

Understanding The Relationship Between Self-Control and Grit: The Mediating Role of Academic Motivation and Attention Control

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Abstract:


Over the past several decades, the psychological concepts of self-control and grit have gained prominence in the research literature. While these constructs have been studied extensively in isolation, there has been growing interest in understanding the relationship between the two constructs and the factors that mediate this relationship. The current study sought to examine the relationship between self-control and grit in a sample of 1079 undergraduate students (67.9% female) from twelve different state universities. Specifically, this study aimed to examine the mediating role of academic motivation and attention control in this relationship. Correlational analyses revealed that self-control and grit were positively associated with each other, as well as with academic motivation and attention control. Mediation analyses using bootstrapping procedures revealed that academic motivation and attention control partially mediated the relationship between self-control and grit. In other words, higher levels of self-control were associated with higher levels of academic motivation, which was associated with higher levels of grit. Similarly, higher levels of self-control were associated with better attention control, which was associated with higher levels of grit. These findings have important implications for understanding the components that contribute to the development of grit and suggest that interventions aimed at enhancing academic motivation and attention control may promote the development of greater grit in individuals.

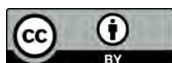
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INTRODUCTION

Grit is a character trait that has attracted the interest of educational researchers and professionals over the last few decades (Credé et al., 2017; Credé, 2018). The term "grit" was first used by Duckworth and her colleagues, who defined it as an individual the inclination to have perseverance and passion for attaining long-term objectives. Grit has two unique components, including persistence in effort and consistency of interest (Duckworth et al., 2007). Grit, regarded as one of the most valuable non-cognitive indicators of academic performance (Duckworth et al., 2007), has evolved in conjunction with the positive psychology field (Kannangara et al., 2018). While grit is not associated with IQ, it has been shown to improve academic success, such as high school and college completion, and perseverance at the United States Military Academy (Duckworth et al., 2007). Similar findings were reported by other researchers. Individuals with higher levels of grit were found to have better academic performance (Hagger & Hamilton, 2019; Jiang et al., 2019), higher school engagement (Hodge et al., 2018; Li & Zhu, 2020), greater academic productivity (Hodge et al., 2018), higher effort on learning activities (Hagger & Hamilton, 2019), and higher academic-related goal commitment (Tang et al., 2021).

Several studies have revealed a relationship between the concept of grit and certain personal benefits in addition to academic success. Grit has a substantial positive correlation with resilience (Kannangara et al., 2018), well-being (Kannangara et al., 2018; Von Culin et al., 2014), mindset (Kannangara et al., 2018), life satisfaction, and peace (Şimşir & Dilmaç, 2022), harmony in life (Vainio & Daukantaitė, 2016), hope, and self-efficacy (Ekinci & Koç, 2022), happiness (Ekinci & Hamarta, 2020a; Singh & Jha, 2008), and work engagement (Suzuki et al., 2015). Ultimately, the literature suggests that grit is a positive trait that leads to favorable life outcomes.

Although grit has been recognized as a reliable indicator of life outcomes, its determinants and underlying mechanisms remain poorly understood. To put it another way, there is a gap in the literature that attempts to explain the fundamental process of grit. This research is focused on filling this gap. Self-control and motivation are conceptually the two fundamental psychological processes that underlie grit (Duckworth & Gross, 2014; Ekinci & Hamarta, 2020b, Von Culin et al., 2014; Wang et al., 2018). According to Seligman (2011), grit, an excessive type of self-control, may allow individuals to pursue long-term goals despite the temptations and distractions of short-term pleasures. In this context, we aimed to investigate the role of self-control, attention, and motivation in affecting grit in this study. We also formulated a mediation model based on theoretical explanations and empirical studies.

Grit has been primarily considered by personality researchers as a facet of the personality trait of conscientiousness (Lucas et al., 2015) as it is a component of the Big Five family of conscientiousness (Duckworth et al., 2007), and is highly associated with

conscientiousness (Ekinici et al., 2021; Ponnock et al., 2020). Some researchers also consider grit to be a form of courage (Maddi et al., 2012) and self-control (Duckworth & Gross, 2014). Self-control and grit are often used interchangeably, and these two factors are strongly correlated and predict success outcomes (Duckworth et al., 2007; Hagger & Hamilton, 2019; Ponnock et al., 2020). Although research has shown that self-control, other non-cognitive concepts, and grit are highly connected (Credé et al., 2017; Duckworth et al., 2007), their conceptual and empirical distinctions, as well as the extent to which they may differentially influence outcomes, have recently received attention (Duckworth & Gross, 2014). There is a paucity of empirical studies in the literature investigating the association between self-control and grit and the mechanism underlying this link. Therefore, in this investigation, we extend previous studies by empirically examining the cross-sectional links between grit and self-control, academic motivation, as well as attention control, and theoretically broaden the understanding of grit.

Conceptual and Theoretical Framework

Self-control and grit are characteristics related to effortful endurance in goal-directed activities (Hagger & Hamilton, 2019). Self-control refers to the ability to manage one's actions, emotions, and thoughts in order to accomplish higher-order goals (Baumeister et al., 2007; Inzlicht & Schmeichel, 2012). Even though immediate satisfaction may be more pleasurable, people with strong self-control make choices that are consistent with their long-term objectives (Baumeister et al., 1998). Duckworth and Gross (2014) offered conceptual explanations for the distinction between self-control and grit. They suggested that people's ability to exercise self-control is linked to their capacity to inhibit their urges to act and regulate their behavior, such as resisting the temptation to indulge in tasty but harmful foods when dieting. These behaviors necessitate some effort to resolve the tension between goal-directed activities. On the other hand, grit involves taking deliberate actions to achieve greater, long-term objectives and organizing behavioral efforts in that direction. Grit requires persistent and tenacious effort toward a hierarchically organized objective despite challenges and failures, often overspending years or decades. Gritty individuals do not alter their course in the face of obstacles and disappointment (Duckworth et al., 2007). They are also inclined to manage their behavior and use their resources to resolve goal conflicts when they arise (Hagger & Hamilton, 2019). Therefore, gritty people consistently employ their capacity for self-control as they progress. In this sense, the process model of ego depletion may provide a useful theoretical foundation for explaining the relationship between self-control and grit (e.g., Inzlicht & Schmeichel, 2012; Milyavskaya & Inzlicht, 2018).

The process model of ego depletion is an alternative model that provides a more mechanical explanation of the resource model of self-control (commonly called the Strength Model; Muraven et al., 1998), which is one of the leading theories in the literature. The Strength Model was developed to investigate empirically the variability of sequential self-

control tasks across situations (Dvorak & Simons, 2009). The theory argues that self-control is an intrinsic capacity that is limited by the amount of internal resources or energy that can be used (Baumeister et al., 1998). This resource is prone to exhaustion over time, similar to how a muscle tires following action. As a result, after exerting self-control on one task, a person's ability to exercise self-control on subsequent tasks is diminished, which impairs their performance on further self-control tasks, such as managing emotions, completing puzzles, solving math problems, or making decisions (Baumeister et al., 1998). Additionally, self-control can be strengthened by consistent, small acts of self-control (Muraven et al., 1999).

There are some critical questions about the Strength Model, such as the nature of the resource and the process of ego depletion, despite the fact that it has highlighted an underappreciated aspect of self-control, served as a conceptual heuristic, and provided an organizing framework to comprehend a crucial characteristic of self-control resources (Hagger et al., 2010; Inzlicht & Schmeichel, 2012). The process model of ego depletion attempts to explain the specific cognitive, emotional, and motivational mechanisms of self-control and its depletion (Inzlicht & Schmeichel, 2012). According to this model, a reduction in motivational orientation and attentional focus is the cause of how exercising self-control at Time 1 reduces self-control at Time 2 (ego depletion). In other words, the shift in people's self-control ability over the course of successive self-control tasks is due to the change in their motivational orientation and attentional focus.

Motivation is the first significant process in the model. Lack of motivation contributes to the failure of self-control. Primary self-control strategies are able to shift people's motivation away from additional restraint and toward pleasure and enjoyment. Several studies have shown that increasing motivation and rewards can enable people to maintain self-control (e.g., Milyavskaya et al., 2015; Muraven & Slessareva, 2003). In this regard, we expect that academic motivation may play a mediating role in the association between self-control and grit. Academic motivation is referred to as an internal force that encourages and guides behavior targeted at accomplishing academic objectives (Pintrich & Zusho, 2002). It is the driving force that encourages an individual to attend school and succeed (Clark et al., 2014). Similarly, grit is a motivational concept that requires an individual to execute consecutive self-control duties in order to reach their long-term objectives (Duckworth & Gross, 2014; Schimschal et al., 2021). Motivation might reduce ego depletion of self-control and lead to more grit.

Attention is the second main focus of the model. Depletion impairs attention, causing it to shift from indicators of goal conflict and discrepancy to indicators of potential reward and pleasure. Following the self-control behavior, individuals experience a change in this monitoring mechanism, making them less sensitive to emotional and cognitive cues indicating a conflict or disparity between intended and actual states. Rather, they pay attention to and notice indicators related to pleasure and satisfaction (Inzlicht & Schmeichel, 2012). Furthermore, Milyavskaya and Inzlicht (2018) suggested that attention enhances self-

control in two possible ways: by getting the self-control conflict into cognitive awareness and by selectively highlighting the value sources of each option. Previous research has shown that self-awareness (self-focused attention) enhances the ability to exercise self-control (e.g., Alberts et al., 2011). Given these findings, we anticipate that attention control may play a mediating role in the relationship between self-control and grit.

Additionally, empirical studies in the literature have revealed associations between self-control, motivation, attention, and grit. For example, Pala and Başbüyük (2023) reported that self-control and motivation are positively correlated and important predictors of achievement. The study conducted by Muenks et al. (2018) demonstrated that motivational variables are associated with grit and both predictors of academic success in students. Furthermore, attention control has been found to be positively related to both self-control (Stocker et al., 2020) and grit (Smith et al., 2020) in earlier studies. However, to the best of our knowledge, no study has ever been a study that investigated the connections between grit, motivation, attention, and self-control. This study will therefore contribute to the literature.

The Present Study

In this cross-sectional study, we aimed to investigate the relationship between self-control and grit among undergraduate students. Additionally, we aimed to test the conceptual model underlying this association. The mediation model established in this study is based on the process model of ego depletion, and the number of studies testing this model in the literature is quite limited (e.g., Haynes et al., 2016). Therefore, this study may contribute to testing the theory and filling a gap in the body of literature. As mentioned earlier, there is also a conceptual discussion regarding the connections and differences between the concepts of self-control and grit. This study might provide a novel and alternative perspective to this debate. Finally, we established the following hypotheses:

1. Self-control would positively predict grit.
2. Academic motivation and attention control would play a mediating role in the relationship between self-control and grit.

METHOD

Participants

In this study, we conducted a cross-sectional survey using a sample of 1079 undergraduate students (67.9% female) from twelve state universities in Turkey. The participants were from 49 different provinces across Turkey and their ages ranged from 17 to 39, with a mean age of 21.4 and a standard deviation of 2.13. The academic level of the participants was distributed as follows: 201 (18.6%) were in their first year, 280 (25.9%) were in their second year, 278 (25.8%) were in their third year, and 320 (29.7%) were in their fourth year. We distributed the online survey through social platforms such as Facebook and WhatsApp and requested participants to share it with others. Prior to data collection,

participants provided informed consent by agreeing to the content and purpose of the study. The survey was open for three weeks, and we closed it for responses once the time had expired.

Instruments

The Brief Multidimensional Self-Control Scale (BMSCS): The BMSCS is a self-report scale consisting of seven-item that are used to measure an individual's level of self-control, as developed by Nilsen et al. (2020). Participants respond to each item on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree" (e.g., "I focus daily on my long-term goals"). In a group of people from Turkey, it was discovered that the scale used in the study was found to have satisfactory internal consistency (Koç et al., 2023), and in this study, the internal reliability of the scale was also found to be acceptable with a Cronbach's alpha coefficient of .69.

Self-regulation Scale (SRS): The SRS is a seven-item self-report scale (Schwarzer, Diehl, & Schmitz, 1999) used to measure the level of attention control in goal pursuit. Participants rate each item using a Likert scale with four-point, where 1 represents "not at all true" and 4 represents "completely true" (e.g., "I can control my thoughts from distracting me from the task at hand"). The SRS demonstrated strong internal reliability in a Turkish sample according to Çevik et al. (2017). The scale demonstrated strong internal reliability in this study, as indicated by a Cronbach's alpha coefficient of .86.

Academic Motivation Scale (AMS): The AMS is a 20-item self-report scale (Bozanoğlu, 2004) used to assess levels of academic motivation. Each item is rated on a 5-point Likert scale ranging from 1, which means "strongly disagree," to 5, which means "strongly agree" (e.g., "As soon as the lesson starts, I pay attention to the lesson"). The academic motivation scale has been widely used in studies of different age groups in the Turkish sample (e.g., Bedel, 2013; Erzen & Çıkrıkçı, 2022; Hotaman & Yüksel-Sahin, 2010). The scale demonstrated strong internal reliability in this study, as indicated by a Cronbach's alpha coefficient of .92. The scale also has acceptable fit values ($\chi^2/sd = 3.5$, GFI = .92, RMSEA = .06, SRMR = .087).

The Short Grit Scale (Grit-S): The Grit-S is an eight-item self-report instrument developed by Duckworth and Quinn (2009) to measure an individual's level of grit. Participants answer the questions on a 5-point Likert scale ranging from "not at all like me" to "very much like me" (e.g., "I have a hard time focusing on projects that take more than a few months to complete"). The scale was found to have acceptable internal reliability estimates in a Turkish sample (Sarçam et al., 2016) and an internal reliability estimate of .64 in the current study.

Data Analyses

To test the mediation of academic motivation and attention control in the relationship between self-control and grit, we used version 3.5 (Model 4) of the PROCESS macro in SPSS, following the guidelines outlined by Hayes (2018). The analysis was based on 5000 bootstrapped samples with a 95% confidence interval, and significance was determined using the criterion that the confidence intervals do not include zero in bootstrapping, as suggested in the literature (Preacher & Hayes, 2008).

Ethical considerations

In this study, all rules stated to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions stated under the title "Actions Against Scientific Research and Publication Ethics", which is the second part of the directive, were taken.

Ethical review board name: Selcuk University Faculty of Education Ethics Committee

Date of ethics review decision: 20.03.2023

Ethics assessment document issue number: 50

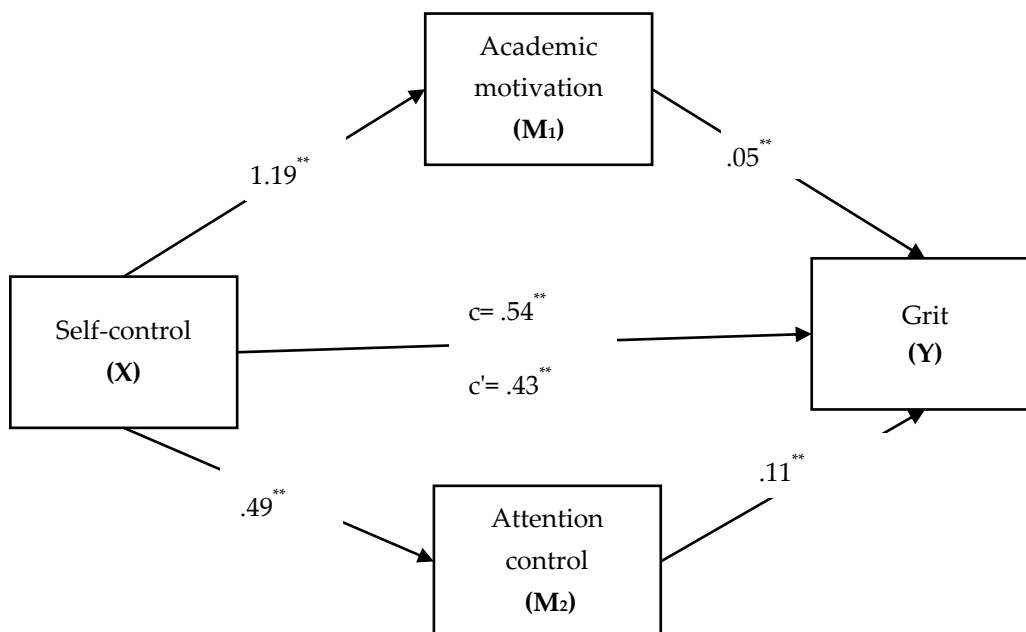
RESULTS

Preliminary Analyses

Table 1 presents the correlations and descriptive statistics among the variables. Initial analysis indicated that the variables had acceptable distributional characteristics for further analysis, with skewness and kurtosis values ranging from -.18 to .66 and being less than 2 in absolute value. Correlation analysis revealed significant positive associations between self-control and academic motivation, attention control, and grit. In addition, academic motivation was significantly and positively associated with attention control and grit, while attention control also showed a significant positive association with grit.

Table 1*Correlations and Descriptive Statistics Among the Study Variables*

Variable	1	2	3	4	M	SD	Skw	Kurt	Min	Max
1. Self-control	-				26.13	4.97	.02	.33	9	40
2. Academic motivation	.42**	-			67.80	14.05	-.18	-.17	24	100
3. Attention control	.56**	.50**	-		19.73	4.28	-.01	-.13	7	28
4. Grit	.60**	.42**	.46**	-	26.74	4.49	.20	.66	11	40

*Note: ** $p < .001$,**Note: ** $p < .001$.***Figure 1.** Mediation Model of Study Variables

The results of the mediation analysis illustrating the relationships between self-control, academic motivation, attention control, and grit, are presented in Figure 1. First, the

results of our study supported Hypothesis 1, as self-control was found to have a positive direct effect on grit ($B = .42, p < .001$). As can be seen in Table 2, academic motivation mediates the relationship between self-control and grit ($B = .06, 95\% \text{ CI } [.04 - .09]$). In addition, attention control plays a mediating role in the relationship between self-control and grit ($B = .06, 95\% \text{ CI } [.02 - .09]$). Thus, our results provide evidence for Hypothesis 2.

Table 2

The Direct and Indirect Effect of Self-Control on Grit.

Path	Coefficient	95% CI	
		LL	UL
<i>Direct effect</i>			
Self-control → Grit	.42**	.37	.48
<i>Indirect Effect</i>			
Self-control → Academic motivation → Grit	.06**	.04	.09
Self-control → Attention control → Grit	.06**	.02	.09
<i>Total indirect effect</i>	.12**	.09	.15
<i>Total effect</i>	.54**	.50	.59

Note: ** $p < .001$

DISCUSSION

The grit literature began to develop with an article published by Duckworth and colleagues in the Journal of Personality and Social Psychology in 2007 (Duckworth et al., 2007). Since then, the topic of grit has gained popularity in the field of psychology, and the number of studies on grit has grown rapidly (Credé, 2018). Grit has also gained interest as a potential intervention topic due to its importance in achieving success in school, the workplace, and personal endeavors (e.g., Ekinci & Hamarta, 2020a; Hagger & Hamilton, 2019; Suzuki et al., 2015; Şimşir & Dilmaç, 2022). Despite these benefits, the grit literature suffers from several significant theoretical and empirical concerns, including a lack of construct validity and discriminant validity (Credé et al., 2017; Credé, 2018; Vazsonyi et al., 2019). For example, a recent meta-analysis suggested that grit researchers have fallen victim to the jangle fallacy because grit may simply be a renamed form of conscientiousness (Credé et al., 2017). Similarly, grit and self-control are strongly correlated and both contribute to academic achievement (Duckworth et al., 2007; Hagger & Hamilton, 2019). However, Duckworth and Gross (2014) characterized grit as a non-cognitive trait that is linked to, but different from, self-control and conscientiousness. Although they accepted the relationship between grit and self-control, they also provided a rationale for why grit was both unique

and different from self-control. Empirical research is needed to comprehend the link between self-control and grit, as well as the underlying mechanisms that drive this relationship as the arguments presented are primarily conceptual in nature. In this study, we investigated the association between self-control and grit, as well as the mediating effects of attention control and academic motivation.

The results of our study confirmed the existing research by demonstrating a strong relationship between self-control and grit (e.g., Duckworth et al., 2007; Kannangara et al., 2018; Ramos Salazar & Meador, 2023; Şimşir & Dilmaç, 2022; Vazsonyi et al., 2019). In other words, the capacity for self-control has a positive effect on the level of grit. For example, Vazsonyi et al.'s (2019) study with university students showed a high level of positive correlation between grit and self-control. Using structural equation modeling, Vazsonyi et al. (2019) carried out extensive model testing and presented evidence of considerable overlap between grit and self-control. The authors noted that the model analyzing the structure of the two concepts had a strong correlation coefficient. Furthermore, the meta-analysis study by Cr  d   et al. (2017) indicated that grit has a very high correlation with self-control.

Supporting our second hypothesis, we found that attention control and academic motivation played a mediating role in the association between self-control and grit. These findings may have theoretical implications for how self-control affects grit. The indirect effect of self-control on grit through attention control and academic motivation is consistent with the resource model of self-control proposed by Inzlicht and Schmeichel (2012). The process model of depletion, based on a sequential task paradigm, argues that exerting self-control at Time 1 results in temporary changes in motivation and attention that weaken self-control at Time 2. Motivational and attentional changes are interdependent and recurrent processes. People may be less aware of cues indicating the need for restraint and more aware of cues indicating reward when they are less motivated to regulate and more eager to indulge. In other words, motivation overcomes the depletion effect and increases self-control performance at Time 2. Motivated individuals focus their attention on long-term goals and cues that signal control rather than on rewards and gratification. Considering that grit requires successive self-control tasks aligned with hierarchical goals (Duckworth & Gross, 2014), the mediating role of academic motivation and attention control can be better understood.

A growing body of research shows that motivation decreases impulsivity toward goal-interfering temptations (Milyavskaya et al., 2015) and enhances self-control when pursuing goals (Muraven & Slessareva, 2003; Vohs et al., 2012). An experimental study by Vohs et al. (2012) demonstrated a significant improvement in self-control in multiple self-control tasks. Furthermore, several researches literature have shown that motivation is positively related to both self-control (Pala & Başıb  y  k, 2023) and grit (e.g., Muenks et al., 2018; Yıldız & Kardaş, 2021). In summary, the mediating role of motivation in the link between self-control and grit is consistent with previous studies.

The ability to control attention is another mechanism that enables people to successfully engage in sequential self-control activities. The ability to maintain self-control tasks can be strengthened by directing attention to goals rather than rewards and pleasures (Inzlicht & Schmeichel, 2012). Duckworth and colleagues also emphasized attention processes in their process model of self-control (Duckworth et al., 2019). According to the process model of self-control, attentional deployment strategies direct an individual's attention to aspects of the environment that promote, rather than weaken, self-control. For example, a student might intentionally direct attention to their math textbook while resisting the urge to use social media by looking away from their smartphone (Duckworth et al., 2019). Thus, focusing individuals' attention on actions that will help them achieve their long-term goals rather than on immediate gratification may improve their self-control performance and contribute to their grit.

LIMITATIONS AND FUTURE STUDIES

Despite its strengths, the current study has some inherent weaknesses. First, the cross-sectional approach used in the study does not allow for the establishment of causality between the variables examined. To overcome this limitation, longitudinal study designs that assess grit, motivation, and self-control over the course of several months or years would be crucial. Such designs would allow for a more effective assessment of the pattern of effects, including both directional and reciprocal effects, as well as modeling of changes in these variables over time. Second, the participants in the study were limited to undergraduate students enrolled in college in a major city in Turkey. More extensive research could be conducted with the participation of college students from different provinces of Turkey and students from other grade levels (i.e., middle school and high school) to increase the generalizability of the research findings. Third, since all the data were self-reported and collected through an online survey, there may be bias due to the tendency of participants to respond in a certain way. Lastly, future studies should use alternative study designs and methods, such as laboratory-based and experimental research, to evaluate the process model of ego depletion.

CONCLUSION

This study provides empirical support for the significant relationship between self-control and grit, despite various limitations. The research also establishes a mediation model that reveals the mediating role of academic motivation and attention control in the relationship between self-control and perseverance. This model, based on the ego-depletion process theory, provides an alternative perspective for understanding the relationship between self-control and grit, as well as helps to test the process model of depletion, which currently lacks adequate empirical support. Overall, the results of this study may provide new insights for researchers in the field.

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