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Investigating the Causal Relationship Between Achievement Motivation and Academic Optimism with Grit, Mediated by Self-Regulation

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A B S T R A C T

Objective: The present study aimed to examine the structural relationships between achievement motivation and academic optimism with grit, considering the mediating role of academic self-regulation among university students.

Methods and Materials: This study employed a descriptive correlational design using structural equation modeling (SEM). The statistical population consisted of undergraduate students enrolled during the 2019–2020 academic year at Shahid Chamran University of Ahvaz, from which 230 participants were selected through convenience sampling. Data were collected using four standardized instruments: the Achievement Motivation Questionnaire (Hermans), the Academic Optimism Scale (Tschannen-Moran et al.), the Academic Self-Regulated Learning Strategies Questionnaire (Zimmerman & Martinez-Pons), and the Grit Scale (Duckworth et al.). The validity of the instruments was assessed through confirmatory factor analysis, and reliability was confirmed using Cronbach's alpha coefficients. Data analysis was conducted using SPSS version 24 and AMOS version 24, and the bootstrap method was applied to test indirect effects.

Findings: The results of SEM indicated that achievement motivation had a significant direct effect on academic self-regulation and grit. Academic self-regulation also had a significant direct effect on grit. Academic optimism showed a significant direct effect on grit but did not have a significant direct effect on academic self-regulation. Furthermore, achievement motivation had a significant indirect effect on grit through academic self-regulation, confirming the mediating role of self-regulation. However, the indirect effect of academic optimism on grit through academic self-regulation was not statistically significant. Overall, the final model demonstrated an acceptable fit to the data based on standard fit indices.

Conclusion: The findings highlight the central role of achievement motivation in enhancing both self-regulated learning and grit, as well as the importance of self-regulation as a key mechanism linking motivation to perseverance.

Keywords: *Achievement motivation, academic optimism, grit, academic self-regulation*

1. Introduction

Academic success in higher education has increasingly been conceptualized as a multifaceted phenomenon shaped by the dynamic interplay of cognitive, motivational, and affective variables. Among these, achievement motivation, academic optimism, self-regulated learning, and grit have emerged as key psychological constructs that significantly influence students' academic trajectories. Contemporary research emphasizes that academic performance is not solely determined by intellectual ability but is strongly associated with motivational dispositions and self-regulatory capacities that enable students to sustain effort and overcome challenges in complex learning environments (Stajkovic et al., 2018). In this regard, the integration of these constructs within a unified explanatory framework offers a more comprehensive understanding of students' academic functioning.

Achievement motivation is widely recognized as a central determinant of students' engagement and persistence in academic tasks. It reflects the internal drive to accomplish goals, attain competence, and achieve excellence in educational settings. Empirical studies have consistently demonstrated that students with higher levels of achievement motivation exhibit greater academic effort, persistence, and performance outcomes (Bin Abdulrahman et al., 2023; Wattanavit & Sakdapat, 2024). Moreover, recent research has highlighted the role of achievement motivation as a precursor to adaptive learning behaviors, including the use of self-regulated learning strategies, which facilitate goal attainment and academic success (Altikulaç et al., 2025). These findings suggest that achievement motivation not only directly influences academic outcomes but also operates through intermediate psychological mechanisms.

One such mechanism is self-regulated learning, which has been extensively studied as a core process underlying effective learning. Self-regulated learning refers to learners' active control over their cognitive, motivational, and behavioral processes in pursuit of academic goals. It involves planning, monitoring, and evaluating one's learning activities and is considered a critical determinant of academic success (Panadero, 2017). Research indicates that students who employ self-regulated learning strategies are better equipped to manage their learning tasks, adapt to challenges, and maintain motivation over time (Fernandez-Rio et al., 2018). Furthermore, self-regulation has been shown to mediate the relationship between motivational factors and academic outcomes, underscoring its pivotal role in educational psychology (Henry & Liu, 2024; Nuryana & Wahyuni, 2025).

In parallel, the construct of grit, defined as perseverance and passion for long-term goals, has gained substantial attention in recent years as a predictor of sustained academic achievement. Grit captures an individual's capacity to maintain consistent effort and interest over extended periods despite setbacks and difficulties (Duckworth et al., 2007). Empirical evidence supports the predictive validity of grit across various domains, including education, where it has been linked to academic persistence, retention, and performance (Eskreis-Winkler et al., 2014; Gruenberg et al., 2019). Moreover, longitudinal studies have demonstrated reciprocal relationships between grit and academic achievement, indicating that these constructs mutually reinforce each other over time (Jiang et al., 2019). Meta-analytic findings further confirm the robustness of grit as a cross-cultural predictor of academic success (Lam & Zhou, 2022).

Despite the growing body of research on grit, scholars have increasingly emphasized the need to examine its antecedents and underlying mechanisms. In this context, achievement motivation and self-regulated learning have been identified as critical factors contributing to the development of grit. For instance, motivated students are more likely to adopt self-regulatory strategies that sustain their effort and commitment, thereby fostering perseverance (Guo et al., 2023). Similarly, self-regulated learning processes enable students to maintain focus on long-term goals, which is a defining characteristic of grit. Recent studies have provided empirical support for these relationships, highlighting the mediating role of self-regulation in the link between motivation and grit (Obeng et al., 2025).

Another important psychological construct relevant to academic functioning is academic optimism. Academic optimism refers to a composite belief system encompassing trust in educators, academic emphasis, and a sense of collective efficacy within the educational environment (Tschannen-Moran et al., 2013). This construct reflects students' positive expectations regarding academic success and their confidence in the supportive nature of their learning context. Research has shown that academic optimism is associated with higher levels of academic achievement, engagement, and resilience (Hayat et al., 2022). Additionally, academic optimism has been linked to adaptive motivational and self-regulatory processes,

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suggesting that optimistic students are more likely to engage in effective learning behaviors (Jafari et al., 2024).

The relationship between academic optimism and grit is also of particular interest. Optimistic students tend to perceive challenges as opportunities for growth, which may enhance their perseverance and long-term commitment to academic goals. Studies have indicated that optimism contributes to resilience and sustained effort, both of which are integral components of grit (Gomez-Molinero et al., 2018). However, the mechanisms through which academic optimism influences grit remain underexplored, particularly in relation to the mediating role of self-regulated learning. Understanding these pathways is essential for developing comprehensive models of student success.

Furthermore, the interplay between achievement motivation, academic optimism, and self-regulated learning highlights the complexity of academic behavior. Motivation provides the initial drive for engagement, optimism shapes students' expectations and attitudes, and self-regulation enables the effective execution of learning strategies. Together, these factors create a synergistic effect that enhances students' ability to persist in the face of challenges and achieve their academic goals. Empirical research supports this integrative perspective, demonstrating that the combined influence of motivational and self-regulatory variables accounts for a significant proportion of variance in academic outcomes (Fatmala, 2025; Makara & Karabenick, 2017).

In addition to these constructs, personality-related factors such as self-efficacy and goal orientation have been shown to interact with motivation and self-regulation in shaping academic performance. For example, self-efficacy beliefs influence students' confidence in their ability to succeed, which in turn affects their motivation and use of self-regulatory strategies (Stajkovic et al., 2018). Similarly, goal orientation determines the extent to which students are focused on mastery versus performance outcomes, influencing their engagement and persistence. These findings underscore the importance of adopting a holistic approach to understanding academic behavior.

Methodologically, structural equation modeling (SEM) has been widely used to examine the complex relationships among psychological variables in educational research. SEM allows for the simultaneous analysis of direct and indirect effects, providing a robust framework for testing theoretical models. Previous studies have successfully employed SEM to investigate the mediating role of self-regulated learning in the relationship between motivation and academic outcomes (Beshlideh, 2018). This approach enables researchers to identify the pathways through which psychological constructs influence each other and to evaluate the overall fit of the proposed model.

Despite the extensive research on achievement motivation, academic optimism, self-regulated learning, and grit, there remains a need for integrative studies that examine these constructs within a unified framework. In particular, the mediating role of self-regulated learning in the relationships between achievement motivation, academic optimism, and grit has not been sufficiently explored. Addressing this gap is crucial for advancing theoretical understanding and informing educational interventions aimed at enhancing student success.

Given the increasing emphasis on student-centered learning and the development of lifelong learning skills, understanding the psychological factors that contribute to academic persistence and success is of paramount importance. Educational institutions are tasked with fostering environments that support students' motivation, optimism, and self-regulatory capacities, thereby enabling them to achieve their full potential. By examining the interrelationships among these constructs, researchers can provide valuable insights into the mechanisms underlying academic success and inform evidence-based practices.

Therefore, the aim of the present study is to investigate the structural relationships between achievement motivation and academic optimism with grit, considering the mediating role of academic self-regulation among university students.

2. Methods and Materials

2.1. Study Design and Participants

The present study is a descriptive correlational study employing structural equation modeling (SEM). The statistical population consisted of all undergraduate students of Shahid Chamran University of Ahvaz who were enrolled during the 2019–2020 academic year, with a total population of approximately 6,500 students. Sampling was conducted using a convenience sampling method. Accordingly, given that the proposed model included eight parameters (paths), 30 participants were considered per parameter, resulting in a total estimated sample size of 240 individuals. The questionnaires were administered online, and ultimately 230 participants completed the questionnaires, constituting the final sample of the study (response rate = 95.8%).

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2.2. Instruments

Achievement Motivation Questionnaire: In the present study, the Achievement Motivation Questionnaire developed by Johannes J. Hermans (1987) was used to measure achievement motivation. Hermans designed 29 items based on ten distinguishing characteristics of individuals with high versus low achievement motivation. The scoring of the questionnaire is conducted using a Likert-type scale, where responses are assigned values from 1 to 4 or 4 to 1 depending on the direction of the items. Higher scores indicate higher levels of achievement motivation, whereas lower scores reflect lower levels of achievement motivation. The minimum possible score is 29 and the maximum is 116. Aboighasemi (2004) reported the reliability of the Achievement Motivation Questionnaire using Cronbach's alpha coefficient as 0.79. In the present study, the reliability coefficients calculated using Cronbach's alpha and split-half methods were 0.77 and 0.78, respectively. Validity was assessed using initial confirmatory factor analysis, which indicated that items 4, 10, 11, 15, 20, 24, 25, and 29 did not have acceptable factor loadings (less than 0.30); therefore, these items were removed, and the model fit indices for the 21-item version of the questionnaire were re-evaluated. Based on the RMSEA value of 0.051, the questionnaire demonstrated satisfactory validity.

Academic Optimism Scale: Academic optimism was measured using the Academic Optimism Scale developed by Megan Tschannen-Moran et al. (2013). This scale consists of 28 items and three subscales: student trust in teachers (10 items; items 1–10), academic emphasis (8 items; items 11–18), and school/university unity (10 items; items 19–28). Responses are scored on a five-point Likert scale ranging from 1 (very low) to 5 (very high). Items 17, 23, and 28 are reverse-scored. The total score is obtained by summing the scores of the three subscales, with a possible range from 28 to 140. Ghadampour et al. (2017) reported Cronbach's alpha coefficients for the subscales of student trust in teachers, academic emphasis, and school unity as 0.85, 0.95, and 0.90, respectively. In the present study, the reliability coefficients for the overall scale (0.94) and its subscales (student trust in teachers = 0.93, academic emphasis = 0.84, school unity = 0.87) were all acceptable (above 0.70) based on Cronbach's alpha. Confirmatory factor analysis was used to assess validity, and with an RMSEA value of 0.065, the scale demonstrated good model fit.

Academic Self-Regulated Learning Strategies Questionnaire: Academic self-regulation was measured using the Self-Regulated Learning Strategies Questionnaire developed by Barry J. Zimmerman and Manuel Martinez-Pons (1986). Zimmerman and Martinez-Pons identified 14 self-regulated learning strategies through interviews with 80 high school students and subsequently developed a 15-item questionnaire. These strategies include self-evaluation, organizing and transforming, goal setting and planning, seeking information, keeping records and monitoring, environmental structuring, self-consequences, rehearsing and memorizing, seeking peer assistance, seeking teacher assistance, seeking adult assistance, reviewing notes, reviewing assignments and tests, and reviewing textbooks. Responses are scored on a four-point Likert scale ranging from 1 (very low) to 4 (most of the time). The minimum score is 15 and the maximum score is 60. In the present study, reliability coefficients calculated using Cronbach's alpha and split-half methods were 0.76 and 0.70, respectively. Initial confirmatory factor analysis indicated that items 8, 13, 14, and 15 did not have acceptable factor loadings (less than 0.30); therefore, these items were removed, and the model fit indices for the 11-item version were re-evaluated. With an RMSEA value of 0.063, the questionnaire demonstrated acceptable validity.

Grit Scale: Grit was measured using the 17-item Grit Scale developed by Angela Duckworth et al. (2007). This scale is scored using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items 2, 3, 5, 7, 8, and 11 are reverse-scored. The total score ranges from 12 to 60. Angela Duckworth et al. (2007) reported a Cronbach's alpha coefficient of 0.85 for the scale. Hosseni et al. (2018) also reported a reliability coefficient of 0.84 using Cronbach's alpha. In the present study, reliability coefficients based on Cronbach's alpha and split-half methods were 0.79 and 0.71, respectively. Initial confirmatory factor analysis indicated that items 3, 5, 7, and 16 did not have acceptable factor loadings (less than 0.30); therefore, these items were removed, and the model fit indices for the 13-item version were re-evaluated. With an RMSEA value of 0.079, the scale demonstrated acceptable validity.

2.3. Data analysis

To test the indirect (mediating) effects in the proposed model, the bootstrap method was employed using SPSS version 24 and AMOS version 24 software.

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3. Findings and Results

In this section, the demographic characteristics of the study participants, including gender and faculty of study, are reported as frequencies and percentages, and age is reported using the mean, standard deviation, minimum, and maximum values. Overall, the findings showed that, out of the 230 participants in this study, 136 were male and 94 were female, with frequency percentages of 59.1% and 40.9%, respectively. The participants' age range was between 19 and 39 years, with a mean and standard deviation of 21.61 and 3.62, respectively. Table 1 presents the descriptive findings related to the variables of the present study.

Table 1

Descriptive Findings Related to the Variables of the Present Study

Variables	Mean	Standard Deviation	Minimum Score	Maximum Score
Achievement Motivation	64.18	6.65	47	80
Academic Optimism	93.51	18.27	43	139
Academic Self-Regulation	32.09	5.37	16	43
Grit	51.04	6.47	29	65

According to Table 1, among the research variables, academic optimism had the highest mean score (93.51), whereas academic self-regulation had the lowest mean score (32.09). Pearson's zero-order correlation coefficient was used to examine the relationships among the research variables. Table 2 presents the results as a correlation coefficient matrix. These correlational analyses provide insight into the bivariate relationships among the study variables.

Table 2

Correlation Coefficients Among the Variables of the Present Study

Variables	1	2	3	4
1. Achievement Motivation	1			
2. Academic Optimism	0.51**	1		
3. Academic Self-Regulation	0.49**	0.37**	1	
4. Grit	0.65**	0.32**	0.32**	1

Before testing the proposed model, the underlying assumptions of structural equation modeling were examined to ensure that the data met the required conditions. Accordingly, four assumptions of structural equation modeling were assessed: missing data, outliers, normality, and multicollinearity. In the present study, because the questionnaires were administered online, there were no missing data. Outliers are scores located farther from the rest of the data and exceeding the expected range. There are two types of outliers: univariate and multivariate outliers. In the present study, univariate outliers were examined by calculating Z scores for the variables using SPSS version 24. The results showed that the scores of three participants (16, 36, and 225) were three standard deviations above or below the mean; therefore, these participants were excluded from the hypothesis testing analyses. The fit results of the proposed model and the final model are presented in Table 3.

Table 3

Fit Indices of the Proposed Model and the Final Model

Fit Indices	χ^2	df	χ^2/df	GFI	AGFI	TLI	CFI	IFI	RMSEA
Proposed Model	405.65	246	1.65	0.87	0.84	0.91	0.92	0.92	0.055
Final Model	326.99	240	1.36	0.89	0.86	0.95	0.96	0.96	0.041

As shown in Table 3, the relative chi-square index (χ^2/df = 1.65), goodness-of-fit index (GFI = 0.87), adjusted goodness-of-fit index (AGFI = 0.84), Tucker–Lewis index (TLI = 0.91), comparative fit index (CFI = 0.92), incremental fit index (IFI = 0.92), and root mean square error of approximation (RMSEA = 0.055) indicated an acceptable

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model fit. However, due to the non-significance of the direct path from academic optimism to academic self-regulation, this path was removed, and the model was reanalyzed.

According to the results presented in Table 3, the fit indices of the final model after removing the nonsignificant direct path from academic optimism to academic self-regulation, including relative chi-square (χ^2/df = 1.36), goodness-of-fit index (GFI = 0.89), adjusted goodness-of-fit index (AGFI = 0.86), Tucker–Lewis index (TLI = 0.95), comparative fit index (CFI = 0.96), incremental fit index (IFI = 0.96), and root mean square error of approximation (RMSEA = 0.041), indicated a desirable and acceptable fit of the final model to the data. Therefore, the final model had satisfactory goodness of fit. Table 4 presents the parameters related to the direct effects among the variables in the final research model.

Table 4

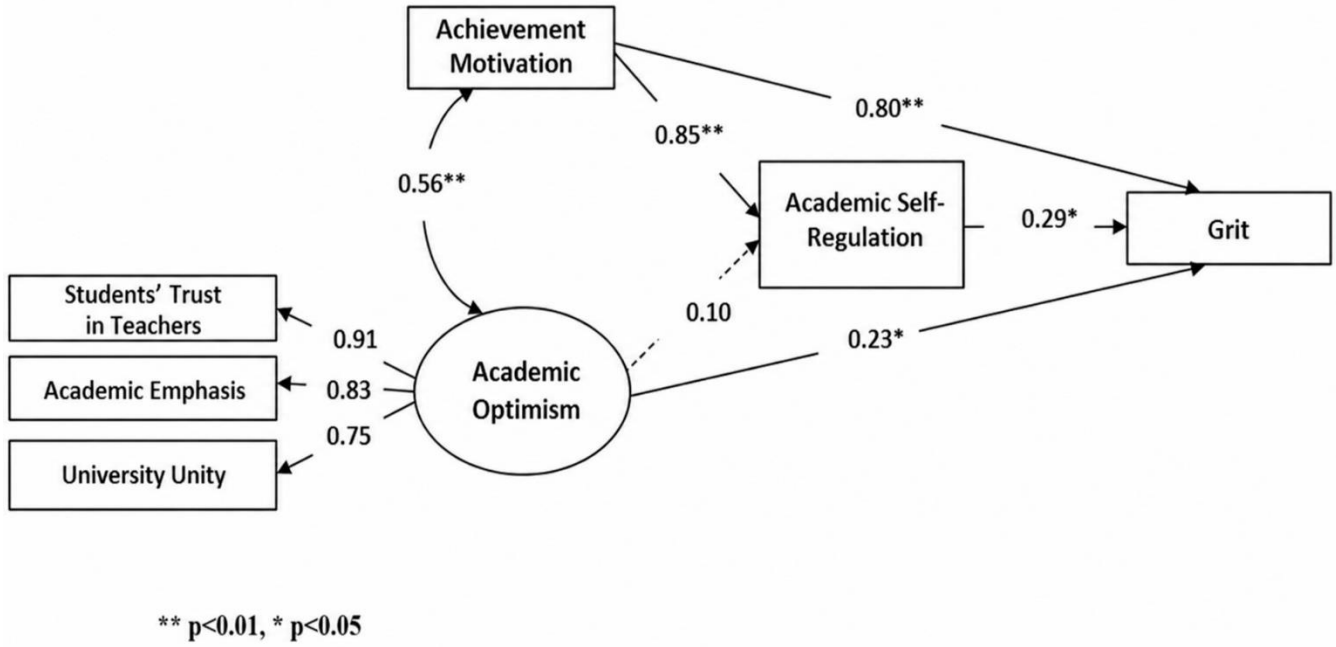
Parameters of Direct Effects Among the Research Variables in the Final Model

Path	B	β	C.R.	p	Result
Achievement Motivation → Academic Self-Regulation	0.83	0.85	4.33	0.0001	Hypothesis confirmed
Achievement Motivation → Grit	1.09	0.80	2.95	0.003	Hypothesis confirmed
Academic Optimism → Academic Self-Regulation	0.05	0.10	0.90	0.366	Hypothesis rejected
Academic Optimism → Grit	0.12	0.23	1.99	0.049	Hypothesis confirmed
Academic Self-Regulation → Grit	0.28	0.29	2.01	0.033	Hypothesis confirmed

As shown in Table 4, among the direct paths, the path from academic optimism to academic self-regulation was nonsignificant and was removed from the final model. Figure 1 shows the final model of the present study and the path coefficients.

Figure 1

The Final Model and Path Coefficients in the Present Study



** p<0.01, * p<0.05

To examine the hypotheses related to the direct relationships among the variables, the standardized path coefficients in the final model were used (Table 4), and the findings for each direct hypothesis/path were evaluated separately. Based on Table 4, the path coefficient between achievement motivation and academic self-regulation was β = 0.85, and the obtained critical ratio was 4.33, which was statistically significant at p = 0.0001. Therefore, the first hypothesis, stating that achievement motivation has a direct effect on academic self-regulation, was confirmed. The path

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coefficient between achievement motivation and grit was β = 0.80, and the obtained critical ratio was 2.95, which was statistically significant at p = 0.003. Therefore, the second hypothesis, stating that achievement motivation has a direct effect on grit, was confirmed. In addition, the path coefficient between academic optimism and academic self-regulation was β = 0.10, and the obtained critical ratio was 0.90, which was not statistically significant at p = 0.366. Therefore, the third hypothesis, stating that academic optimism has a direct effect on academic self-regulation, was rejected. Furthermore, the path coefficient between academic optimism and grit was β = 0.23, and the obtained critical ratio was 1.99, which was statistically significant at p = 0.049. Therefore, the fourth hypothesis, stating that academic optimism has a direct effect on grit, was confirmed. The path coefficient between academic self-regulation and grit was β = 0.29, and the obtained critical ratio was 2.01, which was statistically significant at p = 0.033. Therefore, the fifth hypothesis, stating that academic self-regulation has a direct effect on grit, was confirmed.

One underlying assumption of the proposed model of the present study was the existence of mediating paths. The bootstrap method was used to determine the significance of these mediating relationships. Given the nonsignificance of the path from academic optimism to academic self-regulation and its removal from the final model, only the mediating role of academic self-regulation in the relationship between achievement motivation and grit was examined. Table 5 presents the results obtained from the bootstrap method in AMOS version 24.

Table 5

Bootstrap Results for Mediating Paths

Path	Nonstandardized Indirect Effect	Standardized Indirect Effect	Lower Bound	Upper Bound	Significance Level
Achievement Motivation → Academic Self-Regulation → Grit	0.082	0.073	0.040	0.122	0.0001

As shown in Table 5, the indirect effect of achievement motivation on grit through academic self-regulation was 0.073, which was statistically significant at p < 0.0001. In addition, the lower bound of the confidence interval for academic self-regulation as the mediating variable between achievement motivation and grit was 0.040, and the upper bound was 0.122. The confidence level for this interval was 95%, and the number of bootstrap resamples was 2,000. Because zero was not included in this confidence interval, the indirect relationship between the variables was significant. Therefore, the sixth hypothesis, stating that achievement motivation has an indirect effect on grit through academic self-regulation, was confirmed. Given the nonsignificance of the path from academic optimism to academic self-regulation and its removal from the final model, the indirect path from academic optimism to grit through academic self-regulation could not be statistically examined. Therefore, the seventh hypothesis, stating that academic optimism has an indirect effect on grit through academic self-regulation, was rejected.

4. Discussion

The present study aimed to examine the structural relationships among achievement motivation, academic optimism, academic self-regulation, and grit, with a particular emphasis on the mediating role of self-regulation. The findings of the structural equation model revealed several important direct and indirect relationships that contribute to a deeper understanding of students' academic functioning. Overall, the results supported a model in which achievement motivation plays a central and multifaceted role, directly influencing both academic self-regulation and grit, while also exerting an indirect effect on grit through self-regulation. In contrast, academic optimism demonstrated a more selective pattern of influence, showing a direct relationship with grit but not with academic self-regulation.

One of the key findings of this study was the significant direct effect of achievement motivation on academic self-regulation. This result aligns with theoretical and empirical research emphasizing that motivated learners are more likely to engage in active learning processes, including planning, monitoring, and evaluating their academic behaviors. Achievement motivation provides the psychological energy necessary for initiating and sustaining self-regulatory strategies, which are essential for effective learning (Altikulaç et al., 2025; Panadero, 2017). This finding is consistent with prior studies demonstrating that students with higher motivation levels tend to exhibit stronger self-regulated learning behaviors and greater academic

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engagement (Fernandez-Rio et al., 2018; Henry & Liu, 2024). Moreover, the role of motivation as a precursor to self-regulation has been highlighted in models that conceptualize learning as a goal-directed process driven by internal motivational states (Nuryana & Wahyuni, 2025). Therefore, the present finding reinforces the notion that achievement motivation is a foundational determinant of students' capacity to regulate their own learning.

The results also indicated a strong direct effect of achievement motivation on grit. This finding suggests that students who are highly motivated to achieve are more likely to demonstrate persistence and sustained effort toward long-term academic goals. This relationship can be explained by the conceptual overlap between achievement motivation and the perseverance component of grit, as both constructs involve a commitment to goal attainment despite obstacles. Previous research has similarly reported positive associations between motivation and grit, indicating that motivated individuals are more resilient and persistent in challenging situations (Guo et al., 2023; Obeng et al., 2025). Furthermore, the theoretical framework proposed by Angela Duckworth emphasizes that grit is closely related to sustained motivation and goal commitment (Duckworth & Gross, 2014; Duckworth et al., 2007). The present findings thus contribute to the growing body of literature suggesting that achievement motivation serves as a key antecedent of grit in academic contexts.

Another important finding of the study was the significant direct effect of academic self-regulation on grit. This result highlights the role of self-regulatory processes in fostering students' perseverance and long-term engagement with academic goals. Self-regulated learners are better able to manage their time, maintain focus, and adapt their strategies in response to challenges, all of which contribute to the development of grit. This finding is consistent with previous research demonstrating that self-regulation is positively associated with persistence and academic resilience (Fernandez-Rio et al., 2018; Guo et al., 2023). In addition, studies have shown that self-regulated learning strategies enable students to sustain effort over time, thereby enhancing their capacity for long-term goal pursuit (Man-Chih, 2006). The present study extends this line of research by providing empirical evidence for the direct influence of self-regulation on grit within a structural model.

The mediating role of academic self-regulation in the relationship between achievement motivation and grit was also supported by the findings. Specifically, achievement motivation was found to have a significant indirect effect on grit through self-regulation. This result suggests that motivated students are more likely to engage in self-regulatory behaviors, which in turn enhance their perseverance and commitment to long-term goals. This mediation effect is consistent with prior studies that have identified self-regulation as a key mechanism linking motivation to academic outcomes (Altikulaç et al., 2025; Obeng et al., 2025). The findings also align with theoretical models that conceptualize self-regulation as a process through which motivational factors are translated into observable behaviors and outcomes (Panadero, 2017). Therefore, the present study provides further support for the integrative role of self-regulation in connecting motivational constructs with behavioral outcomes such as grit.

In contrast to the significant effects observed for achievement motivation, the relationship between academic optimism and academic self-regulation was not statistically significant. This finding suggests that, although academic optimism reflects positive beliefs about the educational environment and expectations for success, it may not directly translate into the use of self-regulatory strategies. This result is somewhat inconsistent with previous studies that have reported positive associations between optimism and adaptive learning behaviors (Hayat et al., 2022; Jafari et al., 2024). One possible explanation for this discrepancy is that academic optimism may operate through different mechanisms, such as enhancing emotional resilience or reducing anxiety, rather than directly influencing cognitive and behavioral regulation. Additionally, cultural or contextual factors may moderate the relationship between optimism and self-regulation, which warrants further investigation.

Despite the nonsignificant relationship with self-regulation, academic optimism was found to have a significant direct effect on grit. This finding indicates that students who hold positive expectations about their academic environment are more likely to demonstrate perseverance and sustained effort. This relationship can be explained by the role of optimism in fostering resilience and a positive outlook toward challenges, which are essential components of grit. Previous research has similarly highlighted the link between optimism and resilience, suggesting that optimistic individuals are better able to cope with adversity and maintain their commitment to long-term goals (Gomez-Molinero et al., 2018). Furthermore, academic optimism has been associated with higher levels of engagement and motivation, which may indirectly contribute to the development of grit (Ghadampour et al.,

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2017; Tschannen-Moran et al., 2013). The present findings thus underscore the importance of positive psychological dispositions in promoting students' perseverance.

5. Conclusion

Overall, the findings of this study support a comprehensive model in which achievement motivation, academic self-regulation, and academic optimism jointly contribute to the development of grit. The results highlight the central role of motivation in driving both self-regulatory processes and perseverance, while also demonstrating the selective influence of optimism on grit. These findings are consistent with previous research emphasizing the interconnected nature of motivational, cognitive, and affective factors in shaping academic outcomes (Jiang et al., 2019; Lam & Zhou, 2022). Moreover, the use of structural equation modeling in the present study provides a robust framework for understanding the complex relationships among these variables, thereby contributing to the advancement of theoretical models in educational psychology (Beshlideh, 2018).

6. Limitations & Suggestions

One of the main limitations of the present study is the use of a correlational design, which restricts the ability to draw causal inferences among the variables. Although structural equation modeling provides insights into directional relationships, it does not establish true causality. Additionally, the use of convenience sampling limits the generalizability of the findings to other populations and contexts. The reliance on self-report questionnaires may also introduce response biases, such as social desirability or common method variance. Furthermore, the study was conducted within a single university context, which may not fully capture the diversity of student experiences across different educational settings.

Future research should consider employing longitudinal or experimental designs to better examine causal relationships among achievement motivation, academic optimism, self-regulation, and grit. Expanding the sample to include students from diverse academic disciplines and cultural backgrounds would enhance the generalizability of the findings. Researchers are also encouraged to explore additional mediating and moderating variables, such as self-efficacy, emotional intelligence, and social support, to provide a more comprehensive understanding of academic behavior. Moreover, qualitative approaches could be used to gain deeper insights into students' lived experiences and the contextual factors influencing their motivation and perseverance.

From a practical perspective, educational institutions should design interventions aimed at enhancing students' achievement motivation and self-regulated learning skills, as these factors play a critical role in fostering grit. Training programs that focus on goal setting, time management, and reflective learning strategies can help students develop stronger self-regulatory capacities. Additionally, creating a supportive and optimistic academic environment may encourage students to maintain positive expectations and resilience in the face of challenges. Educators should also consider incorporating motivational and psychological skill-building components into the curriculum to promote students' long-term academic success and personal development.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed in this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

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