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ORIGINAL

THE EFFECTS OF PSYCHOLOGICAL STRESS AND ANXIETY ON ACADEMIC ACHIEVEMENT IN ATHLETES: STRATEGIES FOR EFFECTIVE COPING.

Yichuan He¹, Dongfang Chen^{1*}, Xinqi Cui²

¹Physical Education Department, Beijing University of Posts and Telecommunications, Beijing 100876, Beijing, China.

²Telecommunication Engineering Department, Beijing University of Posts and Telecommunications, Beijing 100876, Beijing, China.

E-mail: hychuan@bupt.edu.cn

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ABSTRACT

This study investigates the impact of psychological stress and anxiety on the academic performance of student-athletes and explores effective strategies to manage these challenges. Focusing on 56 sophomore students majoring in sports training at Xiangyang Polytechnic University, the study examines the relationships between training time, perceived stress, and academic performance. The findings reveal a significant negative correlation between training time and academic performance, with increased training hours leading to lower GPA. Moreover, the study identifies a positive correlation between training time and psychological stress, indicating that higher training loads exacerbate stress levels, which in turn further diminishes academic outcomes. Mediation analysis confirms that psychological stress partially mediates the relationship between training time and GPA. To mitigate these negative effects, the study recommends implementing flexible training schedules, providing psychological support, and promoting stress management programs tailored to student-athletes. These interventions are crucial for helping student-athletes achieve a better balance between their academic and athletic commitments, ultimately leading to improved academic performance and overall well-being. This research provides valuable insights and practical recommendations for educators and athletic trainers to support the dual development of student-athletes in both academic and sports domains.

KEYWORDS: Student-athletes; Psychological stress; Academic performance;

Coping strategies

1. INTRODUCTION

High-level student-athletes in colleges and universities face significant challenges in balancing their academic responsibilities with the demands of athletic training. This dual commitment often leads to substantial conflicts, which can adversely affect their educational achievements and overall development (Meyer & Maltin, 2010). On one hand, athletes are required to dedicate substantial time and effort to training and competitions to enhance their performance and achieve competitive success. This extensive involvement in sports inevitably reduces the time available for academic pursuits, leading to various difficulties in maintaining academic performance and, consequently, impacting their psychological well-being and comprehensive development (Luthar, Kumar, & Zillmer, 2020). One of the primary issues is the direct conflict between academic schedules and training demands. Training sessions and competitions frequently overlap with class times, making it challenging for student-athletes to fully engage in their studies. This situation exacerbates the struggle to balance their dual roles, leading to increased stress and potential academic underachievement (Shaunessy-Dedrick, Suldo, Roth, & Fefer, 2015). Additionally, the dual pressures of maintaining high academic standards and excelling in sports competitions contribute to significant mental strain. The necessity to meet the academic expectations of their institutions and personal aspirations, coupled with the relentless pursuit of athletic excellence, often results in anxiety, fatigue, and psychological burdens that negatively affect both their academic and athletic performance (Décamps, Boujut, & Brisset, 2012).

Psychological stress and anxiety are pervasive issues among high-level student-athletes striving to balance academics and sports (Gomez, Bradley, & Conway, 2018). The dual pressures they face lead to heightened levels of stress and anxiety, which, if not properly managed, can have detrimental effects on their academic performance. Studies have shown that increased psychological stress and anxiety can result in decreased attention, impaired memory, and reduced learning efficiency, directly impacting academic achievements. Furthermore, prolonged exposure to high levels of stress and anxiety may lead to more severe mental health issues, such as depression and anxiety disorders, necessitating urgent attention and intervention (Yuda et al., 2022). The academic and athletic conflict faced by high-level student-athletes in colleges and universities has garnered significant attention over the years. Researchers have identified several key issues contributing to this conflict, including inaccurate training objectives, weak cultural foundations among athletes, disorganized and inadequate management by relevant authorities (Chang et al., 2020), low academic expectations for high-level sports teams,

and unreasonable training and course schedules. These issues collectively hinder the balanced development of student-athletes, limiting their academic and athletic potential (Firth-Clark, Sütterlin, & Lugo, 2019). The current state of comprehensive education for high-level student-athletes reveals significant gaps and challenges. The lack of coordination between academic institutions and athletic training programs exacerbates the difficulties faced by student-athletes in balancing their dual commitments (Bjornsen-Ramig, Warehime, Bigaouette, & Dinkel, 2020). Furthermore, the absence of effective support systems and intervention strategies for managing psychological stress and anxiety contributes to the challenges they face (Fegert, Vitiello, Plener, & Clemens, 2020). Addressing these issues requires a holistic approach that integrates educational and athletic development, providing student-athletes with the necessary support to thrive in both domains (Thomas, Cassady, & Heller, 2017). To address the academic and athletic conflicts faced by high-level student-athletes and promote their holistic development, the following solutions and strategies can be implemented:

1. Implementing flexible scheduling options for both training and academic activities can help alleviate conflicts. Universities should develop policies that allow student-athletes to adjust their training and class schedules to minimize overlap. Additionally, providing academic support services, such as tutoring and counseling, can help student-athletes manage their academic workload more effectively. This approach ensures that student-athletes have the necessary resources to succeed academically while maintaining their athletic commitments.

2. Establishing comprehensive mental health and stress management programs specifically designed for student-athletes can mitigate the psychological impact of balancing academics and sports. These programs should include regular psychological counseling, stress management workshops, and resilience training. By addressing the mental health needs of student-athletes, universities can help them develop effective coping strategies, reducing the negative effects of stress and anxiety on their academic performance and overall well-being.

3. Strengthening the collaboration between academic and athletic departments is crucial for supporting student-athletes. Universities should create interdepartmental committees or task forces dedicated to addressing the unique needs of student-athletes. These committees can facilitate communication, ensure that academic and athletic schedules are harmonized, and develop tailored support plans for individual student-athletes. By fostering a supportive and coordinated environment, universities can help student-athletes achieve a better balance between their academic and athletic responsibilities.

The effective implementation of comprehensive education for high-level student-athletes aligns with the scientific development perspective advocated by the central government and resonates with the goals of modern sports. This approach not only contributes to the cultivation of well-rounded socialist builders and successors with all-around development in morality, intelligence, physical fitness, aesthetics, and labor but also provides high-level talent for the development of sports and school physical education. By adopting these measures, we can promote the development of comprehensive education for student-athletes, providing theoretical support for their training and contributing to the nation's pool of high-level sports talent. Ultimately, this will facilitate the coordinated development of youth culture and sports, leading to healthier, more resilient, and well-rounded individuals who are prepared to excel in both academic and athletic pursuits.

2. Methodology

2.1 Study Participants

This study involved 56 sophomore students majoring in sports training at Xiangyang Polytechnic University, including 38 males and 18 females. The participants were divided into five sports disciplines: basketball, track and field, tennis, badminton, and taekwondo. The distribution of participants by gender and discipline is shown in Table 1.

Table 1: Distribution of Participants by Sport and Gender

DISCIPLINE	MALE PARTICIPANTS	FEMALE PARTICIPANTS	TOTAL PARTICIPANTS
BASKETBALL	12	4	16
TRACK AND FIELD	10	6	16
TENNIS	6	3	9
BADMINTON	5	3	8
TAEKWONDO	5	2	7
TOTAL	38	18	56

All participants provided informed consent before participating, ensuring they were aware of the study's purpose and their rights. Participant information was anonymized, and all data were securely stored for research purposes only.

2.1.1 Weekly Training Hours

To evaluate the balance between academics and sports training, the study recorded the weekly training hours of participants across different sports and genders. The training hours varied based on the discipline and gender, as

shown in Table 2.

Table 2: Weekly Training Hours by Discipline and Gender (Hours/Week)

DISCIPLINE	MALE	TRAINING HOURS (MALES)	FEMALE	TRAINING HOURS (FEMALES)
BASKETBALL	12	8-12	4	6-10
TRACK AND FIELD	10	10-14	6	8-12
TENNIS	6	6-10	3	5-9
BADMINTON	5	7-11	3	6-10
TAEKWONDO	5	8-12	2	7-11
TOTAL	38	-	18	-

These data provide a foundation for analyzing the time allocation between academics and training and its impact on psychological stress and academic performance.

2.1.2 Academic Performance Assessment

The impact of training load on academic performance was assessed by calculating the average GPA of all participants, categorized by discipline and gender. The GPA data are presented in Table 3.

Table 3: Academic Performance (GPA) by Discipline and Gender

DISCIPLINE	AVERAGE GPA (MALES)	AVERAGE GPA (FEMALES)	OVERALL GPA
BASKETBALL	2.8	3.0	2.85
TRACK AND FIELD	3.0	3.2	3.10
TENNIS	3.1	3.3	3.20
BADMINTON	3.0	3.1	3.05
TAEKWONDO	2.9	3.0	2.95
OVERALL	2.96	3.12	3.04

These data illustrate the academic performance across different sports and will be used to analyze the relationship between training time and academic outcomes.

2.1.3 Measurement of Psychological Stress and Anxiety

The Perceived Stress Scale (PSS) and the Generalized Anxiety Disorder 7-item (GAD-7) scale were used to measure the psychological stress and anxiety levels of the participants. The average scores by discipline and gender are presented in Table 4.

Table 4: Psychological Stress and Anxiety Levels by Discipline and Gender

DISCIPLINE	AVERAGE PSS (MALES)	AVERAGE PSS (FEMALES)	OVERALL PSS	AVERAGE GAD-7 (MALES)	AVERAGE GAD-7 (FEMALES)	OVERALL, GAD-7
BASKETBALL	18	20	18.5	7	8	7.25
TRACK AND FIELD	19	21	19.5	8	9	8.5
TENNIS	17	18	17.5	6	7	6.5
BADMINTON	18	19	18.5	7	8	7.25
TAEKWONDO	20	21	20.5	8	9	8.5
OVERALL	18.4	19.8	19.1	7.2	8.2	7.6

These data provide a basis for exploring the relationship between training load and psychological health among student-athletes.

3. Data Analysis

The data analysis is divided into several sections to explore the relationships between training time, academic performance, and psychological stress, and to further analyze how these factors affect the overall performance of student-athletes.

3.1 Descriptive Statistical Analysis

Descriptive statistics were used to summarize the basic data of the study participants and to reveal general trends and characteristics. This analysis includes:

3.1.1 Gender and Discipline Distribution

An analysis of the gender and discipline distribution of the 56 participants, showing that 38 (67.9%) are male and 18 (32.1%) are female.

3.1.2 Weekly Training Hours

Calculation of the mean and standard deviation of weekly training hours for each discipline and overall.

3.1.3 Academic Performance (GPA)

Calculation of the mean and standard deviation of GPA for each discipline and overall, showing GPA ranges between 2.85 and 3.20.

3.1.4 Psychological Stress and Anxiety Levels

Analysis of PSS and GAD-7 scores, indicating average PSS of 19.1 ± 2.0 and GAD-7 of 7.6 ± 1.2 across all participants.

3.2 Correlation Analysis

To investigate the relationships between training time, academic performance, and psychological stress, Pearson correlation coefficients were calculated (Samaha & Hawi, 2016). The analysis revealed significant linear relationships between these variables. The Pearson correlation coefficient r is calculated as:

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}} \quad (1)$$

Where, r_{xy} represents the Pearson correlation coefficient between variables x and y . x_i represents the observation of the i -th sample on variable x , such as training time. y_i represents the observation of the i -th sample on variable y , such as GPA or PSS score. \bar{x} and \bar{y} represent the mean values of variables x and y , respectively. n represents the sample size.

The range of values for the Pearson correlation coefficient is $[-1, 1]$, where $r_{xy} > 0$ indicates a positive correlation between variables x and y ; the closer r_{xy} is to 1, the stronger the positive correlation. $r_{xy} < 0$ indicates a negative correlation between variables x and y ; the closer r_{xy} is to -1, the stronger the negative correlation. $r_{xy} = 0$ indicates that there is no linear correlation between variables x and y .

3.2.1 Correlation Analysis Results

This study conducted a correlation analysis to examine the relationships between training time, academic performance (GPA), and psychological stress (PSS score). The results are as follows: The correlation analysis revealed a significant negative correlation between training time and academic performance:

$$r_{T,GPA} = -0.45, p < 0.01 \quad (2)$$

This result indicates that as training time increases, students' GPA significantly decreases. This negative correlation is particularly pronounced in the track and field and basketball disciplines. The analysis also found a significant positive correlation between training time and psychological stress (PSS score):

$$r_{T,PSS} = -0.40, p < 0.01 \quad (3)$$

This suggests that the longer the training time, the higher the perceived stress levels of the students. This relationship is especially strong in the basketball and taekwondo disciplines. The correlation analysis between psychological stress and academic performance revealed a significant negative correlation:

$$r_{PSS,GPA} = -0.50, p < 0.01 \quad (4)$$

This result indicates that higher levels of perceived stress are associated with lower academic performance, suggesting that psychological stress is an important factor influencing academic outcomes. Through the correlation analysis, this study highlights the significant relationships between training time, academic performance, and psychological stress. Specifically, the negative correlation between training time and academic performance suggests that intensive training may undermine students' academic success.

Furthermore, the positive correlation between training time and psychological stress, along with the negative correlation between stress and academic performance, underscores the role of psychological stress as a key mediator affecting academic outcomes. These findings provide quantitative evidence for understanding the challenges student-athletes face in balancing their academic and athletic responsibilities, and they offer scientific support for strategies aimed at improving academic performance and mental health.

3.3 Regression Analysis

To comprehensively explore the direct impact of training time on academic performance and the indirect impact mediated by psychological stress (Li, Huang, Hu, & Zhao, 2022), this study employed multiple regression analysis and mediation effect models. Below are the relevant formulas and detailed explanations of the parameters.

3.3.1 Direct Regression Analysis of Training Time on Academic Performance

First, a model was established to assess the direct impact of training time on academic performance. This model evaluates the influence of training time (T) as the independent variable on academic performance (GPA) as the dependent variable. The regression model is expressed as follows:

$$GPA_i = \beta_0 + \beta_1 \times T_i + \varepsilon_i \quad (5)$$

Where, GPA_i represents the GPA of the i -th student. β_0 is the intercept, representing the baseline level of academic performance when

training time is zero. β_1 is the regression coefficient for training time, indicating the average impact on GPA for each additional hour of training per week. T_i represents the weekly training time (hours/week) of the i – th student. ε_i is the error term, representing the variance in academic performance that is not explained by the model. The analysis revealed that $\beta_1 = -0.42, p < 0.01$, indicating that for each additional hour of training per week, GPA decreases by an average of 0.42 points, and this relationship is statistically significant.

3.3.2 Mediation Effect Analysis of Psychological Stress

To assess the mediation effect of psychological stress (PSS score) in the relationship between training time and academic performance, this study employed the mediation effect analysis method proposed by Baron and Kenny (Diseth & Kobbeltvedt, 2010), which involves the following two regression models:

3.3.2.1 Impact of Training Time on Psychological Stress

First, the direct effect of training time (T) on psychological stress (PSS) was analyzed using the following regression model:

$$PSS_i = \alpha_0 + \alpha_1 \times T_i + \varepsilon'_i \quad (6)$$

where, PSS_i represents the PSS score of the i – th student. α_0 is the intercept, representing the baseline level of psychological stress when training time is zero. α_1 is the regression coefficient for training time, indicating the average impact on PSS for each additional hour of training per week. ε'_i is the error term, representing the variance in psychological stress that is not explained by the model. The analysis showed that $\alpha_1 = -0.40, p < 0.01$, indicating that for each additional hour of training per week, the PSS score increases by an average of 0.40 points, and this relationship is statistically significant.

3.3.2.2 Joint Impact of Training Time and Psychological Stress on Academic Performance

Next, a regression model was constructed to analyze the combined effect of training time (T) and psychological stress on academic performance:

$$GPA_i = \beta_0 + \beta'_1 \times T_i + \beta_2 \times PSS_i + \varepsilon''_i \quad (7)$$

where, GPA_i represents the GPA of the i – th student. β_0 is the intercept, representing the baseline level of academic performance when training time and PSS are zero. β'_1 is the regression coefficient for training time, indicating the direct impact on GPA after controlling for psychological stress. β_2 is the regression coefficient for PSS, indicating the impact on GPA for each

additional point increase in the PSS score. ε_i'' is the error term, representing the variance in academic performance that is not explained by the model.

The analysis results indicated that $\beta_1' = -0.28, p < 0.05$, meaning that after controlling for psychological stress, each additional hour of training per week leads to a 0.28-point decrease in GPA on average, and this relationship is statistically significant. Additionally, $\beta_2 = -0.30, p < 0.01$ showed that each additional point in the PSS score results in a 0.30-point decrease in GPA on average, confirming that psychological stress has a significant negative impact on academic performance.

3.4 Model Explanation and Mediation Effect Assessment

In regression analysis, assessing the explanatory power of the model and the mediation effect is crucial to understanding the relationships between variables (Ramli, Latan, & Nartea, 2018). This study evaluates the explanatory power of the regression model using the coefficient of determination (R^2) and examines the mediation effect of perceived stress (*PSS* score) in the relationship between training time (*T*) and academic performance (*PSS*).

3.4.1 Model Explanatory Power (R^2)

The coefficient of determination, R^2 , is a measure of the proportion of variance in the dependent variable that is predictable from the independent variables. The formula for R^2 is as follows:

$$R^2 = \frac{SSR}{SST} = 1 - \frac{SSE}{SST} \quad (8)$$

Where, R^2 is the coefficient of determination, indicating the proportion of variance in the dependent variable (GPA) explained by the independent variables (training time and perceived stress). *SSR* (Sum of Squares for Regression) is the sum of squares due to regression, representing the variance explained by the model. *SST* (Total Sum of Squares) is the total variance in the dependent variable. *SSE* (Sum of Squares for Error) is the sum of squares due to error, representing the variance not explained by the model. The final regression model in this study yielded an R^2 of 0.38, indicating that 38% of the variance in GPA can be explained by training time and perceived stress. This suggests that while the model explains a substantial portion of the variance in academic performance, there are other factors not included in the model that account for the remaining 62%.

3.4.2 Mediation Effect Assessment

To evaluate the mediation effect of perceived stress (*PSS*) on the

relationship between training time (T) and academic performance (GPA), the study follows the method proposed by Baron and Kenny. The mediation analysis involves the following regression equations: First, the direct effect of training time on academic performance is assessed using the following regression model:

$$GPA_i = \beta_0 + \beta_1 \times T_i + \varepsilon_i \quad (9)$$

where β_1 represents the direct effect of training time on GPA . Next, the effect of training time on perceived stress is examined using the following regression model:

$$PSS_i = \alpha_0 + \alpha_1 \times T_i + \varepsilon'_i \quad (10)$$

where α_1 indicates the effect of training time on perceived stress. Finally, a regression model incorporating both training time and perceived stress is constructed to assess their joint effect on GPA :

$$GPA_i = \beta_0 + \beta'_1 \times T_i + \beta_2 \times PSS_i + \varepsilon''_i \quad (11)$$

where β'_1 represents the direct effect of training time on GPA after controlling for perceived stress. β_2 represents the effect of perceived stress on GPA . The total effect of training time on GPA is represented by β_1 . The indirect effect of training time on GPA through perceived stress is represented by $\alpha_1 \times \beta_2$. The direct effect of training time on GPA , after accounting for perceived stress, is represented by β'_1 . The mediation effect can be calculated as the difference between the total effect and the direct effect:

$$Indirect\ Effect = \beta_1 - \beta'_1 \quad (12)$$

A significant indirect effect indicates that the mediator (perceived stress) plays a crucial role in the relationship between the independent variable (training time) and the dependent variable (GPA). $\beta_1 = -0.42$, $\beta'_1 = -0.28$: The results show that perceived stress partially mediates the effect of training time on GPA . After including perceived stress in the model, the direct effect of training time on GPA decreases from -0.42 to -0.28. The calculated mediation effect ($Indirect\ Effect = -0.42 - (-0.28) = -0.14$) indicates that perceived stress significantly mediates the impact of training time on academic performance.

3.4.3 Interpretation of Results

Through the calculation of R^2 and the mediation effect, the following conclusions were drawn: Training time and perceived stress together explain 38% of the variance in students' GPA . Perceived stress partially mediates the relationship between training time and academic performance. Specifically,

training time not only directly impacts *GPA* but also indirectly affects *GPA* by increasing perceived stress. These findings provide new insights into the complex mechanisms through which training time influences academic performance and suggest that interventions aimed at reducing perceived stress could potentially improve academic outcomes for student-athletes (Sepulveda, 2008).

4. Conclusion

This study investigated the relationship between training time, perceived stress, and academic performance among student-athletes. The findings provide valuable insights into the challenges faced by student-athletes in balancing their academic responsibilities with the demands of athletic training. The key conclusions are as follows: The analysis revealed a significant negative correlation between training time and academic performance (*GPA*). As training time increased, *GPA* tended to decrease, indicating that the intensive demands of athletic training can adversely affect academic outcomes. The study found a significant positive correlation between training time and perceived stress (*PSS* score). This suggests that as student-athletes devote more time to training, their levels of stress increase, potentially contributing to the decline in academic performance.

Perceived stress was identified as a partial mediator in the relationship between training time and academic performance. The mediation analysis showed that training time indirectly affects *GPA* by increasing perceived stress, which in turn negatively impacts academic performance. This highlights the importance of addressing stress management in student-athletes to mitigate the adverse effects of intensive training on their academic success. The regression models used in this study explained 38% of the variance in academic performance, indicating that while training time and perceived stress are important factors, other variables may also influence academic outcomes. This suggests the need for further research to explore additional factors that may affect the academic performance of student-athletes.

In summary, this study underscores the complex interplay between athletic training, stress, and academic performance in student-athletes. The findings suggest that interventions aimed at reducing perceived stress and carefully managing training schedules could help improve academic outcomes for student-athletes. These results provide a foundation for developing strategies to better support student-athletes in achieving both their academic and athletic goals.

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