

# THE RELATIONSHIP BETWEEN PHYSICAL EXERCISE LEVELS AND ANXIETY OF COLLEGE STUDENTS DURING THE COVID-19 PANDEMIC

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## SUMMARY

**Background:** Subjective anxiety is one of hot spots in the field of positive psychology. It can not only evaluate a person's quality of life, but also measure a person's mental health and psychological development level. Therefore, it has important theoretical significance to study the relationship between physical exercise and subjective anxiety.

**Subjects and methods:** In order to examine the relationship between physical exercise and the subjective anxiety among college students, a questionnaire survey method was completed by 1,000 college students in Zhengzhou University. After psychological construction and empirical exploration, the psychological construction model of the subjective anxiety of college students is proposed, and the method of structural equation modeling is used to verify the model.

**Results:** There is a significant correlation between the duration of exercise and the subjective anxiety among college students. Duration of exercise and body satisfaction have the highest correlation with a correlation coefficient of 0.331, which has a significant negative correlation with negative emotions. Exercise intensity is significantly correlated with positive emotions and physical satisfaction. There is a significant positive correlation between exercise intensity and duration of exercise and the various levels of physical self-esteem, but the correlation with the coping style is not significant. The duration of exercise is significantly negatively correlated with conversational disturbances and social barrier. The exercise intensity is significantly negatively correlated with social barrier. The duration of exercise is significantly negatively correlated with neuroticism, and the amount of exercise is significantly positive with introverted personality. Related. The various levels of subjective anxiety among college students are significantly related to physical self-esteem, positive coping, interpersonal relationships and personality characteristics.

**Conclusions:** The subjective anxiety among college students who participate in physical exercise is stronger than that of college students who do not exercise. This difference is manifested in the emotional component and special life satisfaction between the two. Short-term physical exercise has no effect on the subjective anxiety of college students. Light and moderate exercise intensity have a deeper impact on the subjective anxiety among college students with the increase of exercise duration. Physical exercise can not only directly affect subjective anxiety among college students, and but also affect college students' subjective anxiety through intermediary variables such as physical self-esteem, interpersonal relationships, and personality characteristics.

**Key words:** physical exercise - subjective anxiety - college students - psychological mechanism

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## INTRODUCTION

Substantial studies on emotion regulation support that regulation of cognitive reappraisal is more effective than expression suppression. Guided and spontaneous cognitive reappraisal can well reduce participants' emotion experience. Cognitive reassessment can be used to help individuals generate more positive emotions in stressful situations (Andreotti 2013). Goldin et al. used cognitive reassessment for psychotherapy of 75 adult patients with anxiety disorder. The results showed that participants' social anxiety was significantly reduced (Goldin et al. 2012). According to the laboratory study of expression suppression by Goldin et al., the main trial instruction asked the subjects to suppress the negative emotions of aversion stimulus, and the negative emotional experience reported by the subjects was relatively fewer than non-inhibitors, but more than the participants under cognitive reappraisal conditions (Goldin et al. 2008). Research from physiological psychology further supports

the idea that cognitive reappraisal is better than expression inhibition. The brain areas related to emotion regulation mainly include the amygdala (amygdala), medial orbitofrontal cortex (mOFC), bilateral prefrontal lobes (PFC), and anterior cingulate gyrus (Bush et al., 2000). Some studies argue that cognitive reappraisal can reduce the activation of the amygdala, but also the activation of the ventromedial orbitofrontal cortex (Phan et al. 2005, Schaefer et al. 2002). However, expressive suppression does not reduce the activation of amygdala; on the contrary, it increases the activation of the medial orbital frontal lobe (Ohira et al. 2006). ERP study by Cheng Li et al. (2011) on the regulation of fearful emotions showed that cognitive reappraisal started earlier and lasted longer than that of expressive suppression in regulating negative emotions, which again verifying that cognitive reappraisal is better than expressive suppression.

Generally speaking, previous research on emotion regulation focus on weakening the adjustment methods (evaluation neglect and expression inhibition), yet few

research on enhancing adjustment (evaluation attention and emotional catharsis). In fact, athletes not only need to control impulse and inhibit the expression of negative emotions, but also need to seek adaptive expression of positive and negative emotions, no matter in daily life or competitions (Wang & Guo 2003). This kind of adaptive expression actually exists, which gradually attracts the attention of more researchers. In the process of training and competition, athletes will produce a variety of complex emotions, and even extreme changes in their emotional state will occur in an instant. Athletes will seek various ways to express the emotions. In sports situations, it is still unclear whether the effects of emotion regulation methods are different from the situations involved in previous studies, so it is necessary to conduct a more in-depth discussion on them.

Substantial studies on the self-control of athletes are being carried out in the field of sports. Studies have shown that loss of self-control can lead to more “Yips” (an involuntary muscle contraction that manifests itself differently across sports) in athletes who emphasize the stability and control of technical movements in sports such as table tennis, badminton, tennis and golf; The “Polar Bear” experiment discovered the inverse effect of psychological control, and proposed the theory of inverse processing based on a series of empirical studies (Wegner et al. 1987).

The self-control attrition model believes that the energy loss of self-control is only temporary, which can be compensated in certain ways, including rest or sleep (Baumeister et al. 2000), increasing motivation level (Bargh 1990), supplementing blood glucose (Gailliot et al. 2007) and so on. The latest research shows that emotional state is closely related to self-control. Positive emotions can effectively offset the loss of self-control and vice versa. Studies on the influence of different emotion regulation methods on self-control show that under negative emotions, the strategies of restraint and evaluation will consume more control resources (Li 2012).

Since the rise of exercise psychology in the 1960s and 1970s, physical exercise and mental health has become an important field in the study of sports psychology. Studies on the relationship between physical exercise and mental health mainly focuses on physical exercise, mood improvement, the influence of physical exercise on personality and self-concept, the relationship between physical exercise and cognitive function, and the mechanism by which physical exercise produces psychological benefits. Anxiety, depression, fear, stress, tension and other words that reflect negative emotions are more common among previous studies. It seems that most sports psychologists are more enthusiastic about the relationship between physical exercise and negative emotions and behaviors of human, not positive emotions. In fact, it is extremely necessary for exercise psychology to pay attention to the positive aspects of humanity, which will help ordinary people live healthier and better by using physical exercise. Subjective anxiety is one of hot spots in the field of positive psychology. It can not only evaluate a person's quality of life, but also measure a person's

mental health and psychological development level. Therefore, it has important theoretical significance to study the relationship between physical exercise and subjective anxiety, explore the reasons for the relationship between the two, further clarify the role of physical exercise in improving people's quality of life and maintaining people's mental health, promoting people's psychological development, and enriching the theory of exercise psychology and verifying the theory of subjective anxiety. The paper attempts to focus on the research process of the concept, measurement and predictive indicators of subjective anxiety, supplemented by the relationship between physical exercise and subjective anxiety and its predictive indicators. It adopts questionnaire survey, interview, and mathematical statistics method. Based on the analysis of the problems in the research on the relationship between physical exercise and subjective anxiety, the research hypothesis was put forward and verified.

## METHODS

It is found that the research results about the relationship between physical exercise and subjective anxiety are not yet unanimous. At the same time, these studies also have obvious weaknesses. For example, most studies are based on the psychological factors influencing physical exercise such as time, type, frequency, intensity of exercise, etc., and rarely consider the comprehensive and interactive effects of these factors on subjective anxiety; there are lacks of controlled variable in previous research. In terms of these deficiencies, this paper attempts to study and solve the following questions: Is there a relationship between physical exercise and the subjective anxiety of college students? If there is a relationship, how do the four elements of physical exercise proposed by traditional sports affect the subjective anxiety of college students? What is the psychological mechanism of the effect of physical exercise on the subjective anxiety among college students?

Sampling survey is used to study the questions mentions and the data are collected from students in Zhengzhou University. Out of the 1,000 questionnaires distributed, 968 questionnaires were retrieved. The physical activity rating scale (PARS-3) was revised by Deqing Liang and others from Wuhan Sports University, which measures the amount of physical exercise from three aspects: the intensity of physical exercise, exercise time and exercise frequency, and the amount of physical exercise is used to measure participation level of physical exercise. The score of the amount of physical exercise = intensity \* (time -1) \* frequency. Each aspect is divided into 5 levels, with 5- point scale. The maximum amount of physical exercise is 100 points, and the minimum value is 0 point. The physical exercise evaluation standard is: light exercise intensity (1-19), medium exercise intensity (20-42), high exercise intensity (43-100). The test-retest reliability of the scale is 0.82.

The Physical Self-Esteem Scale for College Students was revised by Xia Xu and others. It includes a main scale

for physical self-worth and four sub-scales for athletic skill, physique, physical attraction and physical fitness. All the questions on the scale were given two kinds of statements to the subjects. The subjects chose one of the statements that fit them, and then chose to answer them from “completely consistent” and “somewhat consistent”. Each question is a 4- point scale, and the total score range for each subscale is 6-24. Analysis revealed that these scales had good reliability and validity.

In this study, a group test was used. In class lessons or physical education theory courses, participants were instructed to fill in the questionnaire. The entrusted examiners did not study intensively before answering the questionnaires. The study used written notices to issue test

requirements to the examiners and supplemented the test by telephone or e-mail.

## RESULTS

The scales applied in the research was re-tested to improve the reliability of the research results. The reliability test results showed that the internal consistency of these scales is great and acceptable. It can also be seen from Table 1 that the Cronbach coefficient of the five subscales of the subjective anxiety among college students is between 0.62 and 0.89, indicating that the subjective anxiety scale has high reliability.

**Table 1.** Descriptive statistical results of assessment tools and reliability indicators (n=968)

Measured variable	<i>M</i>	<i>SD</i>	Value range	Cronbach $\alpha$	Split-half
Positive emotion	19.4	4.6	6-30	0.76	-
Negative emotion	30.8	9.9	12-60	0.89	-
Life satisfaction	22.0	6.1	8-40	0.82	-
Learning satisfaction	17.6	4.7	6-30	0.76	-
Body satisfaction	10.8	2.6	3-15	0.62	-
Body self-worth	13.7	3.1	6-24	0.69	-
Athletic ability	13.9	3.8	6-24	0.81	-
Physical conditions	15.7	3.8	6-24	0.74	-
Physical attractiveness	13.6	3.2	6-24	0.83	-
Physical fitness	14.8	3.1	6-24	0.72	-
Active coping	2.8	0.47	1-4	0.71	-
Passive coping	2.2	0.53	1-4	0.66	-
Interpersonal relationship	9.4	5.3	0-28	-	0.77
Extraversion-introversion	7.8	2.8	0-12	-	0.70
Neuroticism	4.8	3.1	0-12	-	0.75
Physical exercise level	31.7	18.5	0-80	-	-

In order to more accurately reveal the relationship between physical exercise and subjective anxiety, it is necessary to control the variables in life event that are most likely to affect the subjective anxiety among college students. For this reason, this study uses the five dimensions of subjective anxiety among college students, namely positive emotion, negative emotions, life satisfaction, learning satisfaction, and body satisfaction as dependent variables, and unfortunate events, interpersonal changes, changes in household income, and changes in academic performance as independent variables. This paper conducts a multivariate analysis of variance on the relationship between the independent and dependent variables, and eliminates the samples that probably affect the subjective anxiety among college students. Due to the multivariate variance analysis of multiple independent and dependent variables, the Wilks' Lamhlt method, which has strong resilience with a long history, is used for the overall test. The results show that in the multivariate significance test of the five dimensions and four dependent variables, the Wilks'  $\Lambda$  value is between 0.975-0.992 ( $P < 0.05$ ), reaching a significant

level. This explains that the four dependent variables may all affect the subjective anxiety among college students. Therefore, eliminating the samples involving the four variables among 1000 samples, the remaining 803 samples are used to further study the relationship between physical exercise and the subjective anxiety among college students.

**Table 2.** A Multivariate statistical test of different life events on levels of subjective anxiety among college students

Variables	Value	<i>F</i>	<i>Df</i>	<i>P</i>
Unfortunate events	0.992	2.98	5	0.011
Interpersonal changes	0.991	3.35	5	0.005
Changes in academic performance	0.975	4.91	10	0.000
Changes in household income	0.979	4.05	10	0.000

In order to examine whether there is a relationship between the subjective anxiety among college students

and physical exercise, the survey item of “Are you actively participating in physical exercise besides physical education?” According to the results, the samples are divided into the non-exercise group and exercise group, to assess the level of subjective anxiety among college students in the two groups. In order to improve the reliability of the result, this research analyzes the relationship between subjective anxiety and examines some demographic variables such as grade, gender, school location, school category, and academic performance rankings, before examining the impact of the two levels of this variable on the subjective anxiety among college students. The results show that gender and school category have obvious main effects on the subjective anxiety among university students (the Wilks’ value of gender=0.965,  $F=5.527$ ,  $P<0.01$ ; the Wilks’ value of school category=0.924,  $F=4.230$ ,  $P<0.01$ ), but no interaction between them. Therefore, when investigating the differences in subjective anxiety among college students who actively participate in physical exercise, it is necessary to control the variables of gender and school category.

The paper analyzes the exercise intensity and the duration of exercise that measure the level of long-term physical exercise and the subjective anxiety among college students and its predictive indicators. It is found that there is a significant correlation between the duration of exercise and the subjective anxiety among college students. Duration of exercise and body satisfaction have the highest correlation with a correlation coefficient of 0.331, which has a significant negative correlation with negative emotions. Exercise intensity is significantly correlated with positive emotions and physical satisfaction. There is a significant positive correlation between exercise intensity and duration of exercise and the various levels of physical self-esteem, but the correlation with the coping style is not significant. The duration of exercise is significantly negatively correlated with conversational disturbances and social barrier. The exercise intensity is significantly negatively correlated with social barrier. The duration of exercise is significantly negatively correlated with neuroticism, and the amount of exercise is significantly positive with introverted personality. Related. The various levels of subjective anxiety among college students are significantly related to physical self-esteem, positive coping, interpersonal relationships and personality characteristics. Among them, negative emotions are significantly negatively correlated with physical self-esteem, positive coping, and introverted personality characteristics, and are significantly positively correlated with negative coping, interpersonal disturbances, and neuroticism; other dimensions of college students’ subjective anxiety have opposite relationship with the predictors compared with negative emotions.

## CONCLUSIONS

By analyzing the research literature on the relationship between physical exercise and subjective anxiety, this

paper puts forward the deficiencies in this field of research, and focuses on solving these problems. It always runs through the elements of physical exercise, subjective anxiety among college students and its predictive indicators.

The following conclusions are obtained through the research: (1) The subjective anxiety among college students can be divided into five dimensions: positive emotion, negative emotion, life satisfaction, learning satisfaction, and body satisfaction. (2) The compiled subjective anxiety scale with good reliability and validity can reflect the full picture of the subjective anxiety among college students. It can be used to conduct diagnosis, consultation and guidance on the mental health and psychological development of college students. (3) The subjective anxiety among college students who participate in physical exercise is stronger than that of college students who do not exercise. This difference is manifested in the emotional component and special life satisfaction between the two. (4) Short-term physical exercise has no effect on the subjective anxiety of college students. (5) Light and moderate exercise intensity have a deeper impact on the subjective anxiety among college students with the increase of exercise duration. The effect of vigorous intensity activities on subjective anxiety among college students with the increase of exercise duration shows an inverted “V”-shaped curve; as the increasing duration of exercise, the effect of moderate exercise intensity is significantly better than the that of light and vigorous exercise intensity. (6) Compared with the exercise intensity, the duration has a more important impact on the subjective anxiety among college students. (7) Physical exercise can directly affect the subjective anxiety among college students, and also operate the subjective anxiety among college students through intermediary variables such as physical self-esteem, interpersonal relationship, and personality. (8) Physical exercise is a positive coping, but it would do nothing to improve coping styles. (9) Exercise situations have different effects on the subjective anxiety among college students. The situation that is conducive to stimulating the autonomy and relationship needs of exercisers is more helpful to improve the subjective anxiety among college students. This suggests that contextual factors need to be considered when formulating exercise prescriptions for the impact of physical exercise on mental health. (10) Psychological variables have different requirements for exercise duration. This suggests that when formulating exercise prescriptions for the impact of physical exercise on mental health, it is necessary to determine the duration of the exercise program according to different psychological variables.

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**Contribution of individual authors:**

Yi Liu: conception and design of the manuscript and interpretation of data, literature searches and analyses, manuscript preparation and writing the paper;

Tao Meng: made substantial contributions to conception and design, literature searches and analyses, participated in revising the article and gave final approval of the version to be submitted.

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# A META-ANALYSIS OF THE EFFECTS OF PHYSICAL ACTIVITY INTERVENTION ON ANXIETY AND DEPRESSION IN CHINESE COLLEGE STUDENTS

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## SUMMARY:

**Background:** Systematic evaluation of the effects of physical activities on the psychological disorders of Chinese college students, aiming to provide reference for the improvement and alleviation of anxiety, depression, and other psychological disorders of college students.

**Subjects and Methods:** By searching CNKI, Wanfang and VIP databases, 32 randomized controlled trials on the effects of physical activities on anxiety and depression in college students were included, 10 of which included anxiety indicators and 22 included depression indicators.

**Results:** Meta analysis showed that physical activity intervention could effectively improve and relieve anxiety of college students (WMD=3.97, 95% CI: 2.74, 5.20,  $P<0.00001$ ). Subgroup analysis showed that the difference of different physical activity intervention methods on the anxiety of college students was statistically significant. At the same time, physical activity intervention can effectively improve and relieve the depression of college students (WMD=4.15, 95% CI: 3.27, 5.03,  $P<0.00001$ ). Subgroup analysis showed that there was statistical significance in the influence of different physical activity intervention methods on college students' depression.

**Conclusions:** Sports intervention has a positive effect on improving and alleviating the anxiety and depression of Chinese college students and other psychological diseases. Different ways of sports activities have the effect on reducing the anxiety and depression of Chinese college students.

**Key words:** sports - college students – anxiety – depression-mental illness

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## INTRODUCTION

Studies have shown that 12-32% of the population in developed countries has symptoms associated with anxiety or depression (Haller et al. 2014, Wittayanukorn et al. 2014). The incidence of anxiety or depression is much higher among college students than among adults. Mental illness has become a non-negligible problem affecting college students' daily study life and physical and mental health. Anxiety and depression are common psychological diseases among college students. Due to the physical and mental development of college students is not mature, the self-regulation ability is relatively poor, heavy learning tasks, easy to cause college students anxiety or depression and other psychological problems. Anxiety symptoms are common among Chinese college students, and the incidence is increasing year by year. The survey shows that the detection rate of anxiety among college students reaches 25.7% (Cheng & Jia 2019). Compared with anxiety, the incidence of depression is also a major problem. Relevant studies show that the incidence of depression among Chinese college students reaches 29.3% (Tang et al. 2013). Anxiety or depression symptoms of college students are basically mild to moderate, which can be effectively alleviated with appropriate intervention. However, if they cannot be improved and alleviated in time, they are likely to develop into clinical anxiety or depression in the future (Karsten et al. 2011), and even lead to the occurrence of dangerous events such as self-harm and death of others in college

students.

At present, the main intervention means for anxiety or depression symptoms are drugs, psychology, and exercise. Drug intervention is generally suitable for the group with relatively serious anxiety and depression symptoms, but drug intervention generally has different side effects. Although psychological intervention usually has no side effects, most students are repellent to such intervention and refuse to accept it. Physical activity intervention can reduce the level of anxiety and depression, improve the overall emotional health, and is of great significance to alleviate the symptoms of anxiety and depression. Studies have shown that physical activity is a safe and effective intervention to improve and relieve symptoms of anxiety and depression (Dunn et al. 2005, Olafsdottir et al. 2018). In view of this, this paper conducted a Meta-analysis on the randomized controlled trials of physical activity on the intervention of anxiety and depression in college students to explore the effects of physical activity on anxiety and depression in Chinese college students, aiming to provide a reference for the improvement of anxiety and depression in Chinese college students by physical activity.

## SUBJECTS AND METHODS

### Literature search

This study used the methods described in the Cochrane Manual of Systematic Evaluation (Higgins & Green 2013) and was assessed and reported in accordance