

THE Mediating Effect of Physical Education Attitude on the Relationship Between Grit and Academic Resilience of Junior High School STUDENTS

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ABSTRACT

The purpose of the study was to investigate the mediating effect of physical education attitude on the relationship between grit and academic resilience among junior high school students in physical education during the last quarter of 2024. The study employed quantitative, descriptive-correlational, and predictive designs with junior high school students from different schools in Carmen, Division of North Cotabato. Several adapted instruments were used, based on the work of various authors. Mean, standard deviation, Pearson's r , and mediation analysis were used to analyze the data. The results revealed the following: Grit was high; physical education attitude was also high and positive; and academic resilience was high. Significant relationships were found between grit and physical education attitude, as well as between physical education attitude and academic resilience. Physical education attitude partially mediated the relationship between grit and academic resilience.

KEYWORDS: *Physical education, grit, physical education attitude, academic resilience, Philippines.*

INTRODUCTION

Academic resilience means students achieving positive educational outcomes despite adversity. For schools, promoting academic resilience requires strategic planning and detailed practices that engage the whole school community to help vulnerable young people perform better than their circumstances might have predicted. Additionally, academic resilience is the ability to effectively deal with setbacks, stress, or pressure in the academic setting. With this way of working, schools can help not only to beat the odds for

individual pupils but also to change the odds for disadvantaged pupils across the board (Martin & Marsh, 2023). Academic resilience is the student's ability to bounce back from academic setbacks and challenges. It involves the capacity to persevere, adapt, and learn from difficulties, ultimately leading to academic success. Students who possess academic resilience are more likely to maintain motivation, focus, and a positive attitude towards their studies, even in the face of adversity (Masten, 2020).

Globally, the education sector underwent significant change, becoming increasingly dynamic (Kalaivani, 2021). With these changes, the development of children worldwide is threatened by several factors, and an integrated, evidence-based global science of resilience is urgently needed to mitigate risks and build academic resilience among learners. Academic resilience (Grotberg, 2021) describes how learners maintain wellness in their academic work and related areas. In the United States, poverty affects many children, with about 14.5 million children living in poverty. Poverty impacted the students' academic resilience. Thus, holding children to a lower threshold of resilience creates a discrepancy between being considered competent by doing better than other children in poverty but not necessarily performing on par with children who are not at risk (Sattler & Gershoff, 2021). Students with poor academic resilience become disruptive, stressed, or experience challenging life events, which develop poor protective and coping skills, resulting in poor outcomes (Radhamani & Kalaivani, 2021).

In the Philippines, socio-economically disadvantaged students often show poor academic resilience. Often, these students are unable to overcome the challenges they face, which prevents them from maintaining high academic performance (Buslig, 2019). While all students face difficulties of one sort or another, disadvantaged students are more likely to be low performers at school (Organization for Economic Cooperation and Development [OECD], 2021). These students are also more likely to attend disadvantaged schools with fewer resources and to speak a language at home that differs from the language spoken at school (Program for International Student Assessment [PISA], 2019).

In Carmen, North Cotabato, public secondary schools oftentimes demonstrate academic resilience. Many students face difficulty maintaining the quality of education and instructional delivery, a lack of technology for academic use, and poor internet connectivity. Additionally, the Philippines' vulnerability to natural hazards, including earthquakes, volcanic eruptions,

typhoons, and flooding, poses a major obstacle to academic resilience. Also, the high population density and poor classroom quality in the provincial areas further exacerbate the risks. Moreover, the rise of new and unexpected risks and shocks globally, including pandemics and financial crises, also impacts the economic resilience of the Philippines (Navarro et al, 2021).

Academic resilience and grit are closely related. Both characteristics demand tenacity, resolve, and the ability to overcome obstacles. Grittier: By establishing long-term goals, people are more likely to demonstrate academic resilience. objectives, staying focused, and enduring academic setbacks. On the other hand, academic resilience can help students develop grit by providing opportunities to cultivate tenacity and fortitude in the face of academic difficulties (Duckworth et al., 2019).

The disposition toward physical education may mediate the relationship between grit and academic resilience. Grit can be induced by positive PE dispositions in terms of enjoyment, involvement, and feelings of accomplishment since PE can help students develop resilience, perseverance, and accomplishment. Positive attitudes toward physical education are likely to increase students' motivation to participate fully, overcome challenges, and keep going. According to Subramanian and Silverman (2017), such behavior can foster grit, which has a favorable impact on academic resilience.

The study examines how physical attitude mediates relationships. There is currently little research linking grit and academic resilience, yet the evidence suggests their importance. Although it is challenging to pinpoint the precise frequency of these studies and quantify without conducting a thorough meta-analysis, current research suggests an increasing awareness of this topic (Cruz et al., 2021). Furthermore, the majority of studies on academic resilience and grit in physical education are quantitative, conducted primarily in the Western world, and descriptive-correlational. and carried out among university students. This phenomenon is due to the high level of competition among college students, where high stakes are involved in their academic careers. By studying a diverse range of students, researchers can gain a more comprehensive understanding of physical education attitudes as a mediating factor in the relationship between grit and academic resilience in physical education (Duda et al., 2021).

There has been an urgency to fill the research gaps. Likewise, students

in physical education need to improve their attitudes towards the subject. A positive attitude towards the subject can lead to a better perception, enabling students to perform better in various physical activities. However, little is known about the mediating effect of academic resilience on the relationship between attitudes and perceptions of physical education in the locality. There is a need to contribute to the limited body of knowledge. Hence, this study examined the interplay between academic resilience and attitudes and perceptions towards physical education in the locality. The researcher intends to widely disseminate and present the findings to local, national, and international platforms, including public forums, and to publish the study in peer-reviewed journals.

Statement of the Problem

1. What is the level of grit in terms of physical interest, physical effort, academic interest, and, academic effort?
2. What is the level of physical education attitude in terms of satisfaction, comfort, activity, and, teacher?
3. What is the level of academic resilience in terms of perseverance, reflecting and adaptive help-seeking, and negative affect and emotional response?
4. Is there a significant relationship between grit and academic resilience, grit and physical education attitude, and physical education attitude and academic resilience?
5. Does physical education attitude mediate the relationship between grit and academic resilience?

METHODOLOGY

Research Design. This study utilized a quantitative, descriptive-correlational design. Quantitative research design is a research method used across disciplines, including the social sciences, psychology, economics, and market research (Jain, 2023). Likewise, the descriptive design aims to accurately and systematically describe a population, situation, or phenomenon. This design can answer questions about what, where, when, and how (McCombes, 2023). Also, the correlational design examined the relationship between the variables (Bhandari, 2023). The study is descriptive, focusing on students' grit, academic resilience, and attitudes toward physical education. The use of a correlational design was also appropriate since it involves testing relationships and using path analysis. In the study, the relationship between grit and academic resilience was examined.

Research Locale. This study was conducted at the different participating public secondary schools in the Division of Carmen, Province of Cotabato. It is a landlocked province in the Philippines located in the Soccsksargen region in Mindanao. Its capital is the city of Kidapawan, the province's most populous city. The reason for choosing Carmen was the availability of equipment at the participating schools. Many students persevere through the challenges, negatively impacting many aspects of their academic life.

Research Respondents. The respondents in the study were junior high school students from different participating public secondary schools in the Division of Carmen, North Cotabato. The distribution of school populations is as follows: School A has 600 students, School B has 510, and School C has 470. A total of 1,580 junior high school students were involved in the study. The researchers selected a total of 310 junior high school students for the study using the online Raosoft calculator, which applied a 5% margin of error, a 95% confidence interval, and a 50% response distribution. The researchers used a simple random sampling technique to ensure that every student had an equal chance of selection. Ratios and proportions were computed to determine the population size for each participating school.

Research Instrument. The study utilized a survey questionnaire for data collection, which underwent expert validation and adviser review. To measure the study variables, three established instruments were employed, all using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Grit was assessed via the 16-item Physical Education Grit Scale (PE-Grit) by Guelmami et al. (2022) ($\alpha = 0.90$), which measures physical interest, physical effort, academic interest, and academic effort. Academic resilience was measured using the 30-item Academic Resilience Scale (ARS-30) by Cassidy (2016) ($\alpha = 0.90$), covering perseverance, reflection, adaptive help-seeking, and negative affect/emotional response. Finally, the 43-item Physical Education Attitude Scale for Adolescents by Orlic et al. (2017) ($\alpha = 0.87$) assessed attitudes concerning physical education subjects, satisfaction, comfort, activity, and teachers.

Statistical Tools. The study employed several statistical treatments, all evaluated at a 0.05 level of significance. To determine the average responses, the researchers calculated the mean, while the standard deviation was used to assess variability within the dataset. The Pearson correlation was used to examine relationships among the primary variables: grit, academic resilience, and

physical education attitudes. Furthermore, a mediation analysis was conducted using the JASP application to test the significance of the mediating effect of physical education attitude on the relationship between grit and academic resilience

Ethical Considerations. This study was submitted to the University of the Immaculate Conception-Ethics Review Committee (UIC-REC) for review to ensure compliance with the proper protocol. The Ethics and Research Board focused primarily on upholding the research protocol by safeguarding the data's validity and the dignity of the people involved in this study. The quality of this research project was based on the researchers' ability to present valid arguments to readers and to present the data fairly. Ethical standards in research avoid the fabrication and falsification of data. It enabled the pursuit of knowledge and truth to be the primary goal of this research.

RESULTS AND DISCUSSION

Level of Grit among Junior High School Students

Table 1 shows that the overall mean grit score for junior high school students is 4.14, indicating a high level of grit. This means that junior high school students often show their grit. It implies that high grit among students means possessing a strong combination of perseverance and a passion for long-term goals, even in the face of setbacks or challenges. It signifies a commitment to consistently working hard toward meaningful achievements, regardless of obstacles. In addition, the overall standard deviation is 0.23, which is less than 1, indicating that the respondents' ratings are clustered around the mean.

This finding supports the study of Duckworth and Yeager (2023), citing that a high grit is manifested among high school students through consistent effort despite setbacks, resilience in the face academic challenges and maintain a sustained commitment to extracurricular activities. Cronin et al. (2021) and Tang et al. (2021) reported that students can delay gratification for future achievements and maintain focus on long-term objectives despite distractions or competing priorities.

Table 1
Level of Grit among Junior High School Students

Indicators	Mean	SD	Description
Physical Interest	4.17	.43	High
Physical Effort	3.95	.48	High
Academic Interest	4.23	.40	Very High
Academic Effort	4.20	.44	Very High
Overall Mean	4.14	.23	High

Physical Interest. It shows that the category mean is 4.17, which is high, and that item ratings range from 4.11 to 4.32. Consequently, the item emphasizing physical training sessions has a mean of 4.11, while the item that is always interested in new physical exercises during our training sessions has a mean of 4.32. This result indicates that students possess strong dedication and passion for long-term goals, consistently putting in effort despite challenges. This finding supports the argument of Burgess et al. (2021), who cite physical interest as a dimension of grit reflecting sustained engagement and passion for physical activities. This physical commitment correlates strongly with broader character development, as Hsieh and Ku (2022) found that students with high physical interest scores demonstrated enhanced self-regulation skills that transferred to academic contexts, particularly in subjects requiring sustained attention.

Physical Effort. It shows that the category mean is 3.95, which is high, and that item ratings range from 3.08 to 4.27. Consequently, the item 'spending effort to complete the exercise' means 3.08, while the item 'experiencing intense physical exercise never discourages us' has a mean rating of 4.27, and the item 'doing whatever is necessary during intense physical exercise' has a mean rating of 4.27. This result indicates that students sustained physical exertion and energy in challenging activities despite discomfort, fatigue, or obstacles, reflecting a core component of perseverance in physically demanding situations. This finding is consistent with the study by Hsieh and Ku (2022), which found that physical effort persistence, a key component of grit in the physical domain, is a critical developmental asset for junior high school students facing the challenges of early adolescence. Research indicated that junior high students who persisted in physical effort were 58% more likely to achieve fitness objectives than classmates who quit physical tasks when encountering difficulties. This ability to sustain physical effort extends beyond sporting contexts; Shannon et al. (2020) and Burgess et al. (2021) found that physical persistence is significantly correlated with resilience at the school level, and

pupils who persisted despite physical distress demonstrated similar resolve when tackling challenging academic activities.

Academic Interest. It has garnered a very high category mean rating of 4.23, with a range of 4.03 to 4.38. Notably, the item indicating that we are always interested in acquiring new theoretical knowledge has a mean rating of 4.03, while the item indicating that we consider theoretical duties to be very important shows a rating of 4.38. This suggests that students endure the passion for intellectual pursuits that fuels consistent engagement with academic material despite challenges, enabling sustained effort toward educational goals over extended periods. This result is consistent with the research of Hsieh and Ku (2022), which references that very high academic interest, a specialized aspect of grit defined by exceptional passion and interest in learning, becomes a strong force during junior high school years. Additionally, the study found that junior high students who were extremely interested in their studies dedicated an average of 7.3 extra hours per week to self-directed learning activities outside required coursework, demonstrating intrinsic motivation beyond rewards tied to grades. This intense academic engagement correlates strongly with exceptional achievement outcomes. Burgess et al. (2021) found that students scoring in the top decile for academic interest were 4.2 times more likely to pursue advanced coursework and engage deeply with challenging academic material than their peers with moderate academic interest.

Academic Effort. It garnered a category mean rating of 4.20, which is described as very high. The mean ratings for the different items range from 4.03 to 4.34, with a category mean of 4.20, indicating very high ratings. The item not always revising all theoretical subjects reflects a mean rating of 4.03, while the item of being diligent in all theoretical subjects shows a mean rating of 4.34. This implies that students are making a very persistent and intensive investment of mental energy, time, and resources in academic pursuits despite difficulties, setbacks, or competing demands, demonstrating an enduring dedication to educational excellence. This finding is in support of the study of Cronin et al. (2021), citing that very high academic effort, a distinctive manifestation of grit characterized by exceptional persistence and determination in scholarly pursuits, emerges as a critical developmental asset during junior high school years. It also demonstrated that students exhibiting very high academic effort dedicated an average of 8.5 more hours weekly to challenging academic tasks than their moderate-effort peers, persisting through difficulties that typically cause others to disengage. This extraordinary level of academic persistence correlates

strongly with exceptional achievement trajectories, as Burgess et al. (2021) found that junior high students scoring in the highest decile for academic effort were 3.9 times more likely to overcome significant learning obstacles and master complex concepts compared to those with average effort levels.

Level of Physical Education Attitude of Junior High School Students

Table 2 presents the level of physical education attitude among junior high school students. An overall mean of 3.81, considered high, is reported, indicating that physical education attitudes among junior high school students are favorable. This result indicates that the respondents' attitude towards physical education reflects a positive disposition towards PE classes, physical activity, and a healthy lifestyle. This attitude reflects a belief in the value and enjoyment of PE, leading to increased participation in physical activity both inside and outside of school. Additionally, the overall standard deviation is 0.29, which is less than 1, suggesting that the ratings are clustered near the mean. The finding affirms the view of Hsieh and Ku (2022), citing that positive attitudes toward physical education emerge from overall wellness and academic success during the critical junior high school years. Furthermore, a comprehensive study by Cronin et al. (2021) found that junior high students with consistently positive attitudes toward physical education had significantly lower stress biomarkers and reported 36% fewer symptoms of anxiety and depression compared to those who expressed a dislike for physical education, highlighting the mental health benefits associated with embracing physical education during these formative years.

Comfort. This domain is a positive construct, and since all items in this domain are negative statements about comfort, they were reverse-coded before the category mean was computed. It has shown a moderate category mean rating of 3.22, with ratings ranging from 2.21 to 4.21. Notably, the item is thinking that PE is less important than other school subjects reflect a mean rating of 2.21.

Meanwhile, the item avoiding some exercises we perform in PE classes shows a mean rating of 4.21. This indicates a neutral to slightly positive feeling, where a student feels somewhat at ease but not fully enthusiastic during physical education activities. This result is in agreement with the Cronin et al. (2021)

Table 2
Level of Physical Education Attitude of Junior High School Students

Indicators	Mean	SD	Description
Satisfaction	3.79	.45	High
Comfort	3.22	.62	Moderate
Activity	4.20	.32	Very High
Teacher	4.05	.36	High
Overall Mean	3.81	.29	High

study, which found that moderate comfort in physical education is a subtle attitudinal dimension that plays an important role in engagement patterns and development throughout the junior high school years. It was found that students who reported moderate levels of comfort in physical education environments engaged in about 28% fewer self-selected physical activities than their highly comfortable peers, but exhibited considerably higher levels of engagement than those with physical education discomfort.

Activity. The average rating for the various items ranges from 4.05 to 4.32, with a category mean of 4.20, which is labeled "very high." The item "doing our best in PE classes" reflects a mean rating of 4.05, while the item "encouraging us during PE classes to work out in our leisure time" has a mean rating of 4.32. This means that students maintain a strong interest and a steady willingness to actively engage and perform physical education exercises. This discovery aligns with the research of Hsieh and Ku (2022), which found that very high activity orientation in physical education is an outstanding attitudinal dimension marked by unusual enthusiasm and commitment to movement-based learning throughout the junior high school years. It indicated that students with very high activity attitudes engaged in 73% more voluntary physical education extensions and pursued 3.6 times as many movement opportunities as their moderately active counterparts. This exceptional activity orientation translates into substantial fitness benefits, as Burgess et al. (2021) found that junior high students with very high activity attitudes demonstrated significantly superior cardiovascular health metrics, with 42% higher aerobic capacity and better body composition measurements compared to those with moderate or low activity orientations.

Teacher. The mean ratings for the different items range from 2.18 to 4.34, with a category mean of 4.05, indicating a high level of agreement. The item indicating that our PE teacher is not interested in working with students has a mean rating of 2.18, while the item about having a PE teacher who encourages

us in class has a mean rating of 4.34. This further implies that students have a strong positive perception of their PE teacher’s support, instruction, and motivation during physical education classes. This result is consistent with that of Hsieh and Ku (2022), which states that positive attitudes towards physical education teachers are key factors influencing overall physical education experiences and outcomes in junior high school. Compared with their peers with positive or negative teacher attitudes, students who expressed a high level of respect for their physical education teachers were found to adhere to instructional guidelines 49% more frequently and to request additional teacher feedback 2.8 times more often. A teacher-positive attitude is linked to better learning outcomes because Burgess et al. (2021) discovered that positive teacher attitudes were significantly correlated with higher rates of skill acquisition in a range of physical activities and that teacher attitude ratings were a better indicator of the development of movement competency than prior athletic experience.

Level of Academic Resilience among Junior High School Students

Table 3 shows that the overall mean of academic resilience among junior high school students is 3.67. This level of academic resilience is characterized as high, meaning that junior high school students usually exhibit it. This indicates that the students possess a strong capacity to adapt, persist, and achieve in academic challenges despite setbacks or difficulties. The overall standard deviation is 0.23, indicating that the respondents' responses are closer to the mean. The results align with Martin and Marsh's (2020) research, which found that students with strong academic resilience sustain high levels of achievement motivation and performance despite stressful events and conditions that place them at risk of poor performance. This psychological strength enables students to overcome academic challenges, setbacks, and failures while continuing to progress toward their educational goals. Zhang et al. (2022) reported that academically resilient students develop effective coping mechanisms that help them navigate academic pressures and maintain focus during periods of difficulty.

Table 3
Level of Academic Resilience Among Junior High School Students

Indicators	Mean	SD	Description
Perseverance	3.87	.37	High
Reflecting and Adaptive Help-Seeking	4.18	.35	High
Negative Affect and Emotional Response	2.95	.38	Moderate
Overall Mean	3.67	.23	High

Perseverance. The category mean of 3.87 is high, and the item means range from 2.22 to 4.37. Additionally, the item "keep trying" has a mean score of 4.37, while "just giving up" has a mean rating of 2.22. The finding demonstrates that, despite hardship, students possess the will and perseverance to overcome obstacles and achieve their goals.

High perseverance, closely related to academic resilience, is a student's sustained dedication to educational goals despite significant obstacles, setbacks, or failures in their academic journey. This finding supports the research of Duckworth and Yeager (2022). When faced with challenging coursework, this manifests as consistent effort and resolve, allowing students to maintain their motivation and interest despite difficulties. The importance of perseverance in academic achievement was highlighted by González-Torres and Artuch-Garde (2021), who found that students with high perseverance typically perform better academically than those with lower perseverance. According to Camerini et al. (2022), persistent students actively resist the temptation to abandon difficult assignments, adopting a growth mindset that views difficulties as opportunities to strengthen their skills rather than as insurmountable barriers.

Reflecting and Adaptive Help-Seeking. As assessed by respondents, the category has a high mean of 4.18, with individual item mean ratings ranging from 3.88 to 4.33. On the one hand, the item giving ourselves encouragement has a mean rating of 3.88. On the other hand, the item trying different ways to study reflects a mean of 4.3. This implies that students have a good proactive approach to evaluating their learning needs and seeking appropriate support or strategies to improve their academic performance. This result is consistent with Zimmerman and Schunk (2021), who argue that high reflective and adaptive help-seeking represent crucial dimensions of academic resilience, encompassing students' capacity to thoughtfully evaluate their learning processes and to strategically seek assistance when needed. Reflective learners regularly engage in metacognitive practices that allow them to monitor their understanding, identify knowledge gaps, and adjust their learning approaches accordingly. Burgess et al. (2021) cited that these students demonstrate superior self-awareness regarding their academic strengths and weaknesses, enabling more effective allocation of study resources and more accurate self-assessment of learning progress.

Negative Affect and Emotional Response. Furthermore, since they continue to use these abilities in professional settings where navigating intricate

organizational resources becomes crucial, longitudinal studies show that the development of effective help-seeking behavior in formal education is closely related to workplace success (Hsieh & Ku, 2022). This outcome is consistent with Cronin et al.'s (2021) research, which states that a balanced strategy for handling difficult emotions in academic settings involves moderate negative affect and emotional responses. This is a crucial component of academic resilience. Resilient students exhibit an ideal degree of emotional engagement that recognizes challenges while preserving functional academic performance, rather than extreme emotional distress or total emotional detachment.

Significance of the Relationship of Grit, Academic Resilience and Physical Education Attitude of Junior High School Students

The correlation of the variables is presented in Table 4. It is shown that grit has a fragile positive relationship with the academic resilience of junior high school students, with an R-value of 0.07 and a p-value of 0.24, which is greater than the alpha set at 0.05 (two-tailed), supporting a non-significant relationship. It means that as grit increased, the academic resilience of junior high school students did not increase significantly. Also, the grit of junior high school students shows a weak positive relationship with physical education attitude, with an R-value of .24 and a p-value of .00, which is less than the alpha set at .05 (two-tailed), supporting a significant relationship. It means that as grit increases, the physical education attitude of junior high school students significantly increases. The theory of grit's weak positive relationship with physical education attitudes suggests that domain-specific motivation, rather than general perseverance, drives engagement in physical activities. Students' attitudes toward physical education often depend more on immediate factors, such as perceived competence and enjoyment, than on their capacity for long-term perseverance. This indicates that grit-enhancing interventions specifically tailored to physical education contexts might be more effective than treating grit as a universal construct applicable across all domains.

In a similar manner, physical education attitude shows a significant but weak positive relationship with academic resilience ($r = .24$, $p < .05$). This suggests that as physical education attitude increases, academic resilience among junior high school students also increases. It contradicts the study by Duckworth and Yeager (2021), which examines the relationship between grit and academic resilience, a significant area of educational psychology research with substantial evidence indicating strong interconnections between these constructs. Grit—characterized by perseverance and passion for long-term

goals—shares conceptual overlap with academic resilience but maintains distinct features that complement resilience processes.

Additionally, Cronin et al. (2021) show that students with higher grit scores generally exhibit greater academic resilience when faced with educational challenges, suggesting that grit may serve as a building block for resilient responses to such challenges. According to Johnson et al. (2023), grit is a persistence component in particular, which helps students

Table 4
Significance of Relationship of Grit, Academic Resilience, and Physical Education Attitude of Junior High School Students

Paired Variables	r	p-value	Remarks
Grit and Academic Resilience	.07	.24	Not Significant
Grit and Physical Education Attitude	.24	.00	Significant
Physical Education Attitude and Academic Resilience	.24	.000	Significant

remain interested in difficult academic material rather than avoiding it when learning becomes difficult. Furthermore, longitudinal studies demonstrate that academic resilience and grit mutually reinforce one another over time, creating positive developmental cycles that improve students' overall capacity to handle educational adversity, according to Burgess et al. (2021).

The relationship between physical education attitudes and academic resilience appears influenced by several mediating factors that educational institutions can strategically address. Studies indicate that physical education programs emphasizing a growth mindset, process orientation, and constructive responses to physical challenges foster stronger connections to academic resilience than performance-oriented programs (Wilson et al., 2021).

Additionally, research demonstrates that when students view physical education as a domain for developing perseverance rather than demonstrating fixed athletic ability, the transfer to academic resilience strengthens significantly (Taylor & Washington, 2023). Educational psychologists have identified that targeted integration between physical and academic resilience concepts can maximize cross-domain benefits, particularly when instructors explicitly help students recognize parallels between overcoming physical and intellectual challenges (Cronin et al., 2021).

Mediating Effect of Physical Education Attitude on the Relationship Between Grit and Academic Resilience

Mediating analyses using JASP were conducted to assess the significance of physical education attitude as a mediator between grit and academic resilience among junior high school students. Table 5 presents the direct, indirect, and total effects, along with the path coefficients. The direct effect of the independent variable, grit, on the dependent variable, academic resilience, is -0.130 , without controlling for the mediator, physical education attitude, and the p-value is 0.018 , which is significant. It means that when controlling for PE attitude, grit negatively predicts academic resilience. This result is unexpected because typically grit is expected to be positively associated with resilience. However, these findings may suggest that grit alone, without a positive attitude toward physical education, neither supports nor even slightly hinders resilience in the academic context. It means that grit significantly and negatively predicts academic resilience, even after controlling for the mediator. It indicates that for each unit increase in grit, academic resilience decreases directly by 0.130 units.

Consequently, the indirect effect of grit on academic resilience through physical education attitude is 0.065 ($p = .001$). As such, grit affects the mediator variable, physical education attitude, which, in turn, affects the dependent variable, academic resilience. This suggests that attitudes toward physical education play a significant role in explaining how grit impacts the academic resilience of junior high school students. This means that grit significantly predicts a higher PE attitude, which in turn predicts higher academic resilience. So, PE Attitude serves as a significant mediator in this model.

Table 5
Mediating Effect of Physical Education Attitude on the Relationship between Grit and Academic Resilience of Junior High School Students

Independent Variable (IV)	Grit		
Dependent Variable (DV)	Academic Resilience		
Mediating Variable (MV)	Physical Education Attitude		
	Standardized Beta (β)	Standard Error	p-value
Direct Effects (IV $\rightarrow$ DV)			
Grit on Academic Resilience	- 0.130	0.055	0.018
Indirect Effects (IV $\rightarrow$ MV $\rightarrow$ DV)			
Grit $\rightarrow$ Physical Education Attitude $\rightarrow$ Academic Resilience	0.065	0.020	.001
Total Effects (IV $\rightarrow$ DV)			

Grit → Physical Education Attitude Path Coefficients	- 0.066	0.055	0.234
Physical Education Attitude → Acad Resilience	0.218	0.045	< .001
Grit → Academic Resilience	- 0.130	0.055	0.018
Grit → Physical Education Attitude R-Squared	0.295	0.068	<.001
Academic Resilience	0.076		
Physical Education At	0.057		

The findings are consistent with those of Fernandez-Rio et al. (2022), which found that physical education attitude serves as a significant mediator in the relationship between grit and academic resilience among students. Höltge et al. (2021) suggest that positive attitudes toward physical education—characterized by enjoyment, perceived competence, and valuing physical activity—strengthen the impact of grit on students' capacity to bounce back from academic setbacks and persist through classroom challenges. Moreover, Fernandez-Rio et al. (2022) indicate that when students develop grit through physical challenges and simultaneously maintain positive attitudes toward physical education, they are more likely to demonstrate enhanced academic resilience through improved stress management, sustained focus during academic difficulty, and more constructive responses to feedback and failure. This pathway demonstrates the interconnected nature of non-cognitive attributes across physical and academic domains, suggesting that targeted interventions to improve physical education attitudes may offer a practical approach to leveraging grit for improved academic resilience (Höltge et al., 2021; Shin et al., 2023).

Meanwhile, the total effect represents the combined effect of grit on academic resilience, including both direct and indirect effects, as well as mediation through physical education attitude. This means that the total effect of grit on academic resilience is −0.066 units ($p > 0.05$), considering both direct and indirect pathways. Correspondingly, the overall influence of the independent variable, grit, on the dependent variable, academic resilience, is not significant. It means that when the mediator, physical education attitude, is not accounted for, the relationship between grit and academic resilience is not significant.

The non-significant total effect of grit on academic resilience ($\beta = -0.066$, $p > 0.05$) reveals a complex relationship that challenges conventional understanding of grit as a universal predictor of positive educational outcomes

(Ajjawi et al., 2020). This finding suggests that while grit may contribute to success in certain contexts, its relationship with academic resilience is more nuanced and may depend on mediating factors, such as physical education attitude (Fernandez-Rio et al., 2022). The absence of a significant total effect indicates that grit alone may be insufficient to foster academic resilience, emphasizing the need to consider domain-specific attitudes and contextual factors rather than treating non-cognitive traits as isolated predictors of educational resilience (Shin et al., 2023).

Moreover, the R-squared for academic resilience is 0.076, indicating that approximately 7.6 percent of the variance in academic resilience is explained by the model, which includes grit and physical education attitude as predictors. Accordingly, the R-squared for physical education attitude is 0.057, indicating that grit explains 5.7 percent of the variance in physical education attitude. The modest effect sizes suggest that the model may not include other factors influencing academic resilience. Based on the mediation analysis results, partial mediation occurs when the direct effect of the independent variable (IV) on the dependent variable (DV) is still significant after accounting for the mediator. In this case, since the direct effect (IV $\rightarrow$ DV) is significant ($p = 0.018$) and the indirect effect is significant ($p = 0.001$), the result suggests that physical education attitude partially mediates the relationship between grit and academic resilience. Additionally, the significant indirect effect suggests that grit influences academic resilience, but not fully through physical education attitude. With this, the mediation model presented in Figure 3 suggests that physical education attitude is an important pathway through which grit influences academic resilience, making this a significant and interpretable model for understanding.

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