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The Effect of Physical Exercise on College Students' Mental Health and General Self-efficacy

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Abstract

Objective: The objective of this study is to examine the relationship between physical exercise, mental health and general self-efficiency among college students

Method: The random sampling method is used to select undergraduates from colleges, wherein the study uses the physical exercise rating scale (PARS- -3), the General Self-Efficacy Scale (GSES) and the Symptom Self-Rating Scale (SCL-90) to survey 366 college students, and use descriptive statistics, t-test, analysis of variance to analyze resulting data.

Results: The amount of physical exercise reported by men is higher than that of women (t=3.95), the amount of physical exercise of urban students is higher than that of rural students (t=2.96); The self-efficacy and mental health of the large exercise group are higher than those of the small exercise group (t = 7.88, 8.26). There is a significant positive correlation between the amount of physical exercise and the level of self-efficacy and mental health (r=0.42, 0.32, 0.36); Self-efficacy plays a partially mediating role vis-a-vis the influence of physical exercise on mental health.

Conclusion: Physical exercise can directly affect the level of mental health, and it can also indirectly affect the level of mental health through self-efficacy. The correlation coefficients of physical exercise amount, body self-esteem and self-efficacy were significantly correlated at 0. 001 level. Body self-esteem and physical exercise had positive predictive effects on self-efficacy.

Keywords: Physical exercise; College students; Mental health; Self-efficacy

Introduction

In the wake of the 21st century, science and technology have developed rapidly, and the pace of modern life has accelerated, bringing huge shocks and changes to the body and mind of contemporary college students, while producing unprecedented pressure on them. Relevant information shows that, approximately 20%~30% of college students have a tendency of psychological disorder, approximately 10% of people have severe psychological disorders, people with serious psychological abnormalities account for 1%, and the proportion of mentally unhealthy people is also recorded to be on the rise (Chen et al., 2016). Mental health of college students can affect their healthy growth and development. Therefore, how to improve the mental health of college students is a problem that needs to be solved urgently in the education and psychology circles. Self-efficacy is a core concept in Bandura's social cognitive theory, this concept was first proposed in 1977. Self-efficacy is an important domain-specific concept, because a person has a higher self-belief in a certain aspect; on the other hand, this may not be the same case. However, researchers also found that there is a general sense of self-efficacy, which refers to an individual's overall self-confidence when coping with various challenges in different environments or facing new life situations; it is also the ability to judge whether one has the confidence to accomplish a certain thing (Ersöz, 2017). General self-efficacy is another important variable in psychology, and a key determinant of people's behavior, as it refers to people's subjective judgments about whether they can successfully perform a certain achievement behavior.

In response to this research question, Cho et al. (2015) conducted a research that found that life events are objective stimuli or external pressures that can cause people to feel nervous. Life events accompanied by stress can cause emotional changes and affect mental health. When an individual encounters certain life events, a stress system is activated which determines whether an individual performs a stress response and how to perform a stress response; the operation of this system determines the extent of the individual's impact and the corresponding changes in physical and mental health. In the operation of the stress system, in addition to the stress response shown, a series of intermediate processes are also involved, such as personal cognitive evaluation, personality characteristics and other factors. These factors play a direct or indirect role in the stress process, affect the intensity of psychological stress response and stress tolerance, and regulate the relationship between psychological stimulation and health (Cho et al., 2015). Mache, S. and

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others believe that after a certain period of physical exercise, people become more extroverted and feel emotionally better. The reason may be that physical exercise provides students with an open, social, curious and entertaining place, and that it is conducive to the energetic and emotional upsurge of the students. It also provides a material basis for the development of an extroverted personality, which means that extroverted has a higher sensitivity to positive emotions, as extroverted people are generally more active and happier. Physical exercise is an important part of a healthy lifestyle in today's society, and it is also the learning and life content that young students should actively participate in. Physical exercise can effectively reduce anxiety, regulate mood, improve mood as well as improve sleep quality, so as to effectively better mental health. Participating in physical exercise has a positive effect on physical and mental health. The influence and effect of physical exercise on the mental health of college students cannot be replaced by any other means or methods. A number of past works have helped establish the importance of physical exercise to mental health (Mache et al., 2015).

On the basis of the current research, the questionnaire survey method is used to investigate the impact of college students' physical exercise on self-efficacy, mental health and the relationship between the three, as well as explore the mediating role of self-efficacy vis-a-vis the impact of physical exercise on mental health of college students. This is done so as to provide a theoretical basis and operational ideas for colleges and universities to improve the mental health of college students. As shown in Figure 1, the higher the SCL-90 score, the more serious the mental ill health symptoms. The results showed that the mental health level of the heavy exercise group was higher than that of the small exercise group. As shown in Table 1, the total score of SCL-90 is significantly negatively correlated with the total score of GSES, indicating that mental health level is significantly positively correlated with self-efficacy. The total score of SCL-90 and PARS-3 was significantly negatively correlated, indicating that the level of mental health was significantly positively correlated with the amount of physical exercise. There was a significant positive correlation between the total score of GSES and the total score of PARS-3, indicating that self-efficacy was positively correlated with the amount of physical activity. As shown in Table 2, self-efficacy has a significant mediating effect on the impact of physical exercise on mental health.

Physical Exercise and Mental Health

Physical exercise is the presentation of an activity performed in order to advance or preserve physical fitness as well as an individual's overall health. The purpose of physical activity is to help ensure good health and maintain a required level of physical fitness. Therefore, the performance of any activity to improve the fitness by an individual to improve the overall health is known as physical exercise. It is highlighted in several previous studies that physical exercise has a significant relationship with the improvement of health among individuals (Chekroud et al., 2018; Liang et al., 2020). Physical exercise is generally directed toward improving athletic capability or skill.

Along with the other individuals, physical exercise holds significant value for the students (Ertan & Özyol, 2020), particularly at college level. It has a relationship with college students through performance in academic career. Generally, students engaging in regular exercise remain strong, mentally and physically. The mental well-being of college students leads towards higher performance achievement and mental wellbeing can be promoted with the help of routine physical exercise. Therefore, physical exercise has a relationship with the mental health of students (Chekroud et al., 2018) which has significant importance for their academic career.

Mental health comprises an individual's emotional, psychological, as well as social well-being. It impacts on how individuals think, feel and act. It also helps to determine how individuals handle stress, relate to others, and make various required choices. Mental health is significant at every stage of life, from childhood through adolescence and adulthood. Furthermore, mental health relates to cognitive and behavioral as well as emotional well-being. It can be further stated that mental health is all about how people think, feel, and behave with or around others. Past literature also supports the idea that any physical activity leads to the better mental health (Halonen et al., 2020; G. Yang & D'Arcy, 2022). According to Santos et al. (2021), there is a relationship between physical fitness and mental health, and physical fitness can be attained through physical exercise. Due to the key influence of physical exercise on students, physical education is provided at various institutions (Sum et al., 2018). Therefore, mental health has key importance for college students and improvement in mental health can be achieved with the help of regular physical exercises (Auerbach et al., 2018) .

Physical Exercise and Self-Efficacy

Self-efficacy denotes an individual's belief in his or her own capability (M. M. Yang et al., 2020) to perform certain behaviors essential to deliver quality performance. It reflects the level of confidence in one's capability to apply control over one's own motivation, behavior, as well as

social environment. The concept of self-efficacy is originally propounded by the psychologist Albert Bandura, abd denotes to an individual's belief in their ability to perform behaviors which are important to produce definite performance achievements. Self-efficacy is an important element which touches every area of human endeavor. It has the ability to influence the decisions of an individual which, in turn, impact on an individuals' life.

Self-efficacy has a key connection with physical exercise. According to Rieder et al. (2021), physical activity must address perceptions of self-efficacy to promote interventions. Furthermore, a study carried out by O'Neil-Pirozzi (2021) shows that, perception of any challenge in relation to physical exercise can affect the self-efficacy of an individual. In addition to this, another study conducted by Yamaguchi et al. (2021), examines the effects of exercise on the determination of various physical function, exercise habits, as well as self-efficacy, reporting that exercise has a significant relationship with the self-efficacy of individuals. It shows that self-efficiency has key importance for individuals because it has direct connection with mental capability. Thus, it is evident on the basis of several previous studies that self-efficiency is influenced by physical exercise. Therefore, in the case of college students, the role of self-efficacy is important and require physical exercise on routine basis which is expected to have a significant influence on their level of academic activities performance.

Method

This paper assumes:

(1) There were significant differences in body self-esteem and general self-efficacy between male and female college students;

(2) The level of body self-esteem and general self-efficacy of college students who participated in different amounts of physical exercise were higher than those who did not regularly participate in physical exercise;

(3) Physical self-esteem and general self of college students who participated in physical exercise for different durations was higher than those who did not regularly participate in physical exercise.

Experimental subjects

This research uses random sampling to select undergraduates from a university to complete the test. A total of 400 questionnaires were distributed, and 366 valid questionnaires (91.5%) were returned. Among them, 187 are males and 179 are females; 75 freshmen, 80 sophomores, 88 juniors, and 123 seniors; 189 people in science and engineering, 177 people in literature and history. There are 195 only children and 171 non-only children; 226 are from rural areas and 140 are from urban areas.

Experimental method

Physical exercise rating scale

The physical exercise level is measured by the Japanese scholar Hashimoto Takao, using the physical exercise rating scale (PARS-3) revised by domestic scholar Liang Deqing and others. The scale examines the intensity of physical exercise, the time of each exercise and the frequency of physical activity (Laloyaux et al., 2015). The calculation method for the total score of physical exercise is: The amount of physical exercise = intensity × (time-1) × frequency. Each question on this scale contains 1 to 5 grades, and the scoring method is based on the grade from 1 to 5 points, therefore, the highest score is 100 points, and the lowest score is 0 points. Among them, the physical exercise score ≤ 22 points is counted as small exercise volume, and the score of 23 to 45 points is counted as medium exercise volume, while a score of 45 points or more is counted as a large amount of exercise. The test-retest reliability of the scale is 0.86.

General self-efficacy scale

Self-efficacy is measured using the General Self-Efficacy Scale (GSES) compiled by Schwarzer et al. and translated and revised by Wang Caikang et al. The scale has 10 questions, each with 1~4 options, and the scoring method is based on grades from 1 to 4 points; the higher the score, the higher the participants' sense of self-efficacy. The internal consistency coefficient of the scale is 0.88, and the test-retest reliability is 0.85.

Symptom self-rating scale

Mental health level was measured using the Symptom Self-Rating Scale (SCL-90) revised by Wang et al. (2017); the table has a total of 90 questions, contains 10 factors, which are somatization, interpersonal sensitivity, anxiety, compulsion, depression, hostility, terror, paranoia, psychosis and others. Options from 1 "No" to 5 "Severe", a total of 5 grades, a score of 90 points indicates asymptomatic, mental health is very healthy, with a limit of 160 points, more than 160 points indicate potential psychological problems. The higher the score, the more serious the psychological problems of the subjects，and therefore, the lower the level of mental health (Lip, R. ,2015). The lower the score, the fewer unhealthy symptoms, which indicates a higher level of mental health. The scale is widely used as a research tool for college students' mental health and has good reliability and validity.

Results

Differences in demographic variables of college students' physical exercise, self-efficacy, and mental health

The differences in the demographic variables of the scores of college students' physical exercise, self-efficacy and mental health level measurement scales are studied, and the college students in this study have no differences in self-efficacy and mental health in terms of gender, grade, professional category, whether or not they are only children, and the place of origin. There are no significant differences in physical exercise in demographic variables such as grade, professional category, and whether or not to be an only child. tTere is a significant difference in gender (t=3.95), as the amount of physical exercise of men (30.94±26.26) is significantly higher than that of women (20.60±22.69). There is also a significant difference in the amount of physical exercise between college students from urban and rural colleges (t=2.89), as the amount of physical exercise of urban students (28.65±26.33) is higher than that of rural students (21.00±21.98).

Self-efficacy and mental health of different physical exercise groups

An independent sample t test was conducted on the self-efficacy and mental health of college students whose physical exercise volume reached large and small exercise volume. The SCL-90 total scores and GSES total scores of different physical exercise groups are found to be significantly different，with the self-efficacy score of the large exercise group being higher than that of the small exercise group; the total score of SCL-90 of the large exercise group is lower than that of the small exercise group (Schönfeld et al., 2016). Since the score of SCL-90 is interpreted thus; the higher the score, the more serious the mental unhealthy symptoms appear, the results show that the mental health level of the large exercise group is higher than that of the small exercise group, as shown in Figure 1.

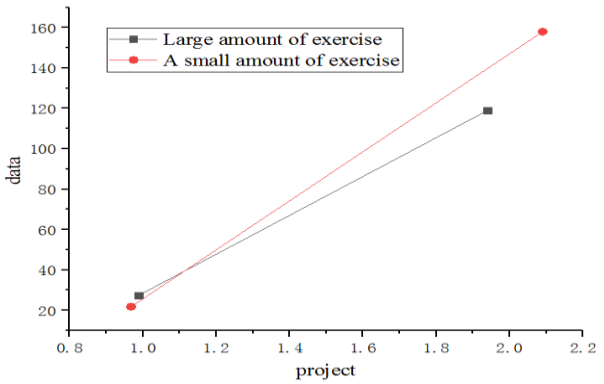

Figure .1 Comparison of self-efficacy and mental health of college students with large/small physical exercise volume

Correlation among college students' physical exercise, self-efficacy, and mental health

A pairwise correlation analysis of the scores of college students' physical exercise, self-efficacy and mental health level measurement scales found that，the total score of SCL-90 is significantly negatively correlated with the total score of GSES. Since the higher the total score of SCL-90, the unhealthier the mentality is, which shows that the level of mental health is significantly positively correlated with self-efficacy. The total score of SCL-90 is significantly negatively correlated with the total score of PARS-3, which shows that there is a significant positive correlation between the level of mental health and the amount of physical exercise. The total score of GSES is significantly positively correlated with the total score of PARS-3, indicating that self-efficacy is positively correlated with physical exercise volume. See Table 1 for details.

Table 1

Correlation of college students' physical exercise, self-efficacy, and mental health (r)

Project	PARS-3	GSES	SCL-90
PARS-3	---		
GSES	0.45	---	
SCL-90	-0.38	-0.39	---

The mediating role of self-efficacy in the influence of physical exercise on the mental health of college students

From the results in Table 2, it can be seen that there is a significant correlation between self-efficacy, physical exercise, and mental health, satisfying the premise hypothesis of intermediary effect; therefore, it can be tested in accordance with the method of sequential test of mediation effect. The results show that self-efficacy has a significant mediating effect in the influence of physical exercise on mental health，and the ratio of the mediating effect to the total effect is a * b/c=0.40X-0.28/-0.36=31.1%, see Table 2.

According to the above analysis of the mediation effect, a model diagram of the mediation effect is obtained (see Figure 1), and the data shown in the figure are the corresponding path analysis coefficients. It can be seen from the path coefficient in the figure that physical exercise can directly affect the level of mental health，and it can also indirectly affect the level of mental health through self-efficacy.

Table 2

The mediating effects of self-efficacy (m) in physical exercise (x) predicting mental health (y) are successively tested

Step	Standardized regression equation	Regression coefficient test
First step （c）	y=-0.35x	SE=0.098 t=-7.16
Second step （a）	m=0.42x	SE=0.012 t=8.02
Third step(b、c)	y=-0.26m -0.24x	SE=0.436 t=-5.28 SE=0.102 t=-4.75

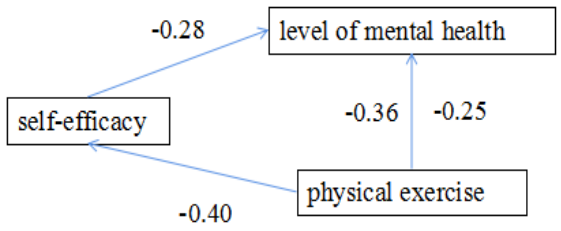

Figure. 2 The mediation model of self-efficacy between physical exercise and mental health

Discussion

This research examines the physical exercise, self-efficacy and mental health status among college students and the relationship between the three. Moreover, the mechanism of self-efficacy on the relationship between physical exercise and mental health is discussed. The results of the study found that, there are no significant differences in the level of self-efficacy and mental health of college students in demographic factors such as gender, grade, professional category, whether or not they are only children, and their birthplace; however, there are differences found in the amount of physical exercise by gender and birthplace. Specifically, the amount of physical exercise of men is higher than that of women, and the amount of physical exercise of urban students is higher than that of rural students. These results are consistent with previous related studies. The study found,= that the physical exercise scores of male college students are significantly higher than that of female college students, and male college students are more involved in physical exercises; this is probably a result of society's expectations for male roles often include characteristics such as strong and robust Moreover,the young men of college students can also make their bodies more masculine through physical exercises，in an effort to enhance their attractiveness to the opposite sex. On the other hand, the amount of physical exercise of urban students is higher than that of rural students, which may be due to the acceptance of more urban cultural propaganda， as urban students may have a deeper understanding of the concept of the importance of physical exercise; however, rural students have had more opportunities to participate in physical labor before, and they have relatively neglected physical exercise (Woolley et al., 2006).

This study also found differences in self-efficacy and mental health among different physical exercise groups. The self-efficacy and mental health of the large exercise group are higher than those of the small exercise group. Correlation analysis further proves this group difference. Correlation analysis shows that， there is a significant positive correlation between the amount of physical exercise and self-efficacy; it further shows that the greater the amount of physical exercise among college students, the higher their sense of self-efficacy. This is consistent with the research results of various previous studies. In their research, they found a positive correlation between physical exercise and self-efficacy. The reason may be that irregularly insisting on a certain amount of physical exercise is a test of personal will， and it can also help develop a more beautiful and a healthier body, so as to enhance the individual's positive evaluation of his own volitional ability and his confidence in their body. These positive evaluations and self-confidence will extend to other areas of life, and improve their self-efficacy. The results of the correlation analysis also found that, there is a significant negative correlation between the physical exercise scale score and the SCL-90 score, showing that the greater the amount of physical exercise of college students, the lower the score of the symptom self-rating scale, and the higher the level of its mental health, that is, the amount of physical exercise is significantly positively correlated with the level of mental health (Fang & Yu, 2015). This result is consistent with many studies, some scholars' studies have proved that participating in physical exercise can regulate emotions and relieve stress，ppromote the individual to maintain a good mental state, as well as promote the development of mental health. Studies have also found that physical exercise can enhance an individual's mental toughness, thereby improving the individual's mental health.

Conclusion

After boys and girls have exercised for a certain period of time, there are different changes in the neurotic dimension of personality factors. Relatively speaking, girls have become more emotionally stable and have developed lower levels of anxiety than boys, and it is easy to restore calm. Physical exercise can effectively reduce the intensity of stress caused by

life events. The cooperative exercise situation is better than the autonomous exercise situation in reducing stress intensity. Physical exercise can effectively reduce the level of Jiao Zhong and depression. The cooperative exercise situation is better than the autonomous exercise situation in improving state anxiety and overall anxiety. Self-efficacy plays a partially mediating role in the impact of physical exercise on mental health, that is, physical exercise has an indirect effect on mental health by improving self-efficacy. Individual college students who engage in a lot of physical exercise can transfer bad emotions and improve mental toughness through physical exercise, and in doing so, lead to an improvement mental health. In addition, physical exercise also has an impact on mental health through self-efficacy. The improvement of self-efficacy can improve the individual's stress ability, therefore, individuals with high self-efficacy are more confident in facing up to various unknown challenges. This trait affects the individual's physical and mental health by affecting the body and mind regulation system. Physical exercise is more effective in reducing state anxiety than trait anxiety; as a special intervention situation, physical exercise has a more obvious effect on transient emotional experience. For this reason, it is important to work hard to improve your relationship with those around you and maintain good communication with them thorugh close social support and good interpersonal relationships. The system gives individuals a sense of security and enables them to experience higher self-efficacy, which can not only enhance their self-confidence and reduce their anxiety, but also transfer to other areas of activity.

Study Implications

The current study examined the relationship between physical exercise, mental health and general self-efficiency among college students. This relationship has not been examined in previous studies. Although the role of physical exercise, mental health and general self-efficacy is considered by various scholars in the past (Auerbach et al., 2018; Gross et al., 2018; Nowiński et al., 2019), this specific relationship has not been studied in the context of college students. Therefore, this study investigated a relationship which was largely ignored by previous studies. More specifically, this study contributed to existing literature by examining the effect of physical exercise on mental health. This relationship is rare among college students. The effect of physical exercise is investigated be explored prolifically in relation to patients; however, this relationship needed to develop among college students. Secondly, this study examined the effect of physical exercise on self-efficacy. This relationship is also rarely discussed in studies related to college students. Third, this study examined the role of self-efficiency on the level of mental health which is not formally documented by previous studies. Hence, this study carries major implications for literature. Practically, this study highlighted several important elements needed to promote students' mental health and self-efficacy which can be helpful for practitioners seeking to enhance students' academic performance. This study recommended that colleges engage in efforts to promote various physical exercise activities in order to promote students' mental health for ensuring better performance in their academic life/career.

Limitations and Future Directions

The current study is limited to college students only. The relationship examined between physical exercise, mental health and general self-efficiency is based in the context of college students, and future studies should examine this relationship among postgraduate students at higher educational institutions as well as at school level. This study considers the metal health in relation to physical exercise; however, physical exercise has a significant effect on the overall health of students. Thus, future studies should include the overall health of students including mental health in relation to physical exercise. Additionally, mental health plays an important role in college student's academic career/success. Physical exercise has an effect on mental health which has a direct effect on students' academic career, which unfortunately, is not examined in this study. Hence, future studies should examine the role of mental health on students' academic career or students' academic performance through physical exercise.

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