Self-control and grit: How do they affect Academic Procrastination among Malaysian Undergraduates?

Authors: Poh Chua Siah*, Pui Kei Cheow, Jo Yee Lim, Yee Qi Yap, Pit Wan Pung

Affiliation: Department of Psychology and Counseling, Universiti Tunku Abdul Rahman, Kampar Campus, Malaysia
*Corresponding author, siahpc@utar.edu.my

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ABSTRACT

Research has shown that both self-control and grit are negatively associated with procrastination. However, the mechanisms linking these three variables remain insufficiently understood. Drawing on the hierarchical model of goals as a theoretical framework, this study proposed an indirect-only model, hypothesizing that self-control influences procrastination solely through its effect on grit. To test this hypothesis, a sample of 160 undergraduate students from a Malaysian university participated in an online survey, recruited through purposive and snowball sampling techniques. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate both the measurement and structural models. The results supported the proposed predictions, confirming the indirect effect of self-control on procrastination via grit. These findings suggest that, despite their conceptual overlap, self-control and grit perform distinct roles in the pursuit of goals. Specifically, self-control alone appears insufficient for attaining long-term objectives; achieving overarching goals amidst setbacks and disappointments necessitates the sustained effort embodied by grit. This study enhances the understanding of the intricate interplay among self-control, grit, and academic procrastination among undergraduate students. Furthermore, it highlights the potential of self-control training to enhance grit, thereby indirectly promoting academic success.

Keywords: self-control; grit; hierarchical goal framework; procrastination; undergraduate students; Malaysia

1. Introduction

Procrastination, a ubiquitous behavioral pattern, afflicts numerous individuals daily. This behavior is characterized by the intentional postponement of intended actions, even when individuals fully recognize the potential negative consequences of their procrastinatory tendencies. (Klingsieck, 2013). Typically, procrastination involves deferring essential tasks and responsibilities in favor of more immediate or less demanding activities. In essence, procrastination entails a voluntary, irrational, and sometimes gratuitous delay in executing actions, disregarding the subjective discomfort and detrimental consequences that such delays can have. (Steel, 2007)

In the academic realm, procrastination manifests in a unique and specialized form, commonly referred to as academic procrastination. Ajayi (2020) defines academic procrastination as the deliberate postponement of tasks and activities that are fundamental to an individual's educational journey and the development of their cognitive abilities. Such tasks encompass a range of academic undertakings, including exam preparation, completing assignments, conducting research, and participating in coursework. Individuals struggling with academic procrastination frequently defer these scholastic obligations until the last minute or sometimes fail to meet crucial deadlines (Novitasari & Prihantoro, 2023).

Numerous studies have investigated the prevalence of procrastination, yielding compelling evidence of its widespread nature across diverse populations and academic settings. Uzun Ozer et al. (2014) conducted an empirical investigation that unequivocally demonstrated the ubiquity of procrastination within contemporary society. Further corroborating this notion is a study conducted by Ferrari et al. (2005) in the United States. Their research estimated that procrastination is a common practice among approximately 20% of men and women, deeply ingrained in their daily routines.

Academic procrastination, a specific manifestation of this pervasive behavior, has also been extensively studied across various countries. Steel (2007) comprehensively reviewed academic procrastination among college students. His findings revealed a staggering statistic: over 75% of college students habitually engage in academic procrastination. This widespread pattern of deferring crucial tasks, such as assignment completion, paper writing, or exam preparation until imminent deadlines, highlights the deep-seated nature of procrastination within the academic realm.

He (2017) further explored the prevalence of academic procrastination across different academic levels within a United Kingdom-based university. His study unveiled that academic procrastination affected a substantial proportion of students at all levels – 34% of undergraduates, 43% of master's students, and 44% of doctoral students. These findings underscore the pervasiveness of procrastination across the academic spectrum, suggesting that it is not a phenomenon limited to any stage of education.

Bakar and Khan (2016) conducted a study at a university in Johor, Malaysia, revealing an even higher prevalence of procrastination among undergraduates. Their findings indicated that an astonishing 79% of the undergraduates could be classified as either procrastinators or, in more severe cases, as severe procrastinators.

Saplavska and Jerkunkova (2018) conducted research involving undergraduate students at a university in Latvia. Their research outcomes revealed that a significant proportion, specifically 48%, of these

undergraduates consistently engaged in the practice of completing their academic tasks at the eleventh hour, indicating a prevalent tendency toward academic procrastination.

The pervasive nature of academic procrastination has drawn attention to its detrimental impacts on students' academic performance and overall well-being. Numerous studies have shed light on the multifaceted repercussions of procrastination, encompassing physical, mental, and social dimensions.

Procrastination can have a significant impact on physical health. For example, Sirois et al. (2015) have highlighted that individuals struggling with procrastination frequently experience sleep deprivation, characterized by disrupted sleep patterns and difficulty falling asleep. As a result, they often awaken feeling unrested, contributing to a cascade of adverse health consequences.

Procrastination also exerts a profound influence on mental health. Beutel et al. (2016) have demonstrated an inverse relationship between procrastination and psychological well-being, with procrastination escalating stress and anxiety levels. The act of postponing tasks engenders discomfort and unease, fostering persistent anxiety, stress, and fatigue among procrastinators. Duru and Balkis (2017) have extended these findings to reveal that procrastination is correlated with diminished self-esteem, academic achievement, and overall personal well-being. Westgate et al. (2017) demonstrated a significant link between academic procrastination and heightened alcohol craving and consumption among American undergraduates. Melaku et al. (2015) further emphasized this association, revealing that Ethiopian medical undergraduates grappling with academic stress due to procrastination exhibited a higher propensity for substance abuse, including alcohol consumption.

Furthermore, social ramifications also come to the fore. Andangsari et al. (2018) conducted a study involving Indonesian undergraduate students, illuminating a positive correlation between academic procrastination and emotional and social loneliness. These findings underscore the deleterious effects of procrastination on social connections and emotional well-being.

Self-control plays a significant role in procrastination. Duckworth and Steinberg (2015) defined self-control as the voluntary act of restraining immediate urges and placing more excellent value on long-term goals. It involves overriding one's inner responses, including impulses, emotions, thoughts, and behaviors. Individuals with higher self-control capacity often demonstrate better abilities to restrain impulsive actions, manage their emotional expressions, avoid distractions, and focus on essential tasks.

Gottfredson and Hirschi (1990) proposed the theory of crime. They identified characteristics associated with low self-control, including impulsivity, a tendency towards risk-seeking behavior, a short temper, a preference for simple tasks, a tendency to engage in risky activities, and being self-centered. Individuals who lack self-control may struggle to prioritize long-term benefits. Low self-control may impact various aspects of one's life, including the quality of marriage, career choices, and relationships with peers and family. Individuals with low self-control are more likely to experience unstable relationships, friendships, or jobs, often due to their inability to maintain long-term commitments or a lack of interest in them. Studies have supported the associations between low self-control with crime, drug use, school underachievement, and failure at task performances (Baumeister et al., 2007; Li et al., 2022; Ramadhan, 2022).

Family plays a crucial role in developing self-control (Holmes et al., 2019). Self-control development unfolds through the interactions between individuals and their families. Changes in the family environment can impact self-control development, and changes in adolescents' self-control can also influence the dynamics of their family environment (Kim et al., 2022). Parental behavior plays a significant role in fostering self-control. Various parenting behaviors, including inadequate parental supervision, insufficient discipline, and insufficient affection, can adversely affect self-control.

Conversely, effective parenting behavior can instill self-control. Beyond family and parenting behaviors, other factors are associated with self-control, such as peer influence (Meldrum et al., 2012). Research has demonstrated that peer factors exert a powerful influence on self-control. Peer influence can impact self-control through social learning, emphasizing that peers act as socializing agents and influence individuals' attitudes and behaviors.

A compelling body of research has established a significant association between self-control and academic procrastination (Dewany et al., 2023; Widya Nadya Rostania et al., 2023; Wijaya & Tori, 2018). Individuals with higher levels of self-control consistently demonstrate lower tendencies for academic procrastination, while those with lower self-control are more likely to engage in procrastination (Marliyah et al., 2020).

Empirical studies further support this inverse relationship between self-control and academic procrastination. Haekal et al. (2022) examined the self-control levels of 125 Psychology students at the University of Muhammadiyah Bandung, Indonesia, and found a significant correlation between self-control and academic procrastination. Students with higher self-control tended to procrastinate less, while those with lower self-control were more likely to procrastinate. Similarly, Zheng and Xu (2022) conducted a study involving 157 college students in China and found a significant negative correlation between self-control and academic procrastination.

Moreover, Wijaya and Tori (2018) revealed that self-control significantly predicted both general and academic procrastination, with a more significant impact on general procrastination than academic procrastination. Widya Nadya Rostania et al.'s (2023) study involving 105 students from vocational high schools in Jakarta found that self-control significantly predicts academic procrastination. Students with high self-control can prioritize important tasks over those they may find more enjoyable. In contrast, those lacking self-control are more likely to engage in activities that are not in their best interests. Additionally, Zhao et al.'s (2021) survey of 503 Chinese college students uncovered a significant correlation between self-control and its impact on academic procrastination. Self-control influences academic procrastination through its effect on time management disposition. Students with a lower level of time management often require assistance in managing their time effectively, which can lead to procrastination.

Besides self-control, grit has also been found to be associated with procrastination. Grit, a concept introduced by psychologists Angela Duckworth and James Gross (2014), is a distinctive personality trait characterized by an individual's unwavering passion and perseverance in pursuing long-term goals. It encompasses the ability to sustain unwavering determination and effort in the face of adversities and setbacks, a quality that plays a pivotal role in achieving enduring success. Individuals endowed with grit are less likely to give up when confronted with challenges, demonstrating remarkable resilience and capacity for sustained effort. Duckworth et al. (2007) emphasize that gritty

individuals are not necessarily more talented or intelligent than their peers; instead, they possess the unwavering determination to persevere through challenges and setbacks, ultimately achieving their goals. Vallerand (2012) highlights that gritty individuals are not content with sporadic bursts of effort; they are committed to the long-term journey, even when faced with setbacks and plateaus.
Empirical research suggests that the influence of nature surpasses that of nurture in shaping one's grit. Twin studies have revealed moderate heritability estimates of 37% for grit perseverance and 20% for grit consistency of interest (Rimfeld et al., 2016). These findings imply that grit exhibits a certain degree of resistance to change. Nevertheless, grit tends to burgeon over time, particularly as individuals attain clarity regarding their aspirations and passions (Duckworth & Eskreis-Winkler, 2013).

A substantial body of research has investigated the relationship between grit, a personality trait characterized by perseverance and passion, and academic procrastination. These studies have consistently shown a negative association between grit and procrastination, suggesting that individuals with higher levels of grit are less likely to procrastinate.

In a study conducted in China, Jin et al. (2019) found a significant negative correlation between grit and academic procrastination among 1,098 university students. Similarly, Attia and Abdelwahid (2020) reported a similar inverse relationship between grit and procrastination in a study involving 324 nursing students in Egypt. These findings were further corroborated by Rouhi et al. (2021), who observed that grit negatively predicted academic procrastination among 500 Iranian high school students. Additionally, Siah et al.'s (2019) study involving 430 Malaysian undergraduates provided further evidence of this inverse relationship.

Recent research has delved into the relationship between grit and self-control. While these constructs share similarities, they also exhibit distinct roles in shaping an individual's success.

Several studies have demonstrated a substantial correlation between grit and self-control. Vazsonyi et al. (2019) The study, involving 1907 participants, found a significant overlap between the two constructs. Similarly, Muenks et al. (2017) observed a noteworthy convergence between grit and self-control in their research involving U.S. high school students and undergraduates. These findings were further corroborated by Gonzalez et al. (2020) in their study involving two distinct participant samples.

Despite this evidence of overlap, Duckworth and Gross (2014) posit that grit and self-control exhibit distinct qualities. According to their perspective, grit is more closely aligned with long-term goals that span an individual's entire life, while self-control is primarily linked to achieving day-to-day successes. This distinction is supported by empirical evidence from Boerma (2020), who found that grit significantly predicted grade point averages, while self-control demonstrated less predictive power.

Further research has examined the relationship between grit, self-control, and academic outcomes. Oriol et al. (2017) discovered that grit is positively associated with academic self-efficacy rather than self-control within primary and secondary student samples. Similarly, Suzuki et al. (2015) concluded that grit significantly predicted work engagement even after controlling for other personality traits, including self-control and the Big Five personality factors.

Werner et al. (2019) employed commonality analysis to scrutinize the unique and combined influences of grit, self-control, and conscientiousness in predicting motivation for academic goals. Their findings indicated that the collective effects of grit, self-control, and conscientiousness accounted for the greatest variance in motivation for academic goals, followed by the combined effects of grit and conscientiousness. In contrast, the unique contribution of self-control to motivation for academic goals was minimal.

In conclusion, although grit and self-control exhibit conceptual overlap and a strong correlation (Gonzalez et al., 2020; Muenks et al., 2017; Vazsonyi et al., 2019), their predictive validity differs across contexts (Boerma, 2020; Duckworth & Gross, 2014; Oriol et al., 2017; Suzuki et al., 2015). Grit appears to be more strongly associated with long-term academic and motivational outcomes, while self-control plays a more limited role in these domains. These findings highlight the nuanced interplay between these constructs and their distinct contributions to individual success.

Despite thoroughly examining the available scholarly literature, we have yet to uncover any studies that specifically investigate the interplay among self-control, grit, and academic procrastination. However, relevant research explores the association between self-control, grit, and other significant outcomes. These findings provide valuable insights into the potential relationships between these constructs and academic procrastination.

Hwang et al. (2018) conducted a study involving 509 female undergraduates in South Korea. Their findings revealed that grit mediates the relationship between self-control and academic performance, as measured by grade point averages. These findings suggest that grit is crucial in translating self-control into concrete academic achievements.

Similarly, Ramos Salazar and Meador (2023) conducted an online survey involving 511 undergraduate students. Their results indicated that self-control serves as a mediating construct in the relationship between grit and autonomous behaviors, as well as well-being. These results imply that self-control may facilitate the positive effects of grit on individual outcomes.

1.1. Aims of Study

Previous research on self-control and grit has yielded mixed findings, with some studies suggesting a high correlation between the two constructs (Gonzalez et al., 2020; Muenks et al., 2017; Vazsonyi et al., 2019) and others indicating distinct predictive validities (Boerma, 2020; Oriol et al., 2017; Suzuki et al., 2015). These results suggest that, despite some overlapping, self-control and grit possess unique characteristics that warrant further exploration. This study aims to reconcile these perspectives by employing the hierarchical model of goals (Duckworth & Gross, 2014) as a theoretical framework, specifically, it hypothesizes that self-control and grit serve distinct functions in reducing academic procrastination.

Based on Duckworth and Gross's (2014) A hierarchical model of goals allows for an understanding of the similarities and differences between self-control and grit within a framework of hierarchical goals. According to this model, goals are organized hierarchically, with lower-order goals (e.g., completing daily tasks) serving as prerequisites for higher-order goals (e.g., achieving long-term success). Self-control is more closely associated with everyday success, such as meeting deadlines or resisting

immediate distractions. At the same time, grit is linked to exceptional, long-term achievements that may take years or even a lifetime to accomplish.

Building on this framework, we propose that reducing academic procrastination can be conceptualized as a higher-order goal, requiring individuals to sustain self-control across multiple trimesters of undergraduate study consistently. We hypothesize that self-control influences procrastination indirectly through the concept of grit. This is because self-control alone may not be sufficient to manage procrastination in the long term, and sustaining self-control throughout an entire academic program requires the grit for perseverance and long-term focus. In other words, while self-control enables students to resist immediate distractions and complete tasks within a given trimester, grit provides the sustained motivation and resilience needed to maintain this self-discipline across all trimesters of their undergraduate studies.

Accordingly, an indirect-only model (Zhao et al., 2010) proposed to examine the psychological mechanism that associates the relationships among self-control, grit and academic procrastination. The conceptual framework (Fig. 1) and hypotheses are shown as follows:

H1: Self-control is not associated with procrastination.
H2: Grit is associated with procrastination.
H3: Self-control is associated with grit.
H4: Grit mediates the relationship between self-control and procrastination.

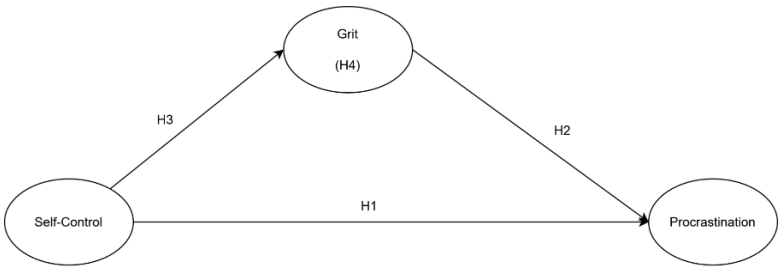

Fig 1. The conceptual framework

2. Method

2.1 Sample

The sample size for this study was determined using an online structural equation model calculator (Daniel, 2023). The criteria used for the sample size calculation were an effect size of 0.3, a statistical power of 0.8, three latent variables, 26 observed variables, and a significance level of 0.05. The minimum sample size calculated using these criteria was 119. One hundred sixty respondents from a university participated in the study (M = 21.74, SD = 0.973). Of the respondents, 99 (60.7%) were female, and 61 (37.4%) were male.

2.2 Procedure

Following approval from the University's Scientific and Ethical Committee (U/SERC/02/2023), an online questionnaire was developed using Qualtrics to facilitate data collection. Participant recruitment was conducted through purposive and snowball sampling techniques. Purposive sampling, a non-probability method, involves selecting participants based on their suitability for the study's objectives, guided by specific inclusion and exclusion criteria (Daniel, 2011). For this study, the inclusion criteria required participants to be undergraduate students enrolled at a Malaysian university and aged between 18 and 25 years. Exclusion criteria eliminated individuals who were not undergraduate students in Malaysia, those studying at overseas universities, or those younger than 18 or older than 25 years of age. Complementing this approach, snowball sampling, also known as chain or sequential sampling, was utilized, whereby initial respondents recruited additional participants from their personal networks, such as friends, relatives, or acquaintances (Makwana et al., 2023). The questionnaire link was disseminated through the researchers' personal contacts, including their own social media networks (e.g., WhatsApp, Facebook, and Instagram), as well as through participants' contacts. Additionally, participants were encouraged to share the survey link with their own social media connections. Prior to completing the questionnaire, participants were presented with an informed consent form on the first page of the survey. This form outlined the study's objectives, potential benefits and risks of participation, and data management protocols, emphasizing that only the research team would have access to the data and that all data would be destroyed following publication. Participants were required to indicate their consent by selecting a checkbox to either agree or disagree before proceeding with the survey. The questionnaire was structured into three distinct sections. Section A contained the informed consent form, Section B collected demographic information from participants, and Section C included validated measurement tools: The Academic Procrastination Scale, the Brief Self-Control Scale, and the Short Grit Scale. Data collection was successfully completed over one month.

2.3 Measurements

2.3.1 Demographic Information: In this section, participants were asked to provide their age, gender, and whether they were undergraduate students at a Malaysian university.

2.3.2 Academic Procrastination Scale: The Academic Procrastination Scale-Short Form is a 5-item scale designed by Yockey (2016) to measure academic procrastination. Participants were asked to rate their level of agreement with each item on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A sample item is "I put off projects until the last minute." Higher mean scores indicate a greater frequency of academic procrastination. The Cronbach's alpha coefficient for the scale was reported as 0.87. Its applicability has been evidenced across diverse contexts, as it has been utilized in studies conducted in Spain, Indonesia, and Malaysia(Martín-Puga et al., 2022; Rasyid et al., 2023; Siah et al., 2019).

2.3.3 Brief Self-Control Scale: The Brief Self-Control Scale is a 13-item scale developed by Tangney et al. (2004) to measure self-control. Participants were asked to rate the extent to which each item described them on a 5-point Likert scale (1 = Not at all like me to 5 = Very much like me). A sample item is "I am good at resisting temptation." Four reversed items were recoded. Higher mean scores indicate higher levels of self-control. The Cronbach's alpha for the scale was reported as 0.89. Its utility

has been demonstrated in research across various countries, including Indonesia, China, and Malaysia (Kadri et al., 2019; Wijaya & Tori, 2018; Zhao et al., 2021).

2.3.4 Short Grit Scale: The Short Grit Scale is an 8-item scale developed by Duckworth and Quinn (2009) to measure grit. Participants were asked to rate their agreement with each item on a 5-point Likert scale (1 = Not at all like me to 5 = Very much like me). A sample item is "Setbacks don't discourage me." Four reversed items were recoded. A higher mean score indicates a higher level of grit. Cronbach's alpha coefficient for the scale was reported as 0.81. Its applicability has been established in research across diverse countries, including the United Kingdom, China, and Malaysia (Jin et al., 2019; Rimfeld et al., 2016; Siah et al., 2019). For this study, only the total mean score of the Grit-S was utilized, rather than the separate perseverance and interest subscales. This decision aligns with empirical evidence indicating that the Grit-S is essentially unidimensional, with a single factor accounting for the majority of the scale's variance. Moreover, the subscales offer limited incremental predictive power beyond the total score, supporting the use of a composite grit measure in analyses (Gonzalez et al., 2020).

2.4 Data Analyses and Data Cleaning

The descriptive results were analyzed using the SPSS program, while the Partial Least Squares Structural Equation Modeling (PLS-SEM) was analyzed using the SmartPLS program. According to Hair et al. (2016)PLS-SEM is particularly suitable when the primary objective of applying structural modeling is to predict and explain target constructs. PLS-SEM is primarily employed in exploratory research to develop and refine theories, as it emphasizes explaining the variance in dependent variables within the model. Unlike covariance-based SEM, which is better suited for confirmatory analysis and theory testing, PLS-SEM excels in situations where the research aims to identify relationships and patterns in complex models, especially when the focus is on prediction rather than strict model fit.

The SPSS program with Mardia's macro was employed to assess the normality of the data by examining multivariate skewness and kurtosis (Cain et al., 2017). The findings revealed that the data were not multivariate normal, as evidenced by Mardia's multivariate skewness ($\beta = 9.23$, $p < 0.001$) and Mardia's multivariate kurtosis ($\beta = 59.16$, $p < 0.001$). Following recommendations from Hair et al. (2019) and Ramayah et al. (2017), the SmartPLS program, a non-parametric analysis software capable of fulfilling the objective of testing a theoretical framework from a predictive perspective (Willaby et al., 2015), was utilized to evaluate the measurement model, followed by a structural model to investigate the relationships among the variables (Wong, 2013). Additionally, the bootstrapping method with 5000 resamples was utilized to assess the significance of the path coefficients. No data was missing since the survey was conducted online and designed to elicit responses to all questions.

3. Results

3.1 Measurement Model

3.1.1 Construct Reliability and Discriminant Validity: Composite reliability was employed to assess the internal consistency of the scales, as it is better suited for the Partial Least Squares-Structural Equation Model (PLS-SEM) due to its consideration of varying outer loadings on the construct (Hair et al., 2016). As presented in Table 1, all scales exhibited composite reliability values ranging from 0.74 to 0.90, exceeding the recommended threshold of 0.7. These results suggest that the latent constructs of all scales possess acceptable internal consistency. Furthermore, all measurements demonstrate heterotrait-monotrait ratios below the critical value of 0.90, indicating that the discriminant validity of all measurements is satisfactory (Table 1).

Table 1. Composite Reliability and Discriminant Validity of Measurements

	Total items	Mean	SD	Composite reliability	Heterotrait-monotrait Ratio	
					1	2
1. Grit	8	3.16	0.67	0.83		
2. Procrastination	5	2.81	1.06	0.90	0.69	
3. Self-control	13	3.39	0.75	0.74	0.81	0.53

3.1.2 Coefficient of Determination, Effect Size, and Collinearity Statistics of Measurements: Table 2 shows that large effect sizes were found for grit and procrastination, with r^2 values of 0.53 and 0.35, respectively. Besides, a large effect size was found between self-control and grit, $f^2 = 1.11$. A medium to large effect size was found between grit and procrastination, $f^2 = 0.14$, and a small effect size was found between Self-control and Procrastination, $f^2 = 0.02$. There was no collinearity issue as the variance inflation factor of all predictors was also below 5 (Hadi et al., 2016).

Table 2. Coefficient of Determination (r^2), Effect Size (f^2), and Collinearity Statistics (VIF) of Measurements

Exogenous	Endogenous	r^2	f^2	VIF
Grit		0.53		
	Self-control		1.11	1.00
Procrastination		0.35		
	Grit		0.14	2.22
	Self-control		0.02	2.12

3.2 Structural Model

After controlling for the gender and age variables, the one-tailed test, along with bootstrapping results using 5000 samples, revealed that Self-control was positively associated with grit ($p < 0.001$), but not with procrastination ($p = 0.059$). Besides, grit is also associated with procrastination, $p < 0.001$ (Table 3).

Table 3. Results of Structural Model Analyses

	Hypothesis	Beta	Std. Beta	T-Values	*p*-Values	95% Percentile Confidence Interval
Self-control → Procrastination	H1	-0.17	0.11	1.51	0.066	[-0.37, -0.01]
Grit → Procrastination	H2	-0.44	0.10	4.25	< 0.001	[-0.59, -0.27]
Self-control → Grit	H3	0.73	0.04	19.56	< 0.001	[0.67, 0.79]
Self-control → Grit → Procrastination	H4	-0.32	0.08	3.93	< 0.001	[-0.45, -0.19]
Control Variables						
Age → Procrastination		0.01	0.06	0.01	0.498	[-0.09, 0.09]
Gender → Procrastination		-0.31	0.14	2.27	0.012	[-0.54, -0.09]

3.3 Mediating and Moderating Effects

The decision tree proposed by Zhao et al. (2010) was used to examine the mediating effects of grit. As shown in Table 3, the findings revealed that grit significantly indirectly affects the relationship between Self-control and Procrastination ($p < 0.001$). These findings indicate that grit mediates the relationship between Self-control and Procrastination. Additionally, the direct effect of Self-control on Procrastination was insignificant ($p = 0.059$), further supporting the indirect-only mediating effect of grit. Moreover, the moderating effect of Grit and Self-control on Procrastination was not found to be significant ($p = 0.231$).

4. Discussion

Academic procrastination, delaying or postponing tasks until the last minute, is prevalent among students worldwide. Identifying the factors contributing to procrastination is crucial for developing effective interventions to promote academic success. This study investigates the complex relationships among self-control, grit, and academic procrastination, employing Duckworth and Gross's (2014) hierarchical model of goals as a theoretical framework.

Extensive research has established a negative association between self-control and grit, on the one hand, and academic procrastination, on the other. However, the precise nature of the relationship between self-control and grit remains a subject of debate. Some scholars argue that self-control and grit are distinct constructs, each contributing uniquely to an individual's success (Boerma, 2020). In contrast, others argue that grit constitutes a subcomponent of self-control, positing self-control as a broader construct encompassing grit (Werner et al., 2019). To address these perspectives, this study adopts Duckworth and Gross's (2014) hierarchical model of goals, which provides a lens to examine how self-control and grit interact to influence procrastination. Given that sustaining self-control throughout an academic program demands perseverance and long-term focus qualities encapsulated by grit, this study proposes an indirect-only model, wherein self-control affects procrastination solely through grit.

The results of this study revealed no significant direct effect of self-control on procrastination, suggesting that self-control alone is insufficient to mitigate procrastinatory behavior. This finding diverges from prior research that identified a significant association between self-control and academic procrastination (Widya Nadya Rostania et al., 2023; Wijaya & Tori, 2018). One plausible explanation for this discrepancy is that earlier studies may not have adequately differentiated between self-control and grit. The significant association previously attributed to self-control might, in fact, stem from grit rather than self-control in isolation.

Conversely, a significant positive association with a large effect size was observed between self-control and grit, indicating shared underlying mechanisms. This aligns with prior research documenting substantial overlap between the two constructs (Gonzalez et al., 2020; Muenks et al., 2017; Vazsonyi et al., 2019).

Furthermore, grit exhibited a significant negative association with procrastination, underscoring its more direct role in reducing such behavior. This finding supports Duckworth and Gross's (2014)

assertion that grit is particularly adept at addressing long-term, goal-related challenges, such as procrastination.

The study also identified a significant indirect mediating effect of grit in the relationship between self-control and procrastination. While self-control contributes to the development of grit, it is grit that directly influences procrastination behavior. These findings corroborate Duckworth and Gross's (2014) hierarchical model, which positions self-control and grit within a framework of goal pursuit. Self-control enables individuals to navigate conflicting immediate, lower-level goals, but it is insufficient for achieving long-term, overarching objectives in the face of setbacks, where grit becomes essential. Thus, although self-control and grit share conceptual similarities, they serve distinct functions in goal attainment.

5. Conclusion

This study advances the understanding of the intricate interplay among self-control, grit, and academic procrastination among undergraduate students. The findings suggest that self-control and grit are interconnected, with self-control potentially enhancing the effectiveness of grit in reducing procrastination. These insights carry both theoretical and practical implications, emphasizing the value of enhancing self-control to bolster grit and, consequently, indirectly reduce procrastination.

6. Implication

From a theoretical standpoint, this study provides empirical support for Duckworth and Gross's (2014) hierarchical model of goals, suggesting that self-control underpins grit and may be foundational to its development. This contribution enriches our comprehension of the psychological mechanisms linking self-control and grit to academic procrastination.

Practically, the findings highlight the potential of self-control training as an intervention to indirectly enhance grit and reduce procrastination among undergraduates. Existing programs demonstrate that self-control can be cultivated through various means, such as parental and peer relationships (Holmes et al., 2019; Kim et al., 2022; Meldrum et al., 2012), mindfulness training (Suárez-García et al., 2020), goal-setting exercises (Duckworth et al., 2018), and cognitive reappraisal strategies (Stiller et al., 2019). By fostering self-control, educators and counsellors can empower students to develop the grit necessary for achieving academic goals. Additionally, targeted interventions to enhance grit directly have also been proposed (Hwang & Nam, 2021), offering further avenues for practical application. However, the efficacy of such programs within the Malaysian context remains underexplored and warrants further empirical investigation.

7. Limitations

Despite its contributions, this study has limitations that warrant consideration. The use of purposive and snowball sampling methods may limit the generalizability of the findings to the broader undergraduate population. Moreover, the correlational design precludes definitive conclusions about causality among the variables (Shaughnessy et al., 2015). Future research should employ more diverse sampling techniques to examine the robustness of the findings and consider longitudinal designs to explore the causal dynamics among self-control, grit, and procrastination over time. In addition, Future

research should explore alternative theoretical frameworks to investigate further the relationship between self-control, grit, and academic procrastination. Additionally, qualitative approaches could provide deeper insights into students' perceptions of their procrastination behaviors and the roles of grit and self-control in these patterns. Such studies could also examine potential contextual differences, including whether the current model demonstrates greater applicability for specific subgroups of undergraduate students based on demographic or academic backgrounds.

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