The Role of Physical Exercise in Improving College Students' Psychological Quality Under the Background of Ideological and Political Education

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Abstract

Sports activities constitute a significant component of campus culture, embodying both cultural and spiritual dimensions. They wield a subtle yet profound influence on the holistic development of college students, encompassing physical well-being, mental health, and personality cultivation. Enhancing the construction of campus sports culture holds considerable merit in consolidating the primacy of ideological and political education within higher education institutions, augmenting the efficacy of physical education programs, and fostering the development of campus spiritual ethos. Accordingly, this paper endeavours to investigate the role of physical exercise in enhancing the psychological well-being of college students within the contextual framework of ideological and political education. For this study, a random sampling method was employed to select 500 college students from two distinct universities. The participants, aged between 17 to 23 years, comprised predominantly (98.65%) Han nationality individuals, with 63.26% originating from urban or rural areas, and 54.68% being only children. The physical exercise, psychological stress levels, and health statuses of 405 college students were assessed utilizing standardized tools including the Physical Activity Memory Scale, the Chinese College Student Psychological Stress Scale, and the Disease Severity Scale. The categorization of physical exercise levels was determined by converting the assessment results of the Physical Activity Memory Scale into metabolic equivalents. Prior to conducting follow-up data analysis, the researcher administered diagnostic interviews to all participants, adhering to the criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Subsequently, 36 students potentially exhibiting mental disorders, such as severe depression, anxiety, or obsessive-compulsive disorder, were excluded. Additionally, 43 individuals were unable to provide data due to reasons such as enrolment or dropout, while 16 participants failed to furnish data for other unspecified reasons. Consequently, the final sample comprised 405 individuals, consisting of 284 males and 121 females, with an average age of (19.04 ± 1.31) years. At baseline, a notable positive correlation was observed between disease status and psychological stress ($r=0.26$, $P<0.05$). Conversely, no significant correlations were found between physical exercise and disease status ($r=0.06$, $P>0.01$) or between physical exercise and psychological stress ($r=-0.04$, $P>0.01$). A multi-layer linear model analysis revealed that both psychological stress ($\beta= 0.23$, $P<0.01$) and physical exercise ($\beta= 1.54$, $P<0.01$) significantly predicted disease occurrence. Furthermore, the interaction between physical exercise level and psychological stress demonstrated significance ($\beta= 0.05$, $P<0.05$). Implications and Conclusion: Physical exercise serves as a modulating factor in the relationship between psychological stress and disease onset, potentially mitigating the adverse impact of psychological stress on health outcomes. Furthermore, engagement in physical activity has been associated with enhancements in mental well-being and resilience, suggesting potential benefits through the integration of physical activity into holistic educational approaches.

Keywords: Physical Exercise, Psychological Stress, Multi-Layer Linear Model.

Introduction

Physical education plays a vital role in fostering ideological and political education and facilitating the holistic development of college students (Huang & Zhan, 2021). The implementation of sports activities not only enhances the physical fitness of students but also serves as a pivotal instrument in instilling correct ideologies, fostering positive attitudes, fostering a conducive collegiate atmosphere, and bolstering cohesion. Sports activities within educational settings transcend mere physical exercises; they are integral components of spiritual civilization construction, crucial for fostering the psychological well-being of college students (Bailey, 2006; Downs & Ashton, 2011).

Participation in school sports offers students direct experiences in teamwork and competition, facilitating a deeper understanding of adherence to rules and equitable competition (Smith & St Pierre, 2009; Weinberg et al., 2000; Yang & Li, 2017). Consequently, students confront the dynamics of success and failure, thereby enhancing their

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societal adaptability. Engaging in these activities also cultivates adaptive skills, organizational proficiency, problem-solving abilities, and adherence to principles, contributing to holistic personal development.

Moreover, participation in sports activities promotes interpersonal communication and mutual exchange, thereby enhancing social skills under the guidance of socialist core values. In contemporary China, amidst rapid economic and social developments, graduating students face escalating pressures, leading to divergent responses. Notably, psychological issues among college students, stemming from academic stress, environmental challenges, and financial burdens, are increasingly prevalent (Kruisselbrink Flatt, 2013). Untreated, these issues may precipitate severe psychological disorders, hindering students' future prospects. Hence, proactive measures are imperative to fortify the psychological resilience of college students (Tian et al., 2021). This study aims to investigate the role of physical exercise in enhancing college students' psychological resilience within the framework of ideological and political education. The research framework comprises four main chapters: literature review, research methodology, data analysis and findings, and discussion, implications, and future directions.

Literature Review

Firstly, the implementation of campus sports activities serves as an effective means to enhance both the physical and mental well-being of students (Hu & Prompanyo, 2021). Engaging in physical exercises facilitates the development of robust physical health, bolstering immune functions and physiological capacities (Haskell et al., 1985; Karpov et al., 2021; Mikkelsen et al., 2017). Concurrently, it significantly contributes to nurturing positive mental health outcomes (Biddle & Asare, 2011). Participation in sports induces a state of happiness, fostering a positive and optimistic demeanour (Bendíková & Dobay, 2017). Sports serve as a mechanism for swiftly addressing negative emotions, thus facilitating prompt adjustments to one's mental state, thereby promoting mental well-being.

Secondly, campus sports activities augment the quality of student life. Despite the rich and varied nature of university experiences, the rigors of academic pursuits often leave students fatigued. Engaging in recreational activities within this context helps regulate the pace of life, infusing joy into daily routines. The integration of work and leisure activities enhances students' learning disposition. Moreover, sports activities provide fertile grounds for the improvement of students' communication skills. Interactions between students and educators, as well as among peers, foster an environment conducive to open communication, thereby enhancing interpersonal skills.

To enhance the psychological resilience of college students, comprehensive measures must be taken. Initiatives should commence with the establishment of psychological profiles for each student, assessing temperament, personality, adaptability, and mental health upon entry into the institution. Timely intervention strategies, such as individual or group counselling sessions, should be implemented to address psychological issues. Additionally, integrating mental health education as a compulsory component of the curriculum can provide students with essential insights into psychological well-being (Yanhong, 2021).

Furthermore, ideological and political education plays an integral role in psychological quality education. Psychological well-being often hinges on the establishment of correct worldviews, values, and life outlooks. Ideological and political education endeavours to instil these values, guiding students toward a positive life trajectory (Moreira et al., 2022). By closely integrating ideological and political education with psychological education, students are empowered to cultivate a balanced and constructive perspective on life, values, and the world (Yang, 2022).

Moreover, sports competitions serve as platforms for enhancing student cohesion across academic disciplines. Organizing school-wide sports events fosters a sense of unity among students. Such competitions, designed to achieve victory, promote internal collaboration and collective training, reinforcing the collegiate spirit. The symbiotic relationship between the cultivation of college spirit and sports activities is evident, as both endeavours reinforce each other.

In conclusion, amidst the expanding college enrolment and escalating employment competition, it is imperative for college students to possess robust comprehensive qualities and adaptability. Strengthening the psychological resilience of college students remains an ongoing imperative, given the significant implications for their future success and well-being.

Research Objects and Methods

Research Object

This study involved a random selection of 500 college students from two universities, aged between 17 and 23 years old, of whom 98.65% identified as Han nationality, 63.26% hailed from urban or rural locales, and 54.68% were sole offspring. Evaluation of physical exercise, psychological stress levels, and health status among 405 college students was conducted utilizing the Physical Activity Memory Scale, the Chinese College Student Psychological Stress Scale, and the Disease Severity Scale. The categorization of physical exercise

levels was established through metabolic equivalent conversions based on the Physical Activity Memory Scale measurements. Prior to subsequent data collection, diagnostic interviews were administered to all participants per the DSM-IV criteria, resulting in the exclusion of 36 individuals with potential mental disorders. Furthermore, 43 participants were excluded due to logistical issues such as enrolment or dropout, while 16 individuals were excluded due to other miscellaneous factors, yielding a final sample size of 405 participants, comprising 284 males and 121 females, with an average age of (19.04 ± 1.31) years (Yu, 2022).

Survey

The researcher actively engaged in the school's classroom activities and lectures, which were systematically arranged by the institution, with all participants providing signed consent letters. During the assessment sessions, participants initially completed demographic information, followed by comprehensive questionnaire surveys. To ensure anonymity, each participant was assigned a unique code and their birthdate recorded. For subsequent data tracking, the researcher cross-referenced the code with the birthdate to ensure consistency across assessments. The questionnaire administration procedure remained consistent for each assessment. Professional personnel were available to address participants' inquiries during each assessment session, with tracking occurring every three months, specifically in March, June, September, and December 2012, spanning a one-year period (Wang, 2021).

Research Tools

Psychological Stress

The "China College Student Psychological Stress Scale" (CCSPSS), developed by the research team of the Ministry of Education's "College Student Mental Health Assessment System," consists of 85 items. Participants were tasked with reporting recent life events and daily occurrences and assessing their perceived "nature" and "degree of psychological impact." Within the nature column, events are categorized into positive, negative, and neutral, and participants rate the psychological impact of each event based on intensity and duration, utilizing a seven-point scale ranging from "Minimal" to "Maximum" (with scores of 1 to 7, respectively). The full-scale score is derived from the sum of scores from the life event subscale and the daily trivia subscale, encompassing scores from the positive event, negative event, and neutral event subscales. Higher total scores indicate elevated levels of psychological stress. The scale demonstrates reliability and validity in accordance with measurement standards (Jiang, 2021).

Health Status

The Severity of Illness Rating Scale (SIRS) developed by ALLEN was utilized for assessment, a scale commonly employed in stress and health research renowned for its robust validity in appraising physiological ailments. Encompassing a comprehensive spectrum of prevalent illnesses, ranging from common ailments like colds and sore throats to chronic conditions such as diabetes and cancer, the scale systematically ranks and assigns scores to the severity of each malady, totalling 124 grades. The cumulative disease score comprises the sum of individual disease grade scores across all items. In the initial measurement, participants were prompted to enumerate the illnesses experienced within the preceding year, whereas in subsequent measurements, they were queried regarding any ailments contracted since the prior assessment, extending through the conclusion of the fourth tracking measurement period (Zhang, 2021).

Physical Training Level

The measurement of physical exercise intensity was conducted utilizing the Adolescent Physical Activity Recall Questionnaire (APARQ) in conjunction with the Metabolic Equivalent of Energy (METS). This process entailed two steps: Firstly, the Adolescent Physical Activity Recall Questionnaire was employed to gather data on the types, frequencies, and durations of weekly physical exercise activities within the recent period.

Secondly, utilizing the information acquired from the physical activity recall questionnaire (comprising item details, frequency, and duration), comparisons were made with specific metabolic equivalent values corresponding to various types of physical activities as delineated in the Physical Activity Summary of BARBARRA E2000. Subsequently, the energy expenditure associated with the performed physical exercises was computed (Zhu et al., 2021).

Currently, various self-report scales are available to gauge the intensity of physical exercise, encompassing diary entries, activity recall questionnaires, quantitative reviews, and interviews. Among these, the recall method predominates in epidemiological studies due to its widespread usage and practicality. This study employs the Adolescent Physical Activity Recall Questionnaire (APARQ), which prompts participants to delineate the types, frequencies (weekly), and durations of physical activities undertaken within the recent timeframe across four distinct categories: (1) Organized sports both within and outside the school; (2) Unorganized sports both within and outside the school; (3) Organized physical activities both within and outside the school; and (4) Unorganized physical activities both within and outside the school (Sun, 2021).

Given the study's focus on college students deliberate and planned physical activities aimed at maintaining or enhancing physical health, as opposed to activities necessitated by daily living (such as household chores or walking), only categories

(1) and (2) are required for listing in the assessment. Subsequently, the research team members will assign metabolic equivalent values to various activities—such as family chores, professional duties, household maintenance, gardening, religious observances, volunteer work, miscellaneous activities, sedentary behaviour, and diverse sports—based on the Physical Activity Summary of BARBARBARRA E2000. These values will be compared with the types of physical exercises reported by students in the physical activity recall questionnaire, and the corresponding metabolic equivalent values will be calculated. Subsequently, the energy expenditure in physical exercise will be computed using the individual's metabolic equivalent and body weight, according to the formula: Energy consumed by physical exercise (Kcal) = METS × Student weight (kg) × Frequency (/week) × Time (hours). A higher total energy expenditure signifies a higher level of physical activity. The utilization of the METS method for determining physical activity levels demonstrates robust reliability and validity (Zhao & Zhang, 2021).

Data Analysis

Data integration and establishment of a multi-layer linear regression model were conducted utilizing SPSS 17.0 and HLM 6.0 statistical software. Given the potential correlation between observed values within subjects across different measurement time points in longitudinal studies, a "random effect model" test was initially performed to enhance model fit and mitigate inaccuracies resulting from over-parameterization or covariance structure constraints. Subsequently, following the completion of the random model test, parameters of the independent variables were incorporated into the regression equation to assess the regulatory impact of physical exercise on psychological stress (Cui et al., 2021).

The scores representing physiological diseases (health status) across the four observation periods served as the primary layer of data detection. At the secondary layer, the baseline disease level (score at the first assessment), average weekly physical exercise volume, and psychological stress score were utilized. The equation model for the primary layer is then formulated as follows:

$$\text{Score of physiological diseases} = \beta_{0i} + \beta_{1i}(\text{Measurement time})ij + \varepsilon_{ij}$$

Where, "0" represents the intercept, "1" denotes the slope, "i" refers to the ith measured entity, and "j" pertains to the time of the jth measurement.

The equation model for the second stratum is formulated as follows:

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\text{physical exercise})1i + \gamma_{02}(\text{Baseline disease status})1i + \gamma_{03}(\text{psychological stress})li + \gamma_{04}(\text{physical exercise}) \times (\text{psychological stress})li + \mu_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(\text{physical exercise})1i + \gamma_{21}(\text{Baseline disease status})1i + \gamma_{31}(\text{psychological stress})li + \gamma_{41}(\text{physical exercise}) \times (\text{psychological stress})li + \mu_{1i}$$

In this study, each parameter is characterized by two subscripts. If the first subscript is 0, it denotes a parameter linked to the intercept of the equation in the first layer; similarly, if the second subscript is 0, it signifies the parameter corresponds to the intercept component of the equation in the second layer. Conversely, if the first subscript is 1, it indicates that the parameter is associated with the slope in the equation of the first layer; and if the second subscript is 1, it suggests that the parameter pertains to the slope component in the equation of the second layer.

The fundamental premise of this investigation is that physical exercise can modulate the influence of psychological stress on disease (Yusli et al., 2021).

Results

Descriptive Statistics

During the initial assessment, significant correlations were observed among baseline disease levels, psychological stress, physical exercise volume, standard deviation, and correlation coefficient. Notably, a significant positive correlation was detected between disease status and psychological stress (r=0.26, P<0.05), while no significant correlations were found between physical exercise and disease status (r=0.06, P>0.01), as well as between physical exercise and psychological stress (r=-0.04, P>0.01) (refer to Table 1). Over the course of a year, physical exercise status, psychological stress, and disease occurrence demonstrated considerable instability, manifesting notable fluctuations (refer to Table 2). Analysis of sports types revealed ball games (e.g., table tennis, badminton, basketball, football) to be the most prevalent, followed by running, aerobics, and dancing, collectively accounting for over 60% of total time. Conversely, resistance activities (e.g., weightlifting) consumed comparatively less time. Regarding the level of physical exercise, subjects expended an average of 368.25 kJ of energy per week on physical activity, although the high standard deviation indicates substantial inter-subject variability. Examination of psychological stress revealed a notable prevalence of stress stemming from interpersonal relationships and emotional states, while major life events such as family relocation or bereavement were less common. Disease occurrences predominantly comprised minor

ailments like colds, fever, and sore throats, which may be attributed to the subjects' age demographic.

Table 1

Standard Deviation and the Correlation Coefficient

	Mental Stress	Physical Exercise	Disease	The First Measurement	
				M	SD
Mental stress	1.00	-0.04	0.26	112.36	54.87
Physical exercise		1.00	0.06	368.25	103.32
Disease			1.00	5.41	2.56

Table 2

Means and Standard Deviations of Each Data at Tracking Measurements

Testing	Mental Stress	Physical Exercise	Disease
The first time	112.36±54.87	368.25±103.32	5.41±2.56
The second time	134.24±60.43	403.33±94.57	4.32±2.13
The third time	117.83±58.30	36.42±97.38	4.06±1.95
The fourth time	101.97±50.67	412.86±105.43	3.96±2.37

Multi-Layer Linear Model Data Analysis

(1) Random Model Test

Prior to examining the impact of physical exercise, psychological stress, and their interaction on diseases, it is imperative to assess the random effects within the model, accounting for the correlation among observed values in the subjects. Specifically, this entails evaluating the trajectory of all observed diseases without intervention from independent variables. Results indicate pronounced disparities in both intercept and slope (P<0.01), as well as significant chi-square test outcomes for residuals, suggesting substantial individual differences over time. Consequently, additional variables must be incorporated to elucidate this variation (refer to Table 3).

Table 3

Parameter Estimates of the Random-Effect Model

Fixed effect part	β	SE	T	Randomized effect section	SD	DF	λ^2
γ_{00}	4.24	0.35	<0.01	μ_0	18.54	404	<0.01
γ_{10}	0.53	0.14	<0.01	μ_1	1.08	404	<0.01

Note: γ_{00} refers to the intercept in layer 1, the intercept in layer 2, γ_{10} refers to the intercept in layer 1, μ_0 refers to the residual in the intercept in layer 1, μ_1 refers to the residual in layer 2 based on the slope in layer 1.

(2) Effect of interaction between physical exercise and psychological stress on diseases

The predictive analysis of the data tracking process reveals significant predictive effects of psychological stress (β= 0.23, P<0.01) and physical exercise (β= 1.54, P<0.01) on disease occurrence. Moreover, the interaction between physical exercise level and psychological stress also demonstrates significance (β= 0.35, P<0.05) (refer to Table 4).

Table 4

Fixed Effects of the Model of Physical Exercise

	β	SE	DF	F	P
Baseline disease status	4.86	0.29	404	386.32	<0.01
Physical exercise	1.54	0.27	404	50.59	<0.01
Mental stress	0.23	0.02	1157	93.56	<0.01
Physical Exercise × Mental stress	0.05	0.01	1157	5.78	<0.05

To further examine the predictive impact of the interaction between physical exercise and psychological stress on health status throughout the tracking process, participants were stratified into high and low physical exercise groups based on the criterion of 1.5 standard deviations. Subsequently, the model was employed to forecast the disease level trends in these groups under varying levels of psychological stress. Results indicate a significant increase in disease status scores with rising psychological stress levels among college students with low levels of physical exercise (β= 0.08, t=3.15, df=1 157, P<0.01) as well as those with higher levels of physical exercise (β= 0.11, t=7.32,

df=1157, P<0.01). Notably, the slope of the lower exercise group was significantly steeper compared to the higher exercise group (t=2.15, df=1 157, P<0.05) (refer to Figure 1).

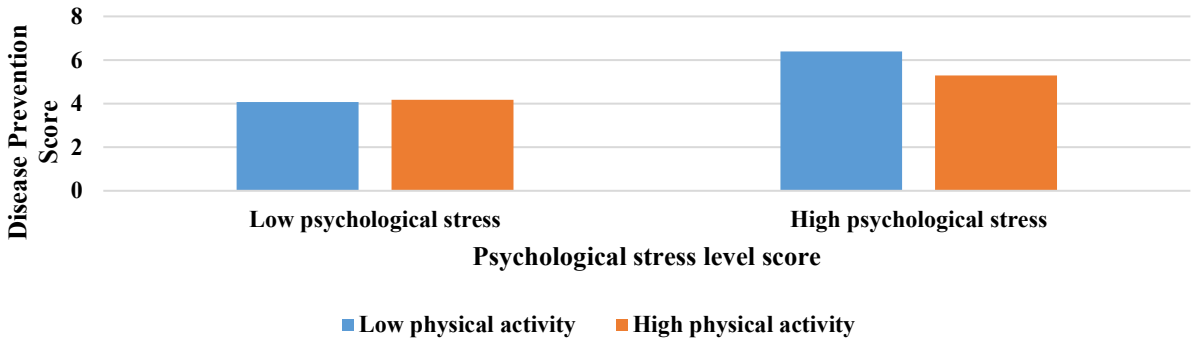

Figure 1: Interaction Effects Between Exercise and Psychological Stress.

Discussion

The author conducted a longitudinal research investigation building upon prior studies, wherein the findings underscored the significance of psychological stress as a key factor influencing disease occurrence. Numerous preceding studies have established a correlation between psychological stress and health outcomes, enabling the anticipation of diverse health issues. The present study corroborates these previous findings, demonstrating that psychological stress serves as a robust predictor of disease occurrence, evidenced in both the initial cross-sectional examination and the longitudinal analysis (P<0.05), thereby bolstering the findings of earlier relevant research (Ren et al., 2021).

The stress buffer hypothesis posits that psychological stress disrupts the equilibrium of both mind and body, posing a threat to overall health. Physical exercise serves as a coping mechanism by providing resources through psychological and physiological avenues, thereby mitigating the psychological stress response and reinstating internal stability and psychological well-being. This model assumes that individuals possess varying degrees and types of stress susceptibility factors, each with a distinct threshold value. When this threshold is surpassed, various stress-related health issues may arise. Physical exercise is proposed as a regulating variable that modulates this threshold, thereby influencing the relationship between stress and health (Prihanto et al., 2021).

Existing literature predominantly comprises cross-sectional research, often entailing inter-tested variables, thereby limiting the depth of analysis concerning differences among individuals across various levels of physical exercise in response to changes in psychological stress. This study employs a multi-layer linear model to analyse the interaction between physical exercise and psychological stress in relation to disease impact. Findings reveal that individuals with higher levels of physical exercise exhibit lower disease scores than their counterparts with lower levels, when confronted with similar levels of psychological stress (P<0.01). Moreover, as psychological stress levels increase, disease scores also rise, albeit at significantly different growth rates between low and high physical exercise groups (P<0.01). This underscores the role of physical exercise in modulating the impact of psychological stress on health. Individuals who engage in regular exercise are less susceptible to health issues stemming from psychological stress compared to those who do not, thus providing crucial evidence supporting the stress buffer hypothesis of physical exercise (Rahawi et al., 2021).

Regarding the underlying mechanisms, current literature primarily delineates the cardiovascular hypothesis, neuroendocrine hypothesis, and attention-transfer hypothesis. However, the author refrains from engaging in a discussion on the mechanistic level, indicating the necessity for further investigation (Palermi et al., 2022).

It is crucial to control for the physical fitness level of participants, as there exists a logical and theoretical correlation between the subjects' physical fitness level and the factors of physical exercise (Shams et al., 2021). However, due to logistical constraints, this study failed to gather objective physical fitness data. Hence, further exploration is warranted to ascertain whether the physical fitness level and physical exercise mutually contribute to each other's variance. The study's temporal span was limited to one year, potentially introducing estimation bias in the model (Carraça et al., 2021).

Conclusion

Off-campus activities play a vital role in advancing college students' ideological and political education. It is imperative to utilize sports activities as a platform for ideological and political education effectively. By identifying key moments in each sports activity and seamlessly integrating ideological and political education, we can enhance students' holistic

development, thereby improving their ideological and political qualities. Given the current ideological and political context, prioritizing psychological quality education for college students is essential. Education authorities and academic institutions should proactively address this need by bolstering psychological quality education initiatives to enhance students' psychological resilience. College students' psychological quality is an indispensable personal attribute in contemporary times, with far-reaching implications for both individual development and national talent enhancement. Hence, universities should initiate pragmatic measures tailored to students' daily lives to actively foster psychological resilience.

Given the current ideological and political landscape, prioritizing psychological quality education for college students is imperative. Education departments and institutions should actively enhance psychological quality education efforts to bolster students' resilience. As psychological quality significantly impacts both individual development and national talent enhancement, universities must actively promote psychological quality cultivation tailored to students' daily lives. Additionally, physical exercise can mitigate the adverse effects of psychological stress on health, highlighting the importance of promoting physical activity among students. Leveraging campus leisure activities effectively enhances students' overall quality, encompassing physical and mental well-being, entertainment understanding, and communication skills. Sports competitions, in particular, foster critical skills such as planning, communication, cooperation, and self-control.

Theoretical and Practical Implications

The study holds several theoretical and practical implications. Theoretically, it underscores the pivotal role of physical exercise in enhancing the psychological well-being of college students within the framework of ideological and political education. Theoretical frameworks indicate that regular engagement in physical activities can ameliorate students' mental health by mitigating stress, anxiety, and depression, while concurrently enhancing self-esteem and overall psychological welfare. Moreover, participation in physical endeavours fosters improved cognitive faculties, concentration, and memory, all of which are fundamental for effective ideological and political education initiatives.

Practically, integrating physical exercise into the college curriculum presents manifold benefits for students' psychological welfare and ideological and political education. Educational institutions can integrate physical education courses, sports clubs, and leisure activities into the academic agenda to encourage consistent physical engagement among students. Such endeavours provide avenues for stress relief, physical fitness enhancement, and the cultivation of a positive mindset, all of which contribute to elevated psychological well-being.

Furthermore, collaborative efforts between departments of physical education and ideological and political education can be instrumental. Such collaboration may entail joint workshops, seminars, or campaigns aimed at elucidating the symbiotic relationship between physical exercise and psychological health. By infusing ideological and political concepts into physical education initiatives, students can develop a comprehensive understanding of the interplay between physical and mental health in their overall personal development and growth.

Limitations and Future Directions

The study's significant findings prompt reflection on its limitations and underscore avenues for future research. Notably, the present study faces constraints that warrant exploration in subsequent investigations. Initially, the generalizability of the findings is circumscribed by the limited scope of data collection, which was confined to two colleges. Consequently, the study's outcomes may not accurately reflect the diverse community of college students attending various institutions, residing in disparate locales, and representing diverse cultural backgrounds. Addressing this limitation necessitates future research endeavours with a broader sample size encompassing a more extensive array of colleges, thereby ensuring the findings' representativeness and relevance to a wider population.

Furthermore, the measurement of psychological quality in this study exhibits additional limitations. While the investigation focused on the effects of physical exercise on college students' psychological well-being, the specific psychological variables assessed may not encapsulate the full spectrum of students' psychological experiences. Future research should endeavour to incorporate a more comprehensive array of measures, including stress levels, self-esteem, motivation, and resilience, to afford a more nuanced understanding of the impact of physical exercise on college students' psychological quality. Moreover, the study's focus predominantly on the value of physical activity neglects potential influences from other factors, such as social support, academic demands, or extracurricular engagements. To elucidate the interplay between these variables and physical activity, future investigations should contemplate examining their associations and potential moderating effects. This holistic approach will facilitate a deeper comprehension of the multifaceted influences shaping college students' psychological well-being.

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