Impact of Grit and Self-Control on the Academic Success of Pharmacy Students

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Abstract

This study examines Grit and Self-control and identifies predictors of pharmacy students' GPA. A cross-sectional study of 417 students (October 2021) utilized the Grit-S scale (assessing Consistency and Perseverance) and the Self-control scale. Data analysis was performed using R language. Students reported moderate levels of Perseverance, Consistency, and Self-control (mean: 3.00-3.40, score range: 1.00-5.00). A Bayesian Modeling Averaging-optimized regression analysis (R^2 = 0.6161) confirmed all three traits ($p < 0.001$), and religious affiliation ($p = 0.003$) as positive predictors of GPA, contributing 40.10%, 37.51%, 20.50%, and 1.89%, respectively, of the R^2. As the first empirical study in Viet Nam validating the strong predictive capacity of these traits ($R^2 > 61\%$), this work establishes a critical baseline by characterizing student cohorts' GPA assessed in 2021. These data suggested that students with higher levels of grit could achieve higher GPAs. Therefore, school administrators should implement strategies to improve students' grit for academic success.

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Keywords

Perseverance, Consistency, Self-control, GPA, Pharmacy education

1 Introduction

Education is critical in developing qualified human capital, accelerating economic development and solving social challenges. Students are also expected to devote a significant amount of time to education and graduate with high academic standing. Grade point average (GPA) is the most widely used indicator of academic success, accounting for 54.8% of the total studies analyzed in a comprehensive analytic review [1]. Grit is defined as a person's ability to maintain passion and perseverance for long-term goals in the face of setbacks and obstacles [2, 3]. Self-control is defined as the ability to deliberately adjust or repress internal reactions, as well as the ability to interrupt and refrain from engaging in unwanted behavioral tendencies [4]. Unlike cognitive intelligence (IQ), which is relatively fixed, these non-cognitive traits are malleable and open to pedagogical interventions, making them critical targets for educational research [2, 5]. In physical therapist students, grit was reported to play a crucial role as an independent predictor of academic success and clinical performance [6]. Additionally, a positive association has been found between grit and higher levels of achievement among nursing students [7]. A study of 1 377 Vietnamese medical and health students at Medicine and Pharmacy Faculty, Hue University found that self-control was the most critical component

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in students' ready network structures for online learning [8]. However, there is a paucity of research examining these traits within the specific context of pharmacy education. Unlike general undergraduate programs, the pharmacy curriculum imposes a unique "dual demand": the need for short-term regulation (Self-control) to manage high-volume memorization and long-term stamina (Grit) to navigate rigorous clinical training. Therefore, disentangling the specific influence of these two constructs on academic performance is essential.

This study aimed to (1) examine the level of grit and self-control of pharmacy students and (2) evaluate the impacts of these two intrinsic factors on the academic success represented by the grade point average of Vietnamese pharmacy students. Findings from this research would provide insights into the role of grit and self-control in shaping academic outcomes and offer recommendations for educational institutions to enhance the learning experiences and performance of pharmacy students.

2 Research methods

2.1 Study design and participants

We conducted an online cross-sectional study at Nguyen Tat Thanh University, Ho Chi Minh City, Viet Nam from October 11th to October 20th, 2021.

Inclusion criteria: Pharmacy students engage in the survey voluntarily and anonymously.

Exclusion criteria: incomplete responses and repetitive answers, and zigzagging response patterns to the entirety of the questionnaire.

The sample size for this cross-sectional study was determined using Cochran's formula [9] for an infinite population. Based on a 95% confidence level (Z = 1.96) and a 5% margin of error (e = 0.05), a minimum of 385 participants was required. A total of 454 students from second to forth year participated; after excluding outliers, the final sample consisted of 417 students.

2.2 Research instruments

The survey questionnaire had 30 items, which comprised three parts:

Socio-demographic characteristics: (nine questions) to gather data of gender, year of study, GPA, religion, financial pressure, rigorous curriculum, enjoyment of studying pharmacy, intention to pursue another degree or a postgraduate degree, and adequate sleep.

The Short Grit Scale (Grit-S): The scale was selected due to its established validity and suitability compared to other scales [3]. The Grit-S scale was divided into two four-item subscales: Perseverance of Effort and Consistency of Interest. The mean score was calculated by dividing the total score by 8. This average score lied between 1 point (low grit) and 5 points (high grit). Higher mean scores indicate higher degrees of grit.

The Brief Self-Control Scale (BSCS) (13-items) was designed to evaluate dispositional self-regulatory behaviors utilizing a 5-point Likert scale that ranged from 1 (not like me at all) to 5 (very much like me). The scale has demonstrated comparable efficacy to full-length version [4]. This mean score can vary from 1 point (weak self-control) to a maximum of 5 points (strong self-control). The total score was divided by 13 to derive the mean score. Higher mean scores on this scale imply greater self-control.

2.3 Validity and data collection procedures

The questionnaire was prepared in Vietnamese and distributed to students via convenience sampling through their Google Meet classrooms.

Pilot phase: the purpose of the pilot study was to determine the viability and applicability of the Vietnamese research tools and procedures as well as the participants' level of comprehension. The responses acquired from pilot study participants were omitted from the final data analysis (official phase). The eight-item Grit Scale was analyzed through factor analysis, confirming two factors: "Perseverance of Effort" and "Consistency of Interest", which aligned with the previous research [3]. The scale showed high reliability for the total scale and subscales (all Cronbach's alphas > 0.8). Similarly, the 13-item Brief Self-Control Scale was examined through factor analysis, revealing a single component as found in previous research [4]. The scale exhibited high reliability (Cronbach's alpha > 0.8).

Official phase: the survey was validated and distributed to participants using an online platform due to the COVID-19 pandemic in Ho Chi Minh City, Viet Nam, at the time of the research, which required remote data collection methods for safety reasons. An online version of the questionnaire was developed using Google Forms for data collection. The survey was distributed through online classes where participants received a hyperlink to access the questionnaire. The estimated completion time was 10 min to 15 min. The reliability of the scales and subscales was acceptable, with all Cronbach's alpha coefficients exceeding 0.7 (Table 1).

Table 1 Factor analysis, reliability statistics of the instruments

Scale/Subscales	Pilot test (in-person) (n = 60)		Official test (online survey) (n = 417)	
	Number of items	Cronbach's alpha	Number of items	Cronbach's alpha
Total Grit-S	8	0.822	8	0.787
Perseverance of Effort	4	0.806	4	0.825
Consistency of Interest	4	0.854	4	0.816
Total Brief Self-Control	13	0.934	13	0.852

2.4 Data analysis

Data analysis and visualization were performed using the R statistical environment (version 4.3.1). Prior to analysis, outliers were checked. The difference was considered significant at a p-value ≤ 0.05.

The Kruskal-Wallis test was used to examine differences in the scores of students' grit or self-control scores across different GPA levels.

Multiple linear regression was used to identify the predictors of the students' GPA. The dependent variable was GPA. The independent variables included eight socio-demographic indicators, two Grit subscale scores, and a Self-control scale score. The regression model was constructed based on the theoretical structure illustrated in the Conceptual Framework (see Figure 1). The highest posterior probability model proposed by Bayesian Model Averaging (BMA) was used in a multivariable linear analysis. According to the Lindeman, Merenda, and Gold definition, the relative importance of each GPA predictor was established.

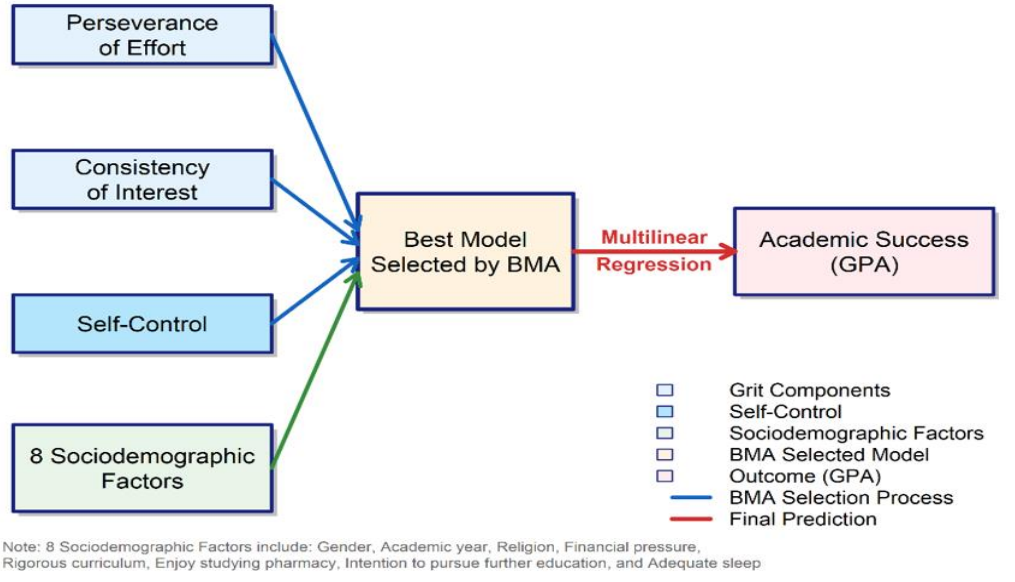

Figure 1 The conceptual framework of the study illustrating the hypothesized relationships between Grit (Perseverance of Effort and Consistency of Interest), Self-control, Sociodemographic factors, and Academic Success (GPA).

2.5 Ethical consideration

Students' involvement in the study was entirely voluntary and anonymous. We further emphasized that students were also free to withdraw from this study at any time. Prior to beginning data collection, the study questionnaire was approved by Nguyen Tat Thanh University's Pharmacy Faculty scientific Committee.

3 Results

3.1 Socio-demographics of participants

Table 2 Characteristics of participants

Characteristics	Classification	Number of students (n = 417)	Rate (%)
Gender	Female	334	80.1
	Male	83	19.9
Year of study	Year 2	136	32.6
	Year 3	149	35.7
	Year 4	132	31.7
Grade point average (GPA)	Mean (SD)	2.68	(0.40)
	Fail (Under 2.00)	15	3.6
	Average (2.00-2.49)	118	28.3
	Fairly good (2.50-3.19)	238	57.1
	Good (3.20-3.59)	39	9.4
	Excellent (3.60-4.00)	7	1.7
Religion	(Yes)	121	29.0
Financial pressure	(Yes)	213	51.1
Rigorous curriculum	(Yes)	337	80.8
Enjoy studying pharmacy	(Yes)	370	88.7
Intend to pursue another degree/ a postgraduate degree	(Yes)	248	59.5
Get enough sleep	(Yes)	281	67.4

The validated response rate was 91.85% (417/454). Of the 417 participants, 334 were female (80.1%). There were 32.6% second-year students, 35.7% third-year students, and 31.7% fourth-year students. The grade point average on a 4.0 scale (GPA) was 2.68 (0.40), with a fairly good 57.1%, an average 28.3%, a good 9.4%, and an excellent 1.7%, whereas 3.6% of students had a failing GPA. Approximately 29.0% of participants had a religious affiliation. Financial pressure was reported by 51.1% of participants. A significant proportion considered the curriculum rigorous (80.8%), and most students enjoyed studying pharmacy (88.7%). The intention to pursue another degree or postgraduate education was expressed by 59.5% of participants. In terms of sleep, most participants reported sufficient sleep (67.4%).

3.2 Pharmacy students' grit and self-control level

Table 3 Students' grit and self-control scores

Scale/Subscales	Possible range	Observed range	Mean (SD)
Total Grit-S	1-5	1.25-4.88	3.07 (0.73)
Perseverance of Effort	1-5	1.00-5.00	3.14 (0.91)
Consistency of Interest	1-5	1.00-5.00	3.00 (0.94)
Total Brief Self-Control	1-5	1.54-4.77	3.40 (0.76)

Participants showed moderate levels of grit and self-control, with mean scores of 3.07 (0.73) (score range of 1 to 5) and 3.40 (0.76), respectively. Regarding the Grit scale, students had higher score on Perseverance of effort 3.14 (0.91) than Consistency of Interest 3.00 (0.94).

3.3 Grit and self-control of pharmacy students by GPA level

Figure 2A illustrates a clear increasing trend in Grit levels as students' GPA increases. Specifically, Grit scores were significantly higher than the overall mean (3.07) in the Fairly good ($p < 0.05$), Good and Excellent groups ($p < 0.001$). Conversely, Grit scores in the Failing and Average groups were significantly lower than the overall mean ($p < 0.001$).

Figure 2B indicates a different pattern for Self-control. Scores were significantly higher than the overall mean (3.4) in the Fairly Good and Good (GPA) groups ($p < 0.001$). However, unlike Grit, the Excellent group did not show a significantly higher score. Meanwhile, Self-control scores in the Failing and Average groups remained significantly lower than the mean ($p < 0.001$).

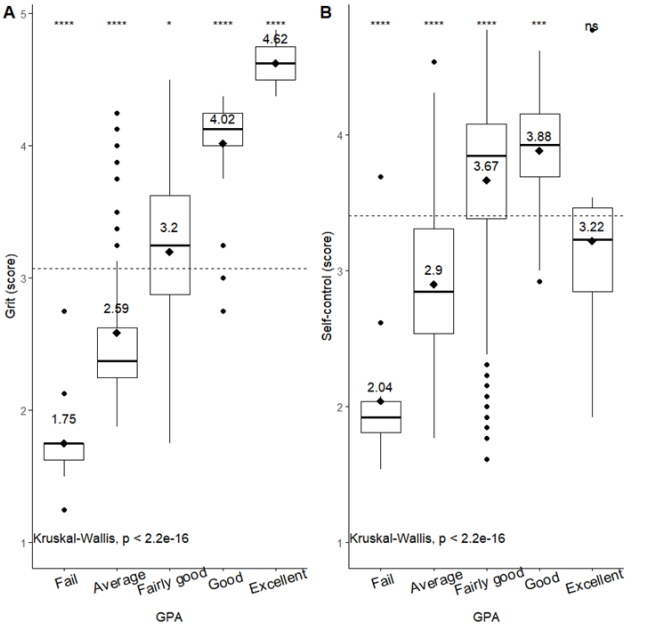

Figure 2 Pharmacy Students' Grit and Self-Control scores by GPA level (Notes: compare each of the five groups against "all", ----- base mean score, ns: non-significance)

3.4 Predictors of Students' GPA

Table 4 Predictors of Vietnamese pharmacy students' academic performance (GPA)

Predictors	Regression coefficient (SE)	*p*-value	Relative important metrics of *R* square (%)
(Constant)	1.155 (0.064)	< 0.001	
Religion (Yes)	0.082 (0.027)	0.003	1.89
Self-Control	0.105 (0.018)	< 0.001	20.50
Grit-Perseverance of Effort	0.190 (0.015)	< 0.001	40.10
Grit-Consistency of Interest	0.181 (0.014)	< 0.001	37.51

$R^2 = 0.6161$, Residual standard error = 0.2517, posterior probability = 0.488

Equation: GPA = 1.155 + 0.082 × Religion (Yes) + 0.105 × Self-Control + 0.190 × Grit-Perseverance of Effort + 0.181 × Grit-Consistency of Interest

According to the BMA prediction model with the highest posterior probability (48.80%), the multiple linear regression identified Consistency ($p < 0.001$), Perseverance ($p < 0.001$), Self-control ($p < 0.001$), and Religion ($p = 0.003$) as significant positive predictors of GPA. These factors explained 61.61% of the variance in students' GPA. The remaining 38.39% is likely attributable to other variables not observed in this study. Perseverance was the most significant predictor, contributing 40.1% of the R-square. Consistency, Self-control, and Religion made up (37.5, 20.5, and 1.89)%, respectively, of the R-square. Notably, the Grit subscales combined accounted for 77.61% of R-square. These data suggest that students with higher levels of grit and self-control, especially grit, could achieve higher GPA.

4 Discussion

This study investigated the features of grit and self-control in pharmacy students and how these factors could help predict a student's GPA. In this study, we have shown that (1) pharmacy students exhibited a moderate level of grit, with both subscales, Perseverance of Effort and Consistency of Interests, also at a moderate degree. In terms of self-control, the participants also demonstrated moderate levels. There were significant differences in grit and self-control among different students' GPA levels (both *p*-values < 0.001). Indeed, students with GPA ranging from fairly good to higher scales had higher scores than the grit mean score and the opposite of the remaining GPA levels. In the case of self-control, students with fairly good and good GPA scales had higher self-control scores than the mean score, whereas students with excellent GPA had no significant differences. However, it should be noted that the sample in this study included only seven excellent students, which limited the statistical power. A critical theoretical distinction explains why both constructs were included in the model despite their correlation. While Grit and Self-control are related, they operate on different temporal scales. Self-control, as defined by [4], refers to the capacity to regulate momentary impulses and resist immediate temptations (e.g., ignoring distractions to study for an evening). In contrast, Grit entails the enduring stamina to maintain interest and effort toward a superordinate goal over years, despite failure or adversity [3]. For pharmacy students, Self-control is required for daily study discipline, while Grit is essential for navigating the long-term rigor of the multi-year clinical curriculum. (2) After adjusting for socio-demographic factors in the linear regression equation, grit and self-control (in scores) were the main positive predictors of students' GPA.

The current study's findings on pharmacy students' grit score (3.07 (0.73)) were consistent with prior research on four-year degree Malaysian pharmacy students, where the grit mean score was (3.1 (0.4)) [10], and undergraduate pharmacy students in 14 Asian and Middle Eastern nations had a grit mean score of (3.15 (0.54)) [11]. Our results on the relationship between grit level and the GPA scale also share similarities with previous studies' findings. Specifically, while our study showed that grit level had a relationship at all GPA scales, previous studies reported that students with self-reported GPA ≥ 3.50 had a higher mean grit (3.3 (0.4)) and (3.7 (0.5)), respectively, than any others with lower GPA [10, 12].

In terms of Self-control, pharmacy students' level of self-control (3.4 (0.76)) was aligned with a previous study on university students (3.16 (0.6)) [5], indicating that students both had moderate levels of self-control. In addition, self-regulation of effort was positively and statistically significantly associated with students' GPA at a moderate level [13].

According to the linear regression model, students' grit was a positive predictor of the GPA, and a higher grit level increased the students' GPA. This finding is aligned with previous findings, which provided evidence that heightened levels of grit were associated with enhanced academic performance among pharmacy students [11]. The greater the grit and self-efficacy, the greater the academic success [14]. Besides, students' self-regulation of effort strongly predicted students' GPA [13]. In terms of religious affiliation, the current study is in accordance with a study conducted in Pakistan, which also reported a significant correlation between religion and academic performance among undergraduate students [15].

From an educational perspective, these findings have practical implications. Instead of viewing Grit and Self-control as fixed innate traits, recent research suggests that they are malleable qualities open to pedagogical interventions [2]. Therefore, pharmacy schools should move beyond traditional lecturing to implement strategies that foster these attributes. For instance, incorporating complex problem-based learning and rigorous clinical simulations can require students to practice perseverance. Furthermore, mentorship programs can help students reframe academic setbacks as learning opportunities rather than failures, thereby explicitly cultivating their psychological endurance alongside professional knowledge.

Finally, regarding the data collection timeline (October 2021), we acknowledge the temporal gap. However, the positive correlation between these non-cognitive traits and academic performance is a strong positive relationship, which is consistent with previous studies [11, 14]. This implies that the basic association between grit, self-control, and GPA holds true for current pharmacy cohorts, regardless of the specific academic year.

5 Conclusion

This study provides empirical evidence that grit and self-control are positively associated with the academic achievement of pharmacy students. Specifically, our results showed that the students possessed moderate levels of these traits. The multivariable linear regression model successfully explained 61.61% of the variance in their GPAs. Among the key predictors, perseverance of effort had the strongest impact by accounting for 40.1% of the R^2 followed by consistency of interest (37.5%) and self-control (20.5%). Higher scores on measures of perseverance, consistency of interests, and self-regulation were linked to superior cumulative GPAs. Consequently, fostering these non-cognitive skills should be considered a valuable component of pharmacy training. To operate this, educators could design curricula that feature complex, semester-long projects to develop sustained effort. Training modules focused on practical time-management and specific learning techniques could enhance students' self-control. Furthermore, establishing a dedicated faculty mentorship system would allow for personalized guidance, helping students cultivate a growth mindset by learning from setbacks. Communicating the value of effort-based achievement and providing avenues for skill development are crucial for improving both academic results and long-term professional resilience.

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Tác động của sự kiên trì và sự tự chủ đến thành tích học tập của sinh viên dược Việt Nam

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Tóm tắt Nghiên cứu này khảo sát Sự bền bỉ (Grit) và Khả năng tự chủ (Self-control) và xác định các yếu tố dự báo điểm trung bình tích lũy (GPA) của sinh viên ngành Dược. Nghiên cứu cắt ngang (tháng 10 năm 2021) với sự tham gia của 417 sinh viên, sử dụng thang đo Grit-S (đánh giá Sự nhất quán và Sự kiên trì) và thang đo Tự chủ rút gọn (Brief Self-Control scale). Dữ liệu được phân tích bằng ngôn ngữ *R*. Kết quả cho thấy sinh viên Dược có mức độ Kiên trì, Nhất quán và Sự tự chủ ở mức trung bình (điểm số trung bình từ 3,00 đến 3,40, khoảng điểm: 1,00 đến 5,00). Phân tích hồi quy tuyến tính đa biến sử dụng mô hình dự báo tốt nhất theo phương pháp Bayesian Modeling Averaging (R^2 = 0,6161) xác định cả ba đặc điểm (p < 0,001) và có theo tôn giáo (p = 0,003) là những yếu tố dự báo tích cực của GPA, và lần lượt đóng góp 40,10 %, 37,51 %, 20,50 % và 1,89 % vào giá trị R^2. Đây là nghiên cứu thực nghiệm đầu tiên tại Việt Nam kiểm chứng năng lực dự báo mạnh mẽ của các đặc điểm này (R^2 > 61 %). Công trình thiết lập một cơ sở nền tảng quan trọng cho đặc điểm kết quả học tập (GPA) của các nhóm sinh viên được đánh giá trong năm 2021. Kết quả nghiên cứu cho thấy sinh viên có mức độ bền bỉ và tự chủ cao hơn có khả năng đạt được thành tích học tập tốt hơn. Do đó, nhà trường cần xem xét triển khai các chiến lược nhằm bồi dưỡng những phẩm chất này cho sinh viên để góp phần nâng cao kết quả học tập.

Từ khóa Sự kiên trì, sự nhất quán, khả năng tự chủ, GPA, đào tạo dược