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The Impact of Physical Activities and Psychological Health on Students Academic Performance: Mediating Role of Students Mental Health

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Abstract
The increasing majority of mental health problems among university students and their potential impact on academic performance is a major concern. Despite the known benefits of physical activity and psychological health, there is limited research examining its role in reducing mental health and improving academic performance. Therefore, this study investigates the influence of physical activity and psychological health on the academic performance of university students with mental health as a mediating effect. Employing a quantitative cross-sectional research approach, data were collected from 370 students at public sector universities through a self-administered questionnaire. Collected data were analyzed through the SPSS using process mediation. Descriptive statistics highlighted students' positive perceptions of their physical activities, psychological health, mental health, and academic performance. Further, regression results demonstrated that all dimensions of physical activities namely control competence for physical training, physical specific mood regulation, and effective physical activity self-control positively and significantly impact academic performance. In the same vein, psychological health also positively and significantly

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influences academic performance. Mental health also partially mediates the relationship between physical activity dimensions, psychological health, and academic performance. The findings emphasize the significance of raising physical activities and psychological health to enhance students' academic performance. This research contributes valuable insights into the relationship between physical activity, mental health, and academic performance with implications for educational policy and student support programs. This study is innovative in investigating the mediating effect of mental health on the relationship between physical activity and academic performance, and it is the first study in the context of university students. It places unique emphasis on the complementary roles of physical and psychological well-being in academic performance. This study addresses an important gap by examining the relationship of these factors in a specific educational context.

Keywords: physical activity, mental health, psychological health, academic performance.

Introduction

Academic performance (AP) is an important concern for the student because it greatly affects their future opportunities and career prospects. High AP lies in a student's ability to understand, analyze, and practice the learned concepts AP is often used to measure student progress because it is important for learning, training, and other learning opportunities. Intellectual ability, students' overall well-being, time management skills, and motivation to reach their goals contribute to employee development (Herbert, 2022). Historically, AP is also a crucial concept because it reflects the understanding of the students in subjects and career opportunities (Khan, 2024). It also serves as a key indicator of personal and institutional effectiveness in achieving learning behavior. Various factors including environmental, psychological, and socioemotional factors affect AP, which provides a strong approach when studying predictors of AP. Therefore, AP becomes an area of research with the significance of previous studies.

Mental health (MH) increase the AP significantly (Wyatt et al., 2017). Emotional and cognitive well-being affects many aspects of learning, such as attention, which are important to AP (Cuartero & Tur, 2021). MH conditions such as anxiety, depression, and stress have been shown to negatively impact students' ability to pay attention in class, complete assignments on time, and actively participate in their studies (Wong & Wong, 2021). Additionally, MH issues can affect a student's social relationships, self-esteem, and self and perception that he/she has been able to work, making it important for education systems to give attention to health care (Agnafors et al., 2021). Students who report positive MH perform better academically which suggests a strong positive relationship between MG and AP (Pearce et al., 2022). This highlights the importance of addressing MH as a key factor in student AP.

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Besides being important for MH, physical activity (PA) has been found to have a significant positive impact on MH, which in turn affects AP (Glavaš & Pavela Banai, 2024). Regular PA does not necessarily promote health but also enhances cognitive functions, including memory, concentration and executive function (Erickson et al., 2022). Exercise stimulates brain activity and improves resulting in increased learning ability and increased concentration in academic tasks (Rotondo et al., 2023). In addition, PA activity plays an important role in reducing symptoms of stress, anxiety, and depression, which are often barriers that often hinder AP (Rotondo et al., 2023). Mental Health, defined as emotional well-being and resilience, furthers the benefits of PA by reducing stress and promoting a positive mood (Nuriddinov, 2023). The interaction between PA and MH provides a synergistic effect that enhances psychological well-being and positively affects AP through a more balanced and focused mind that encourages it. In the same vein, psychological health (PH) also positively and significantly increases AP because students with better mental well-being often exhibit improved focus, motivation, and cognitive functioning (Luzano, 2024). Conversely, poor MH can lead to decreased academic achievement due to factors like stress, anxiety, and difficulty concentrating (Nguyen-Thi et al., 2024) Thus, incorporating physical activities and PH into students' daily routines can have a significant impact on AP through improving the MH of students. Therefore, this study enforced the impact of physical and PH on AP through improving MH.

While existing research has extensively examined the relationships between physical activity, PH, MH, and AP, several empirical gaps remain, particularly regarding university students. Much of the existing literature has focused on younger populations, such as high school or college students, with limited attention given to the unique challenges faced by university students, including higher academic pressure, independence, and MH concerns (Benjamin et al., 2024; Li et al., 2024; Wu et al., 2024). Additionally, there is a lack of research that integrates PH as a comprehensive component which is linking it to both PA and AP. Furthermore, while PA and PH are well documented to influence both MH and AP. Few studies have explored the mediating role of MH in this relationship, especially in the context of university students (Mosharrafa et al., 2024). In other sense, prior studies on the relationship have been conducted and found isolated effect which is neglecting to examine how MH might mediate the relationship between physical activities, PH and AP (Browning et al., 2021; Saman & Wirawan, 2024). Furthermore, extant studies are also enforced majorly on other educational institutions while having limited attention on Universities. The universities are essential for the students' academic excellence and innovation which is contributing to the nation's socio-economic development. Therefore, to address the previous gaps, study aimed is to the test the influence of PA and psychological activity on university student's AP through mediating effect of MH.

The theoretical implications of this study are significant, as it is among the first to explore the integrated model of physical activities, PH, and AP with MH as a

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mediating factor specifically in the context of universities. This research contributes to the existing body of knowledge by addressing the empirical gaps in understanding how these variables interact uniquely with university students, who face distinct academic pressures and MH challenges. Practically, the findings provide valuable insights for policymakers and educational institutions which emphasizes the need for comprehensive wellness programs that promote PA and psychological well-being to enhance academic outcomes. This aligns with the broader objectives of Vision 2030, which seeks to develop a well-rounded, innovative, and resilient student body capable of contributing to the nation's socioeconomic development and diversification goals. The rest of the paper was divided into four chapters, literature review, research methodology, data analysis and results, and discussion and implications.

Literature Review

Physical Activities and Their Dimensions

Physical activity (PA) shows the movement of the body which shows the strengthening of the muscles (Warburton et al., 2006). It is important in maintaining overall health and well-being, contributing to physical and psychological benefits (Martín-Rodríguez et al., 2024). Regular PA is widely recognized as a key determinant of physical fitness, disease prevention, and enhanced cognitive function (Rocliffe et al., 2024) in increasing AP. PA can be categorized into various types based on intensity, purpose, and context. In other words, it refers to an individual's ability to regulate physical effort levels based on personal fitness and capacity. It is a measure of how well an individual understands and manages their physical limits, avoiding overexertion while achieving the desired outcomes of their activity (Saiz-González et al., 2024).

In the context of AP, PA shown that it is a cognitive function that indicated to improve the problems that is crucial for learning (Muntaner-Mas et al., 2024). Research suggests that active students tend to perform better academically due to improved physical health, better psychological well-being, and enhanced social interactions (Cipriano et al., 2024). Various physical activities are discussed in the literature but among those control competence for physical load, physical-specific mood regulation, and effective PA self-control are important dimensions that increase the culture of learning of the students which helps to increase their AP (Sudeck & Pfeifer, 2016). Among the PA dimensions, CCPL is essential for maximizing the benefits of physical activities while minimizing potential risks of fatigue or injury (Mavilidi et al., 2022; Nobre et al., 2024). Studies have found that students who exhibit high competence in regulating their physical load often maintain better physical health, which directly correlates with improved AP (Mavilidi et al., 2022). Latino et al. (2023) showed that students who engaged in moderate-intensity PA demonstrated better concentration and task completion rates compared to their ability to regulate physical load ensuring

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sustained energy levels, which is critical for effective learning and participation in academic tasks. Furthermore, PA self-control focuses on the systematic management and monitoring of PA patterns (Johnstone et al., 2022). It involves setting clear goals, maintaining consistency, and using feedback mechanisms to ensure the effectiveness of exercise regimens (Johnstone et al., 2022). Further, PA self-control also positively affects MH reducing symptoms of anxiety and depression, boosting self-esteem, and enhancing overall psychological well-being (Aghjayan et al., 2022). They also found that physical activities have a positive and significant impact on AP. They also further argued that further research could also be explored in other countries to increase the student's academic performance.

On the other hand, effective PA supervision has been shown to significantly enhance students' AP by improving cognitive function, concentration, and overall MH. In other sense, further research indicated that well structure PA improved the AP. Additionally, it also helps to reduce stress and anxiety, creating a conducive environment for learning (Prasad et al., 2021). Structured physical activity, such as school sports programs, can develop the discipline and time management skills that are critical to academic success (Osipov et al., 2021). Further empirical studies conducted revealed a positive correlation between physical fitness and which suggests that interventions can be a valuable tool to enhance AP (Komarudin et al., 2023). This study shown the crucial role of incorporating regular PA to enhance students' AP. They also argued that further research could be explored in other countries in the education sector.

Furthermore, PSMR plays a vital role in ensuring that physical activities align with individuals' specific needs and capabilities (Rhodes, 2024). Increasing PA programs have been associated with improved AP due to their impact on physical fitness and cognitive function (Baniasadi, 2024). Aghjayan et al. (2022) highlighted that targeted aerobic exercise interventions led to significant improvements in students' executive functions, including working memory and cognitive flexibility, which are crucial for academic success (Teuber et al., 2024). The findings emphasized the importance of structured and regulated PA moods in increasing academic performance. These previous studies emphasized that PA is a strong phenomenon that significantly impacts academic performance. In other studies, it was also found that PSMR had a positive and significant impact on AP (Cipriano et al., 2024). They also argued that PA and AP relationships could be tested to increase the AP of students. Based on the findings of the study, it is hypothesized that,

H1: CCPL has a positive and significant impact on student's AP.
H2: PSMR positively and significantly influences students' AP.
H3: PSC has a positive and significant effect on students' AP.

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Psychological health and academic performance

Psychological health (PH) represent the emotional and social well-being of individuals which enhance the students AP (Zhao et al., 2024). It plays an important role in determining how individuals cope with challenges and navigate their environments (Pan et al., 2023). Factors such as stress management, self-esteem, emotional regulation, and resilience contribute significantly to PH (Luzano, 2024). Healthy psychological states are linked to higher life satisfaction, better interpersonal relationships, and enhanced productivity (Luzano, 2024). The relationship between PH and APis well-documented. Psychological well-being serves as the foundation for effective learning, influencing cognitive abilities such as attention, memory, and problem-solving which increases AP (Khan, 2024). They also suggested that students with strong PH are more likely to exhibit motivation, focus, and persistence, which are critical for AP.

On the other hand, numerous empirical studies have explored the connection between PH and academic performance. Kaya and Erdem (2021) found that students with higher levels of psychological well-being exhibited better academic grades and greater classroom participation which increases the students' academic performance. Similarly, Pan et al. (2023) further highlighted that students with positive MH had improved GPA scores and fewer behavioral issues in school. Further study emphasized that interventions aimed at improving PH, such as mindfulness training and stress management programs, can significantly enhance students' AP (Malak, 2024). Furthermore, physical activity, social support, and emotional resilience have been identified as critical factors contributing to both PH and AP (Xu & Xu, 2024). They also argued that further research could be explored in other countries to increase the variations in the findings. In another study, it was found that PH has a positive and significant impact on students' AP (Newson & Abayomi, 2024). Thus, based on previous studies, the following research hypothesis has been formulated below,

H4: PH positively and significantly impacts students' AP.

Students Mental Health and Academic Performance

Students MH encompasses emotional, psychological, and social well-being during their educational journey (Mosharrafa et al., 2024). It involves the ability to cope with academic pressures, maintain healthy relationships, and manage emotions effectively (Högberg, 2024). MH issues such as stress, anxiety, and depression are increasingly prevalent among students due to various academic and social challenges (Peng et al., 2023). Maintaining good MH is essential for students to thrive in their academic, personal, and social lives, enabling them to engage fully in their educational experience (Zou et al., 2023). MH is signfiicant in determining students' ability to learn, retain information, and succeed academically (Liu et al., 2023). Students with positive MH are better equipped to focus, solve problems, and manage time

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effectively, all of which are critical for AP (Jehi et al., 2024). Conversely, MH challenges can impair cognitive processes, reduce motivation, and hinder participation in classroom activities (Malak, 2024). Milicev et al. (2023) also highlighted that stress negatively affects students' memory and concentration which is impacting their academic performance. In contrast, interventions like mindfulness training and peer support programs have been shown to improve both MH and AP (Hammoudi Halat et al., 2023). These studies emphasized the importance of addressing MH as a core component of academic success strategies. As a result, the study has developed the research hypothesis listed below,

H5: MH positively and significantly impacts to AP.

Mental health Mediating Role

Extant studies conducted on the impact of physical activities on AP while these studies have limited attention to the mediating roles. Prior literature has shown that PA positively influences AP by enhancing cognitive functions, improving focus, and reducing stress. Regular participation in physical activities promotes better blood flow to the brain, which is associated with improved memory and learning abilities (Muntaner-Mas et al., 2024). Educational institutions that integrate physical activities into their curriculum often then they have good mental fitness of the students (Teuber et al., 2024) which could increase their academic performance. Equally, MH also played an integral role in the increase in the academic success of the students because students with mental well-being are more likely to focus on learning activities (Mosharrafa et al., 2024). Conversely, poor MH can lead to decreased concentration, absenteeism, and lower academic achievement (Ola-Williams et al., 2024). Support systems and interventions that promote MH can enhance students' academic outcomes.

Despite substantial evidence supporting the independent impacts of physical activities and MH on academic performance, limited research examines the combined framework where MH mediates the relationship between physical activities and academic outcomes. Existing studies often overlook how improvements in MH through improving PA could enhance academic performance. This gap highlights the need for further exploration of the relationship between these factors to provide a more comprehensive understanding of their relationship. In various studies has been found that MH has a mediating variable and they also argued that MH could also be used as a mediating variable in other studies with other variables' relationships (Mosharrafa et al., 2024). Therefore, using MH as a mediating variable is justified because previous studies have primarily focused on the direct effects of physical activities on academic performance, leaving the indirect mechanisms largely unexplored. MH serves as a critical pathway because physical activities are known to reduce stress, improve mood, and enhance emotional regulation (Mahindru et al., 2023) directly contributing to better learning the students to improve their academic

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performance. Daniels et al. (2023) further highlighted that MH played a central role in translating the benefits of physical activities into improved academic performance. Therefore, this study has used MH as a mediating variable. In various studies mental has been used mediating variables in various other contexts.

Pan et al. (2023) also indicated that improved mental well-being facilitated better academic performance. Rodríguez et al. (2022) also that MH is an important predictor of increased AP. They also identified that mental could be tested in further research with other variables. On the other hand, MH has been also used in the study of Mosharrafa et al. (2024) where they found that MH is a significant predictor to increase in the student's potential in their physical activities that will increase their learning capacity. Further empirical study of the relationship between PA and AP has been conducted and found a positive and significant impact on AP (Liu et al., 2023). They further argued that increased PA was associated with better grades and test scores. Similarly, Wang et al. (2023) also demonstrated that regular exercise improved cognitive function and AP. However, the relationship between PA and AP could be further explored by examining the mediating effect which should test how PA improves mental well-being, which in turn enhances AP. On the other hand, empirical studies have been conducted on PH and AP. Pan et al. (2023) further found that students with higher life satisfaction and lower levels of anxiety achieved better AP. Similarly, Khan (2024) also established that MH issues like depression and stress negatively impact students' AP. Despite these findings, they also argued that further research could explore the specific mechanisms through which PH influences learning processes, such as motivation, cognitive engagement, and resilience, to provide deeper insights into this relationship. These studies emphasize the role of MH in increasing the positive effects of various predictors on AP through improving MH. As a result, the study has developed the research hypothesis listed below.

H6: MH positively and significantly mediates the relationship between CCPL and students' AP.

H7: MH positively and significantly mediates the relationship between PSMR and students' AP.

H8: MH positively and significantly mediates the relationship between PSC and students' AP.

H9: MH positively and significantly enhances the relationship between PH and students' AP.

Research objects and Material

The study aimed to test the influence of physical activity and psychological health on university students' academic performance through the mediating effect of mental health. The quantitative research approach was to test the study objective. Quantitative research offers objective measurements and statistical analysis, allowing for identifying patterns and relationships. This approach enables researchers to

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generalize findings from a sample to a larger population, enhancing the scope and applicability of the study (Borgstede & Scholz, 2021). In another sense, a cross-sectional research approach was employed. Cross-sectional research is considered efficient and cost-effective, catching a snapshot of data at a single point in time. Furthermore, it allows for the simultaneous examination of multiple variables, making it useful for exploring prevalence and associations (Davies, 1994).

Questionnaire and Data Collection Procedure

Data was collected through the survey instrument, which was adopted from the extant literature and already used and tested. Physical activity is measured by three dimensions namely control competence for physical training which is measured through 6 items, physical-specific mood regulation measured through 4 items, physical activity self-control measured through 3 items. These were adopted from (Sudeck & Pfeifer, 2016). Psychological health comprises 5 items which were adapted from the study of Taleb et al. (2023) and were used on a dichotomous scale. Mental health comprises four items (Zang et al., 2022). Lastly, academic performance comprises my 4 items of (Alam et al., 2021). Each item was measured on five-point Likert scale where 1 for strongly disagree and 5 for strongly agree. The questionnaire variables are depicted in Figure 1 below,

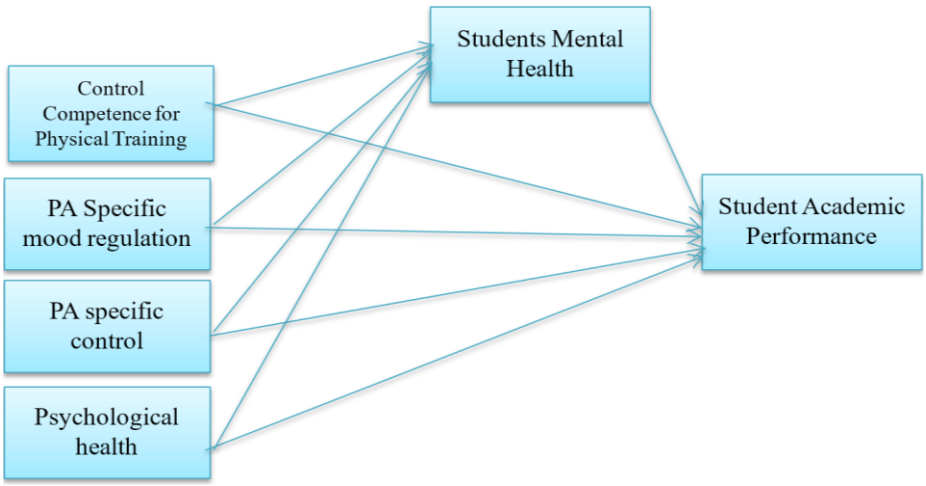

Figure 1: Conceptual Framework.

The questionnaire was distributed among the public sector university students. Studying students at public sector universities offers the strength of representing a significant segment of the nation's higher education population which is potentially providing insights into a specific demographic with shared cultural and educational experiences. The questionnaire was distributed using a convenient sampling technique. Utilizing convenience sampling, while potentially introducing bias allows for a practical and readily accessible approach to data collection, facilitating gathering responses within resource constraints. The study sample size was 450 which provides a reasonably strong foundation for statistical analysis which enhances the potential for generalizable findings. The collection of data through a self-administered

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questionnaire allows for efficient and standardized data collection, while also granting respondents anonymity which may increase honesty. Among 450 sample size, 370 were returned back. Receiving 370 responses ensures a high response rate which is strengthening the validity of the study through mitigating potential non-response bias (Adcock, 1997).

Data Analysis

The collected analysis using SPSS. Analysis was conducted in both demographic and inferential analysis were conducted in the next two sections.

Demographic Profile of Respondents

The demographic data of 370 university students reveals a balanced gender distribution, with 48.6% representations of male and 51.4% representations of female. In terms of age, the majority of students (40.5%) are between 18-22 years old, followed by 37.8% in the 23-27 years range, and 16.2% in the 28-32 years range. A smaller proportion (5.4%) are aged 33 years and above. Regarding preferred games, football is the most popular sport, with 32.4% of students indicating it as their game of choice, followed by basketball (21.6%), cricket (16.2%), and tennis (10.8%). Volleyball and other games each account for 8.1% and 10.8% of preferences, respectively. The majority of participants (81.1%) are undergraduate students, while 18.9% are pursuing graduate-level education. This demographic distribution suggests a diverse sample of students with varying ages, gender representation, game preferences, and academic levels, providing a comprehensive view of university students' characteristics. Table.1 below predicts the aforementioned outcomes.

Table 1: Demographic Characteristics

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	180	48.60%
	Female	190	51.40%
Age	18-22 years	150	40.50%
	23-27 years	140	37.80%
	28-32 years	60	16.20%
	33 years and above	20	5.40%
Preferred Games	Football	120	32.40%
	Basketball	80	21.60%
	Cricket	60	16.20%
	Tennis	40	10.80%
	Volleyball	30	8.10%
	Others	40	10.80%
University Educational Level	Undergraduate	300	81.10%
	Graduate	70	18.90%

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Descriptive Statistics

This section shows the descriptive statistics. The mean score for CCPL (Control Competence for Physical Load) is 3.971, suggesting that students generally perceive themselves as moderately competent in managing physical load, with a slight tendency toward higher ratings (skewness of -0.210). PSMR (Physical-Specific Mood Regulation) has a mean of 4.234, indicating a relatively high perception of their ability to regulate physical activities, with most students rating themselves positively (skewness of -0.223). For EPACE (Effective Physical Activity Control), the mean score is 3.941, reflecting moderate to high self-assessment of their physical activity control, with a slight skew towards higher ratings (skewness of -0.153). The mean score for PP (Psychological Health) is 4.053, showing that students generally rate their psychological health positively, with a slight leftward skew (skewness of -0.142). MH (Mental Health) also shows a high mean of 3.951, indicating generally favorable perceptions of mental health, with a small negative skew (skewness of -0.131). Finally, AP (Academic Performance) has a mean score of 3.980, reflecting a positive self-assessment of academic performance, with a slight tendency toward higher ratings (skewness of -0.162). The minimum and maximum values for all variables range from 1 to 5, indicating variability in responses across the sample. Overall, these results suggest that university students tend to rate their physical activities, mental health, and academic performance positively, with some variation in individual perceptions. The above is predicted in Table 2.

Table 2: Descriptive Findings

Variables	Mean	Min	Max	Skewness
CCPL	3.971	1	5	-0.210
PSMR	4.234	1	5	-0.223
SPACE	3.941	1	5	-0.153
PP-	4.053	1	5	-0.142
MH	3.951	1	5	-0.131
AP	3.981	1	5	-0.162

Note: CCPL-Control Competence for Physical traning, PSMR-Physical-Specific Mood Regulation, EPACE-Effective Physical Activity Control, PP-Psychological Health, MH-Mental Health, AP-academic performance.

Multicollinearity

The Variance Inflation Factor (VIF) values provide insights into the degree of multicollinearity among the predictor variables in the model. In general, a VIF

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value above 10 indicates problematic multicollinearity, while values between 1 and 5 suggest a low to moderate degree of collinearity, and values close to 1 indicate minimal collinearity. All of these VIF values are well below 5, which indicates that there is no significant multicollinearity among the independent variables in the model. The relatively low VIF values suggest that each variable provides unique information to the model (Cheah et al., 2018). Therefore, multicollinearity is not a concern in this case, and the regression results are likely to be reliable and interpretable. The above values are predicted in Table 3.

Table 3: Multicollinearity

Variable	VIF
CCPL	1.812
PSMR	2.132
EPAC	1.921
PP	2.345

Note: CCPL-Control Competence for Physical training, PSMR-Physical-Specific Mood Regulation, EPACE-Effective Physical Activity Control, PP-Psychological Health, MH-Mental Health

Reliability Analysis

The factor loadings and Cronbach's alpha values for the variables indicate strong reliability and validity for the measurement model. Factor Loadings refer to the correlation between each item (question or statement) and the underlying construct (latent variable) (Cheah et al., 2018). They indicate the extent to which each item is related to the factor it is intended to measure. A higher factor loading (usually above 0.7) suggests that the item is strongly related to the construct, meaning it contributes well to measuring the latent variable (Cheah et al., 2018). Cronbach's Alpha is a measure of internal consistency that reflects how items are being correlated in the model. It is commonly used to assess the reliability of a scale. A Cronbach's alpha value above 0.7 indicates acceptable reliability, with values above 0.8 generally considered good, and values above 0.9 indicating excellent internal consistency analysis (Chung et al., 1998). The below Table 4 shown construct fulfill the requirement of reliability.

Table 4: Reliability analysis

Variable	Item	Factor Loadings	Cronbach Alpha
CCPL	CCPL1	0.764	0.921
	CCPL2	0.824	
	CCPL3	0.783	
	CCPL4	0.811	
	CCPL5	0.851	

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Variable	Item	Factor Loadings	Cronbach Alpha
PSMR	PSMR1	0.782	0.912
	PSMR2	0.843	
	PSMR3	0.794	
	PSMR4	0.804	
EPAC	EPAC1	0.773	0.903
	EPAC2	0.832	
	EPAC3	0.762	
PP	PP1	0.793	0.932
	PP2	0.824	
	PP3	0.781	
	PP4	0.803	
	PP5	0.831	
MH	MH1	0.812	0.891
(Mediator)	MH2	0.851	
	MH3	0.834	
	MH4	0.872	
AP	AP1	0.832	0.884
(Dependent)	AP2	0.883	
	AP3	0.864	
	AP4	0.852	

Regression Results

The regression results reveal that all dimensions of physical activity positively and significantly impact students' academic performance which is understanding the crucial role these factors play in enhancing academic performance. CCPL positively and significantly (β = 0.351, t = 4.220) effect on AP. Similarly, PSMR positively and significantly (β = 0.331, t = 3.559) affects AP. Furthermore, EPACE also positively and significantly (β = 0.282, t = 3.861) effect on AP. Furthermore, PH positively and significantly (β = 0.431, t = 6.951) effect on AP. MH also has a direct positive and significant effect on AP (β = 0.530, t = 7.462. Direct effect results are shown in Table 5.

Table 5: Direct Effect results

Relationships	β	SE	T-Value	95% CI (Lower)	95% CI (Upper)
CCPL->AP	0.351	0.083	4.220	0.212	0.523
PSMR->AP	0.331	0.093	3.559	0.122	0.481
EPACE->AP	0.282	0.073	3.861	0.140	0.422
PP->AP	0.431	0.062	6.951	0.281	0.522
MH->AP	0.530	0.071	7.462	0.362	0.642

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The mediating role of MH in the relationship between PA dimensions and AP adds depth to the findings. CCPL positively and significantly influences AP through MH (β = 0.151, t = 3.021), similarly, PSMR positively and significantly (β = 0.122, t = 3.051) and EPACE positively and significantly (β = 0.143, t = 4.612) exhibit significant indirect effects via MH. The strongest mediating effect is observed in the relationship between PH and AP, which is positively and significantly mediated by MH (β = 0.242, t = 3.901). Indirect mediating effect results are predicted in Table 6 below,

Table 6: Mediating effect Results

Mediating Path	B	SE	95% CI (Lower)	95% CI (Upper)	T Statistics
CCPL-→ MH→ AP	0.151	0.051	0.05	0.26	3.021
PSMR→ MH→ AP	0.122	0.042	0.04	0.22	3.051
EPACE→ MH→ AP	0.143	0.031	0.05	0.24	4.612
PH→ MH→ AP	0.242	0.062	0.09	0.33	3.901

Note: CCPL-Control Competence, PSMR-Physical-Specific Mode Regulation, EPACE-Effective Physical Activity Control, PP-Psychological Health, AP-academic performance, MH-mental health

Discussion

The study aimed to test the influence of physical activity and psychological health on university students' academic performance through the mediating effect of mental health. The regression results show that all dimensions of physical activity positively and significantly influence on academic performance of university students. Among the dimensions, control competence for physical training positively and significantly influences academic performance. This result shows that when the student's control competency increases then their academic performance also increases. The result is in line with the study of (Mavilidi et al., 2022; Nobre et al., 2024) where they highlighted that students who effectively manage their physical load experience enhanced cognitive abilities that increase the academic performance of the students. The control competence for physical training helps them balance these demands effectively, reducing the risk of physical and mental fatigue that can impede academic performance. Therefore, it is enforced that universities should focus on the control competencies to increase academic performance that will increase the competitive advantage in the global universities. On the other hand, physical-specific mood regulation also positively and significantly influences the student's academic performance of University students. This relationship emphasized the significance of engaging in structured physical activities which is promoting to enhance his academic performance. The results are in line with the study of Komarudin et al. (2023), who found that regular engagement in specific physical activities, such as aerobic exercises or sports, boosts cognitive flexibility and attentional control. For university students,

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structured physical activities can act as a form of behavioral regulation, teaching time management and goal-setting skills that directly benefit academic performance. Participation in such activities also increases a sense of community and support, as many structured physical activities are group-based, further contributing to emotional stability and academic persistence. Additionally, regular engagement in these activities could reduce inactive behavior that increases academic performance (Teuber et al., 2024). These studies emphasize the significance of physically structured regulation that could increase academic performance which will increase the competitive advantage in the national and international market.

On the other hand, effective physical activity self-control also has a positive effect on the academic performance of university students. This finding highlights the importance of maintaining a balanced approach to physical activity which is ensuring that students allocate adequate time for exercise without compromising their academic responsibilities. Teuber et al. (2024) supported the same results when they indicated that moderate-to-vigorous physical activity enhances executive functioning, which is crucial for academic tasks like problem-solving and planning. For university students, effective physical activity self-control can serve as a tool to alleviate academic stress and improve mood, indirectly supporting better academic outcomes. Furthermore, students who engage in physical activities at optimal levels often report higher energy levels and better sleep patterns, both of which are essential for academic performance. The balance achieved through controlled physical activities ensures that students do not experience burnout, a common issue in rigorous academic environments, thereby sustaining their focus and productivity over time. These previous findings and arguments emphasized that effective physical control is an important factor that increases the academic performance of students.

Further findings highlighted that psychological health also significantly and positively affects the academic performance of university students. The results are supported by Khan (2024) who identified that mental well-being is an important factor for academic performance. University students often face significant psychological challenges including stress, anxiety, and depression that can hinder their academic progress. This study highlights that improving psychological health could lead to better emotional regulation that could increase motivation, and enhanced cognitive engagement which could contribute to academic performance. Moreover, psychological health could positively influence social interactions which increases better relationships with peers and instructors which is crucial for collaborative learning environments. The findings also suggested that psychological health acts as a foundational element that interacts with physical activity dimensions to intensify their positive effects on academic performance. For instance, involvements that address psychological health not only improve mental well-being but also enhance the benefits derived from physical activities which is supported by (Xu & Xu, 2024) who demonstrated that the entwined nature of psychological health increases

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academic performance. These studies emphasized that psychological health is an important factor in enhancing the academic performance of university students. Mental health also positively and significantly affects to academic performance of university students. The findings are supported by the study (Liu et al., 2023).

Further mediating effect results show that physical activity dimensions and academic performance relations are partially mediated by mental health. This finding shows that when the adult's physical activities are properly addressed then their mental health improves which increases their academic performance. As, the mediating effect first time is tested, therefore these findings could not be directly supported. While, these results could be supported by the study of (Mosharrafa et al., 2024). who argued that physical activity enhances neurocognitive function, memory, and executive control, all of which are essential for academic tasks. The mediating role of mental health in this relationship further emphasizes the interconnectedness between physical activity and psychological well-being. The empirical evidence is further supported by the study Muntaner-Mas et al. (2024), where they highlighted that regular physical activity reduces symptoms of stress and anxiety which creates an optimal mental state for learning that could increase academic performance. These findings are evidence that in the university students incorporating physical activity into daily routines could significantly reduce academic pressures and improve concentration which is enabling them to achieve better academic performance.

On the other hand, psychological health also positively and significantly affects academic performance with the mediating effect of mental health. This result also emphasized that mental health is being served as a critical factor because this psychological well-being translates into a better academic performance which is supported by Wang et al. (2023), who identified the important role of mental well-being in promoting motivation, emotional regulation, and cognitive engagement. These results also demonstrated that addressing psychological health activities not only improves emotional stability but is also helps to strengthen the student's ability strengthens students' ability to manage academic performance. The study mediating the effect of mental health reinforces the argument that psychological health interventions should target both physical and mental dimensions to maximize academic performance. This integrated approach aligns with prior studies, such as those by Pan et al. (2023), which highlight the synergy between mental and physical health in achieving optimal academic performance.

Implication

This study makes an important theoretical contribution by extending existing knowledge on the relationship between physical activity, psychological health, mental health, and academic performance especially in the context of university students. Unlike existing research that focuses primarily on college students, this study is one of the first to examine

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these variables comprehensively among university students, addressing an important gap in the literature. Through incorporating exercise concepts such as weight management skills, physiologically specific prescribing regulations, and exercise efficacy, the study extends theoretical frameworks of health and academic performance. These findings will contribute to allowing researchers to develop a better understanding of the interactions between physical and mental health which encourages further exploration of integrative programs that incorporate these concepts in the educational sector. Further, study findings with significant impact also contributed that the mediating effect is a strong contribution of the study which could increase the strength of this framework for other researchers.

From a practical perspective, findings of this study have valuable implications for university administrators, educators, and policymakers who aim to enhance academic achievement through creative interventions focused on health. The evidence highlights the need for universities to develop programs that encourage regular physical activity increase medication efficiency, regulate specific physical medication prescribing, and activity management emphasizing effectiveness. These programs can be integrated into the learning environment through physical activity programs, sports programs, and structured exercise classes. In addition, mental health interventions should be prioritized to support students' psychological well-being, as it is a major mediator in the relationship between health interventions and academic success. Combining physical activity with mental health support programs such as counseling and stress management sessions can provide a strong approach to student achievement. This study also highlighted the significance of addressing both physical and mental health to achieve optimal academic performance and sets a precedent for organizations to implement strategies to manage university students' special needs will be addressed specifically.

Conclusion and Future Directions

The study highlights the important role of physical activity and mental health in improving the academic performance of university students. The findings indicated that various aspects of physical activities contribute significantly to academic performance. This positive impact highlighted the importance of promoting regular physical activity as a way to improve not only physical well-being but also academic performance. Additionally, psychological health emerged as a significant positive influence on academic performance which indicates that psychological well-being is important for students to reach their full academic potential. Furthermore, the role of mental health in partially mediating the relationship between physical activity and academic achievement provides deeper insights into the relationship between these factors This suggests that although physical activity has a direct effect on academic performance, its effects are also through enhanced mental health. These findings have practical implications for educational institutions, highlighting the importance of policies and programs that promote physical and mental health to promote academic performance. Integrating physical and mental health interventions into student

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services can increase academic performance.

The study has various limitations that could be addressed for further research. Firstly, the study was limited to university students while ignoring other school students where physical activities also played an integral role. Therefore, further comparative studies could be conducted on both schools and universities to know the variations in results. Secondly, the study was limited to the mediating effect while having limited attention to the moderating effect, therefore further research could conducted on the moderating effect to increase the predictive power of the model. Finally, the study focused on a quantitative research approach where data was collected through self-administered questionnaires. Further research could also be conducted on the mixed methods of both quantitative and qualitative methods to know the variations in results.

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