Grit and Self-control: Independent Contributors to

Achievement Goal Orientation and Implicit Theories of Intelligence

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by

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Abstract

Grit and self-control were examined to determine their constructual independence and relation to students’ implicit theories of intelligence and achievement goal orientation. Participants were 26 female and 9 male undergraduate students. Subjects completed two different measures of self-control and a measure of grit. While grit and self-control as measured by the Brief Self-Control Scale appeared to tap a common construct, grit and self-control measured by the Go/No Go test were independent constructs. Moreover, grit and self-control predicted different beliefs about intelligence and achievement goal orientation.

Key words: grit, self-control, theories of intelligence, achievement goal orientation
Grit and Self-control: Independent Contributors to
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Athletes, students, lawyers, among many others are described as “gritty” people given the long-term dedication and perseverance required to succeed in these areas. Grit is the most common characteristic in the most prominent leaders in every field including law, medicine, business, writing, athletics, and others (Duckworth et al., 2007). Grit can be used to describe anyone who works arduously, and displays perseverance and passion for long-term goals (Duckworth et al., 2007). Constructs such as zeal, effortful persistence, or the capacity for hard work relate to grit (Duckworth & Gross, 2014). Duckworth and Quinn (2009) explain that grit includes the ability to maintain effort and interest in certain projects or goals that can take month or longer to complete. Additionally, grit requires an ability to overcome obstacles on the way towards achieving the goal. The long-term component of the definition is what differentiates grit from other constructs that may be confused with it, such as self-control, conscientiousness. The goal of this study is

As evidence mounts to distinguish grit as a unique and valid construct, several questions remain regarding its relation to self-control. The goal of the current study is to learn more about the characteristics of individuals possessing different levels of grit and different levels of self-control, to further differentiate grit from self-control, and to examine their contributions to achievement. Additionally, this study focuses on how these differences contribute to different aspects of achievement goal orientation (i.e. mastery vs. performance) (Midgely et al., 1998). This study will also take into account individuals’ theory of intelligence because such theories influence the kinds of goals individuals adopt (Dweck & Legget, 1998).
Grit and Self-Control

Grit is the perseverance and passion for long-term goals (Duckworth et al., 2007, Kelly et al., 2014, Duckworth & Quinn, 2010 etc.) Duckworth, Peterson, Matthews, and Kelly (2007) conducted one of the earlier studies on grit, and explained that grit includes working strenuously toward challenges, maintaining effort and interest over years despite failures, adversity and plateaus in progress. The effort necessary for long-term challenges take years to maintain (Kelly, Matthews, & Bartone, 2014). Additional descriptors of grit propose that the effort put forth to achieve long-term goals is tenacious, and that tenacity allows gritty individuals to overcome a variety of challenges (Abuhassan & Bates, 2015). These long-term goals entail tasks that can take many years of consistent effort and interest. Grit is comparable to a marathon where one needs great stamina and focus, rather than short intense bursts of speed needed in a sprint. Keeping stamina and focus in mind, it is pertinent to understand that true grit is not a state, but rather a trait characteristic that is constant and consistent in individuals who score high in it (Reed, Pritschet, & Cutton, 2012). Grit has strong implications on many aspects of life.

Duckworth & Quinn (2010) found that grit inversely relates to the number of career changes in adults, which highlights the long-term focus and interest necessary in grit. This finding has strong implications for college students’ academic achievement and potentially how the number of changes in major affects their academic success. Additionally, students with high grit scores outperformed peers in regards to grade-point average, and grit was predictor for graduating with honors and being in student leadership in college (Duckworth & Quinn, 2010). Tangney, Baumeister and Boone (2004) found very similar findings regarding grade point average. Adults with higher education attainment score higher in grit than adults who are less educated and the same age, and grit scores increase from associate- to bachelor- to graduate level
degrees (Duckworth et al., 2007). Both studies find correlations between grit and academic achievement; however, these findings offer a look into what grit can attribute to academic success.

Another instance of grit’s effect on achievement is in a study dealing with military school retention. On famous study evaluated grit’s predictability for West Point Cadets’ success over an extended period (Kelly, Matthews, & Bartone, 2014). The military, like other programs and institutions, wish to select and obtain individuals who will complete difficult tasks well. West Point Academy knew the cognitive attributes of previous cadets, but there has to be something else that allows individuals to adapt to a stressful environment. Using grit scales in personality assessments, the study found that grit was the greatest predictor for basic training attrition of West Point Cadets with moderate correlations to cadets’ military program score ($r = .14$, $p < .01$) (Kelly, Matthews, & Bartone, 2014). Cadets with higher grit were also more likely to accept more social support, and greater sustained effort necessary for completing the 47-month program.

A study on novice teachers found that grittier teachers were most likely to remain in the profession, to be effective teachers, and students with gritty teachers showed greater academic progress during the school year (Robertson-Kraft & Duckworth, 2014). The study emphasizes that certain factors such as leadership, college GPA, and standardized test score are not sufficient for the hiring process of teachers. This finding has serious implications for the importance of grit when colleges enroll students based solely on test scores or for college students receiving acceptance into graduate programs. Overall, grit is a stronger predicting factor of success in many facets especially academic achievement.
Grit can be confused with other terms, so establishing grit as an independent factor is imperative. It is important to understand what grit is, and what grit is not. Conscientiousness and self-control are closely related to grit, but there are certain distinctions between them and grit. Abuhassan and Bates (2015) identify grit and conscientiousness as overlapping constructs. Conscientiousness is purposeful, strong willed, determined, and organized behavior. These adjectives are similar to those of grit; however, conscientiousness seems to account for a small percent of variance in occupational achievement (2%). The study believes that the conscientiousness, and other Big 5 items offer very specific definitions, and that other factors contribute to achievement. Additionally, conscientiousness depends on self-control, where grit seems to stand-alone (Duckworth et al., 2007). The study explains that grit and conscientiousness share the same psychological space, but grit’s emphasis on focused effort and long-term perseverance separates it from conscientiousness. Grit and conscientiousness are both trait characteristics, but there are subtle differences between them. Using career changes as the criterion, the study found that grit was a greater predictor of the number career changes. Those who were high in grit were 35% less likely to change their occupation. It is difficult to find occupational success when a person constantly changes his/her job. Grit is a more significant factor in predicting long-term achievement than conscientiousness (Duckworth et al., 2007).

Many studies have studied how self-control and grit relate to each other. Often self-control and grit are used interchangeably, but the two constructs are different. For example, Duckworth and Gross (2014), identify self-control as a related but unique construct. Like grit, self-control correlates with higher socioeconomic status and goal attainment (Duckworth & Gross, 2014). Additionally, self-control processes include inhibiting strong, but ultimately
undesirable impulses, and activating weaker, but desirable impulses that contribute to the desired goal (Fujita, 2011).

Grit and self-control should be understood more as a collaborative network, rather than opposing factors. In order to do this, a hierarchy places grit on top, while self-control holds lower-order goals. The hierarchical approach makes distinguishing self-control and grit understandable with grit’s long-term goals superseding self-control (Duckworth & Gross, 2014). Utilizing a hierarchical goal framework, Duckworth and Gross (2014) place self-control and grit into a dichotomy. In this framework, grit deals with superordinate goals, and having the tenacity and gull to work and face obstacles that arise during the process that may take months and years to complete. Self-control deals with the more short-term goals, and being able to inhibit certain impulses so that the individual can continue to achieve the short-term goals. Self-control governs “lower-order goals” that helps individuals achieve long-term goals. Although grit and self-control complement one another, one does not necessarily need self-control to have grit and vice-versa. Duckworth and Gross (2014) describe grit and self-control as defenders of values goals. The difference is that grit has an allegiance to the highest-level and most important goal despite potential failures and setbacks that are bound to occur. Conversely, self-control traditionally deals with the short-term present obstacle that attempts to distract an individual from the most important goal. In comparison to grit, self-control fluctuates more, making it more state than a trait characteristic.

Similar to grit, self-control has many different definitions. Self-control is the capacity to alter or override dominant response tendencies, and to regulate behaviors and impulses (de Ridder et al., 2012). Other terms for self-control include ego-depletion, delay gratification, and reality principle (Fujita, 2011; Strayhon, 2002). Fujita (2011) conducted a meta-analysis of
numerous studies defining self-control. The study concluded that in part, self-control includes inhibiting smaller immediate rewards in order to receive larger delayed rewards. Like muscles, self-control requires sufficient energy to work, but over exertion causes self-control to fail (Fujita, 2011). An abundance of self-control is beneficial, but a lack implies impulsivity and hurts academic performance (Strayhorn, 2002).

**Academic Achievement**

There are intellectual strengths that contribute to achievement, but there are also non-intellectual strengths that seem to be even stronger predictors (Duckworth & Seligman, 2005). Adolescents who showed strong self-discipline outperformed equally intelligent students who were more impulsive in academic tasks and report cards. Self-control also better predicted increases in academic performance during the school year than IQ (Duckworth & Seligman, 2005). Another study found that adolescents with high self-control went on to become adults with better academic performance, stronger personal relationships, more secure personal attachment, and better psychological adjustment (Tangney, Baumeister, & Boone, 2004). Changes in self-control over time predicted subsequent changes in a student’s GPA (Duckworth, Tsukayama, & May 2010). One longitudinal study measured childhood self-control’s effect on achievement as an adult (Moffit et al., 2011). The study evaluated children from when they were 10 years old, until they were 32 with 96% retention. At 32, those with strong self-control as children went on to be in better physical health in adulthood, while those with lower self-control showed lower socioeconomic status and IQ. Additionally, the adults with lower self-control showed elevated risk for substance dependency, and were more likely to receive conviction of a crime by adult age (Moffit et al., 2011). Research on the impact of grit and self-control on academic achievement also needs to take into account students’ belief system that might affect
their willingness to demonstrate grit and self-control in an academic context. For example, if a student believes that she is born with a predetermined intellectual capacity then she might not work as hard to improve upon her intellectual functioning. Such beliefs are discussed next.

**Theories of Intelligence**

Generally, individuals implicitly understand intelligence as a fixed, unchanging entity or as malleable and incremental in nature (De Castello & Byrne, 2015). Theories of intelligence are beliefs that individuals hold about their ability to change their level of intelligence (De Castello & Byrne, 2015). Research shows that implicit theories of intelligence play a key role in students’ academic motivation and achievement (Chen & Pajeres, 2010). These different theories of intelligence orient individuals towards certain achievement goals, and suggests that students’ definition of success and failure depend on their theories of intelligence (Dweck & Legget, 1988; Chen & Pajeres, 2010). For example, a student who believes that their intelligence is fixed, and there is nothing they can do to change it may adopt helpless behavior because they believe there is nothing that will help them become more intelligent.

Those who believe intelligence to be a fixed entity often adopt performance goals, while those with an incremental belief adopt mastery goals (e.g. intelligence is a controllable quality with the ability to become stronger) (Dweck & Legget, 1988). Individuals who hold incremental theories of intelligence tend to adopt positive academic behaviors. Students with an incremental theory of intelligence tend to be mastery oriented, seek challenges, and maintain high persistence (Dweck & Legget, 1988). One study shows that having students holding an incremental theory of intelligence do not tend to procrastinate on work (Howell & Buro, 2009). Additionally, the study shows that students who adopt an incremental belief about intelligence adopt and utilize factors that which they have control over such as effort, emotional
management, and persistence. The opposite is true of individuals who have entity beliefs of intelligence (Howell & Buro, 2009). Studies found that students with entity beliefs toward intelligence often participate in maladaptive behaviors that hinder academic performance. That is, they often fear failure and self-handicap in order to avoid poor judgments from others (De Castella & Byrne, 2015). Those who hold entity beliefs also participate in helpless behavior, and show low persistence (Dweck & Leggett, 1988). The study illustrates that implicit theories of intelligence predicts students’ achievement goal orientation.

The nature of grit suggests that students who score high in grit will also have incremental theories of intelligence. Remember that grit deals with effortful persistence over time, and incremental intelligence deals with utilizing effort to improve one’s intelligence. Individuals with lower scores in grit and self-control should hold entity beliefs, because students with entity beliefs tend to show a lack of effort and possess other negative academic behaviors shown in the studies discussed earlier.

Achievement goal orientation examines the motivation for individuals’ achievement behavior (Midgely et al., 1998). This is where performance and mastery goals held by students play a role in their theory of intelligence. The goals that individuals have predicate the framework in which they interpret and react to certain events (Dweck & Leggett, 1988). Individuals pursue goals for a variety of reasons including interests categorized as performance (e.g., concern about appearing competent and receiving praise from others) and mastery (e.g., concern about personal learning and skill development) (Midgely et al., 1998). The theory focuses on how students think of themselves, their tasks, and their performances.

Performance goals rest on a variety of motives. For example, an individual might be drawn towards success or some reward (performance approach motivation). Individuals may
withdraw from activities they believe might make them look incompetent (performances avoidance motivation) (Elliot & McGregor, 2001). Approach and avoidance motivation manifests in numerous situations, especially in competence-relevant ones. A student’s perception of ability dictates approach or avoidance (Midgely et al., 1998). Students who perceive themselves as possessing high ability show approach motivation, while those who perceive themselves a less able show avoidance motivation (Midgely et al., 1998).

Performance orientation is maladaptive in the realm of achievement (Dweck & Legget, 1988). This study even refers to performance goals as the maladaptive approach. Individuals with this approach have equal ability as students with mastery orientation, but hold negative self–cognitions when dealing with difficult tasks. These individuals fail highlighting any positives that may have occurred during the tasks, have higher anxiety, and reported boredom during difficult tasks (Dweck & Legget, 1988). Additionally, when individuals face an impossible problem, they abandon all of the previous strategies taught in class. Performance oriented student view difficulties as failures and having low ability, and they believe that putting in further effort is pointless (Dweck & Leggett, 1988). Due to the nature of students who possess performance characteristics, students may also have poor self-control. For example, procrastination is a sign of poor self-control because students may wait until the last minute to complete tasks because of all of the other stimuli that can distract them.

Mastery approach is the more adaptive approach to goal orientation (Dweck & Leggett, 1988). Midgely et al., (1998) identify mastery orientation as a trait found in individuals who seek challenging tasks that cultivate students’ skill with the primary focus on the experience gained during tasks, rather than grades or judgments from others. Mastery orientation is also referred to as learning orientation, because learning is the central focus of those who utilize this
perspective. Mastery oriented individuals have a strong desire to improve their competence (Dweck & Leggett, 1988). These individuals find enjoyment from difficult tasks. During impossible word problems, mastery oriented students did not see themselves as failing, maintained optimism and positive affect, and upheld problem solving techniques taught to them earlier in the experiment (Dweck & Leggett, 1988). Mastery-oriented individual seem to encompass what grit is. Individuals are hardworking, and even despite failures they do not seem to perceive them as failures, but merely a part of the arduous process they are enduring.

Overall, achievement goal orientation depends on one’s implicit theories of intelligence. Students who hold incremental/malleable beliefs tend to have mastery goals. Performance goal orientation stems from holding entity beliefs of intelligence.

The Proposed Study

The current study is designed to assess the independence of grit and self-control as unique constructs that contribute to achievement goal orientation and motivation. Focusing on two separate groups: students who score high in grit and students who score high in self-control, I expect that the high grit group to identify more strongly with an incremental theory of intelligence and to endorse mastery goal orientation. Students in the high self-control group should endorse an entity theory of intelligence and have higher levels of performance goal orientation than students in the grit group due to the short-term and subordinate nature held under the hierarchical theory of grit and self-control. Participants will first complete measures of grit and self-control. If these are, in fact, different constructs, then we should find them to be uncorrelated (i.e., various levels of self-control should be represented at various levels of grit). These groups in particular will allow us to learn more about how grit and self-control independently contribute to achievement motivation.
Method

Participants

Ohio Dominican University undergraduates were recruited by direct solicitation from professors, email, honors sign-up sheets, and text messaging. There were 35 participants (26 female and 9 male). The ages ranged from 18-30 years old. Four academic divisions were represented (natural sciences, social sciences, business, and education).

Materials

Participants entered the lab and demographic information was collected. The demographic information consisted of age, gender, class level, and accumulative GPA. After filling out the demographic sheets, the participants completed a list of tests listed below in a randomized order (see Appendix for the instruments).

The Grit-O Scale. Participants’ grit was measured using The Grit-O Scale. The Grit-O scale is a 12-item self-report measure created by Duckworth et al. (2007). There are six items measuring consistency of interests, and six more pertaining to perseverance of effort. The measure scores items using a 5-point Likert scale (1 = strongly disagree or 5 = strongly agree). Lower scores represent low levels of grit, while higher scores represent high levels of grit. The Grit-O scale has strong internal consistency (Duckworth et al., 2007).

The Brief Self-Control Scale (BSCS). The BSCS is a 13-item measure of self-control adapted from Tangney et al. (2004). The scale scores individuals by using a 5-point Likert scale (1 = not at all like me or 5 = very much like me). Low scores constitute having low self-control, while higher scores constitute having high self-control The Brief Self-Control has strong internal reliability and test-retest reliability (Tangney et al., 2004).
**Go/No-go Recognition of Self-control test.** The Go/No Go test is a hands-on measure of self-control adapted from Gomez, Ratcliff, and Perea, (2007). Using Direct RT software, participants view a list of words presented one at a time on a computer. Items are either real words (e.g. booty) or nonwords (e.g. bootye). The nonword items look very similar to real words, but letters have been added, omitted, or the order is changed. The items used come from the *Index of Words in the Johnson O’Connor Research Foundation, Inc. Vocabulary Item Book* (Gershon, 1988). This list contains words that have empirically derived difficulty values to measure items’ difficulty. Vocabulary Scale Scores (VSS) measure item difficulty (Gershon, 1988). An average ninth-grader typically has a VSS of 79, and an average 24 year old typically has a VSS of 156 (Gershon, 1988). For this study, the items VSS falls between scores below 79 up to 156. The items in the study have been in numerous vocabulary tests from *Wordbooks*, the Foundation’s vocabulary-building program (Gershon, 1988).

The computer randomly presents a word or nonword from the word bank, and the participant decides as quickly as possible whether the item is a real word or not. During the test, 150 real words and 50 nonwords were presented. More words than nonwords were used so that participants saw a string of real words so that they got in the habit of choosing whether the word was real or not. Participants express self-control by accurately pressing the correct button. Participants decide if a word is real by pressing the “?/” key on the keyboard. If the item is a nonword, participants press the “z” key. Thus, real words are “go” trials requiring a rapid response and nonwords are “No Go” trials requiring the inhibition of a response (i.e., don’t press the “?/” key). The process is fast, and participants are quickly pressing the button for real words. In this process, participants must be able to inhibit the urge to press a button if the item is a
nonword. The participants had a practice round of 15 words so they can get used to the speed of the test.

Implicit Theories of Intelligence (Self-Theory Scale). *The Implicit Theories of Intelligence Survey* is an 8-item measure designed to assess whether individuals hold a view of intelligence as fixed (i.e., entity theory) or malleable (i.e., incremental theory) (Dweck, 1999). The *Self-Theory Scale* personalizes language from the original survey implicit theories of intelligence survey (De Castella, & Byrne, 2015). The survey uses a 6-point Likert scale (1 = *strongly disagree* or 6 = *strongly agree*). Both versions correlated high with one another. Additionally, the self-theory version has strong internal consistency (De Castella & Byrne, 2015).

Patterns of Adaptive Learning Scales (PALS). *PALS* is a 9-item measure of achievement goal orientation adapted from Midgely et al. (1998). The items assess the level of students’ possession of performance-approach goals, performance-avoid goals, or mastery goals. The test uses a 5-point liker (1 = *not at all true* or 5 = *very true*). This scale has strong psychometric properties measured using many samples (Midgely et al., 1998).

Procedure

Each trial began with participants filling out a consent form. Participants were instructed to fill out the multiple questionnaires, and to do so as honestly as possible in order to obtain good data. There were two forms of the tests, one given to each participant at random. After each participant finished their tests, they were given instructions on how to complete the *Go/No Go* test on the computer. The participants were instructed to choose whether the word presented on the screen was a real word or a non-word as quickly as they can. After the *Go/No Go* task was over, the participants were briefed on the purpose of the study.
Descriptive statistics for Grit-0 and BSCS are shown in Table 1. Males and females did not differ on these measures, $p$’s > .05. Sex will be excluded as a factor in additional analyses.

Table 1

<table>
<thead>
<tr>
<th>Sex</th>
<th>n</th>
<th>Grit-0</th>
<th>BSCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>9</td>
<td>3.56 (.71)</td>
<td>3.22 (.31)</td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
<td>3.57 (.48)</td>
<td>3.28 (.61)</td>
</tr>
</tbody>
</table>

The second measure of self-control was the Go/No Go task. Recall that participants were required to indicate as quickly as possible whether or not a string of letters was a real or non-word. Because many more strings formed real words, subjects were likely to develop a response set which they would then need to inhibit once they encountered a non-word. Therefore, the indicator of self-control in this task is the accuracy of judging the non-words (e.g., not accidentally hitting the key to indicate “real word.”). Figures 1 and 2 show average reaction time (RT in msec) and accuracy in judging real and non-words as a function of sex, respectively. Two 2 (sex) x 2(word type) mixed ANOVAs were run on each dependent variable. In each case, a main effect of word type was found. Overall, subjects took longer to respond to non-words, $F(1, 33) = 22.49, p < .001$, and the accuracy for non-words was lower than the accuracy for real words, $F(1, 33) = 5.40, p < .05$. 
Running head: GRIT AND SELF-CONTROL

Figure 1. Average reaction time for male and female participants on real and non-words.

Overall, RT’s were longer for non-words.

Figure 2. Accuracy measured in percentage correct for male and female participants on real and non-words.
The Relationship between Grit and Self-Control

The main purpose of this study was to assess the independence of grit and self-control. Table 2 shows the intercorrelations among the grit and self-control tasks.

Table 2

<table>
<thead>
<tr>
<th></th>
<th>Grit-O</th>
<th>BSCS</th>
<th>Go/No-go</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grit</td>
<td>--</td>
<td>.54*</td>
<td>.18</td>
</tr>
<tr>
<td>Self-control (BSCS)</td>
<td>--</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>Self-control (Go/No-go)</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .01

This pattern of correlations suggests that grit measured by the Grit-O scale and self-control measured by the BSCS tap similar constructs and are independent of one another. Using median splits to categorize participants into high and low grit and self-control groups illustrates the independence (see Table 3). The Go/No Go task, however, appears to measure self-control at a more basic, process level and was not correlated with grit. Using this measure it was possible to identify subjects who were high on one measure and low on the other (see Table 4, shaded cells).

Table 3

<table>
<thead>
<tr>
<th></th>
<th>Self-control (BSCS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grit</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>14</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
</tr>
<tr>
<td>High</td>
<td>16</td>
</tr>
</tbody>
</table>

Correlations between Grit, Self-control (BSCS) and Self-control (Go/No Go).
Table 4

*Categorization of Participants Depending on Grit and Self-control Go/No-go scores*

<table>
<thead>
<tr>
<th>Grit</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>High</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

**Contributions of Grit and Self-control to Theory of Intelligence and Achievement Goals**

In order to assess the independence of grit and self-control further, the remaining analyses focus on the groups denoted by the shaded cells in Table 4. Two different 2 x2 mixed ANOVs were ran. The first repeated measure ANOVA was done with participants who were in the “high grit, low self-control” group and the “high self-control, low grit. The first repeated measure ANOVA compared the two groups with the students’ theory of intelligence. We found a main effect of Theory of Intelligence with the high grit group and high self-control group, $F(1, 14) = 18.90, p < .01$. Subjects gave lower average ratings to fixed theory questions (2.25) than to incremental theory ones (4.81). However, there was an interaction between group and theory of intelligence, $F(1, 14) = 5.20, p < .05$ (see Figure 3). Follow up t-test showed that the high grit group rated incremental items higher than the fixed items, $t(8) = 5.43, p < .01$, but the high self-control group did not, $p > .05$. 
Figure 3. Theory of Intelligence scores for high grit/low self-control and low grit/high self-control groups.

A repeated measures ANOVA was ran comparing the high grit group and high self-control group to achievement goal orientation (i.e., performance approach, performance avoid, mastery). We found a main effect of achievement goal orientation, $F(2, 13) = 5.10, p < .05$. A follow up t-test showed that the performance approach (3.08) was equal to performance avoid scores (3.34), $p > .05$. However, performance avoid (3.34) was significantly less than mastery scores (4.12), $t(34) = 4.43, p < .01$ (see Figure 4).
Figure 4. Achievement goal orientation scores for the high grit/low self-control and low grit/high self-control groups.

The second set of repeated measure ANOVA compared the participants who scored low on both grit and self-control or those who scored high on grit and self-control to their theories of intelligence and achievement goal orientation. Repeated measures ANOVA found a main effect of theory of intelligence $F(1, 17) = 40.80, p < .001$. Overall, participants rated entity belief items lower than incremental items (2.18 vs. 4.74 respectively).

In regards to achievement goal orientation, repeated measures ANOVA showed a main effect of achievement goal orientation $F(2, 16) = 13.18, p < .01$ (see Figure 5). Additionally, there was an interaction between group and achievement goal orientations $F(2, 16) = 6.33, p < .05$. Follow-up t test showed low grit/self-control group ratings for the three goal orientations did not differ from one another, $p > .05$. However, the high grit/self-control groups showed that
participants rated performance-avoid items higher than performance-approach $t(8) = 4.54, p < .01$, and mastery goals were higher than performance-avoid items $t(8) = 2.58, p < .05$.

![Graph showing achievement goal orientation scores for low grit/ low self-control and high grit/ high self-control groups.]

**Figure 5.** Achievement goal orientation scores for low grit/ low self-control and high grit/ high self-control groups.

**Discussion**

Overall, the purpose of this study was to determine grit and self-control’s independence of each other. The first hypothesis asserted that the two constructs are independent, given the research separating them in terms of hierarchical goals (Duckworth & Gross, 2014). This study found that grit and self-control’s independence depends on how self-control is conceptualized and measured. The BSCS covers self-discipline, impulsigenic inhibition, work ethic, and goal setting. These are all aspects of self-control, but they also share similarities to other constructs as well. The Go/No Go test seems to tap impulsigenic inhibition. The two different measurements in this study show that self-control as measured by the BSCS and the Grit-O scale shared nearly 30% of the variance. Furthermore, 86% of the subjects scored either above the median or below
the median on both constructs. However, the Go/No Go test and Grit-O scale were uncorrelated with one another and only 54% of the subjects were high or low on both. This suggests that the two different self-control scales do not measure self-control in the same manner. Perhaps the Go/No Go scale emphasizes the more primitive aspect of self-control as simply inhibiting responses. This finding offers more to the field of studying self-control, as studies have been trying to find a definition of self-control for years. One study asserts that self-control has multiple encompassing factors in its make up (Duckworth & Steinberg, 2015). Perhaps, the Go/No Go measures the impulsigenic processes of self-control, while the BSCS measures the higher order, executive function of self-control.

The second hypotheses stated that individuals in the high grit/low self-control group would score higher on mastery orientation than any of the performance goals, and that the same group would hold incremental beliefs of intelligence in comparison to participants in the low grit/high self-control group. These predictions based upon the nature of grit, incremental theories, and mastery orientation. Grit’s long-term aspect captures incremental theories of intelligence and mastery. A student with an incremental theory believes that he/she can increase their intelligence; however, this process does not happen overnight. Additionally, mastery orientation taps long-term goals because these types of individuals wish to learn for the sake of learning and skill acquisition. This is more long-term in nature. The approach that grit, incremental theories of intelligence, and mastery orientation seem to capture a more holistic view of achievement. Conversely, self-control’s short-term nature encompasses that of performance goals and entity theories of intelligence. Both performance goals and entity have a short term nature. Performing tasks just to receive good grades, or to avoid looking incompetent is short-
term. I found that high grit individuals held lower entity beliefs and higher incremental beliefs than the high self-control/low grit group.

Achievement goal orientation scores were rather moderate. However, mastery orientation was significantly greater than performance scores in the high grit/low self-control and high self-control/low grit group of participants, as well as the participants who were high in both grit and self-control or low in both as well. Interestingly, all four groups had relatively low entity belief scores. This suggests that perhaps college students hold more adaptive beliefs about their intelligence, which has positive implications about their study and work habits (Midgeley et al., 1998; De Castella & Byrne, 2015).

These findings, more specifically the one regarding the independence of grit and self-control are somewhat contrary to the past research. If independence of the two constructs is determined how you measure self-control, then what is it about the BSCS that grit and self-control are related. The opposite is true for the Go/No Go. Perhaps these two tests measure self-control in different manners. Thus, perhaps it is important to look at other measures of self-control, compare them to the BSCS, and how they relate to the Grit-O scale. This can be accomplished by running factor analysis to determine which items within these tests tap grit, self-control, and the overlapping areas. The same can be done with the Go/No Go, grit, and other inhibition related self-control tasks, such as eye tracking.

Limitations

One limitation to this study lies in the area of measuring self-control. The Go/No Go test could have potential threats to validity. This measurement suggests that the participants have a certain level of intelligence, reading comprehension, and understands English. After one trial, a
subject admitted she spoke English as a second language, so that could have a possible effect on the outcome of the test.

An error was made in the construction of the scales—items addressing similar issues were grouped together rather than being randomized. For example, the *Patterns of Adaptive Learning Scale* questions were organized by type of achievement goal orientation. The performance goal orientation items were all grouped together, as were the performance goal items, and the mastery items. The same is true with the *Implicit Theories of Intelligence (Self-Theory)* measure. Entity belief items were grouped together in order as well as the incremental belief items. Grouping items together such as this can lead individuals to make certain responses. In addition, participants could identify that the items are measuring the same thing. So rather than answering honestly, participants may answer all of the similar questions the same with the effort of remaining consistent.
References


Appendix

Scales

Directions: Please fill out all of the questionnaires as honestly as can be. Your responses are anonymous and your identity will be kept confidential. After you are finished, take the questionnaire to the instructor and wait for further instructions. Thank you for participating in this study.

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

<table>
<thead>
<tr>
<th>The Brief Self-Control Scale (BSCS)</th>
<th>Not at all like me</th>
<th>A little like me</th>
<th>Somewhat like me</th>
<th>Mostly like me</th>
<th>Very much like me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am good at resisting temptation</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I have a hard time breaking bad habits</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I am lazy</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I say inappropriate things</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I do certain things that are bad for me, if they are fun</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I refuse things that are bad for me</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I wish I had more self-discipline</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. People would say that I have iron self-discipline</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. Pleasure and fun sometimes keep me from getting work done
   | 1 | 2 | 3 | 4 | 5 |
10. I have trouble concentrating
    | 1 | 2 | 3 | 4 | 5 |
11. I am able to work effectively toward long-term goals
    | 1 | 2 | 3 | 4 | 5 |
12. Sometimes I can’t stop myself from doing something, even if I know it is wrong
    | 1 | 2 | 3 | 4 | 5 |
13. I often act without thinking through all the alternatives
    | 1 | 2 | 3 | 4 | 5 |

### Implicit Theories of Intelligence (Self-Theory)

**Directions:** The following questions explore students’ beliefs about their personal ability to change their intelligence level. There are no right or wrong answers.

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Mostly Disagree</th>
<th>Mostly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>
1. I don’t think I personally can do much to increase my intelligence. | 1 | 2 | 3 | 4 | 5 | 6 |
2. My intelligence is something about me that I personally can’t change very much. | 1 | 2 | 3 | 4 | 5 | 6 |
3. To be honest, I don’t think I can really change how intelligent I am. | 1 | 2 | 3 | 4 | 5 | 6 |
4. I can learn new things, but I don’t have the ability to change my basic intelligence. | 1 | 2 | 3 | 4 | 5 | 6 |
5. With enough time and effort I think I could significantly improve my intelligence level. | 1 | 2 | 3 | 4 | 5 | 6 |
6. I believe I can always substantially improve on my intelligence. | 1 | 2 | 3 | 4 | 5 | 6 |
7. Regardless of my current intelligence level, I think I have the capacity to change it quite a bit. | 1 | 2 | 3 | 4 | 5 | 6 |
8. I believe I have the ability to change my basic intelligence level considerably over time. | 1 | 2 | 3 | 4 | 5 | 6 |

### Patterns of Adaptive Learning Scale (PALS)

**Directions:** Here are some questions about yourself as a student. Please choose the answer that best describes what you think.

<table>
<thead>
<tr>
<th></th>
<th>Not at all true</th>
<th>Sometimes true</th>
<th>Very true</th>
</tr>
</thead>
</table>
1. It’s important to me that I learn a lot of new concepts this year. | 1 | 2 | 3 | 4 | 5 |
2. One of my goals in class is to learn as much as I can. | 1 | 2 | 3 | 4 | 5 |
3. One of my goals is to master a lot of new skills this year. | 1 | 2 | 3 | 4 | 5 |
4. It’s important to me that I thoroughly understand my class work. | 1 | 2 | 3 | 4 | 5 |
5. It’s important to me that I improve my skills this year. | 1 | 2 | 3 | 4 | 5 |
6. It’s important to me that other students in my class think I am good at my class work. | 1 | 2 | 3 | 4 | 5 |
7. One of my goals is to show others that I’m good at my class work. | 1 | 2 | 3 | 4 | 5 |
8. One of my goals is to show others that class work is easy for me. | 1 | 2 | 3 | 4 | 5 |
9. One of my goals is to look smart in comparison to the other students in my class.  
10. It’s important to me that I look smart compared to others in my class.  
11. It’s important to me that I don’t look stupid in class.  
12. One of my goals is to keep others from thinking I’m not smart in class.  
13. It’s important to me that my teacher doesn’t think that I know less than others in class.  
14. One of my goals in class is to avoid looking like I have trouble doing the work.