainder Black (9.4%), Latina/o (5.9%), Asian or Asian American (5.1%), and multiethnic (11.3%); six percent of participants did not provide ethnicity information. While the school district prohibited our research team from asking directly about students' or their families' immigrant generational status, we were allowed to ask about languages spoken at home, via the parent consent form and the student questionnaire. If a parent speaks a language other than English at home and the student is bilingual, the implication is that the child may be first- or second-generation immigrant. Over 64% of students spoke only English at home (e.g., monolingual), while close to 36% of students spoke another language at home with parents (e.g., bilingual).

Although the schools were situated in upper-income neighborhoods, they also served some students of less-wealthy families from just outside the immediate surrounding areas. Our research team was prohibited from collecting data on family income at the individual student level. School-level estimates of free and reduced meals status (FARMS), a proxy for socioeconomic status, by ethnic group, however, revealed that across schools, less than 5% of White students, roughly 7% of Black students, and roughly 6% of Latina/o students were eligible for FARMS. This suggests that socioeconomic status was likely not confounded with ethnic group in this sample, although it is possible that other unknown contextual factors caused these groups to be

different. Students were distributed equally across grade levels (31.7% in 3rd grade, 31.7% in 4th grade, and 36.6% in 5th grade). Fifty-two participants were 4th and 5th graders identified as Highly Gifted and enrolled in a program of accelerated and enriched instruction at their schools. These highly gifted students scored significantly better on all literacy achievement measures, but did not differ from their general education peers on any other study variable. This study also included 27 3rd, 4th, and 5th grade classroom teachers (26% male) who completed questionnaires on the participating students in their classrooms.

Procedures

This study utilized data from two time points of a three-time-point, short-term longitudinal study. Time 1 data was collected from late February to mid-May 2015, Time 2 from mid-March to early June 2015, and Time 3 from late May to mid-June 2015. The study included Time 1 and 3 data. The majority of students were individually administered a questionnaire by a graduate student researcher at each time point. The questionnaire topics included self-report measures of grit, emotional and behavioral engagement, growth mindset, and emotion regulation strategies. Due to time constraints of completing data collection within the school year, roughly 15% of students participated in 4-6 person group interviews rather than individual interviews at Times 1 and 3; groups were asked to record their answers silently so as not to influence others in the group. Students interviewed individually reported higher emotional engagement ($t(245) = 2.74$, $p = .007$) and growth mindset ($t(245) = 2.29$, $p = .023$), and performed better on the Time 1 TOSREC reading task ($t(241) = 2.47$, $p = .014$) and Time 3 MAP-R standardized reading test ($t(239) = 2.32$, $p = .021$) than their peers interviewed in groups.

During the 20 - 25 minute interview, the researcher read each interview item to the student and employed an enlarged visual response rating scale. For all students, explanation of items, vocabulary, and examples were given to aid comprehension. Interviews concluded with students completing a three-minute English-language reading performance task (TOSREC). Teachers rated their students' grit and emotional engagement via the online survey platform Qualtrics, as soon as possible after student data was collected, with Time 1 teacher responses collected from March to April 2015, and Time 3 from May to June 2015.

Measures[1]

Grit. Grit was assessed using the 8-item Short Grit Scale (Grit-S; Duckworth & Quinn, 2009). Students rated how much eight statements about maintaining interest and effort on school work sounded like them, on a 5-point scale (1 = Not at all, 5 = Very much). The scale was adapted to increase comprehension for a previous sample of younger, limited English proficiency students (Weston Riley et al., under review). For example, the item, "I have difficulty maintaining my focus on projects that take more than a few months to complete" was changed to "It's hard to focus on school work that takes a long time to complete." Teacher-reported grit items were the same as those used with students, with the exception of changes from first to third person (e.g., "It's hard for the student to focus on school work that takes a long time to complete."). Previous research has shown strong reliability (α = .72 - .84) among ethnically diverse junior-high and high school students, 7-12 year olds in the National Spelling Bee, and elementary aged immigrant students, with mean scores ranging from 3.4 (.8) to 3.81 (.68).

[1] The internal consistency of each measure is reported in the Results section of the paper.

Emotional engagement. Emotional engagement was assessed using the 5-item emotional engagement subscale of the Engagement vs. Disaffection with Learning scale (EvsD; Skinner, et al., 2008). Students rated how much statements about interest and enthusiasm in school ("Class is fun.") sounded like them (1 = Not at all, 5 = Very much). The teacher-reported version of the scale used slightly different item wording (e.g., student-reported "Class is fun" became teacher-reported "For this student, learning seems to be fun."). The EvsD Emotional Engagement subscale has shown adequate internal consistency in elementary-aged samples, for both student (α = .73 - .82) and teacher-reported scores (α = .84 - .94; Skinner et al., 2009; Weston Riley et al., under review).

Behavioral engagement. Behavioral engagement was assessed using the 5-item behavioral engagement subscale of the Engagement vs. Disaffection with Learning scale (EvsD; Skinner et al., 2008). Students rated how much statements about their effort and participation in school ("In class, I work as hard as I can.") sounded like them (1 = Not at all, 5 = Very much). The EvsD Behavioral Engagement subscale has shown adequate internal consistency in elementary-aged samples (α = .61 - .72; Skinner et al., 2009).

Emotion regulation. Anger regulation was assessed using the three-item Distract and three-item Pause Anger subscales from the Emotions as a Child – Emotion Regulation Strategies scale (EAC-ER; Magai & O'Neal, 1997). Students were asked to first rate how often they felt angry or frustrated over the past month (1 = Never, 5 = Very often). Students were then asked to think about those times they felt angry or frustrated and rate how often (1 = Never, 5 = Very often) they would use two different strategies to deal with anger: distraction (e.g., "I would try to get my mind off it") or pausing anger (e.g., "I would take a few deep breaths before reacting"). The EAC-ER has produced

scores with adequate internal consistency and predictive validity with externalizing problems among urban, ethnic minority adolescents.

Growth mindset. Growth mindset was assessed using the Helpless vs. Mastery-Oriented Responses to Failure scales (Blackwell, 2002; Blackwell et al., 2007). Students were read a vignette about failing a quiz in a favorite subject they believed they understood well. Students were then asked to rate how much they agreed with 16 statements about their feelings, attributions for failing the quiz, and subsequent strategies to use in that subject (1 = Disagree a lot, 6 = Agree a lot). Statements represented either a growth or a fixed mindset. For items reflecting a growth mindset, the feeling was determination or motivation, the attribution for the failure was changeable and effort-based (e.g., "I didn't study enough"), and the subsequent strategy was perseverance (e.g., "I would feel motivated, like I wanted to work harder at it"). For items reflecting a fixed mindset, the feeling was sadness or anger, the attribution for the failure was stable and ability based or out of the student's control (e.g., "I wasn't smart enough"), and the response was avoidance (e.g., "I would try not to take this subject ever again"). The original scale consisted of a helpless attributions subscale and a positive strategies subscale; the current study also included a third, feelings subscale as recommended by the scale developers to better suit a younger student sample (Blackwell, personal communication, February 5, 2015). The original scale has produced strong internal consistency (α = .76 - .84) among high-achieving ethnic minority middle school students (Blackwell et al., 2007) and acceptable internal consistency among primarily White, suburban 9th graders (α = .64-.76; Jones, Wilkins, Long, & Wang, 2012).

Literacy achievement.

Reading performance task. The Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner, Torgeson, Rashotte, & Pearson, 2010) tests students' silent reading fluency (speed), decoding (accuracy), and comprehension. Students had three minutes to read as many sentences as possible and decide if each was true or false (e.g., "All pickles are pink."). The TOSREC has excellent reliability and convergent validity with other measures of reading fluency, comprehension, and achievement such as the Woodcock-Johnson Tests of Academic Achievement, 3rd ed. (WJ-III; Wagner et al., 2010).

Standardized test scores. Schools provided three sets of scores from the 2014-2015 Measures of Academic Progress standardized test of reading (MAP-R), a 20-30 minute computerized and skill-adaptive test used by the school district for benchmarking, academic growth tracking and accountability. Average beginning-of-year scores in the normative sample range from 188.3 (15.85) to 205.7 (15.13) for 3rd to 5th grade, and end-of-year scores range from 198.6 (15.10) to 211.8 (14.72).

Demographic variables.

Age. Students ranged in age from 8 to 11 years old. Students were classified as either part of the younger group (ages 8-9) or the older group (ages 10-11).

Bilingual status. Students who spoke only English at home with their parents were classified as monolingual, while students who spoke another language at home with parents were classified as bilingual.

Race/ethnicity. Students were classified as either White or non-White based on their self-reported race during interviews and on student race reported by parents on

consent forms. Students classified as non-White included those reporting a race of Black, Latina/o, Asian or Asian American, or multiethnic. In the case of discrepancy between student and parent reports of student race, parent-reported data was used.

Analysis Approach

Missing data. I decided to retain only participants with complete Time 1 and Time 3 data for this study's analyses. Of 256 total participants, 67% (172 participants) had complete data for all Time 1 noncognitive and Time 3 literacy achievement study variables. The fact that nearly a third of participants had incomplete data is primarily due to missing Time 3 TOSREC literacy achievement data. Due to time constraints during Time 3 data collection, 25% of students did not complete interviews or TOSREC assessments at this time point. In order to increase the number of cases with both Time 1 predictors and Time 3 outcomes, I substituted Time 2 TOSREC scores for these missing Time 3 scores. I deemed this appropriate because a) there was significant chronological overlap between Time 2 and Time 3 data collection, b) the two forms of TOSREC used at Time 2 and Time 3 were both normed using the same sample, and c) the TOSREC instrument is not sensitive to change over such a short period of time, like the 3-4 weeks between Time 2 and Time 3 assessments for most study participants (Mitchell, personal communication, December 1, 2015). After making this substitution, 17% of participants remained without a Time 3 TOSREC score. An additional 6% of incomplete cases were due to unavailable MAP-R standardized reading scores for Spring 2015 (Time 3) from the school district. Excluding outcome data, 90% of participants had complete teacher- and student-reported data on grit, engagement, growth mindset, and emotion regulation at Time 1. Listwise deletion was used for all analyses to ensure only participants with

complete data at both time points were included (n = 192). A power analysis conducted prior to study analyses revealed that the proposed analyses held more than 88% power to detect a Pearson's correlation coefficient of r = .20 with a sample size of 200 and a Type I error rate of .05.

Analytic procedures. Analyses were run using IBM SPSS Statistics, version 22, and MPlus Version 7.4 modeling software. While both teacher- and student-reported data were collected for the grit and emotional engagement measures, teacher- and student-reported data are never combined in any analyses. Rather, separate teacher- and student-reported grit and engagement variables were computed, and used in separate models along with students' reported emotion regulation and growth mindset variables. Models use either student- or teacher-reported grit and engagement data, but never both.

Preliminary descriptive statistics (e.g., means, standard deviations, and Cronbach alpha coefficients) were generated in SPSS for each of the independent variables (grit, emotional engagement, behavioral engagement, emotion regulation, and growth mindset) to investigate the soundness of the data and correspondence with previous research. To examine the conceptual and measurement overlap between the grit measure and the similar noncognitive study variables (Study Aim #1), I first conducted exploratory factor analyses in SPSS, using principal axis factor extraction of grit and noncognitive measure items with direct oblimin rotation procedure, to identify empirically how measure items and subscales naturally grouped together into factors. Items were considered to load sufficiently onto a factor when loadings measured ≥ .40 on the primary factor, and ≤ .20 on all secondary factors. Next, I conducted latent confirmatory factor analyses using MPlus. I tested two competing theoretical models: (1) an Original Scales model with

subscales from each measure loading onto their respective full-scale latent factors, and (2) a Higher-Order Factor model with all measure subscales loading onto one overarching self-regulation latent factor. I also planned to test the factor model indicated by the exploratory factor analyses, if it differed from the theorized models. I set the latent factor of grit to be indicated by its two measured subscales, perseverance of effort and consistency of interests. The latent factor of engagement was likewise indicated by its two measured subscales, emotional and behavioral engagement. The latent factor of growth mindset was indicated by its three measured subscales of feelings, attributions, and strategies; note that these subscales were grouped per the measurement instrument but not theoretically determined. Finally, the latent factor of emotion regulation was indicated by two measured subscales, pause anger and distract. As mentioned above, final models were run as single-rater models, separately for teacher- and student-reported data. Data-model fit for each individual model was assessed using multiple measures of model fit across index classes, including the χ^2 goodness-of-fit value (where smaller values indicate better fit), the root mean square error of approximation (RMSEA) as a parsimonious index (where values $\leq$.06 indicate good fit), the standardized root mean square residual (SRMR) as an absolute index (where values $\leq$.08 indicate good fit), and the comparative fit index (CFI) as an incremental index (where values $\geq$ .95 indicate good fit; Little, 2013). Comparative model fit for the two competing models was assessed by an examination of the Akaike Information Criterion (AIC) fit index for each model.

To explore how grit relates to conceptually and operationally similar noncognitive measures of emotional engagement, behavioral engagement, emotion regulation, and growth mindset in this sample (Study Aim #2), I ran bivariate correlations among all of

the observed variables as well as grit's perseverance and interests observed subscales. I used listwise deletion to ensure all correlations reflected the same group of participants with full Time 1 and Time 3 data. As a more precise method of investigating conceptual overlap between factors, I also explored correlations between the latent grit, engagement, emotion regulation, and growth mindset factors.

To examine if the grit measure predicted later reading achievement, after adjusting for the simultaneous predictive contributions of other noncognitive measures, and after adjusting for previous literacy achievement (Study Aim #3), I used structural equation modeling, running separate models for student- and teacher-reported grit and engagement data. In Model 1, the best-fitting CFA model from Study Aim #1 above was used to model Time 1 latent noncognitive predictors of Time 3 literacy achievement variables. In Model 2, Time 1 literacy achievement control variables were added to Model 1. The CFA model was revised in two ways prior to use in the SEM. First, I included the growth mindset variable as a full-scale measured variable rather than as a latent factor indicated by subscales. Although not as important for testing the measurement model alone in the CFA, it was important to test the psychometrically stronger full-scale variable ($\alpha = .72$) as it related to outcomes. The growth mindset measured variable was set to covary with each of the latent predictor constructs. Second, I adapted the modeling of the grit and engagement latent variables. The Original Scales CFA model indicated high multicollinearity when modeling grit and engagement as separate latent factors. Covariance between grit and engagement was $\beta = .96$ using teacher-reported data, and $\beta = .92$ using student-reported data, suggesting a need to improve this part of the model. Therefore, I created a combined latent factor with both

grit and engagement subscales indicating that factor. Literacy achievement outcomes were modeled as separate, measured variables. They were not used to indicate a single, latent achievement variable because, although they both measure literacy achievement in the broadest sense, the TOSREC and the MAP-R are qualitatively different measures, from administration style (pencil-and-paper over three minutes vs. computerized over 30 minutes) to skill level of questions (grade-level vs. individual skill-adaptive) to skills assessed (basic decoding, fluency and comprehension vs. advanced language arts knowledge and inferential reasoning). Maximum likelihood estimation with robust standard errors (MLM) was used due to its ability to handle non-normality in the noncognitive variable data.

To test if the model of grit and other similar noncognitive variables predicting later literacy achievement differed by the demographic factors of age or ethnic group (Study Aim #4), I conducted multi-group comparisons of Model 1 separately by age and by ethnic group. Participants were divided into two age groups, younger (ages 8-9; n = 106) and older (ages 10-11; n = 145), measured as a dichotomous variable. The ethnic group comparison involved two groups, a White (n = 153) and a non-White (n = 94) student group based on parent report and student self-report, also measured as a dichotomous variable. For both comparison procedures, measurement model invariance (i.e., equality) was tested to determine for which group the model displayed better fit. This was followed by a test of invariance of structural equation model parameter estimates across groups to determine group differences in relations of grit and noncognitive factors with achievement. As exploratory post-hoc analyses to better

understand factors driving these group differences, I also conducted multi-group analyses of the predictive model by bilingual status or highly gifted status.

Chapter 4: Results

Descriptive Statistics

Table 2 presents the means, standard deviations, alpha coefficients, and score ranges for the main study variables. Mean full-scale grit scores, reported both by students and their teachers, were higher in this elementary school sample (3.87 and 3.95, respectively) than mean scores in older student samples used by Duckworth and colleagues (average of 3.4 on a 5-point scale; Duckworth et al, 2007; Duckworth & Quinn, 2009). Internal reliability alpha coefficients of full-scale grit scores were acceptable (student-reported) to excellent (teacher-reported), similar to previous research. Grit's subscale alpha coefficients were also acceptable, with the exception of student-reported grit's interests subscale ($\alpha = .53$). Students rated themselves higher on perseverance of effort than on consistency of interests, $t(250) = 12.23$, $p < .001$. While students reported slightly higher levels of emotional and behavioral engagement than in previous elementary school samples, their teachers rated their emotional engagement at similar levels as teacher ratings in previous studies (e.g., Skinner et al., 2009).

Full-scale emotion regulation and its pause anger subscale scores showed strong internal consistency reliability, while the distract subscale showed weaker reliability; no previous research is available for mean-level comparisons. Scores for students' overall growth mindset were reliable and mean attributions and strategies subscale scores were similar to previous research with ethnic minority and White adolescents (Blackwell et al., 2007; Jones et al., 2012). Growth mindset subscales were not expected to show sufficient internal reliability because the subscales were grouped per the measurement instrument, not theoretically. Students varied widely in their literacy achievement scores, especially

on the TOSREC reading task; standardized scores ranged from Poor to Superior, with a mean in the average range (111.93).

Table 2

Descriptive Statistics of Noncognitive Predictor and Literacy Achievement Outcome Variables

Measures	*M (SD)*	*α*	Range
1. Time 1 Student-Reported Grit[a]	3.87 (.52)	**.66**	2.00 – 4.88
Consistency of Interests subscale	3.57 (.71)	.53	1.75 – 5.00
Perseverance of Effort subscale	4.17 (.59)	**.70**	2.25 – 5.00
2. Time 1 Teacher-Reported Grit[a]	3.95 (.89)	**.93**	1.13 – 5.00
Consistency of Interests subscale	3.83 (.91)	**.83**	1.00 – 5.00
Perseverance of Effort subscale	4.07 (.96)	**.92**	1.00 – 5.00
3. Time 1 Student-Reported Emotional Engagement	4.09 (.65)	**.80**	1.60 – 5.00
4. Time 1 Teacher-Reported Emotional Engagement	4.13 (.88)	**.95**	1.20 – 5.00
5. Time 1 Behavioral Engagement	4.40 (.43)	**.66**	2.80 – 5.00
6. Time 1 Emotion Regulation		**.71**	
Distract subscale	3.07 (.79)	.40	1.00 – 5.00
Pause Anger subscale	3.57 (.84)	**.67**	1.00 – 5.00
7. Time 1 Growth Mindset	4.63 (.51)	**.72**	2.56 – 5.81
Feelings subscale	4.09 (.68)	.30	2.00 – 6.00
Attributions subscale	4.46 (.68)	.43	2.20 – 6.00
Strategies subscale	5.23 (.52)	.55	2.83 – 6.00
8. TOSREC standard index scores	111.93 (15.96)	--	54.50 – 145.50
9. MAP-R	224.20 (14.44)	--	176.00 – 253.00

Note. Bold-faced alpha coefficients meet an acceptable internal reliability level of .65 or higher (DeVellis, 2003). TOSREC = Test of Silent Reading Efficiency and Comprehension (Wagner, Torgesen, Rashotte, & Pearson, 2010). MAP-R = Measures of Academic Progress – Reading; MAP-R scores obtained from school records. All variables student-reported unless otherwise indicated. Listwise $N = 192$.
[a]Full-scale grit score.

Both TOSREC scores and MAP-R standardized assessment scores differed significantly depending on whether or not students were in the highly gifted program ($t(224) = -8.39$

for TOSREC and -18.18 for MAP-R, $p < .001$). Gifted students, not surprisingly, earned higher literacy achievement scores.

Conceptual and Measurement Overlap between Grit and Similar Noncognitive Variables

An exploratory factor analysis of all 40 items from the grit, engagement, growth mindset, and emotion regulation measures extracted 13 factors for student-reported data and 8 factors for teacher-reported data, suggesting that items do not naturally group together into a reasonable number of higher-order factors. Next, I conducted an exploratory factor analysis of the measure subscales rather than individual measure items. These analyses extracted two factors for both student- and teacher-reported data, explaining 52.4% and 61.7% of the variance, respectively. Grit and engagement subscales loaded sufficiently onto one factor, titled Persistence, and emotion regulation and growth mindset subscales loaded sufficiently onto the other factor, titled Regulation.

Figures 1, 2, and 3 present the competing theoretically- and empirically-derived latent factor models I tested for study aim #1. See Figure 1 for the Original Scales theoretical model, Figure 2 for the Higher-Order theoretical model, and Figure 3 for the Two-Factor empirically-derived model. I hypothesized that a model with all measures loading onto a unitary construct (Higher-Order model) would provide a better fit to the data than a model with each measure loading onto its separate theorized factor (Original Scales). Contrary to expectations, confirmatory factor analyses revealed that the overall fit of the Original Scales model to the data was satisfactory (2-3 indices reaching acceptable levels; see Table 3), while the fit of the Higher-Order model to the data was poor (0-1 indices reaching acceptable levels). The smaller χ^2 and AIC index values for the

Original Scales versus the Higher-Order Factor model provided further evidence of the Original Scales model's superior fit (Byrne, 2012). These findings were identical, and AIC indices suggested a similar fit of the model to the data, for both student- and teacher-reported models. While the Two-Factor empirically-derived model had similar fit indices to the Original Scales model for teacher-reported data, its χ^2 and AIC indices were both larger than that of the latter model, suggesting that the Original Scales model still provided the better fit to the data over an empirically-derived model.

Relations of Grit with Similar Noncognitive Variables

For study aim #2, I hypothesized that grit and its subscales would show moderate to strong relations with the noncognitive variables of engagement, growth mindset, and emotion regulation. Table 4 displays bivariate correlations of Time 1 grit and its subscales with each of the other Time 1 noncognitive variables; see Appendix A for full table of intercorrelations among all study variables, including Time 1 and Time 3 achievement outcomes. As expected, grit and its subscales showed weak-moderate to strong positive relations with both emotional and behavioral engagement. Teacher-rated emotional engagement had especially strong relations with teacher-rated grit (r = .77) and grit's perseverance subscale (r = .80). Student-rated behavioral engagement also had strong relations with student-rated grit (r = .50) and grit's perseverance subscale. (r = .58). Somewhat contrary to expectations, only the pause anger subscale of emotion regulation showed relations with grit and its subscales; the distract subscale showed non-significant, near-zero correlations with grit. Furthermore, the magnitude of pause anger's relations with grit was somewhat weaker than expected. Consistent with expectations,

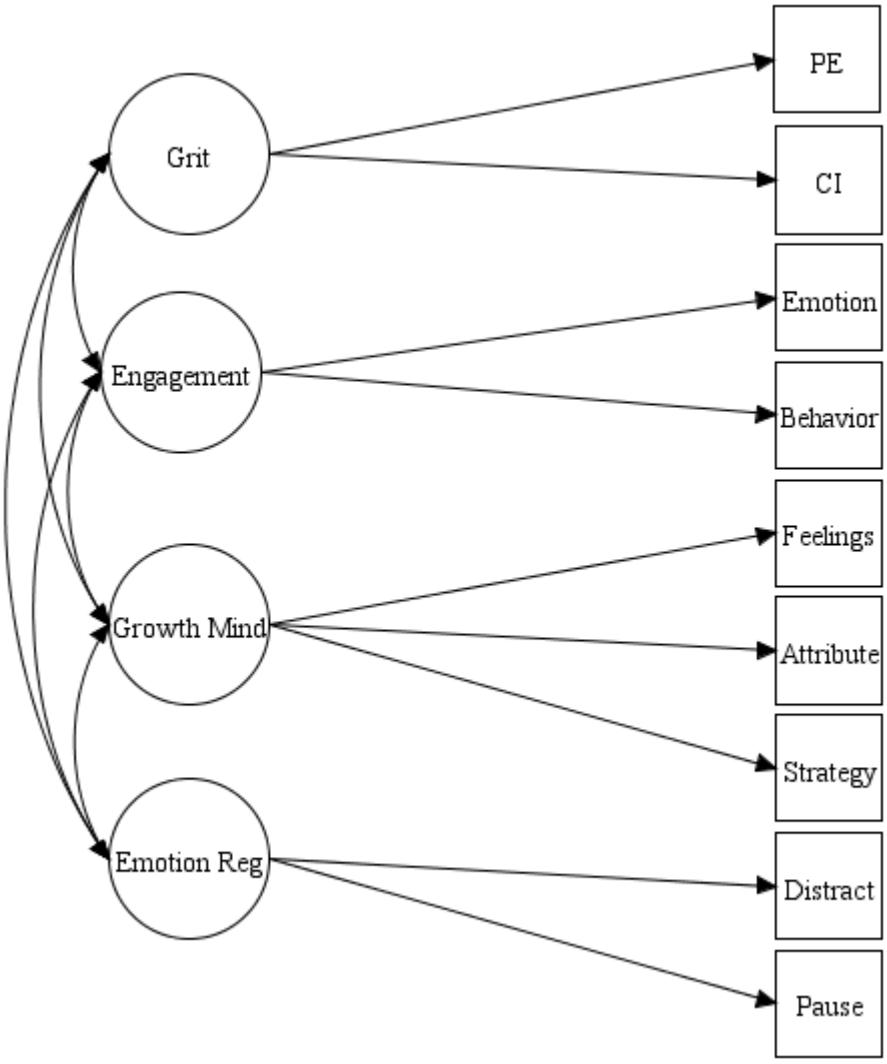

Figure 1. Original Scales confirmatory factor analysis model. Growth Mind = growth mindset. Emotion Reg = emotion regulation. PE = grit's perseverance of effort subscale. CI = grit's consistency of interests subscale. Emotion = emotional engagement. Behavior = behavioral engagement. Feelings = growth mindset's feelings subscale. Attribute = growth mindset's attributions subscale. Strategy = growth mindset's strategies subscale. Distract = emotion regulation's distraction subscale. Pause = emotion regulation's pause anger subscale.

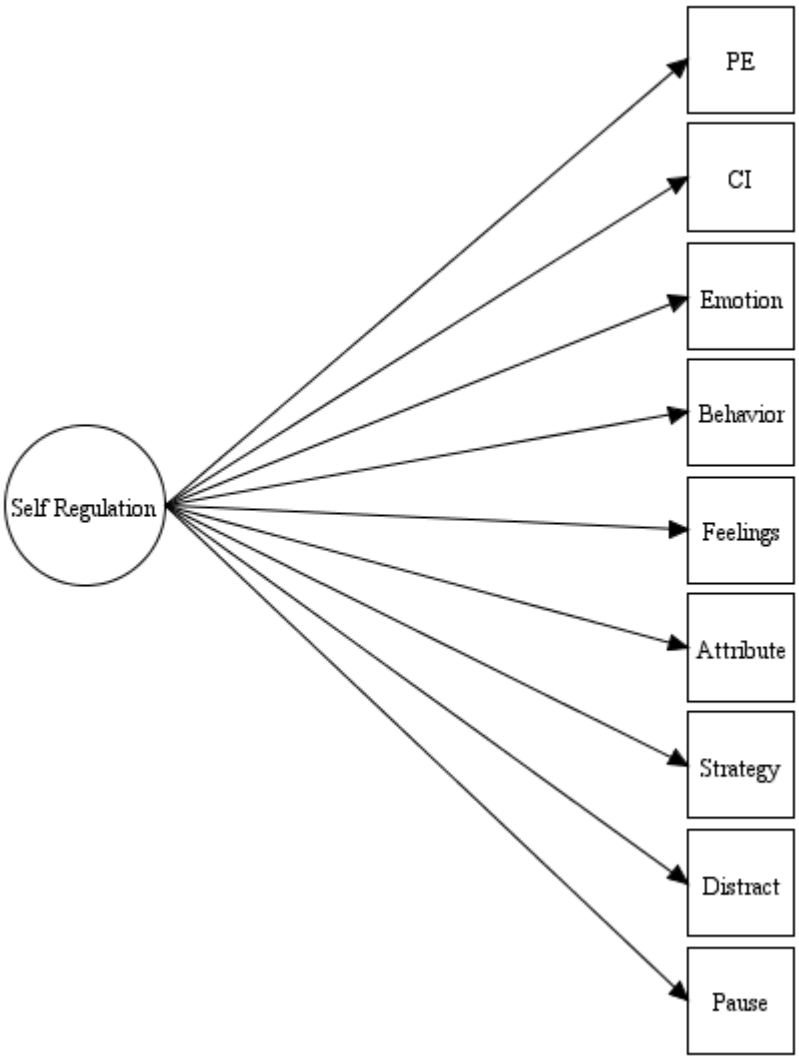

Figure 2. Higher-Order confirmatory factor analysis model. Self-regulation is hypothesized as the higher-order construct, with all noncognitive measure subscales from Figure 1 loading onto this construct.

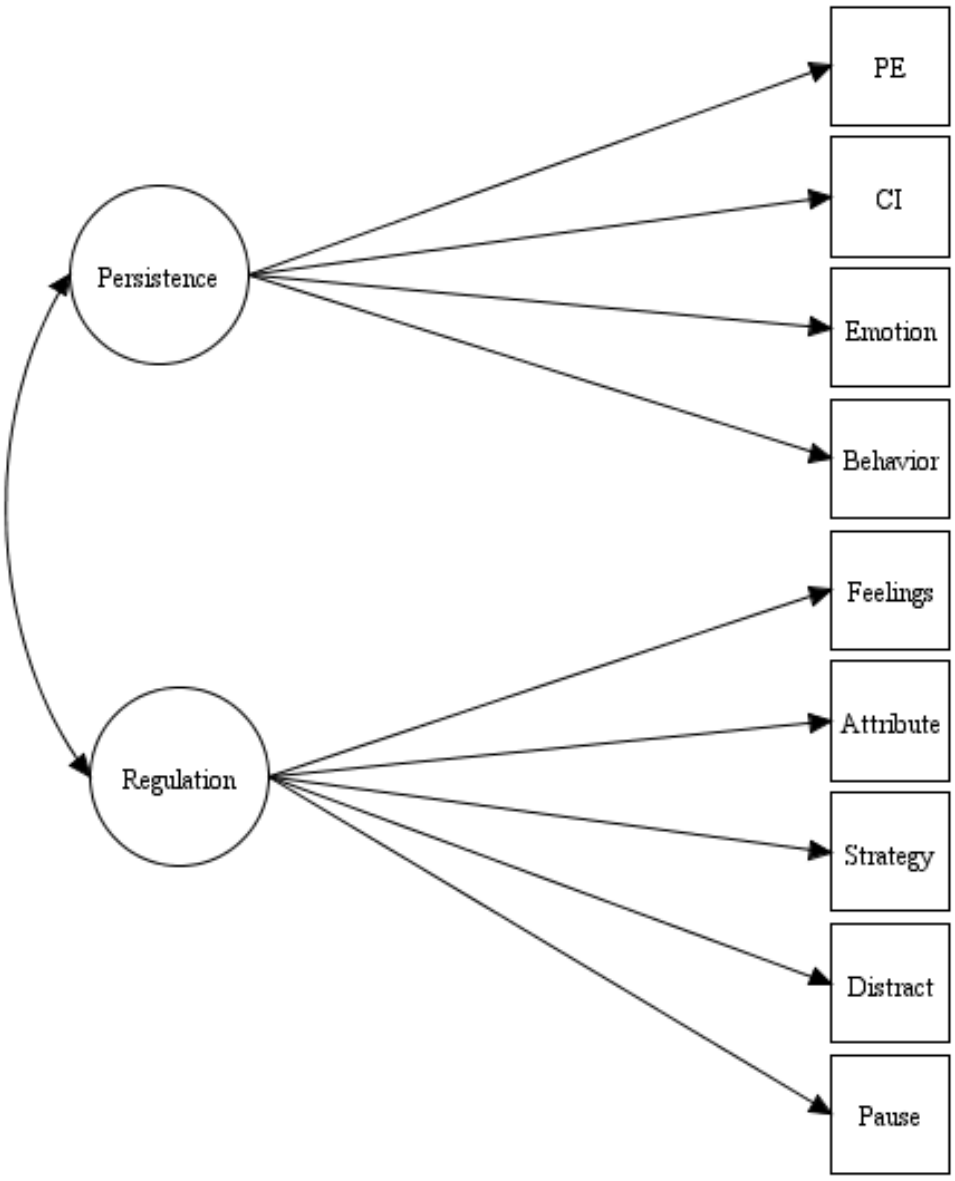

Figure 3. Two-Factor exploratory factor analysis model. Persistence and Regulation emerged empirically as the higher-order constructs, with grit and engagement subscales loading onto the Persistence factor and growth mindset and emotion regulation subscales loading onto the Regulation factor.

Table 3

Fit Statistics for Confirmatory Factor Analysis: Original Scales Model vs. Higher-Order Factor Model vs. Two-Factor Empirically-Derived Model

	Model Fit Statistics				
	χ^2	*RMSEA*	*SRMR*	*CFI*	AIC Index
Student Report[a]					
Original Scales	36.49*	**.06**	**.04**	**.97**	3789.13
Higher-Order	145.56***	.14	**.08**	.75	3902.76
Two-Factor	61.97***	.07	**.05**	.94	3900.18
Teacher Report[b]					
Original Scales	44.39**	.07	**.07**	**.97**	4008.51
Higher-Order	258.30***	.19	.16	.69	4227.52
Two-Factor	70.69***	.08	**.08**	**.95**	4161.03

Note. Boldfaced coefficients meet established criteria for acceptable model fit; smaller chi-square and AIC index values indicate better model fit (e.g., Little, 2013). RMSEA = root mean square error of approximation. SRMR = standardized root mean square residual. CFI = comparative fit index.
[a]*N = 241.*
[b]*N = 240.*
*$p < .05$, **$p < .01$, *** $p < .001$.

however, growth mindset showed a weak to moderate positive correlation with grit and its subscales.

Table 5 displays a correlation matrix for the latent grit, engagement, growth mindset and emotion regulation variables. Similar to bivariate correlations, latent correlations between grit and growth mindset were moderate and positive in magnitude. Similar to hypotheses (although not to bivariate correlation results), moderate latent correlations were found between grit and emotion regulation. Using latent variables, correlations between grit and engagement were even stronger than what was revealed using bivariate correlations.

Table 4

Correlations of Grit with Similar Noncognitive Variables

	Time 1 Student-Reported			Time 1 Teacher-Reported		
Noncognitive Measures	Full Grit Scale	Perseverance of Effort subscale	Consistency of Interests Subscale	Full Grit Scale	Perseverance of Effort subscale	Consistency of Interests Subscale
Student-Reported Emotional Engagement	.45***	.43***	.30***	.32***	.33***	.28***
Teacher-Reported Emotional Engagement	.28***	.22**	.23***	.77***	.80***	.66***
Behavioral Engagement	.50***	.58***	.25***	.38***	.36***	.37***
Growth Mindset	.29***	.23***	.23***	.20**	.19**	.19**
Emotion Regulation						
Distract	.10	.07	.09	.05	.05	.04
Pause Anger	.26***	.18**	.24***	.18**	.16*	.17**

$N = 236$.
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 5

Correlations of Latent Grit with Similar Latent Noncognitive Variables

Noncognitive Measures	Student-Reported Grit	Teacher-Reported Grit
Student-Reported Engagement	.917	
Teacher-Reported Engagement		.956
Growth Mindset	.423	.215
Emotion Regulation	.359	.181

$N = 241$.

Grit's Unique Prediction of Later Literacy Achievement

For study aim #3, I hypothesized that grit would fail to predict later literacy achievement after adjusting for similar noncognitive factors and previous literacy achievement. Figures 4 and 5 present the two structural equation models used to test

grit's prediction of later literacy achievement after accounting for the predictive contributions of similar noncognitive factors (Model 1; Figure 4), and also after accounting for previous literacy achievement (Model 2; Figure 5). Model 1 consisted of Time 1 latent noncognitive variables (grit, engagement, growth mindset, emotion regulation) predicting Time 3 measured literacy achievement variables (TOSREC reading task and MAP-R standardized reading assessment). Model 2 consisted of Model 1 plus Time 1 literacy achievement control variables. The best-fitting Original Scales latent CFA model was used to model the noncognitive predictors, with two revisions as discussed in the Analysis Approach section.

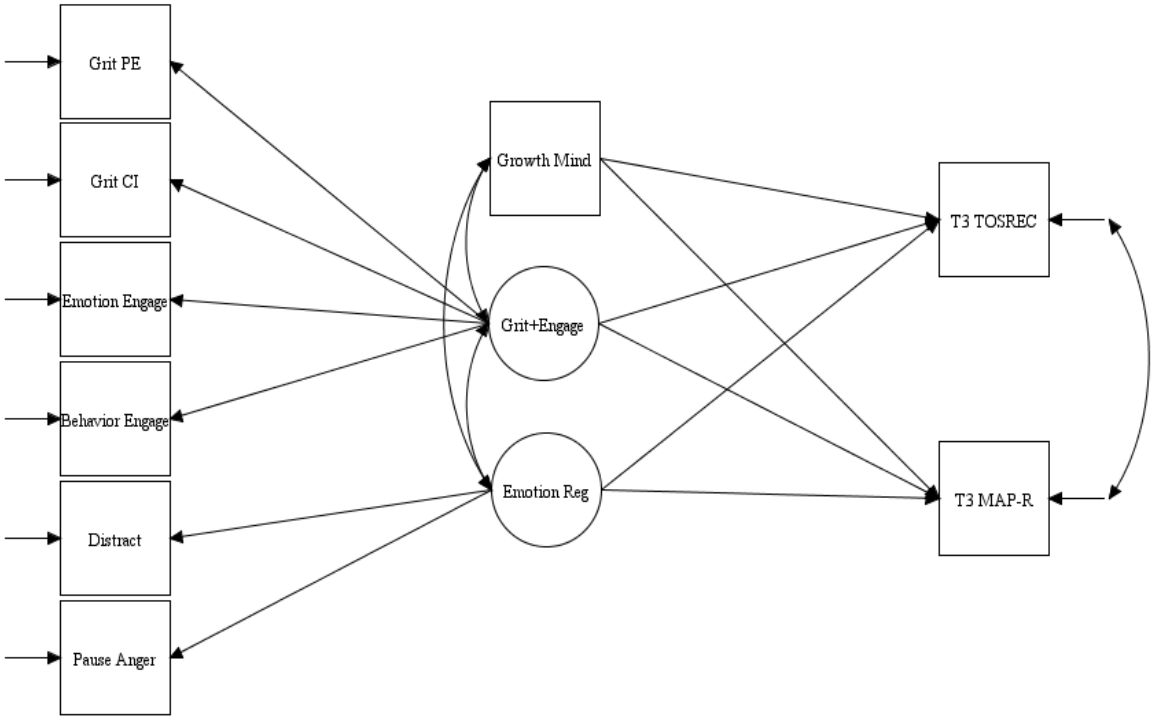

Figure 4. Model 1: structural equation model with Time 1 latent grit + engagement, latent emotion regulation, and measured growth mindset predicting Time 3 measured TOSREC reading task and MAP-R standardized reading assessment.

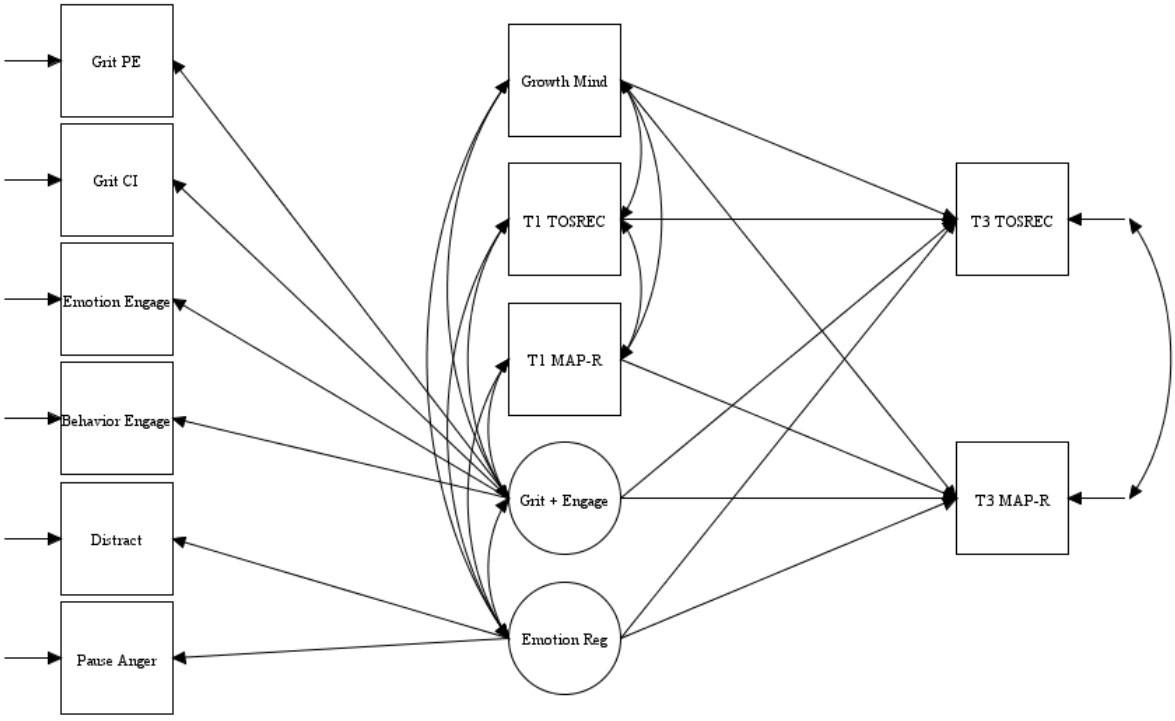

Figure 5. Model 2 including Time 1 literacy controls: structural equation model with Time 1 latent grit + engagement, latent emotion regulation, and measured growth mindset predicting Time 3 measured TOSREC reading task and MAP-R standardized reading assessment, controlling for Time 1 measured TOSREC and MAP-R.

Goodness-of-fit for Models 1 and 2 was acceptable across teacher and student data, with two out of three fit indices meeting acceptable model fit criteria in three of the four models (see Table 6). The larger AIC index and chi-square value for Model 2 vs. Model 1 suggested that adding previous (Time 1) literacy to the model worsened the model fit. Path estimates of the structural equation models for both student- and teacher-reported data can be found in Table 7; I will review teacher-reported model results here. In Model 1, the combined grit and engagement latent variable was the only unique predictor of later literacy achievement, as indicated by significant positive paths from grit + engagement to TOSREC ($\beta = .20$, $p = .006$), and to MAP-R ($\beta = .26$, $p = .001$). Model 2, however, revealed limitations of grit's predictive power, consistent with

my hypothesis. After adding Time 1 TOSREC and MAP-R as previous achievement control variables, the paths from grit + engagement to Time 3 literacy outcomes failed to remain significant. Instead, growth mindset was a significant positive predictor of TOSREC (β =.11, p = .031), and emotion regulation was a marginally significant negative predictor of TOSREC (β = -.11, p = .059). These findings did not hold, however, when each variable was used as a sole predictor in the model (see appendix table A2, Models 2a and 2b). The student-reported models mimicked all noncognitive predictor findings for Model 1, but no noncognitive variables predicted literacy achievement for Model 2.

Table 6

Fit Statistics for Structural Equation Models of Grit and Noncognitive Factors Predicting Later Literacy Achievement

	Student-Reported Models		Teacher-Reported Models	
	Model 1	*Model 2*	*Model 1*	*Model 2*
χ^2	37.17*[a]	66.53***[b]	48.11***[a]	115.40***[b]
RMSEA	.07	.08	.09	.13
SRMR	**.05**	**.06**	**.07**	**.07**
CFI	**.96**	**.95**	**.95**	.91
AIC Index	3067.28	3501.19	3211.68	3644.09

Note. Model 1 = latent grit + engagement, latent emotion regulation, and measured growth mindset as predictors of Time 3 TOSREC reading task and MAP-R standardized literacy assessment. Model 2 = Model 1, controlling for Time 1 TOSREC and MAP-R. Boldfaced coefficients meet established criteria for acceptable model fit; smaller AIC Index values and chi-square values in Model 1 indicate better model fit (e.g., Little, 2013).
[a] df = 20.
[b] df = 30.
** p < .01. *** p < 0.001.

Table 7

Direct Effects in Structural Equation Models of Time 1 Grit and Similar Noncognitive Factors on Time 3 Literacy Achievement

	Student-Reported Model[a]			Teacher-Reported Model[b]		
Parameter Estimate	*Unstandardized*	*Standardized*	*p-value*	*Unstandardized*	*Standardized*	*p-value*
Model 1 Estimates						
Grit + Engage → TOSREC	**.52 (.27)**	**.20**	**.051**	**.23 (.08)**	**.20**	**.006**
Grit + Engage → MAP-R	**.58 (.26)**	**.24**	**.022**	**.29 (.09)**	**.26**	**.001**
Emotion Reg → TOSREC	-.22 (.28)	-.10	*ns*	-.14 (.25)	-.06	*ns*
Emotion Reg → MAP-R	-.05 (.29)	-.02	*ns*	.03 (.27)	.02	*ns*
Growth Mindset → TOSREC	.10 (.19)	.05	*ns*	.23 (.18)	.11	*ns*
Growth Mindset → MAP-R	-.09 (.19)	-.05	*ns*	.06 (.19)	.03	*ns*
Model 2 Estimates						
Grit + Engage → TOSREC	3.51 (3.86)	1.39	*ns*	.05 (.04)	.05	*ns*
Grit + Engage → MAP-R	-1.68 (1.80)	-.69	*ns*	-.03 (.05)	-.02	*ns*
Emotion Reg → TOSREC	-8.79 (9.83)	-2.56	*ns*	**-.24 (.12)**	**-.11**	**.059**
Emotion Reg → MAP-R	3.92 (4.34)	1.18	*ns*	-.02 (.12)	-.01	*ns*

Growth Mindset → TOSREC	2.95 (3.27)	1.54	*ns*	**.21 (.10)**	**.11**	**.031**
Growth Mindset → MAP-R	-1.27 (1.43)	-.69	*ns*	.05 (.09)	.03	*ns*
Time 1 TOSREC → Time 3 TOSREC	**.96 (.32)**	**.97**	**.003**	**.80 (.04)**	**.81**	**< .001**
Time 1 MAP-R → Time 3 MAP-R	**.92 (.15)**	**.94**	**< .001**	**.85 (.04)**	**.88**	**< .001**

Note. Standard errors in parentheses. Model 1 = latent grit + engagement, latent emotion regulation, and measured growth mindset as Time 1 predictors of measured Time 3 TOSREC reading task and MAP-R standardized literacy assessment. Model 2 = Model 1, controlling for measured Time 1 TOSREC and MAP-R. Boldfaced statistics are statistically significant.
TOSREC = Test of Silent Reading Efficiency and Comprehension (Wagner, Torgesen, Rashotte, & Pearson, 2010).
MAP-R = Measures of Academic Progress – Reading.
[a]*N* = 184 for Model 1, 178 for Model 2.
[b]*N* = 183 for Model 1, 176 for Model 2.

Age- and Ethnicity-Related Differences in the Predictive Model

My goal for study aim #4 was to determine ethnic and age differences in the model's noncognitive-achievement paths, with the goal of better understanding what variables were most predictive of achievement, and for whom. I hypothesized that grit and other noncognitive factors would relate more strongly to later literacy achievement for older students. I also hypothesized that the predictive model in general, and the path from engagement to literacy achievement in particular, would differ by ethnic group.

Descriptive differences by age and ethnic group. Participants differed on several of the major study variables, based on age and ethnic group, and I report these mean level differences here solely for descriptive purposes. Regarding age, older students had higher literacy scores at both Time 1 and Time 3. Older students rated themselves as having more grit ($t(202) = -3.40$, $p = .001$). Younger students, however, were rated by their teachers as having more emotional engagement ($t(244) = 2.86$, $p = .005$). As expected, even after controlling for previous achievement (Model 2), age was a significant predictor of both literacy achievement outcomes, with older students more likely to have higher scores on both MAP-R ($\beta = .10$, $p = .004$) and TOSREC ($\beta = .13$, $p < .001$).

In terms of ethnic group, White students received higher teacher ratings of grit ($t(177) = -2.34$, $p = .02$) and emotional engagement ($t(249) = -2.27$, $p = .024$). They also had higher Time 1 TOSREC scores ($t(173) = -2.19$, $p = .03$), and both Time 1 ($t(164) = -2.99$, $p = .003$) and Time 3 ($t(239) = -3.28$, $p = .001$) MAP-R scores. Non-white students rated themselves as more frequently using distraction as an emotion regulation strategy

($t(195) = 2.02$, $p = .045$). Contrary to expectations, ethnic group was not a significant predictor of literacy achievement when it was added to the structural equation models.

Age-related differences in the noncognitive and literacy achievement predictive model. Before using multiple-group analysis to investigate if and how the predictive model differed by age, it was important to run the model within each age group separately to ensure at least marginally acceptable model fit by subgroup (e.g., Little, 2013; Raykov, Marcoulides, & Li, 2012). Teacher-reported Model 1 demonstrated excellent fit with younger student data (RMSEA = .00, CFI = 1.00, SRMR = .06) and marginally acceptable fit with older student data (RMSEA = .13, CFI = .92, SRMR = .08). Modification indices for the older student model, however, suggested that the mean of the emotional engagement subscale should be allowed to vary across groups, so this condition was added to the multi-group model.

I next used multiple-group analysis to test if the full structural equation model differed across younger and older student groups with teacher-reported data. I compared the fit of a model assuming differences across age (all structural paths free to vary) to the fit of a model assuming no differences across age (all structural paths constrained to be equal). The model assuming age group differences provided a somewhat better fit to the data, indicated by a smaller chi-square value (χ^2 (47) = 78.87 versus χ^2 (53) = 84.03). Nonetheless, the $\Delta\chi^2$ of 5.16 ($df = 6$) was not statistically significant, meaning (contrary to predictions) the overall structural equation model was equivalent across age groups. A subsequent analysis of each individual path from noncognitive predictor to literacy achievement outcome also confirmed there were no differences across age group.

For student-reported data, the model did not show acceptable fit with the younger student data. Since it is beyond the scope of this paper to develop a new theoretical model of noncognitive variables and literacy achievement fitting both age groups equally, as would be required to continue multi-group analysis with integrity, I did not continue age group analyses with the student-reported data.

Ethnicity-related differences in the noncognitive and literacy achievement predictive model. Prior to comparing the predictive model by ethnic group, I ran Model 1 within White and non-White subsamples separately to ensure adequate model fit to the data within each group. The model had marginally acceptable to excellent fit to both the non-White (RMSEA = .00-.09, CFI = .93-1.00, SRMR = .04-.08) and White group data (RMSEA = .05-.10, CFI = .94-.98, SRMR = .05-.08), for teacher- and student-reported models. Within the non-White student group, however, excessive covariance was found between teacher-reported grit's perseverance subscale and the other teacher-reported subscales within the grit + engagement construct. To correct this, I fixed both grit subscales and the emotional engagement subscale to covary with each other in the teacher-reported non-White sample, above and beyond the default covariance of loading onto the same construct.

To test if the predictive models differed by ethnic group, I compared the fit of a model assuming differences across ethnic groups (with all structural paths free to vary) to the fit of a model assuming no differences across ethnic groups (with all structural paths constrained to be equal). While the model assuming differences across ethnic groups had a somewhat better fit to the data (χ^2 (46) = 80.20 versus χ^2 (52) = 92.55 for the model assuming no differences), the marginally non-significant $\Delta\chi^2$ of 12.35 (*df* = 6) suggested

that this overall predictive model was technically equivalent across ethnic groups. When I compared each individual structural path from noncognitive variable to literacy achievement outcome one by one with all predictors still included in the model, however, there were some significant differences across groups, consistent with my predictions (Figure 6). Specifically, the path from grit + engagement to TOSREC ($W = 4.79$, $p = .029$) and to MAP-R ($W = 8.59$, $p = .003$) was stronger among non-White students ($b = .53$ for TOSREC, .70 for MAP-R) than among White students ($b = .06$ for TOSREC, .11 for MAP-R). For every point increase in teachers' grit + engagement ratings of White students, students' standard scores increased by only a twentieth of a point on the TOSREC and a tenth of a point on the MAP-R. For non-White students, however, every point increase in teachers' ratings corresponded with half a standard score point increase on the TOSREC and two-thirds of a point increase on MAP-R. No other paths varied across groups, and no ethnic group differences were found for the student-reported model or individual paths. When Time 1 literacy achievement was added to the model, grit + engagement failed to predict later achievement, as in the full-sample analyses.

Differences by highly gifted and bilingual status. To better understand what drove these ethnic group differences in the relations of grit and engagement with literacy achievement, I conducted exploratory post-hoc multi-group analyses with two hypotheses. I first hypothesized that differences were due to the inclusion of highly gifted students. The grit scale was normed on, and preliminary grit research done with, high-achieving student populations, thus predictive relations between grit + engagement and literacy achievement may have been driven by the inclusion of these high achievers in the sample. To test this, I re-ran ethnic multiple-group comparisons excluding 35 White and

17 non-White highly gifted students from their respective subgroups. When highly gifted students were excluded, the ethnic group difference in the relations between grit + engagement and TOSREC disappeared; the relations between these predictors and the literacy achievement outcome were no longer stronger for non-White students. The interaction of grit + engagement and highly gifted status was a weak but significant predictor of MAP-R scores (β = -.10, p = .012), but not of TOSREC scores.

I next hypothesized that ethnic group differences were driven by the underlying factor of bilingual status. The majority of non-White students in the sample (66%) were classified as bilingual and presumed to be first- or second-generation immigrants, while the majority of White students in the sample (80%) were classified as monolingual, therefore the ethnic group differences in the model might have actually been driven by these language and (possible) cultural differences. To investigate, I ran a multi-group analysis of the predictive model by students who only spoke English at home with parents (monolinguals; n = 161) versus students who spoke a language other than English at home with parents (bilinguals; n = 90). As with the ethnic group differences, I first ran the model within the bilingual and monolingual groups separately, to ensure adequate model fit within each group. For student-reported data, the model had an acceptable fit to the data for both bilingual (RMSEA = .07, CFI = .97, SRMR = .06) and monolingual students (RMSEA = .06, CFI = .97, SRMR = .05). For teacher-reported data, however, the model did not have an acceptable fit to the monolingual data, so teacher-reported analyses were discontinued.

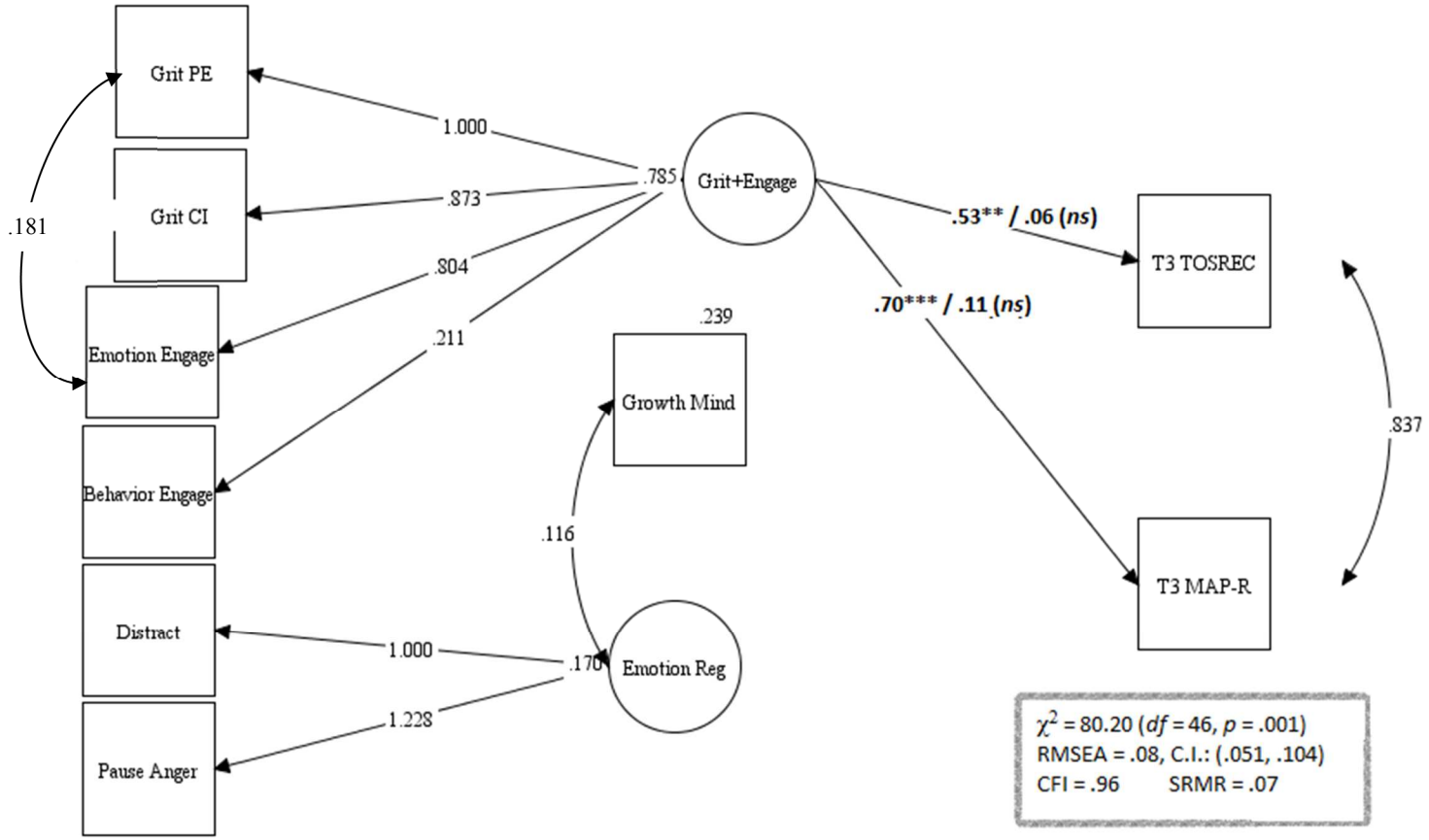

Figure 6. Multiple-group analysis by ethnic group (non-White vs. White), of structural equation model with Time 1 latent grit + engagement, latent emotion regulation, and measured growth mindset predicting Time 3 measured TOSREC reading task and MAP-R standardized reading assessment. Where multiple coefficients are reported on the Grit+Engage to T3 TOSREC and T3 MAP-R paths, significant coefficients (to the left of the slash mark) represent non-White paths while non-significant coefficients (to the right of the slash mark) represent White paths. Residual (error) variances excluded from this graphical model. All path coefficients are unstandardized, significant at the $p < .05$ level, and equal across ethnic groups, with the exception of Grit+Engage to T3 TOSREC and T3 MAP-R (significant for non-White group only).
** $p < .01$. *** $p < .001$.

To analyze structural equation model differences by bilingual status, I compared a model assuming differences by group (with all predictive paths free to vary) to a model assuming no differences by group (with all paths held equal across groups). The $\Delta\chi^2$ of 9.75 (*df* = 6) was not statistically significant, suggesting that the full model did not vary across language groups just as it did not vary across ethnic groups. An investigation of each predictive path one by one while all predictors remained in the model, however, revealed some group differences. Similar to the ethnic group findings, the paths from grit + engagement to TOSREC (*W* = 5.541, *p* = .019) and to MAP-R (*W* = 5.328, *p* = .021) were much stronger among bilingual students (TOSREC *b* = 1.20, *p* = .003; MAP-R *b* = 1.22, *p* = .002) than among monolingual students (*b* = .048 and .137, respectively, *ns*). These bilingual status differences remained even after removing highly-gifted students from the group samples. When Time 1 literacy achievement was added as a control variable to the predictive model, however, grit + engagement failed to predict later achievement better or at all for bilingual students, as in the full-sample predictive analyses.

Chapter 5: Discussion

The overall objective of this study was to test grit's conceptual uniqueness as a noncognitive construct, its ability to add value to predictive models of noncognitive factors and literacy achievement for young, ethnically diverse students, and whether it predicted later literacy differently for different groups of students. First, I examined grit's conceptual and operational overlap with the similar, more established noncognitive measures of engagement, emotion regulation, and growth mindset. Results revealed that it is not appropriate to conceive of grit and other noncognitive constructs as lower-order factors of an overarching self-regulation construct among diverse elementary school students. Grit was moderately related to, yet distinct from, growth mindset and emotion regulation, while it overlapped excessively with engagement, especially at the latent variable level. Second, I examined if grit provided unique power to predict later literacy achievement, and if it continued to predict literacy after controlling for predictive contributions from other noncognitive variables and previous literacy achievement. Results indicated that, among diverse elementary school students, grit and engagement as a joint construct did predict later literacy achievement, but showed little relative importance as it did not predict later literacy when controlling for previous literacy. Third, I examined if the model of grit, other noncognitive variables, and literacy achievement differed by age or ethnic group. Results indicated that patterns of relations among grit, engagement, and literacy achievement were different for White and non-White students, as well as for bilingual and monolingual students, but that net of previous literacy achievement, grit did not predict later literacy achievement for either group.

Conceptual and Measurement Overlap between Grit and Similar Noncognitive Variables

Contrary to my expectations, a model with distinct grit, engagement, growth mindset, and emotion regulation latent constructs fit the study data better than a model with one overarching meta-construct, self-regulation. This model also fit the data better than an empirically-derived two-factor model of overarching Persistence and Regulation. Despite strong theoretical, definitional, and operational similarities among these noncognitive constructs within the self-regulation literature (e.g., Pintrich & DeGroot, 1990; Rojas et al., 2012), grit appeared too distinct from growth mindset and emotion regulation to be combined with them as lower-order factors of the same overarching construct. Indeed, results of the exploratory factor analysis suggest that growth mindset and emotion regulation form their own second-order factor completely distinct from grit.

Grit's uniqueness as a construct was called into question, however, by its considerable overlap with engagement in the Original Scales model, as well as its loading onto a unified factor with engagement in the EFA analyses. It is not surprising to find high overlap between these two constructs, as recent research also found that grit and engagement subscales loaded onto a unified construct (Muenks et al., 2016). Furthermore, both grit and engagement measures have a similar theorized factor structure, with emotional and behavioral subscales, while the other constructs are structured differently. The fact that both 3rd party informants (teachers) and self-raters (students) responded to the grit and engagement scales as if they were the same construct lends support that this overlap is not just theoretical but also practical. If the individuals who are most directly affected by school-based noncognitive programs – teachers and

students – cannot distinguish between grit, emotional engagement, and behavioral engagement on a questionnaire, it seems unlikely the constructs would have a meaningful distinction in practice.

Overlap between grit and emotion regulation or growth mindset was modest, suggesting more conceptual and measurement differences than similarities. A comparison of the constructs' dimensions can shed light on why such a difference was found. For example, successful emotion regulation involves multiple cognitive and attentional skills, including shifting attention away from the source of negative emotion (e.g., Eisenberg & Fabes, 1992), or re-conceptualizing the frustrating situation in a more abstract and emotionally neutral light (Braet et al., 2014; Mischel et al., 2011). A major focus of emotion regulation is the modulation and monitoring of internal feelings, particularly to minimize or avoid the onset of negative emotions (Brock et al., 2009; Eisenberg et al., 1997; Jacobs & Gross, 2014). Grit, on the other hand, often focuses on behavioral actions to pursue an external goal, without an explicit focus on emotions inherent to the construct. Grit primarily involves persevering in the presence of negative affect-producing situations such as "failure, adversity, and plateaus in progress" (Duckworth et al., 2007, p. 1088) or frustration on a difficult academic task (Hoerr, 2012) rather than modifying the affect, although someone practicing grit could simultaneously practice emotion regulation.

In the case of growth mindset, the construct name implies that it is cognitive in nature, a mental interpretation and perception of situations that can lead to certain behaviors, but which in and of itself is not a behavior. Grit, on the other hand, is primarily behavioral. In fact, previous research has suggested that growth mindset may

be a catalyst for grit-like persistence and stamina (Cury et al., 2006; Dweck, Walton, & Cohen, 2014), which implies both a conceptual and temporal separation between these two constructs within the academic achievement process. While researchers may infer growth mindset from perseverance in the face of challenge (King, McInerney, & Watkins, 2012), behavioral observations cannot directly capture the construct of growth mindset. Future studies should examine mediation models to determine if growth mindset does in fact precede grit and if grit mediates the relationship between growth mindset and achievement.

Relations between Grit and Similar Noncognitive Variables

As expected, there was a positive correlation between grit and similar noncognitive factors at both the observed subscale and the latent factor level. Grit had especially strong relations with engagement, which may be explained by how students and teachers conceptualized, and subsequently reported on, these two measures. For students, being interested or emotionally engaged in school may feel similar to wanting to work harder or persevere through difficult work (hallmarks of grit), so students may have reported similarly on the grit and engagement measures. For teachers rating their students, they may observe students' task persistence and class participation and see these behaviors as embodying both grit and engagement, but have trouble distinguishing between the two. Grit and growth mindset also had a moderate relationship, supporting empirical work linking students' incremental (growth-oriented) mindsets and perseverance on academic tasks (Dweck, 2002).

Grit and the emotion regulation strategy of "pause anger" were related, suggesting that although these constructs are not the same, the pursuit of goals inherent in

grit may additionally require regulation of frustration and inhibition of emotional impulses (Mischel, 2014; Mischel, Shoda, & Peake, 1988; Sroufe, 1996). When challenging obstacles arise and individuals are thwarted from attaining a personally valued goal (Duckworth et al., 2007; Duckworth & Eskreis-Winkler, 2013), a response-focused emotion regulation strategy like suppressing or pausing anger to control angry or frustrated impulses (Duckworth, Gendler, & Gross, 2014; Gross, 2002) may be necessary to facilitate showing grit. The antecedent-focused emotion regulation strategy of distraction did not, however, relate to grit. Although this strategy is widely used by children (Skinner & Zimmer-Gembeck, 2007), it is a strategy used prior to the onset of a negative emotion, as a way to avoid experiencing that emotion. When students display grit, however, there is already an obstacle in their way and they are likely already experiencing frustration or other negative emotions, so it may be too late to use distraction as a tool. Future studies should examine the overlap of the specific emotion regulation strategies with grit as a way to further clarify the similarities and distinctions between these constructs and how they interact in the academic context.

Grit's Unique Prediction of Later Literacy Achievement

In this study, when not taking prior achievement into consideration, grit and engagement together formed a powerful predictor of later literacy achievement, more powerful than growth mindset or emotion regulation. These initial findings seemed to suggest something unique and valuable about using students' grit and engagement jointly, rated by either teachers or students, to predict academic outcomes like literacy achievement. Consistent with my hypothesis, however, grit (even when combined with engagement) did not predict later literacy achievement after adjusting for the predictive

contributions of the other noncognitive factors and previous literacy achievement. This finding calls into serious question grit's importance for predicting literacy achievement measures, at least as grit is currently measured and with relatively short-term literacy outcomes.

Research shows that other motivational and noncognitive constructs can and do predict achievement outcomes even after adjusting for the same measure of previous achievement (e.g., Meece et al., 1990; Schunk & Pajares, 2009). Among college students, findings have been mixed with regard to grit's importance in predicting achievement net of previous achievement. Some studies revealed unique predictive validity when accounting for different measures of previous achievement (Chang, 2014; Duckworth et. al., 2007; Strayhorn, 2014), while others found no such predictive advantage over and above previous achievement (Bazelais, Lemay, & Doleck, 2016; Wolters & Hussain, 2015). Within the K-12 student population, only three unpublished studies (Cooper, 2014; Stewart, 2015; Weston Riley et al., under review) have adjusted for the same measure of previous achievement when studying grit's prediction of later achievement, with similar mixed findings. In the current study, previous literacy achievement diluted grit and engagement's predictive power and limited their predictive value. The magnitude of beta coefficients in the structural equation model suggested previous literacy achievement was by far the strongest predictor of later literacy achievement.

One explanation for why grit failed to prove a unique predictor of literacy achievement, net of prior achievement, may be linked to its definition: "passion and perseverance for long-term goals" (Duckworth et al., 2007, p. 1087). In terms of passion, grit may provide relative predictive power net of previous achievement only if

achievement measures are linked to personal interests and goals, thus evoking "passion." The current study did not assess whether literacy achievement was an important goal to the student participants. It is also possible that grit might offer more powerful prediction of longer-term achievement outcomes, such as graduating from high school (Eskreis-Winkler et al., 2014) or successfully starting a company (Abuhassàn & Bates, 2015), rather than short-term achievement outcomes like reading skills growth over two or three months. Future grit studies should adjust for students' personal investment in the outcome measure to assess whether grit's predictive power depends in part on passion for the measured goal. Future researchers should also include identical measures of previous and later literacy achievement, spaced further apart in time (perhaps over a year or more), in order to accurately test the predictive value of grit and similar noncognitive factors for long-term goals. Researchers may also consider modifying the current grit measure to better operationalize this long-term goal pursuit.

Emotion regulation and growth mindset predicted literacy achievement after controlling for previous achievement, but this appeared to be an artifact of having both predictors in the model simultaneously with each other and with grit + engagement, as neither was a significant sole predictor. This contrasts with a previous research study finding emotion regulation ability a better predictor of academic achievement than grit (Ivcevic & Brackett, 2014), but that study used both a different emotion regulation measure and an older student sample. Emotion regulation's lack of correlation with or unique prediction of literacy achievement may be related to the nature of the measure used in this study. The questionnaire asked students to think about times they had been angry or frustrated over the past month, but did not specify that these occasions should be

within the context of school or academics. Participants, thus, may not have been thinking about school-related anger or frustration when answering the questions. Alternatively, emotion regulation may not have been as relevant to literacy achievement merely because participants did not frequently experience anger; over 72% of students reported they felt angry or frustrated "sometimes" or less frequently over the previous month, while fewer than 28% of students felt angry "somewhat often" or "very often." Thus, students may not have needed to use emotion regulation strategies much in the first place.

Growth mindset's inability to uniquely predict literacy achievement may be due to the indirect and developmental nature of growth mindset's influence on children's effort and achievement (Burnette et al., 2013). A fixed or growth mindset does not consistently link to academic performance until about 5th grade (Bempechat, London, & Dweck, 1991). For the current study's sample, two-thirds of the students were not yet in 5th grade, so the stability of these relations may still be developing in the sample, although data did not support this hypothesis. Post-hoc analyses indicated a non-significant trend of 5th graders showing more overall growth mindset than students not yet in 5th grade, $t(193) = -1.913$, $p = .057$, but the magnitude of correlations between growth mindset and literacy achievement outcomes did not differ by grade level (5th vs. 3rd and 4th). As an alternative hypothesis, some research has revealed that students whose self-ratings classify them into a growth or a fixed mindset group, in reality, hold much more complex views of their intelligence and self-efficacy, views that do not neatly fit into these mindset categories and that more closely link to their daily academic behaviors (e.g., Quihuis, Bempechat, Jimenez, & Boulay, 2002). It is also possible that students have been encouraged to have a growth mindset in school and are motivated to rate

themselves high on this construct, but have not been taught how to actually show growth mindset (DeWitt, 2015), leading to no measureable connection with academic outcomes.

Predictive Model Group Differences: Ethnicity and Bilingual Status

The current study attempted to answer a call for a more formal test of the equivalence and relevance of motivational and self-regulatory constructs for diverse student groups (Wigfield et al., 2015). This study investigated which noncognitive factors (grit, engagement, growth mindset, or emotion regulation) are most uniquely predictive of achievement, and for which groups of students. Results of multiple-group analyses indicated that the overall model of noncognitive factors predicting literacy achievement was equivalent for older and younger students, and for both White and non-White students. Two specific paths within the model, however, did differ by ethnic group: teacher-rated grit + engagement was a significant and stronger predictor of both Time 3 literacy achievement outcomes for non-White students. Further post-hoc exploratory analyses suggested that this ethnic group difference might be driven by bilingual student status, presumed to be 1st or 2nd generation immigrants as grit + engagement was also a stronger literacy predictor for bilingual students vs. monolingual students. After adjusting for Time 1 literacy outcomes, however, grit + engagement was not a significant predictor for either individual ethnic groups or bilingual status groups.

My findings suggest that, while grit (along with engagement) appears differentially predictive of literacy outcomes for White vs. non-White and bilingual vs. monolingual elementary school students, it is not actually a meaningful predictor in comparison to the predictive value of previous literacy achievement. Research shows that previous reading achievement is highly indicative of later reading achievement across

racial, socioeconomic, and cultural groups (ACT, 2006; Cummins, Bismilla, Cohen, Giampapa, & Leoni, 2005; Hernandez, 2001), and that noncognitive factors similar to grit can relate to higher achievement even when controlling for previous achievement (e.g., Blackwell et al., 2007; Meece, Wigfield, & Eccles, 1990). In comparison, grit's inability to remain a significant predictor when accounting for both other noncognitive variables and previous literacy achievement in this study seems to support some recent work critiquing grit as lacking conceptual and predictive value (Credé et al., 2016), at least as it is now measured.

Despite a lack of unique predictive value, it is still important to consider reasons for differences in grit's relations with achievement for different ethnic and cultural student groups, as a way to increase the literature base on grit in diverse populations. Why would grit and engagement be stronger predictors of literacy achievement for ethnic minority and bilingual students specifically? Ethnic minority and immigrant students in the U.S. show persistent underachievement compared to their White peers (e.g., NCES, 2012; Planty et al., 2009; Reardon & Galindo, 2009; Rojas-LeBouef & Slate, 2012). They also face well-documented environmental obstacles to achievement such as discrimination (Cobb & Hodge, 2011; Gilliam, Maupin, Reyes, Accavitti, & Shic, 2016; Graham & Hudley, 2005; Howard, 2008), insufficient culturally-relevant instructional practices (e.g., Graham & Taylor, 2002; Herrera, 2010; Tharp, 1989; Sleeter, 2001; Walker, Shafer, & Iiams, 2004), and stress linked to the acculturation process (Alva & De Los Reyes, 1999; Roche & Kuperminc, 2012). The linguistic complexity of the MAP-R standardized achievement test may have presented yet another challenge for these bilingual, English language-learning students, as the cognitive demands are greater

when students must both decode language and comprehend academic content simultaneously (e.g., Paas, Touvinen, Tabbers, & Van Gerven, 2003).

With these unique contextual and linguistic barriers presenting academic challenges (e.g., Suárez-Orozco & Suárez-Orozco, 2001), ethnic minority and immigrant students may need higher levels of grit and engagement to serve a "protective" purpose (e.g., Smalls et al., 2007) and support their achievement. Some research has shown that, indeed, ethnic minority and immigrant parents may place a higher value on persisting through challenge (a manifestation of grit) as a specific means to school achievement, relative to White parents (McCombs & Pope, 1994; Pew Center, 2015). A mixed-methods study of Latina/o first-generation college students highlighted grit's central role in these immigrant students' pursuits of higher education (O'Neal et al., 2016). Qualitative interviews suggested that grit was tied to cultural values of supporting and making their families proud, and was conceptualized as a resilience factor to help overcome financial hardship and psychological distress. For the bilingual elementary school students in the current study, grit may be a similarly motivating factor in the face of academic and cultural hardships. This study, however, suggests there is no clear benefit to focusing on grit as an assessment or academic intervention tool for improving ethnic minority or bilingual students' reading, when previous achievement continues to be the primary indicator of future achievement. Until future researchers can investigate more comprehensive models of noncognitive variables and previous achievement predicting achievement for diverse student groups, researchers and educators risk overestimating grit's importance to achievement for these students.

Developmental Considerations for Noncognitive Variables and Literacy Achievement

In general, while engagement and other noncognitive factors have been found to decline across the grade levels (Gottfried et al., 2001; Peetsma et al., 2005), older students develop more sophisticated skills in these areas (e.g., Skinner & Zimmer-Gembeck, 2007), and links between noncognitive variables like growth mindset or engagement and achievement appear to strengthen over time (see Dweck, 2002, for review). Therefore, it was surprising that the relations between grit + engagement and literacy achievement did not differ in younger vs. older students in this study. This may be due to individual differences in how children of all ages develop ability and effort beliefs, and their responses to failure or social comparison about performance (Skinner & Pitzer, 2012; Wigfield et al., 1998). In the current study, there may be equal numbers of older and younger students espousing a growth mindset, leading to similar relations with achievement.

Despite finding no age differences in the model of noncognitive factors and achievement, some differences did emerge in the structure of the grit construct in this younger student sample overall. When students completed the grit scale, they rated themselves higher on the perseverance than on the interests subscale, and the internal reliability of the interests subscale was poor. The relative weakness of the interests subscale is consistent with developmental limitations in young students' ability to conceptualize consistent goals and interests (e.g., Pintrich & Zusho, 2002), and aligns with the fewer opportunities in elementary school to set personally meaningful long-term goals indicative of the interests subscale. The full construct of grit as theorized, then, may

not be as relevant to elementary school children, although more research should be done to determine if grit's perseverance subscale is relevant for elementary school students. Educators need to think carefully about what components of grit will be comprehensible and relevant to young students if they plan to incorporate grit into their instruction, and keep in mind the limited evidence of grit's predictive value for achievement outcomes.

Limitations

Noncognitive factors show the greatest value for research and practice when they can predict outcomes years or even decades in the future. The greatest limitation of this study's design, therefore, was that literacy achievement outcomes were measured just a couple of months after the first data collection time point, substantially limiting inferences that could be drawn about grit's long-term predictive ability. Additionally, the very short-term nature of this longitudinal study may have inflated the power of previous (Time 1) literacy achievement to predict later literacy achievement and diluted the predictive power of the noncognitive factors. Considering it takes multiple years for bilingual students to acquire academic English proficiency (e.g., Collier, 1987; MacSwan & Pray, 2005), future studies should space data collection so as to have the best chance of capturing variability and growth in literacy skills over time. Until a grit measure is developed which better captures the long-term goal commitment of its conceptual definition, studies may continue to be limited in what they can reveal about grit's unique predictive power even with longer-term outcome measures.

Another significant limitation was the use of rating scale data as the only method to measure the conceptually complex constructs of grit, engagement, emotion regulation and growth mindset. Self- and teacher-rated questionnaires are vulnerable to a variety of

validity threats, including inaccurate interpretation of questionnaire items, difficulty synthesizing retrospective memories of behavior and attitudes, misinterpretation of behaviors as reflecting certain underlying attitudes, or reference bias (Duckworth & Yeager, 2015; Sparks, 2016). Additionally, each of the study variables (particularly engagement and emotion regulation) is a multidimensional construct within a robust conceptual framework (Eisenberg et al., 1997; Reschly & Christenson, 2012), and a 6- to 16-item questionnaire likely cannot sample and represent each construct in a comprehensive way. Indeed, the self-reported rating scales may simply reflect students' subjective beliefs about their levels of certain constructs, which may not align with objective behaviors (Sparks, 2016). Although these measures were efficient and feasible methods of data collection for this study within the logistical limitations of school-based research, the addition of different measurement methods (e.g., behavioral observations, performance-based tasks) in future research might provide more insight into how these constructs manifest in young, diverse children.

Yet another limitation of the study design was the sample size, which was fairly large for school-based research studies but not large enough for ideal construct indication in the measurement models. When modeling latent constructs, it is recommended to have at least three measured indicators loading onto each construct, to enhance the ability to accurately distinguish reliable variance from error variance and to measure covariance between constructs (e.g., Little, 2013). I originally hoped to use individual scale items as indicators of each latent construct, but did not have enough statistical power to estimate that many parameters. Therefore, I used subscale scores as indicators, which are predetermined groupings of measure items and which resulted in me only having two

indicators for the emotion regulation construct. Only having two indicators could have resulted in underestimates of this construct's covariance with other constructs, and the biased groupings of measure items could have contributed to the Original Scales model having superior fit to the data. If individual items had been used, the higher order self-regulation meta-construct model may have provided the better fit. Future research should repeat this study's factor analyses with a larger student sample and with individual items loading onto the latent constructs, to confirm that grit is indeed distinct from emotion regulation and growth mindset.

A significant limitation was the inability to rule out the possible confounding of income and ethnic group, which may jeopardize the accuracy of my conclusions about why ethnic groups differed in the relations of grit, engagement and later achievement. Although school-level estimates of free and reduced meals status (FARMS), a proxy for low-income status, revealed comparably low rates of poverty across White and non-White students, I was unable to collect data on individual student poverty level and thus cannot guarantee income equality. It is possible that income levels differed between White and non-White students in the sample and may have contributed to the group differences discovered. Another limitation was that I used non-English language spoken at home with parents as a rough proxy for immigrant status. Due to school district restrictions on collecting certain demographic information such as generational status, our research team needed to take liberties in classifying students in this way. No additional data was collected to understand similarities or differences in these students' linguistic, cultural, environmental and acculturative backgrounds, therefore, conclusions are speculative about the reasons grit and engagement were more predictive of

achievement for bilingual students. Replication studies should include more explicit demographic variables to rule out confounding factors.

A final limitation was that the teacher-reported models did not consist purely of teacher-reported data, but rather a combination of teacher-reported grit and engagement data and student-reported emotion regulation and growth mindset data. Since grit and engagement were reported by teachers and also were the only sole noncognitive predictors of literacy achievement, it is possible that predictive power was influenced by teachers' reporting styles rather than the power of the constructs themselves. This mix of reporters in the predictive models also limited the ability to infer whether teachers' or students' ratings of grit and engagement are more beneficial for predicting later student achievement outcomes. Future studies should be designed so that both students and teachers complete all of the same measures, in order to make direct comparisons between raters and so that researchers can better understand rater effects on the links between noncognitive factors and achievement.

Conclusions

Researchers and educational policy-makers emphasize the importance of noncognitive skills for all students (e.g., Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Zins et al., 2007). They also discuss noncognitive factors as "resilience" or "protective" factors for traditionally disadvantaged or underachieving students, such as ethnic minority, low-income, or immigrant students (Green et al., 2008; Shechtman et al., 2013), even though many noncognitive measures have not been normed on these demographic groups. Ecological, contextual, and social factors all influence students' abilities to utilize noncognitive skills and resources in support of academic

success, making it unwise to assume that noncognitive factors will manifest similarly across widely different groups of students (Raver, 2004; Sektnan, McClelland, Acock, & Morrison, 2010).

Per the suspicions of recent researchers (Credé et al., 2016), grit may very well be a re-labeling of an existing noncognitive construct like engagement. Furthermore, this study provides evidence that grit and engagement are not significant predictors of achievement for either White or ethnic minority students when accounting for similar noncognitive factors and previous achievement; rather, previous achievement appears to be the strongest predictor. Ethnic minority and immigrant students do face contextual obstacles to achievement, but researchers cannot say with confidence at this time that displaying mindsets and behaviors indicative of grit– persisting on tasks and setting goals for their academic achievement – will alone increase their chances of overcoming these obstacles. To do so would be not only inaccurate but also discriminatory, narrow-minded and morally inexcusable (Turiel, Chang, & Carr, 2016), essentially blaming students themselves for not being gritty enough when other factors such as literacy achievement skills are much more relevant. At the current moment, research supports looking to prior achievement to identify who will experience future success and who will need additional support, and building literacy skills remains a stronger evidence-based intervention for underachievement than building students' grit.

APPENDIX

Table A1

Intercorrelations of all Time 1 Noncognitive Predictors, Time 1 Literacy Achievement Controls, and Time 3 Literacy Achievement Outcomes

	Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
1.	Student Grit	1															
2.	Student PE Subscale	.78***	1														
3.	Student CI Subscale	.86***	.35***	1													
4.	Teacher Grit	.45***	.39***	.35***	1												
5.	Teacher PE Subscale	.46***	.39***	.37***	.94***	1											
6.	Teacher CI Subscale	.39***	.35***	.30***	.94***	.77***	1										
7.	Student Emotional Engagement	.45***	.40***	.34***	.24**	.23**	.22**	1									
8.	Teacher Emotional Engagement	.32***	.22**	.30***	.72***	.77***	.59***	.23**	1								
9.	Behavioral Engagement	.49***	.55***	.28***	.39***	.33***	.40***	.51***	.36***	1							
10.	Growth Mindset	.33***	.25**	.29***	.18*	.18*	.17*	.39***	.11	.38***	1						
11.	Emotion Regulation Pause Anger	.29***	.17*	.29***	.21**	.17*	.22**	.37***	.15*	.28***	.41***	1					
12.	Emotion Regulation Distract	.08	.07	.07	.04	.04	.04	.19*	.03	.25**	.35***	.46***	1				
13.	Time 1 TOSREC	.17*	.12	.15*	.18*	.19*	.16*	.12	.16*	-.01	.09	.07	.05	1			
14.	Time 3 TOSREC	.18*	.20**	.12	.17*	.18*	.14	.11	.11	.04	.12	.02	.04	.83***	1		
15.	Time 1 MAP-R	.30***	.31***	.19*	.28***	.28***	.24**	.14	.14	.08	.09	.07	.06	.63***	.71***	1	
16.	Time 3 MAP-R	.24**	.25**	.16*	.22**	.21**	.20**	.07	.07	.06	.08	.05	.06	.66***	.74***	.88***	1

Note. All noncognitive variables collected at Time 1 and student-reported unless otherwise indicated. Student PE Subscale = student-reported grit's perseverance of effort subscale. Student CI subscale = student-reported grit's consistency of interests subscale. Teacher PE Subscale = teacher-reported grit's perseverance of effort subscale. Teacher CI Subscale = teacher-reported grit's consistency of interests subscale. TOSREC = Test of Silent Reading Efficiency and Comprehension (Wagner, Torgesen, Rashotte, & Pearson, 2010). MAP-R = Measures of Academic Progress – Reading. Listwise $N = 174$.

*$p < .05$.

**$p < .01$.

***$p < 0.001$.

Table A2

Direct Effects in Structural Equation Models of Time 1 Similar Noncognitive Factors and Time 3 Literacy Achievement

Parameter Estimate	*Unstandardized*	*Standardized*	*p-value*
Model 2a Estimates			
Growth Mindset → TOSREC	.08 (.08)	.04	*ns*
Growth Mindset → MAP-R	.00 (.07)	.00	*ns*
Time 1 TOSREC → Time 3 TOSREC	**.79 (.04)**	**.80**	**< .001**
Time 1 MAP-R → Time 3 MAP-R	**.85 (.04)**	**.87**	**< .001**
Model 2b Estimates			
Emotion Regulation Pause Anger → TOSREC	-.04 (.05)	-.04	*ns*
Emotion Regulation Distract → TOSREC	.01 (.05)	.01	*ns*
Emotion Regulation Pause Anger → MAP-R	.00 (.04)	.00	*ns*
Emotion Regulation Distract → MAP-R	-.02 (.05)	-.01	*ns*
Time 1 TOSREC → Time 3 TOSREC	**.81 (.03)**	**.82**	**< .001**
Time 1 MAP-R → Time 3 MAP-R	**.85 (.03)**	**.87**	**< .001**

Note. Standard errors in parentheses. Model 2a = measured growth mindset as Time 1 predictors of measured Time 3 literacy achievement (TOSREC reading task, MAP-R standardized literacy assessment), controlling for measured Time 1 literacy achievement. Model 2b = measured growth mindset subscales as Time 1 predictors of measured Time 3 literacy achievement. Boldfaced statistics are statistically significant. N = 183 for Model 2a, 181 for Model 2b.

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