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How do grit and academic stress influence academic performance? The role of academic self-efficacy as mediator and moderator variable

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Abstract: Online learning systems are currently the primary approach to delivering information and facilitating learning for postgraduate students, replacing traditional in-person methods in many contexts. To succeed academically in this environment, students must adapt to these systems, a process heavily influenced by personal attributes such as grit and self-efficacy. These factors play a crucial role in helping students navigate the unique challenges of online learning, including increased workloads and technological demands. This study examines the role of academic self-efficacy in mediating the influence of grit and moderating the influence of academic stress on academic achievement. The study approach is quantitative, employing a simple random sampling technique with data collection through a online questionnaire. The data analysis methods include descriptive statistical analysis, Pearson correlation, and structural equation modeling (SEM). The participants were 382 Master's students, consisting of 131 men (34.3%) and 251 women (65.7%), with an age range of 22-28 years. Most participants belonged to the Makassar ethnic group (33.0%), with the remaining 67.0% comprising individuals from various other ethnic groups, both within and outside South Sulawesi. The results show an average academic self-efficacy score of 3.36 (SD = 1.08). The findings indicate that academic self-efficacy functions as a perfect mediator in the effect of grit on academic achievement (β= .130; t = 6.366 > 1.96) and as a moderator in the effect of academic stress on academic achievement (β = .027; t = 5.850 > 1.96). Therefore, academic self-efficacy is a major psychological resource that drives academic performance, with the structural model explaining 72.4% of the variability in academic achievement. The study implications support the development of a theoretical model as a basis for implementing programs to improve academic self-efficacy and support students' academic performance in an online environment.

Keywords: academic performance; academic self-efficacy; academic stress; grit; online learning

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Introduction

Online learning systems have been developing rapidly and are the leading platforms for delivering online education worldwide. During the last five years, the Ministry of Education and Culture of Indonesia has stated that learning activities will occur online using existing technology. Even though learning has been widely used in the education process, it also faces many obstacles and problems in its implementation compared to direct (offline) learning systems. Universitas Negeri Makassar (UNM) Postgraduate Program is an example of a hybrid course offering online and offline lectures.

In the context of hybrid learning, which is increasingly being employed with postgraduate students, there are challenges to understanding the factors that affect academic performance. Grit, which reflects long-term perseverance and commitment, is essential in helping students cope with various academic demands, especially in an unstructured learning environment, such as hybrid learning, where students may face less clear guidance and more self-directed tasks. Academic stress often results from such a learning system, as students must balance online and offline study schedules, adapt to technology, and complete independent assignments with high intensity. Such stress can reduce academic performance if not managed effectively. In this case, academic self-efficacy, or students' confidence in their academic success, can be a key variable as a mediator or moderator of the relationship between grit and academic performance.

However, in the implementation of online learning, various problems can still arise, such as the limited effectiveness of the learning process and difficulties for students in remote areas accessing the internet. Moreover, students who participate in online learning systems also say there are different difficulty levels compared to face-to-face learning in completing academic assignments. It is due to limited interaction with lecturers, lack of social support, economic constraints, and unclear learning structures. As a result, many students experience academic stress and procrastination, and tend to delay completing their studies. Acknowledging these challenges and working towards solutions to support students in this new learning environment are essential.

For this reason, students need psychological skills (for example, grit and academic self-efficacy) to help them perseverance and enthusiastically achieve their goals over a long period, with more confidence to face challenges (Alhadabi & Karpinski, 2020; Çınar-Tanrıverdi & Karabacak-Çelik, 2023; Jiang et al., 2023; Zhao et al., 2023). Therefore, before implementing an online learning system, universities must first ensure students' psychological condition so that they can deal with academic difficulties during the process. Psychological aspects have been noted as important factors contributing to the world of education, especially in relation to academic performance. One such aspect that can influence student academic performance during the online learning process is grit. Duckworth et al. explain that this refers to an individual's persistence and effort to continue achieving their goals over a long period. Two factors are involved in measuring grit: persistence of effort and consistency of interest (Duckworth et al., 2007). Grit can improve students' academic performance by giving them persistence, even in an unsupportive environment, without making them reduce their efforts and lose interest.

In addition, conditions resulting from online learning systems can trigger academic stress due to related stressors such as unlimited time, inadequate networks, financial constraints, and teachers' inability to deliver materials effectively. The stress experienced by students varies depending on how they perceive situations and can adapt to them (Stockinger et al., 2021). Academic stress is a physical and psychological

response resulting from an individual's inability to change their behavior, such as that related to writing, observing, listening, and imitating, due to pressure or a mismatch between the demands made on them and their abilities (Chandra, 2020). The results of previous research show that high levels of academic stress can cause impaired thinking, perception, and problem-solving skills (Shadi et al., 2018). Increased symptoms of psychological pressure, such as stress, are generally due to unsuccessful goal achievement (Moss-Pech et al., 2021). Academic stress will also occur if academic demands are made on students that exceed their abilities. Therefore, academic stress can be commonplace amongst students as an antecedent of learning demands. Consequently, students need to be instilled with confidence to respond to such demands, such as academic assignments. Confidence in one's ability to complete tasks in the academic field is known as academic self-efficacy (Schunk & DiBenedetto, 2022). Students' beliefs and skills can be called upon to help them face demands. It is demonstrated by the relationship between academic self-efficacy and educational aspects, such as students' confidence in completing assignments, participating in discussions, or performing well in exams (Cheng, 2020).

Academic performance refers to students' persistence in achieving their academic goals, such as obtaining a degree. It is also the students' knowledge, and the grades lecturers give them over a certain period (Camacho-Morles et al., 2021; MacCann et al., 2020). Based on these two definitions, the researcher concludes that academic performance is based on students' achievements related to the knowledge they possess, articulated through the cumulative achievement index value. Sulla et al. (2022) argue that an individual's academic performance can be influenced by psychological aspects such as excessive pressure (academic stress) in response to academic demands, individual perseverance, persistence in consistently achieving goals over a long period, or grit in the face of severe challenges; and individuals' confidence in their ability to be able to overcome all the demands faced in online learning systems (academic self-efficacy).

Grit refers to perseverance, persistence, enthusiasm, and a strong passion to achieve long-term goals (Duckworth et al., 2023). It is an individual's strength to recover after experiencing failure to achieve something. It is also the ability of individuals to complete tasks and achieve their goals with effort and perseverance (Halperin & Eldar Regev, 2021; Hwang & Nam, 2021; Morell et al., 2021; Schimschal et al., 2021; Verner-Filion et al., 2020). Based on the above explanations, it is concluded that grit is a combination of perseverance and interest in achieving goals over a long period of time, which can be challenging. Duckworth et al. (2023) explain that grit is based on consistency of interest and perseverance of effort. Individuals who have a consistent interest are not easily distracted and remain focused at all times and in all situations, maintaining their interest in the long term. On the other hand, perseverance of effort refers to an individual's resilience and lack of fear in facing challenges or obstacles that hinder them from achieving their goals by continuing to work hard and to achieve their long-term goals earnestly.

Self-efficacy concerns the expectation of an individual's ability to behave in a specific situation (Rudland et al., 2020). It determines whether an individual will exhibit a particular behavior, their strength in surviving and facing difficulties or failures, and their future behavior. Academic self-efficacy is the belief in one's ability to complete academic tasks; organize learning activities; and achieve the expected results. It is an individual's belief in their ability to complete learning tasks by mastering the situation and thus obtaining positive results in relation to their academic performance (Greco et al., 2022; Lei et al., 2022). Based on the above discussion, it can be concluded

that academic self-efficacy is a belief in the equality between the abilities one possesses and academic demands or tasks, in this case, completing academic tasks and arranging learning activities to obtain the best academic performance results.

As a mediator, self-efficacy connects grit and academic performance by enhancing the positive impact of grit on students' academic outcomes. Students with high levels of grit and strong self-efficacy are more likely to confidently approach academic tasks and effectively manage any stress that arises. As a moderator, self-efficacy can also weaken or strengthen the effect of academic stress on academic performance, depending on how confident students are in facing academic demands. Therefore, in a flexible yet challenging hybrid learning environment, it is important to understand how grit, academic stress, and academic self-efficacy dynamically affect academic performance in graduate students.

Bandura (1997) explains that an individual's academic self-efficacy will differ from that of others based on three dimensions. The first dimension is level, which relates to the degree of difficulty of a task compared to an individual's ability to complete it. Such differences can be related to the demands of simple, more challenging, or the most difficult or complex tasks in the domain of a particular function. Second, strength refers to the level of strength of an individual's belief in their abilities. Weak self-efficacy means students may avoid confusing task demands, while higher levels will ensure success despite the difficulties or obstacles. Third, generality is a dimension related to an individual's assessment of their belief in their ability to participate in varied activities and situations.

Each student faces different academic demands. Students encounter increasingly diverse challenges with the current shift to an online learning system. For instance, they must adapt to the new system, cope with a higher workload, and navigate issues such as unreliable internet connectivity. This situation can cause anxiety and academic stress. Ardis and Aliza (2021) state that academic stress is caused when students assess that their abilities are unable to meet the requirements of their environment, leading to personal pressure. Those who experience academic stress will show emotional and physical symptoms. Two factors can affect student stress levels. The first is academic failure, which is the student's objective assessment that they have failed, and the second is perceived academic failure, which is the student's subjective perception that they have failed. Academic failure is an influential factor in increasing stress (Ragab et al., 2021). The factors are interrelated and are strongly influenced by students' psychological resources, particularly their secondary appraisals, in overcoming stress. Grit, one psychological resource, has been reported to be able to influence students' assessment of their perceptions of failure related to academic stress and has an effect on academic performance (Çınar-Tanrıverdi & Karabacak-Çelik, 2023; Özhan, 2021).

Alhadabi and Karpinski (2020) reported that grit was positively related to academic performance. It is synonymous with the individual characteristics that influence the development of strategies to achieve long-term goals. Academic self-efficacy focuses on students' beliefs regarding their ability to master new skills and tasks, especially in certain academic domains (e.g., problem-solving and writing research papers). It is related to an individual's belief in their ability to meet specific achievements, such as academic performance, which affects their thoughts, feelings, and actions. Many studies show that academic self-efficacy affects academic achievement and learning motivation. Many also show that academic self-efficacy and academic performance strongly correlate (Hayat et al., 2020; Lei et al., 2022; Travis et al., 2020). In addition, academic self-efficacy functions as a mediator between grit

and academic performance. It is in line with the research of Alhadabi and Karpinski (2020), who reported that grit positively affected academic performance by examining the influence of mediators involved in academic self-efficacy.

Students are at high risk of academic stress, especially in today's online learning environment. Research by Cao et al. (2020) shows that such learning can create confusion and reduce creativity, productivity, and engagement. High levels of academic pressure can impair concentration and negatively impact performance. Khan (2023) highlights the connection between academic self-efficacy and stress, emphasizing their complex interplay in influencing student success. However, excessive stress can lead to psychological issues, while academic self-efficacy helps students persist in their efforts and manage challenges. It is key in motivating students to complete assignments and affects their overall academic achievement.

Academic self-efficacy also plays a vital role in improving academic performance. Higher-level students tend to perform better (Honicke et al., 2020; Schunk & DiBenedetto, 2022). Self-efficacy is essential for achieving greater intrinsic motivation for learning. Achieving excellence in academic performance is founded on students' intrinsic academic motivation, which plays a vital role in learning and human activities (Abdelrahman, 2020). In other words, achievement motivation affects academic performance. Academic self-efficacy and stress are significant issues among students and can affect their academic performance.

Based on several previous explanations related to the influence of academic stress in causing poor academic achievement, academic self-efficacy is one of the factors that can reduce (moderate) the impact of academic stress on students' academic achievement. Academic self-efficacy also accompanies (mediates) grit in academic achievement.

In addition, academic self-efficacy can also be associated with students' persistence and perseverance in carrying out their guidance (Buzzetto-Hollywood et al., 2019). It shows that although online learning systems create various kinds of problems, they can be overcome by the existence of grit, which can provide students with perseverance and persistence when facing problems, allowing them to achieve their goals even over long periods, meaning that academic performance will certainly also be improved. It is also reinforced by the fact that when students have confidence in their ability to deal with problems, their academic performance will remain stable no matter how big they are. It is in line with the research of Alhadabi and Karpinski (2020), who reported that grit positively affected academic performance, with the mediating effect of academic self-efficacy. Other research has also found that academic self-efficacy mediates the relationship between grit and academic performance (Sulla et al., 2022). The effects of online learning can trigger stress for students, which can have serious consequences for their academic performance. However, as long as they have reasonable confidence in their ability to deal with problems, their academic performance will remain strong.

In light of the above discussion, the structural model of the online learning system needs to be further researched to produce empirical evidence within a context that is based on the reality in the field. This study is the first to evaluate the dual role of academic self-efficacy variables. Therefore, it is important to provide an understanding of a new theoretical model as a basis or reference for practitioners in designing interventions to improve student academic achievement despite challenging demands, heavy workloads, and difficult conditions such as online learning.

Based on the outline, this study aims to examine the role of academic self-efficacy in mediating the influence of grit and moderating the

influence of academic stress on academic achievement. The research model is shown in Figure 1. Six hypotheses are considered in the study:

H1. There is a significant positive influence of grit on academic self-efficacy.

H2. Academic self-efficacy has a significant positive influence on academic performance.

H3. Grit has a significant positive influence on academic performance.

H4. Academic stress has a significant negative influence on academic performance.

H5. A significant relationship exists between grit and academic performance is mediated by academic self-efficacy.

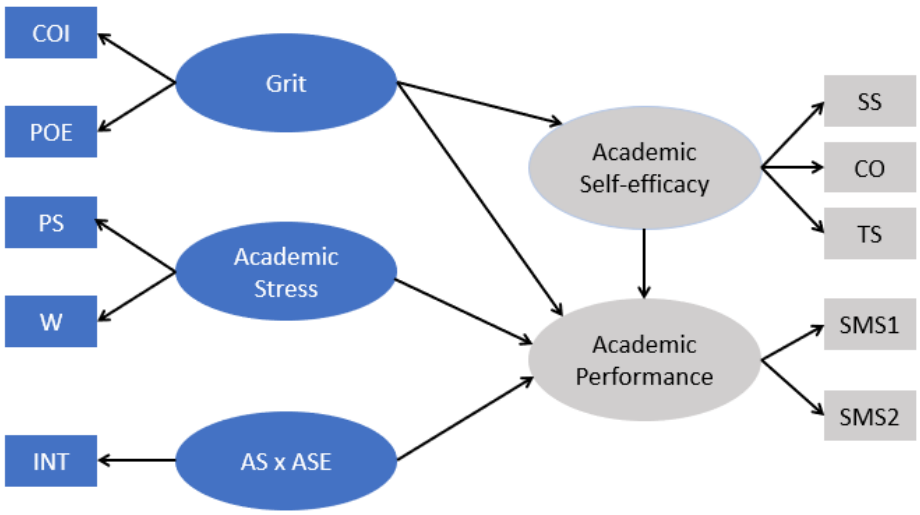
H6. A significant relationship exists between academic stress and academic performance moderated by academic self-efficacy.

Methods

Research Design

This study uses a quantitative method that allows data collection through several scales (Creswell & Creswell, 2018). The research procedures required ethical approval. All the participants were therefore asked to give informed consent, and anonymity was assured to keep their identities confidential.

Figure 1
Research Model



Note:

COI	:	Consistency of interest	INT	:	Interaction
POE	:	Perseverance of effort	SS	:	Social Situations
PS	:	Pressure from study	CO	:	Cognitive Operations
W	:	Workload	TS	:	Technical Skills
AS	:	Academic Stress	SMS1	:	Semester 1
ASE	:	Academic Self-efficacy	SMS2	:	Semester 2

Participants

The study subjects were students in the State University of Makassar Postgraduate Program participating in the online learning system. The number of samples was determined using UNPAD SAS software, with the technique used being simple random sampling. The researcher recorded the names of the subjects and then conducted a lottery to produce random names using the Microsoft Excel program. Those selected were asked to indicate their willingness to participate in this study.

Measures

Grit

Grit was measured using the short version of the grit scale (Grit-S) adapted from Duckworth and Quinn (2009) to evaluate individuals' ability to overcome obstacles and challenges to achieve long-term goals. The scale consists of two aspects, consistency of interest and perseverance of effort, with eight items measured on a 5-point Likert scale (1 = very unsuitable to 5 = very suitable). The scale shows construct validity that was fit to the data with a second-order measurement model (χ^2 = 188.52, df = 19, p < .001, CFI = .96, RMSEA = .076 [90% CI = .066 – .086], λ = .37 – .80, p < .001). The scale also shows adequate internal consistency, both in terms of Grit-S (α = .82) as a whole and in each aspect (α consistency of interest = .77, and α perseverance of effort = .70).

Academic Self-efficacy

Academic self-efficacy was measured using the College Academic Self-efficacy Scale (CASES) adapted from Nugraheni et al. (2016), to evaluate individuals' beliefs in their ability to face academic demands such as studying and completing assignments and to organize learning activities to achieve the expected results. The scale consists of three aspects: overt, social situations, cognitive operations, and technical skills, and involves 11 items arranged based on the domain of academic activities. This scale is rated on a 5-point Likert type (from 1 = Strongly Disagree to 5 = Strongly Agree). In addition, the scale as a whole has adequate internal consistency (α = .889).

Academic Stress

Academic stress was measured using the Educational Stress Scale for Adolescents (ESSA) adapted from Sun et al. (2011) to evaluate students' psychological responses to academic demands, such as college assignments that exceed their ability to adapt. The scale consists of five aspects (pressure from study, workload, worry about grades, self-expectation, and despondency) and 16 items. In this study, only two aspects were used, pressure from study (4 items) and workload (7 items), as these were the only aspects relevant to the research sample based on the pilot study results. The scale is assessed using a 5-point Likert-type scale (from 1 = Strongly Disagree to 5 = Strongly Agree). It showed construct validity that was fit to the data with a second-order measurement model (χ2 = 815.57, df = 99, p < .001, CFI = .90, RMSEA = .07, SRMR = .07, λ = .52 - .85, p < .001). It also showed adequate internal consistency, both on the ESSA (α = .81) as a whole and for each aspect (α = .66 – .75).

Academic Performance

Academic performance refers to student success characterized by satisfactory cumulative achievement index targets. However, in this study, the researcher only focused on achieving GPA scores with a scale of 4.00 within two semesters.

Procedures

The researcher first adapted the scales to suit Indonesian culture. The adaptation process for the grit and academic stress scales followed the ITC Guidelines for Translating and Adapting Tests (International Test Commission, 2017) to ensure linguistic and cultural relevance.

First, bilingual experts familiar with the construct conducted a forward translation of the original scales into the target language. A backward translation by independent translators followed this to verify accuracy and consistency with the original meaning.

Subsequently, a review panel consisting of experts in psychology and language reviewed both translations for content and cultural appropriateness. Finally, a pilot test was conducted with a representative sample of the target population to identify any clarity, relevance, or interpretation issues. Adjustments were made based on the feedback to enhance the validity and reliability of the scales within the new context.

Data Analysis

Descriptive statistical analysis was first evaluated by looking at the mean value, standard deviation, percentage of total scores obtained by research subjects, and percentage of demographic data of research subjects. Correlation analysis between the variables of interest was then performed using the Spearman-Rho correlation method with the help of Jamovi 2.6.13 software. The hypothetical model was further analyzed using moderated structural equation modeling (SEM) with the assistance of LISREL software version 8.80. If there was an error in the measurement model (the model did not fit), the researcher then correlated the covariance error between items in each aspect. In addition, the researcher also used the item parceling method by reducing the number of measurement items after considering the value of the load of the factor below the threshold. This method is used when the number of measurement items is too high or the sample is not large enough, which can cause the constructed research model to become incompatible.

A sensitivity analysis was also conducted to evaluate the robustness of the findings and models by building two simple linear regression models using simulated Monte Carlo datasets. The number of populations was set to N = 1,000,000, and the dataset was randomly sampled 2,000 times with a sample size of n = 200. The parameters were set based on the same simple linear regression models. The two models in this sensitivity analysis were: the association between components of grit and academic performance in Semester 2 (Model 1), and the association between components of academic stress and academic performance in Semester 2 (Model 2). These models were chosen as approximations of the complete SEM. Convergence or discrepancies across results would be used to guide the careful interpretation of the findings. The sensitivity analysis and other visualizations were done with R programming (v4.4.0, R Core Team, 2024) combined with RStudio (v2024.04.1-748, RStudio Team, 2024) using the ggplot2 package (Wickham, 2016; Wickham et al., 2023).

Results

Descriptive Statistics and Correlation

In this research, 382 master's students completed the survey, consisting of 131 males (34.3%) and 251 females (65.7%), with an age range of 22–28 years (47.4%). Among them, 33.0% came from the Makassar tribe, while the remaining 67.0% belonged to other ethnic groups within and outside South Sulawesi. The average grit score was 3.51 (SD = 1.11), with that of academic self-efficacy 3.36 (SD = 1.08), and of academic stress 2.95 (SD = 1.21), with an average score for academic performance of 3.50 (SD = 0.48). In addition, the research data were normally distributed with skewness values not exceeding the range of values -2 to 2, and kurtosis -7 to 7 (Field, 2013). These skewness and kurtosis parameters are methods required by the American Psychological Association (APA) as a standard for reporting results before conducting

inferential analysis (Appelbaum et al., 2018). These normally distributed data show that the research data can be processed continuously. As a result, CB-SEM analysis based on continuous data can be performed with the Maximum-Likelihood (ML) estimator.

The subsequent analysis results correspond to the Pearson correlation used to test the potential relationship between the research variables (Table 1). The analysis showed that grit, academic self-efficacy, and academic stress significantly correlated with academic performance. Furthermore, the internal consistency value for each variable indicates good stability (ω = .886 – .918, α = .886 – .918).

In addition, a correlation heatmap showing the relationships between components of all variables and boxplots of these components are presented below (Figure 2). This information further supports the following factor analysis and sub-sequent analyses. All components were positively correlated with each other, except for the components of academic stress (workload and pressure to study). This heatmap is consistent with the correlation coefficients presented in Table 1.

Measurement Model

SEM analysis consists of two stages: evaluation of the measurement model and the structural model (Anderson & Gerbing, 1988; Daud et al., 2024; Siswanti et al., 2024). At the measurement model stage (Figure 3), which was evaluated using the confirmatory factor analysis (CFA) method, an adequate fit index was obtained or had a data fit ($\chi 2$ = 11.57, df = 26, p = .993, GFI = .994, AGFI = .987, RMSEA = .000 [90% CI = .000 – .000, p =1.000] (Wang & Wang, 2019). Therefore, the model used in this study passed the model fit test or goodness of fit, so it was feasible to continue testing at the structural model test stage.

The standardized loading factor (SLF) value for all indicators was above the threshold value of .50 (Hair Jr et al., 2009), ranging from .876 to .943. The results obtained for each indicator by referring to the SLF value (see Table 2) can be said to have a high correlation value with the measured variable, so it can be concluded that all indicators are in the valid category.

In addition, the average value of extracted variance (AVE) and construct reliability (CR) were also analyzed to determine the reliability level of the proposed model. The AVE value of > .50 and the CR of > .70 were very satisfactory (Hair Jr et al., 2009). Table 2 shows that all AVE and CR values exceeded the threshold values. Therefore, the proposed model is highly reliable and accurate.

Table 1
Correlation between Variables

Variable	M	SD	Skew	Kurt	1	2	3	4
1. Grit	3.51	1.11	-0.078	-1.145	(.886)			
2. Academic self-efficacy	3.36	1.08	0.105	-1.190	.664***	(.913)		
3. Academic stress	2.95	1.21	0.690	-0.856	-.583***	-.612***	(.892)	
4. Academic performance	3.50	0.48	-0.005	-1.927	.717***	.713***	-.599***	(.918)

Note: *p < .05, **p < .01, ***p < .001. Reliability estimates with McDonald's Omega are on diagonal lines and in parentheses.

Figure 2

Correlation Heatmap (Top) and Boxplot (Bottom) of All Variables' Components

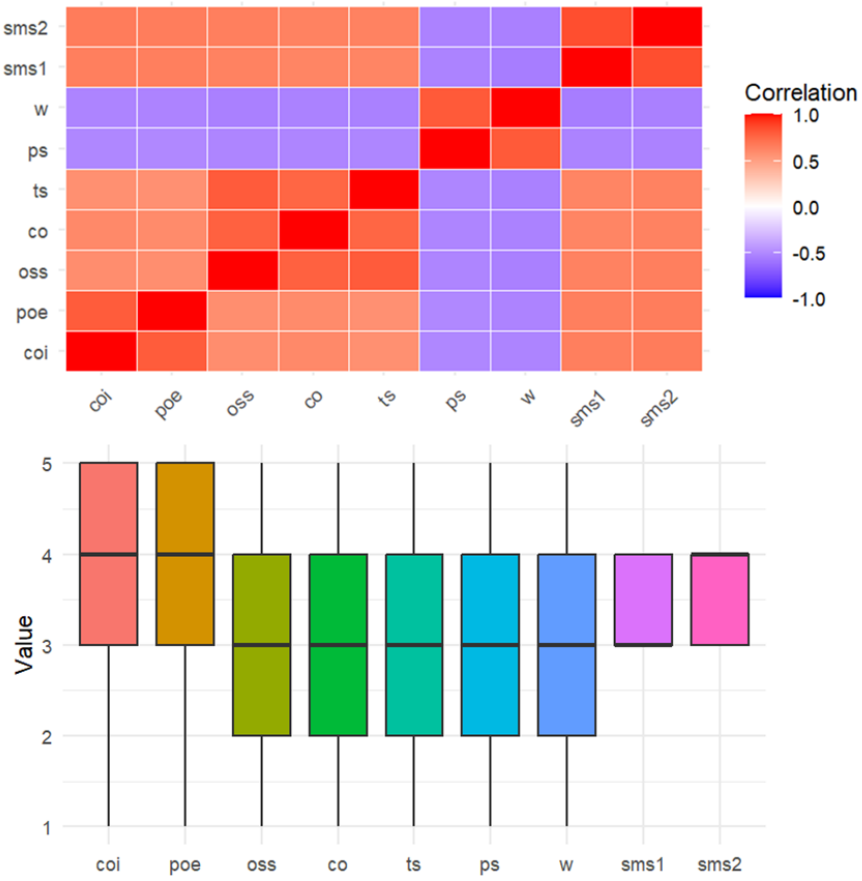
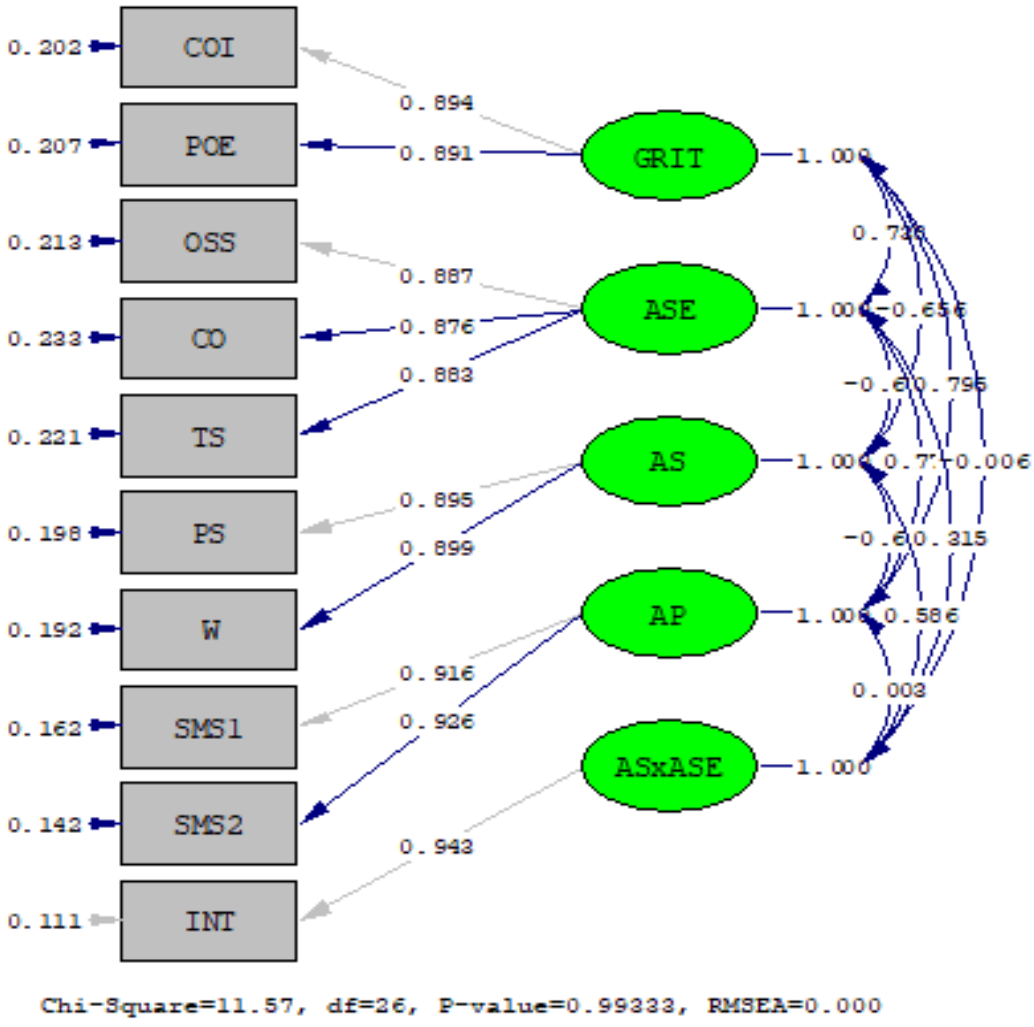


Table 2

Results of confirmatory factor analysis from measurement model

Variable	Indicator	SLF	SE	AVE	CR
Grit	Consistency of interest (COI)	.894	.201	.797	.887
	Perseverance of effort (POE)	.891	.206		
Academic self-efficacy (ASE)	Overt, social situations (OSS)	.887	.213	.778	.913
	Cognitive operations (CO)	.876	.233		
	Technical skills (TS)	.883	.220		
Academic stress (AS)	Pressure from study (PS)	.895	.199	.805	.892
	Workload (W)	.899	.192		
Academic performance (AP)	Semester 1 (SMS1)	.916	.161	.848	.918
	Semester 2 (SMS2)	.926	.143		
AS x ASE	Interaction (INT)	.943	.111	.889	.889

Figure 3
Measurement Model



Structural Model

The study's second stage was evaluating the structural model used to test the hypotheses. Testing began with the analysis of the model fit index. The test results show that the structural model fitted the empirical data (χ^2 = 64.13, df = 28, p < .001, GFI = .969, AGFI = .938, RMSEA = .058 [90% CI = .039 - .077, p = .219], λ = .840 - .954, p < .001 (Wang & Wang, 2019). Although the chi-square p-value was not met because the index is very sensitive to sample size (Nugraha et al., 2024), the researchers considered other fit indices that were more stable to sample variation (such as the RMSEA p-value), which showed a good fit. Therefore, the proposed structural model was declared fit and feasible for use in further hypothesis testing. Table 3 shows that grit has a positive and significant effect on academic self-

efficacy (β = .777; t = 16.153 > 1.96), of which 62.1% (R^2 = .621) of grit contributes to academic self-efficacy. Consequently, H1 is accepted.. The analysis results also showed a significant favorable influence of academic self-efficacy on academic performance (β = .168; t = 6.481 > 1.96), so H2 was also accepted. The test results in relation to the third hypothesis also showed that grit positively and significantly affected academic performance (β = .013; t = 1.122 < 1.96), so H3 was rejected.

With regard to the fourth hypothesis, a significant negative influence of academic stress on performance (β = -.206; t = -10.983 > 1.96) was also shown. In addition, the indirect influence was used to observe the effect of the mediation variables, which reported a significant positive influence of grit on academic performance mediated by academic self-efficacy (β = .130; t = 6.366 > 1.96). Therefore, H5 was accepted. Without a direct effect of grit on academic performance, academic self-efficacy provides a full effect, also known as perfect mediation (Hair et al., 2017; Hayes, 2022).

The interaction effect of academic stress and academic self-efficacy also showed significant results (β = .027; t = 5.850 > 1.96), meaning academic self-efficacy moderates the effect of academic stress on academic performance. Although students experience academic stress due to pressure from study and workload, if they have belief in their ability to overcome it (academic self-efficacy), this enables their academic performance to improve; H6 was therefore accepted. The results of the structural model test (Figure 4) show that the proposed theoretical model contributes 72.9% (R^2 = .729) to explaining academic performance.

Table 3

Results of Hypothesis Testing

Variable	β	SE	*t*	Remarks
Grit ➔ Academic self-efficacy	.777	.048	16.153	H1 Accepted
Academic self-efficacy➔ Academic performance	.168	.025	6.481	H2 Accepted
Grit ➔ Academic performance	.013	.011	1.122	H3 Rejected
Academic stress➔ Academic performance	-.206	.018	-10.983	H4 Accepted
Grit ➔ Academic self-efficacy ➔ Academic performance	.130	.020	6.366	H5 Accepted
Academic stress x Academic self-efficacy ➔ Academic performance	.027	.004	5.850	H6 Accepted

Table 4

Comparison of Simple Linear Regression Models with Academic Performance as a Function of Grit or Academic Stress

Predictors	Model 1 (Grit)		Model 2 (Academic Stress)	
	Regression Model 1	Monte Carlo Simulation	Regression Model 2	Monte Carlo Simulation
Intercept	2.408 (SE = .06)	2.408	4.202 (SE = .05)	4.202
Consistency of Interest	0.157 (SE = .02)	0.156		
Perseverance of Effort	0.360 (SE = .02)	0.360		
Pressure to Study			-0.107 (SE = .02)	-0.107
Workload			-0.128 (SE = .02)	-0.128
Sigma	0.36		0.411	0.410

Figure 4

Structural Equation Modelling

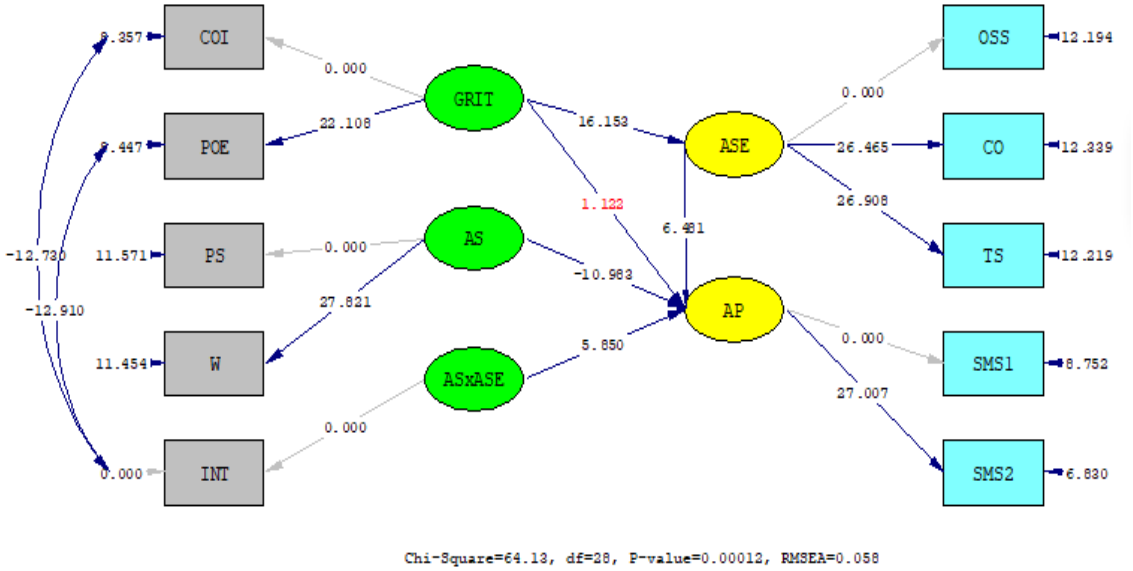
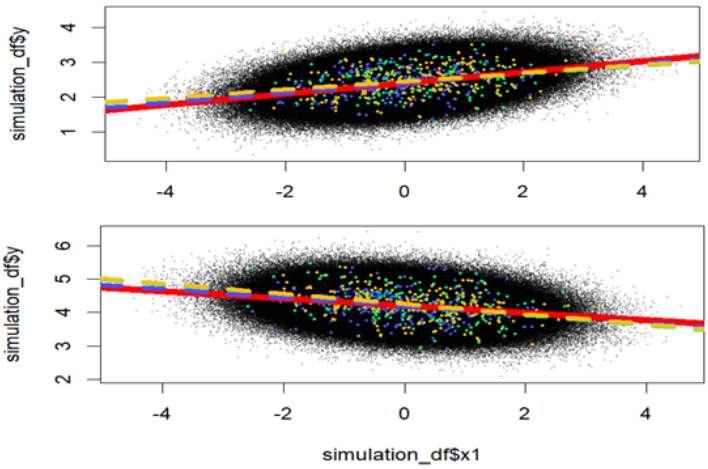


Figure 5

Association between Consistency of Interest (Top) or Pressure to Study (Bottom) and Academic Performance



Sensitivity Analysis

The sensitivity analysis conducted showed robust evidence that academic stress is negatively associated with academic performance. The findings were consistent across the SEM, linear regression model, and Monte Carlo simulated model, as shown in Table 4, Model 2. For instance, higher pressure to study was associated with lower academic performance (β = -0.107, *SE* = 0.02). However, Model 1 in the sensitivity analysis

showed a different result compared to the initial finding, where grit was not associated with academic performance (H3 rejected). On the contrary, the linear regression model indicated that grit was associated with higher levels of academic performance. For example, students with consistent interest had higher academic performance (β = 0.157, *SE* = 0.02). Figure 5 illustrates the described associations. The implications of this sensitivity analysis will be discussed thoroughly in the following section.

Discussion

The Effect of Grit on Academic Self-efficacy

The study findings show that grit has a positive and significant effect on academic self-efficacy. This aligns with research conducted by Jung and Jeong (2018), which showed that grit influenced the academic self-efficacy of nursing students at H University located in Y City. Academic self-efficacy focuses on students' beliefs regarding their ability to master new skills and tasks, especially in certain academic domains (e.g., mathematical reasoning, logical analysis, and critical thinking). It is related to an individual's belief in their ability to meet specific achievements, in this case, academic performance (Hayat et al., 2020; Khan, 2023; Lei et al., 2022; Schunk & DiBenedetto, 2022).

Effects of Academic Self-efficacy on Academic Performance

The findings show a significant positive influence of academic self-efficacy on academic performance, which aligns with the research of Akomolafe et al. (2013), which showed that academic self-efficacy improved student academic performance of students significantly ($\beta = 0.27$, $t = 5.55$; $p < .05$). Several studies demonstrate that academic self-efficacy plays a role in encouraging students to complete assignments, helping them deal with academic pressure; influencing their motivation and achievement of academic tasks; and contributing to determining the amount of effort they put into completing them (Gündoğdu et al., 2020).

Effect of Grit on Academic Performance

The study findings indicate that grit has no effect on academic achievement. This implies that students find it difficult to focus and be consistent in completing all their tasks in order to achieve academic success. It is also consistent with previous research which has shown that grit is not a significant contributor to academic performance (Bazelais et al., 2016). In another study, grit did not contribute to GPA achievement among first-year college students (Stewart, 2015). One reason for this is that academic success is often influenced by other factors, such as cognitive ability, time management, social support, and effective study skills. Therefore, although grit plays a role in persistence, academic success may be more determined by specific skills that support the completion of academic tasks.

Effects of Academic Stress on Academic Performance

The study findings show a significant negative influence of academic stress on academic performance. This result is in line with research conducted by Sohail (2013), which showed that amongst 250 students who completed survey questionnaires and took part in in-depth interviews, there was a negative ($B = -0.478$) and significant ($p < 0.01$) correlation between academic stress and academic performance.

Online learning can affect students due to confusion and stress, a lack of creativity, lower productivity, and a tendency to be passive. When students experience high stress levels due to unprecedented academic pressure will result in poor concentration and impact their academic performance (Chandra, 2020; Kulal & Rahiman, 2023).

Effect of Academic Self-efficacy Mediation on the Effect of Grit on Academic Performance

A significant positive influence of grit on academic self-efficacy mediated by academic self-efficacy was shown. This aligns with Jiang et al.'s research (2023), based on student participants' responses to an online survey containing demographic items and research scales. Their results showed that grit positively affected academic performance mediated by academic self-efficacy. The analysis model reveals that academic self-efficacy can play a supportive and protective role by increasing the positive effects of grit in achieving maximum academic performance and reducing the negative effects of avoidance on academic performance.

Effect of Academic Self-efficacy Moderators on the Effect of Academic Stress on Academic Performance

The findings in this study show that the influence of the interaction between academic stress and academic self-efficacy on academic achievement is significant, so it can be said that the influence of academic stress on academic achievement is moderated by academic self-efficacy. These results align with research conducted by You (2018) on 483 Korean students, which found a significant interaction effect of academic stress and academic performance moderated by academic self-efficacy. Students with solid motivation are less affected by a stressful environment and demands that cause academic stress. In addition, academic stress is not a negative factor and can be a catalyst for improving academic performance in some conditions.

The sensitivity analysis showed inconclusive results regarding the association between grit and academic performance (H3 rejected). It is possible that the SEM provided a more accurate result, as the model was fitted by controlling for other factors, such as self-efficacy, compared to the simple linear regression model. However, it is also important to note that the SEM results might be biased due to the measurement model of grit consisting of only two components (consistency of interest and perseverance of effort). Additionally, the measurement model aggregated all covariate variables. Future studies may achieve a better-fitting model by utilizing all items and components of the grit scale, rather than opting for the brief version. Consequently, future research should further explore the potential positive impact of grit on academic performance.

Conclusion

In conclusion, the study has highlighted the significant impact of academic self-efficacy on academic performance in the context of online learning. Academic self-efficacy positively influences academic performance, indicating that students who believe in their abilities are more likely to perform well. Moreover, academic self-efficacy has been revealed to moderate the relationship between academic stress and academic performance among postgraduate students. The findings underscore the importance of fostering academic self-efficacy to enhance academic performance, particularly in the online learning environment. These insights can inform educational strategies and interventions aimed at supporting students in achieving their academic goals effectively.[]

Author Contribution Statement

Muh. Daud: Conceptualization; Data Curation; Investigation; Methodology; Project Administration; Writing Original Draft; Writing, Review & Editing**. Dian Novita Siswanti:** Methodology; Writing, Review & Editing; Validation. **Dwi Yan Nugraha:** Formal Analysis; Visualization; Writing, Review & Editing. **Edwin Adrianta Surijah:** Validation, Visualization; Writing, Review & Editing.

References

Abdelrahman, R. M. (2020). Metacognitive awareness and academic motivation and their impact on academic achievement of Ajman University students. *Heliyon*, *6*(9), e04192. https://doi.org/10.1016/j.heliyon.2020.e04192

Akomolafe, M. J., Ogunmakin, A. O., & Fasooto, G. M. (2013). The role of academic self-efficacy, academic motivation and academic self-concept in predicting secondary school students' academic performance. *Journal of Educational and Social Research*, *3*(2), 335–342. https://doi.org/10.5901/jesr.2013.v3n2p335

Alhadabi, A., & Karpinski, A. C. (2020). Grit, self-efficacy, achievement orientation goals, and academic performance in University students. *International Journal of Adolescence and Youth*, *25*(1), 519–535. https://doi.org/10.1080/02673843.2019.1679202

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*(3), 411–423. https://doi.org/10.1037/0033-2909.103.3.411

Appelbaum, M., Cooper, H., Kline, R. B., Mayo-Wilson, E., Nezu, A. M., & Rao, S. M. (2018). Journal article reporting standards for quantitative research in psychology: The APA Publications and Communications Board task force report. *American Psychologist*, *73*(1), 3–25. https://doi.org/10.1037/amp0000191

Ardis, N., & Aliza, M. (2021). Grit as a solution for academic stress in students during the covid-19 pandemic. *Proceding of Inter-Islamic University Conference on Psychology*, *1*(1). https://press.umsida.ac.id/index.php/iiucp/article/view/622

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman & Company.

Bazelais, P., Lemay, D. J., & Doleck, T. (2016). How does grit impact college students' academic achievement in science? *European Journal of Science and Mathematics Education*, *4*(1), 33–43. https://doi.org/10.30935/scimath/9451

Buzzetto-Hollywood, N., Quinn, K., Wang, W., & Hill, A. (2019). Grit in online education. *Journal of Education, Society and Behavioural Science*, *30*(4), 1–11. https://doi.org/10.9734/jesbs/2019/v30i430132

Camacho-Morles, J., Slemp, G. R., Pekrun, R., Loderer, K., Hou, H., & Oades, L. G. (2021). Activity achievement emotions and academic performance: A meta-analysis. *Educational Psychology Review*, *33*(3), 1051–1095. https://doi.org/10.1007/s10648-020-09585-3

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, *287*, 112934. https://doi.org/10.1016/j.psychres.2020.112934

Chandra, Y. (2020). Online education during COVID-19: perception of academic stress and emotional intelligence coping strategies among college students. *Asian Education and Development Studies*, *10*(2), 229–238. https://doi.org/10.1108/AEDS-05-2020-0097

Cheng, Y. (2020). Academic self-efficacy and assessment. *Educational Psychology*, *40*(4), 389–391. https://doi.org/10.1080/01443410.2020.1755501

Çınar-Tanrıverdi, E., & Karabacak-Çelik, A. (2023). Psychological need satisfaction and academic stress in college students: mediator role of grit and academic self-efficacy. *European Journal of Psychology of Education*, *38*(1), 131–160. https://doi.org/10.1007/s10212-022-00658-1

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Daud, M., Siswanti, D. N., & Nugraha, D. Y. (2024). The role of meaningful work as a mediation of political organizations on employee engagement. *Jurnal Psikologi Perseptual*, *9*(1), 77–88. https://doi.org/10.24176/perseptual.v9i1.11389

Duckworth, A. L., Copeland, M., Polson, S. H., & Chamorro-Premuzic, T. (2023). *Grit*. Harvard Business Review Press.

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, *92*(6), 1087–1101. https://doi.org/10.1037/0022-3514.92.6.1087

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale (Grit–S). *Journal of Personality Assessment*, *91*(2), 166–174. https://doi.org/10.1080/00223890802634290

Field, A. P. (2013). *Discovering statistics using IBM SPSS statistics*. SAGE.

Greco, A., Annovazzi, C., Palena, N., Camussi, E., Rossi, G., & Steca, P. (2022). Self-efficacy beliefs of university students: Examining factor validity and measurement invariance of the new academic self-efficacy scale. *Frontiers in Psychology*, *12*, 498824. https://doi.org/10.3389/fpsyg.2021.498824

Gündoğdu, K., Dursun, F., & Saracaloğlu, A. S. (2020). Investigation of educational philosophies and general self-efficacy perceptions of graduate students in educational sciences programs. *Psycho-Educational Research Reviews*, *9*(1), 21–32.

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). SAGE Publications, Inc.

Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). *Multivariate data analysis* (7th ed.). Prentice Hall International.

Halperin, O., & Eldar Regev, O. (2021). Predicting academic success based on perseverance and passion for long-term goals (grit) among nursing students: Is there a cultural context? *Nurse Education Today*, *100*, 104844. https://doi.org/10.1016/j.nedt.2021.104844

Hayat, A. A., Shateri, K., Amini, M., & Shokrpour, N. (2020). Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: a structural equation model. *BMC Medical Education*, *20*(1), 76. https://doi.org/10.1186/s12909-020-01995-9

Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (3rd ed.). The Guilford Press.

Honicke, T., Broadbent, J., & Fuller-Tyszkiewicz, M. (2020). Learner self-efficacy, goal orientation, and academic achievement: Exploring mediating and moderating relationships. *Higher Education Research & Development*, *39*(4), 689–703. https://doi.org/10.1080/07294360.2019.1685941

Hwang, M.-H., & Nam, J. K. (2021). Enhancing grit: Possibility and intervention strategies. In *Multidisciplinary perspectives on grit: Contemporary theories, assessments, applications and critiques* (pp. 77–93). Springer International Publishing. https://doi.org/10.1007/978-3-030-57389-8_5

International Test Commission. (2017). *ITC guidelines for translating and adapting tests* (2nd ed.). https://www.intestcom.org/files/guideline_test_adaptation_2ed.pdf

Jiang, L., Zhang, S., Li, X., & Luo, F. (2023). How grit influences high school students' academic performance and the mediation effect of academic self-efficacy and cognitive learning strategies. *Current Psychology*, *42*(1), 94–103. https://doi.org/10.1007/s12144-020-01306-x

Jung, M.-R., & Jeong, E. (2018). Effects of academic stress, academic self-efficacy and major satisfaction in nursing student on grit. *The Journal of the Korea Contents Association*, *18*(6), 414–423. https://koreascience.or.kr/article/JAKO201820159116259.pdf

Khan, M. (2023). Academic self-efficacy, coping, and academic performance in college. *International Journal of Undergraduate Research and Creative Activities*, *5*(1), 3.

Kulal, A., & Rahiman, H. U. (2023). COVID-19 anxiety and uncertainty of classes: Devastating effect on students' academic behavior and performance. *F1000Research*, *12*, 179. https://doi.org/10.12688/f1000research.126095.1

Lei, W., Wang, X., Dai, D. Y., Guo, X., Xiang, S., & Hu, W. (2022). Academic self-efficacy and academic performance among high school students: A moderated mediation model of academic buoyancy and social support. *Psychology in the Schools*, *59*(5), 885–899. https://doi.org/10.1002/pits.22653

MacCann, C., Jiang, Y., Brown, L. E. R., Double, K. S., Bucich, M., & Minbashian, A. (2020). Emotional intelligence predicts academic performance: A meta-analysis. *Psychological Bulletin*, *146*(2), 150–186. https://doi.org/10.1037/bul0000219

Morell, M., Yang, J. S., Gladstone, J. R., Turci Faust, L., Ponnock, A. R., Lim, H. J., & Wigfield, A. (2021). Grit: The long and short of it. *Journal of Educational Psychology*, *113*(5), 1038–1058. https://doi.org/10.1037/edu0000594

Moss-Pech, S. A., Southward, M. W., & Cheavens, J. S. (2021). Hope attenuates the negative impact of general psychological distress on goal progress. *Journal of Clinical Psychology*, *77*(6), 1412–1427. https://doi.org/10.1002/jclp.23087

Nugraha, D. Y., Nashori, F., & Muwaga, M. (2024). Roles of muthmainnah personality and alexithymia in dealing with mental health problems among university students. *INSPIRA: Indonesian Journal of Psychological Research*, *5*(1), 83–94. https://doi.org/10.32505/inspira.v5i1.8496

Nugraheni, R. F. (2016). Kesabaran dan academic self-efficacy pada mahasiswa. *Psikologika: Jurnal Pemikiran dan Penelitian Psikologi*, *21*(1), 78–86. https://doi.org/10.20885/psikologika.vol21.iss1.art8

Özhan, M. B. (2021). Academic self-efficacy and school burnout in university students: Assessment of the mediating role of grit. *Current Psychology*, *40*(9), 4235–4246. https://doi.org/10.1007/s12144-021-02023-9

Ragab, E. A., Dafallah, M. A., Salih, M. H., Osman, W. N., Osman, M., Miskeen, E., Taha, M. H., Ramadan, A., Ahmed, M., Abdalla, M. E., & Ahmed, M. H. (2021). Stress and its correlates among medical students in six medical colleges: an attempt to understand the current situation. *Middle East Current Psychiatry*, *28*(1), 75. https://doi.org/10.1186/s43045-021-00158-w

Rudland, J. R., Golding, C., & Wilkinson, T. J. (2020). The stress paradox: How stress can be good for learning. *Medical Education*, *54*(1), 40–45. https://doi.org/10.1111/medu.13830

Schimschal, S. E., Visentin, D., Kornhaber, R., & Cleary, M. (2021). Grit: A concept analysis. *Issues in Mental Health Nursing*, *42*(5), 495–505. https://doi.org/10.1080/01612840.2020.1814913

Schunk, D. H., & DiBenedetto, M. K. (2022). Academic self-efficacy. In *Handbook of positive psychology in schools* (pp. 268–282). Routledge. https://doi.org/10.4324/9781003013778-21

Shadi, M., Peyman, N., Taghipour, A., & Tehrani, H. (2018). Predictors of the academic stress and its determinants among students based on the theory of planned behavior. *Journal Fundamentals of Mental Health*, *20*(1), 87–98. https://jfmh.mums.ac.ir/article_10060.html?lang=en

Siswanti, D. N., Daud, M., Nugraha, D. Y., Zhalifunnas, M. S., & Nugraha, D. R. (2024). The effect of workplace well-being on task performance in employees: The mediating role of work engagement. *Gadjah Mada Journal of Professional Psychology (GamaJPP)*, *10*(2), 98–104. https://doi.org/10.22146/gamajpp.90500

Sohail, N. (2013). Stress and academic performance among medical students. *Journal of the College of Physicians and Surgeons--Pakistan : JCPSP*, *23*(1), 67–71. http://www.ncbi.nlm.nih.gov/pubmed/23286627

Stewart, S. B. (2015). *Grit and self-control as predictors of first-year student success [Doctoral thesis]*. University of Southern Maine.

Stockinger, K., Rinas, R., & Daumiller, M. (2021). Student adaptability, emotions, and achievement: Navigating new academic terrains in a global crisis. *Learning and Individual Differences*, *90*, 102046. https://doi.org/10.1016/j.lindif.2021.102046

Sulla, F., Aquino, A., & Rollo, D. (2022). University students' online learning during COVID-19: The role of grit in academic performance. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.825047

Sun, J., Dunne, M. P., Hou, X., & Xu, A. (2011). Educational stress scale for adolescents. *Journal of Psychoeducational Assessment*, *29*(6), 534–546. https://doi.org/10.1177/0734282910394976

Travis, J., Kaszycki, A., Geden, M., & Bunde, J. (2020). Some stress is good stress: The challenge-hindrance framework, academic self-efficacy, and academic outcomes. *Journal of Educational Psychology*, *112*(8), 1632.

Verner-Filion, J., Schellenberg, B. J. I., Holding, A. C., & Koestner, R. (2020). Passion and grit in the pursuit of long-term personal goals in college students. *Learning and Individual Differences*, *83–84*, 101939. https://doi.org/10.1016/j.lindif.2020.101939

Wang, J., & Wang, X. (2019). *Structural equation modeling: Applications using Mplus*. John Wiley & Sons.

Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis*. Springer International Publishing. https://doi.org/10.1007/978-3-319-24277-4

Wickham, H., Chang, W., Henry, L., Takahashi, K., Wilke, C., Woo, K., Yutani, H., Dunnington, D., & Brand, T. van den. (2023). *RStudio ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics*.

You, J. W. (2018). Testing the three-way interaction effect of academic stress, academic self-efficacy, and task value on persistence in learning among Korean college students. *Higher Education*, *76*(5), 921–935. https://doi.org/10.1007/s10734-018-0255-0

Zhao, H., Li, Y., Wan, L., & Li, K. (2023). Grit and academic self-efficacy as serial mediation in the Relationship between growth mindset and academic delay of gratification: A cross-sectional study. *Psychology Research and Behavior Management*, *16*, 3185–3198. https://doi.org/10.2147/PRBM.S421544

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