

STUDY ON RELIEVING MENTAL STRESS OF QUARANTINED PEOPLE BY INDOOR EXERCISE DURING THE COVID-19 EPIDEMIC

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SUMMARY

Background: During the epidemic, the mental health of quarantined people is seriously affected. Indoor exercise can alleviate peoples' mental problems and promote physical health, making it an excellent choice for quarantined people. In this study, different frequencies, durations and types of indoor exercise have been investigated, to analyze their effectiveness in relieving mental stress of quarantined people, so as to provide a reference on the issue of mental health protection for quarantined people.

Subjects and methods: In this study, 500 quarantined people from Hebei province have been selected as subjects. Three experiments have been conducted to analyze the effect of exercise on stress relief for quarantined people. Experiment 1 examined the frequency of exercise; experiment 2 examined the duration of exercise and experiment 3 examined the exercise program. The research tools include the Wenjuanxing (an online questionnaire survey platform), the statistical analysis tool SPSS 27.0, and the Sentiment Self-assessment Scale-21 (DASS-21).

Results: The three DASS scores for the isolates, stress and anxiety are the most severe symptoms. In experiment 1, there is no significant difference in relieving mental stress for exercising 3-5 days per week versus 7 days per week. In experiment 2, depression, anxiety and stress decreased significantly before 45-60 min and almost remained unchanged after this period. In experiment 3, the effect of mixed exercise is better than that of a single exercise ($P > 0.01$).

Conclusions: Exercise 3-5 times a week is appropriate. The optimal duration of each exercise session is between 45-60 min, with the effect decreasing in sequence for less than 45 min and not increasing significantly for more than 60 min.

Key words: COVID-19 epidemic - quarantined people - mental stress - indoor exercise

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INTRODUCTION

In December 2019, a novel coronavirus (COVID-19) infection was reported in Wuhan City, Hubei Province, China, followed by the COVID-19 epidemic crisis of varying severity across the country (Kang et al. 2020). During the epidemic, a large number of people are quarantined at home or medical isolated in specified hotels due to the need for prevention and control. Self-isolated at home is necessary for scientific prevention and control, but its negative effects cannot be ignored. Behaviorally, it sets restrictions on movement, expression and daily activities. Physiologically, it can cause physical reactions such as increased heart rate, muscle tension, insomnia, dizziness and headaches (Simpson et al. 2020). In addition to behavioral and physiological effects, the negative psychological impacts of COVID-19 are equally profound (van Vinkers et al. 2020). A national survey shows that quarantined people tend to pay attention to all kinds of information about the epidemic at any time, resulting in tension, anxiety, upset, fear, increased mood ups and downs, etc. Some people also appear irritability, compulsive behavior, loss of interest, inability to concentrate and other conditions (Xiang et al. 2020).

According to a survey conducted by Canadian researchers, there are two types of psychological problems, depression and post-traumatic stress disorder

(PTSD), that are more likely to find in people who are quarantined because of the control of infectious diseases. Depression is a common psychological disorder characterized by a continuous and prolonged depressed mood, ranging from initial malaise to pessimism, anhedonia, negativity, avoidance, and eventually suicidal attempts and behavior, along with symptoms such as somatization pain, chest tightness, and shortness of breath (Chen et al. 2020). There are two main symptoms of PTSD. The first symptom is that, after the end of the traumatic event, there will be "repeated" images of the traumatic event in my mind, with lingering thoughts about the event. For example, there are constant scenes of overcrowded hospitals, with many doctors in protective clothing carrying patients in and out (Shigemura et al. 2020). For some people, the emotional response continues after the event, such as irritability, and chronic depression. Even after a long period of time, the stress does not relieve, and some patients continue to have nightmares related to this time. Secondly, after a traumatic event, some people become hyper-vigilant. They may avoid talking about anyone or anything related to the event. And they are not willing to have further contact with people related to the event and go near the relative place, or even suppress their memories of the event. Besides, they may have difficulty in concentrating and falling asleep or wake up easily after falling asleep.

Additionally, they are particularly worried about the recurrence of the traumatic event and become overprotective of themselves and their families, etc. (Khan et al. 2020).

A study in psychiatry at Yale University indicates that exercise reduces the mental health burden of people regardless of age, race, gender, household income and education level (Schinke et al. 2016). Exercise itself can promote endocrine changes of the human body. The brain will produce substances called endorphins after exercise, and one's mood is related to the number of endorphins secreted by the brain. Exercise can stimulate the secretion of endorphins. The secretion of endorphins will increase when a certain amount of exercise is done. Stimulated by the inner peptide, people's body and mind are in a relaxed and happy state. Aerobics accelerates blood circulation by making people sweat profusely, and stimulates the secretion of endorphins such as corticosteroids and β -endorphins in the body, which is conducive to the inhibition of destructive emotions and the elimination of worries (Moeijes et al. 2019). During the pandemic, the mental health of those in isolation has been severely affected. Exercise is an excellent choice for isolates as it can alleviate mental problems and promote physical health. Considering the limited space and the predominance of indoor exercise, different frequencies, durations and types of indoor exercise have been investigated in this study, to analyze their effectiveness in relieving mental stress of quarantined people, so as to provide a reference on the issue of mental health protection for quarantined people. (Onagbiye et al. 2020).

SUBJECTS AND METHODS

In this study, 500 quarantined people in Hebei Province are selected as research subjects. All participants are informed and agreed to the research

background, research scheme, questionnaire content and other information.

Research tools

The research tools include the Wenjuanxing (an online questionnaire survey platform), the statistical analysis tool SPSS 27.0, and the self-rating scale (DASS-21).

The DASS-21, developed by researchers at the University of New South Wales in Australia, is a scale that shortens the original 42 self-assessment questions to 21, allowing subjects to obtain results more quickly. The scale has now been recognized by medical professionals worldwide and is suitable for a wide range of ages, including the elderly. Different from PHQ-9, the DASS-21 can effectively assess depression, anxiety and stress levels in the general population. It is widely used to assess the severity of three negative emotional states, including depression, anxiety and stress.

There are 21 questions in the DASS-21 self-rating scale, and the scale score is divided into 5 levels, including normal, mild, moderate, severe and very severe. The judgement of severity is based on the difference between the average population and does not represent the severity of the subject's mental health problems. For example, a self-rating scale result indicating a moderate level of depression does not mean that the subject is moderately depressed, but rather that his or her depression is at a moderate level relative to the population average. In general, a subject whose depression, anxiety or stress level is above moderate or above represents a mental health condition that is of concern and immediate professional assistance is recommended. The score for each item is the sum of the question scores multiplied by two, and the relationship between the scores and the severity of symptoms is shown in Table 1.

Table 1. DASS-21 score and severity of symptoms

Factor	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Very Severe	28+	20+	34+

Research methods

This study consists of three experimental projects, which analyze the effect of exercise on the mental stress relief for quarantined people through three dimensions respectively, including exercise frequency, exercise duration and exercise program.

Experiment 1:

60 subjects are randomly selected from 400 subjects, including 36 males and 24 females, and randomly divided into three groups with 20 participants in each group. Group 1 has one to two days of indoor exercise

per week, group 2 has three to five days of indoor physical activity per week, and group 3 has seven days of indoor exercise per week. The experiment has lasted for three weeks. Before and after the experiment, questionnaires are conducted to test subjects' DASS-21 scores.

Experiment 2:

Random sampling method has been adopted to select 180 people as subjects of this experiment, including 95 men and 85 women. They are randomly divided into six groups, with 30 people in each group.

Group 1 exercises for less than 15 min, group 2 for 15-30 min, group 3 for 30-45 min, group 4 for 45-60 min, group 5 for 60-90 min, and group 6 for more than 90 min. The experiment has lasted for three weeks. Before and after the experiment, questionnaires are conducted to test subjects' DASS-21 scores.

Note: Experiment 2 is carried out simultaneously with experiment 1, and the selected subjects do not overlap with the those participating in experiment 1.

Experiment 3:

It is conducted after experiment 1 and experiment 2. Based on the data from Experiment 1 and Experiment 2, a targeted test has been conducted on exercise program by controlling the variable (the frequency and duration of exercise that worked best in Experiments 1 and 2). In this study, all the remaining subjects who have not participated in the experimental project, a total of 160 subjects, including 72 males and 88 females, are

randomly divided into two groups. Group one has a single exercise and group two has a mixed exercise. The experiment has lasted for two weeks. Before and after the experiment, questionnaires are conducted to test subjects' DASS-21 scores.

RESULT

Three weeks after the beginning of the experiment, the DASS-21 scores of each group are collected and sorted out through questionnaire survey. After removing extreme values, the arithmetic mean is taken as the research data. Table 2 shows the influence of exercise frequency on DASS-21 score, Table 3 shows the DASS-21 score of each experimental group before controlling exercise time, and Table 4 shows the DASS-21 score of each experimental group after controlling exercise time.

Table 2. DASS-21 score of subjects at different exercise frequency

	Before experiment			After experiment		
	1-2 days/week	3-5 days/week	7 days/week	1-2 days/week	3-5 days/week	7 days/week
Depression Score	12.56	13.12	12.68	10.83	9.01	9.29
Anxiety Score	14.96	15.24	15.13	10.56	8.09	8.65
Stress Score	26.85	28.52	27.98	24.08	20.22	17.23

Table 3. DASS-21 score of each experimental group before controlling exercise time

	< 15 min	15-30 min	30-45 min	45-60 min	60-90 min	> 90 min
Depression Score	12.58	12.96	13.2	13.24	11.95	12.56
Anxiety Score	13.96	14.25	14.62	14.95	14.03	14.35
Stress Score	25.39	28.62	29.54	26.87	26.26	29.68

Table 4. DASS-21 score of each experimental group after controlling exercise time

	< 15 min	15-30 min	30-45 min	45-60 min	60-90 min	> 90 min
Depression Score	12.49	11.25	9.68	8.05	8.01	7.96
Anxiety Score	13.85	12.05	10.03	7.56	7.34	7.23
Stress Score	24.39	22.13	18.28	16.58	16.25	15.68

According to SPSS data analysis results, before the experiment, there is no significant correlation between the score of depression, anxiety and stress in each group (including those in experiment 1 and experiment 2) ($P > 0.05$). Before and after the experiment, the score of depression, anxiety and stress in the experimental group that exercised 1-2 days a week are significantly correlated at the level of 0.01 ($P > 0.01$). Besides, for the experimental group exercised 3-5 days per week and 7 days per week, the score of depression, anxiety and stress are significantly correlated at the 0.001 level ($P > 0.001$). After comparing the after-experiment data of exercising 3-5 days a week and exercising 7 days a week, there is no significant difference in the scores of the two groups ($P > 0.05$), indicating that there is no significant difference in the effect of exercising 3-5

days per week and exercising 7 days per week on mental stress relief. Comparing the after-experiment data between 3-5 days of exercise per week and 7 days of exercise per week shows that there is no significant difference in the scores ($P > 0.05$). It indicates that there is no significant difference in the effect of 3-5 days of exercise per week and 7 days of exercise per week on mental stress relief. Relatively speaking, subjects who exercised 7 days a week have slightly elevated depression and anxiety scores, thus it can be determined that adopting an exercise program of 3-5 days a week will be better to relieve the mental stress of the quarantined people.

SPSS 27.0 is employed to describe the DASS-21 score of each experimental group after controlling the exercise time, and a two-dimensional area graph is

drawn. The results are shown in Table 5 and Figure 1.

Table 5. Statistical description of DASS-21 scores of each experimental group after controlling exercise time

	Range	Mean	Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Depression Score	4.53	9.5733	1.93375	3.739	0.746	0.845
Anxiety Score	6.62	9.6767	2.79645	7.820	0.675	0.845
Stress Score	8.71	18.8850	3.57014	12.746	0.905	0.845

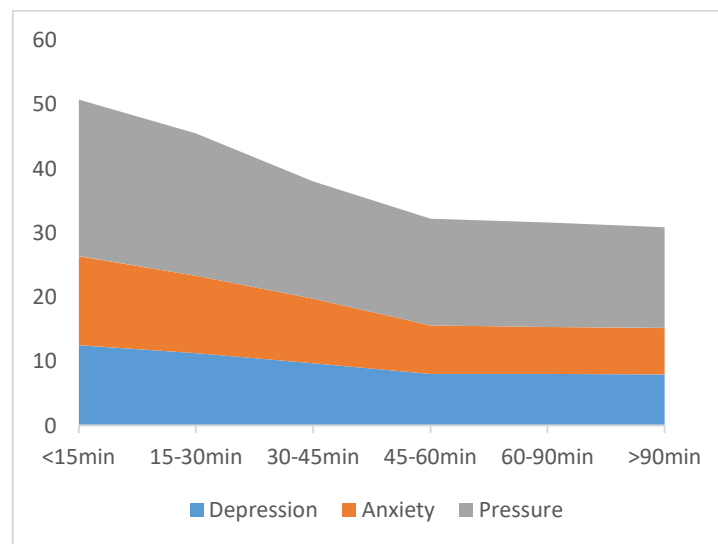


Figure 1. Two-dimensional area graph of DASS-21 score of each experimental group after controlling exercise time

As shown in Table 5, σ (stress) > σ (anxiety) > σ (depression), indicating that the decrease of depression, anxiety and stress varies with the time of daily exercise. Overall, the stress level decreases most significantly, followed by anxiety level and depression level decreased insignificantly. Based on Figure 1, it can be seen that the depression, anxiety and stress decrease more significantly before 45-60 min, and almost remain unchanged after this period. Combined with the above data, it can be inferred that the best effect of daily exercise duration is about 45-60 min. After this time period, the effect of mental stress relief of quarantined people will not change significantly.

According to the results of experiment 1 and experiment 2, the control variables are set as 45-60 minutes of exercise for 3-5 days per week. For the members of the two groups in experiment 3, group 1 has adopted a single exercise program, and group 2 adopted mixed exercise program, such as gymnastics, rope skipping, yoga, etc. The DASS-21 scores of each group before and after the experiment are shown in Table 6.

According to the SPSS analysis, the mixed exercise program is more effective than the single exercise program ($P > 0.01$), and the decrease in stress score is the greatest among the three items, including depression, anxiety and stress.

Table 6. DASS-21 score of subjects under different exercise

	Before experiment		After experiment	
	Single exercise program	Mixed exercise program	Single exercise program	Mixed exercise program
Depression score	12.58	12.23	8.23	7.85
Anxiety score	14.23	14.95	8.96	8.25
Stress score	24.95	25.28	15.09	14.25

CONCLUSIONS

The advantages of indoor exercise are that it is not affected by weather conditions and can be done on a regular basis. Secondly, the courts are more comfortable,

people will not be injured because of the rough outdoor courts. Thirdly, the temperature indoors is constant, so it will not be difficult for the body to adjust to the temperature difference with the outside world after sweating. Indoor exercise is mostly represented by yoga, aerobics, dance and jump rope (Mackensen et al. 2016).

While exercising, it is also important to guard against overdoing it. Firstly, prolonged exercise and intense exercise may increase the burden of the heart and cause some heart problems (Trojian 2016). Secondly, there will be some friction on the joints during exercise. As the joints are protected, there will be no problem in general. However, long-term exercise may lead to severe wear and tear, which can damage the joints and cause discomfort (Jenkin et al. 2018). In addition, people will feel tired when exercising too much, and the reaction speed will be slow. Besides, people will have problems with concentration and coordination. Such situation can easily lead to accidents, increasing the possibility of physical injury. Finally, doing too much an exercise can produce chemical substances that make people excited, which can also be painful all the time, making people addicted. Therefore, excessive exercise may make people dependent. When they stop exercising, they may be suffered from negative emotions, which affects their physical and mental health (Chen & Liu 2020).

According to the pre-experimental questionnaire, stress and anxiety are the most severe among the three DASS scores, with the mean stress score in the moderate to severe range (19-33) and the mean anxiety score in the moderate to severe range (10-19), while depression is relatively mild, with the mean values mostly in the mild depression range (10-13).

Based on the results of the three experimental groups, it can be deduced that 3-5 time of exercise per week is appropriate, and the optimal duration of each exercise session should be between 45-60 min. If the duration is less than 45 min, the effect is weakened. And if the duration is more than 60 minutes, there is no significant higher benefit, which is consistent with the study in the Lancet, Psychiatry Branch. When exercising, it is important to alternate between exercise. If one only engages in a certain exercise, it tends to cause a sense of monotony. A variety of exercises will have a positive effect on the mental state of quarantined people by changing mood and broadening horizons (Malchrowicz-Mosko et al. 2018).

It is worth mentioning that the depression and stress indices of the subjects are always higher than normal value throughout the experiment, which indicates that although exercise can significantly alleviate the poor mental condition of quarantined people, it cannot completely relieve the state. Therefore, quarantined people with relevant needs can mix other program such as psychological counselling and relaxation to relieve mental stress. The causes of psychological problems are complex, and the ways to improve them vary from person to person, and research in this area needs to continue to advance.

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Contribution of individual authors:

Geng Du: conception and design of the manuscript and interpretation of data, literature searches and analyses. Tao Tao: made substantial contributions to conception and design, manuscript preparation and writing the paper.

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A STUDY ON MITIGATION STRATEGIES OF PSYCHOLOGICAL ANXIETY OF COLLEGE STUDENTS UNDER LEARNING STRESS

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SUMMARY

Background: With the rapid development of social economy and the acceleration of the current life pace, "anxiety" has become a common phenomenon. Academic stress, as one of the core sources of college students' stress, has an important impact on college students in terms of anxiety.

Subjects and methods: 1,240 college students were investigated by Questionnaire Star, a questionnaire survey tool, and Self-rating Anxiety Scale. The results were analyzed by the statistical analysis software SPSS 26.0.

Result: Among the 1,240 subjects, participating the survey, 232 students (18.7%) were in normal condition, 785 (63.3%) were mildly anxious, 192 (15.5%) were moderately anxious, and 31 (2.5%) were severely anxious. For college students, their anxiety is affected by different factors including gender, grade and academic performance. Among the different coping strategies of anxiety, the effect of psychological counseling turns out to be the best. On the other hand, avoidance strategy leads to aggravation of anxiety.

Conclusions: College students' anxiety is affected by gender, grade, academic performance and other factors. Among the coping strategies of anxiety, turning to psychiatrists for professional psychological counselling shows the best effect. Instead, avoidance strategy leads to a more severe situation of anxiety.

Key words: learning stress - college students - anxiety disorder - anxiety relief

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INTRODUCTION

Anxiety disorder, also known as anxiety neurosis, is one of the most common diseases of neurosis. It is characterized by the emotional experience of anxiety and divided into two forms. One is chronic anxiety (also referring to generalized anxiety disorder) and the other one is acute anxiety. The most intuitive manifestation of stress is anxiety, which further leads to insomnia and even develops into depression. The results of a national survey in 2020 showed that anxiety and its induced depression have become the primary psychological problems that college students face at this moment. Anxiety may cause mental tension, memory deterioration, elevated blood pressure, anorexia and insomnia. If anxiety lasts for a long period and is not alleviated timely, there will be more serious physical discomfort. The symptoms may include continuous dizziness or temporary loss of memory, chronic or severe headache, tremor, urticaria, unbearable emotional hypertension, etc. (Starcevic et al. 2007).

With the rapid development of social economy and the acceleration of the current life pace, people are more prone to negative emotions and "anxiety" has become a common phenomenon. As a specific group, college students are at the stage of developing life values and world views in all aspects. Facing this diversified and rapidly developing society, they are going through different kinds of pressures (Wu et al. 2020). What's worse, in recent years the suicide cases of college students caused by anxiety and depression

are increasing year by year. The anxiety of college students has aroused concern from all walks of life. As one of the core sources of stress for college students, academic stress has an important impact on college students in terms of anxiety (Seligman & Wuyek 2007).

Colleges and universities have gathered the most outstanding talents from the country. They provide professional courses and rich teaching source for students. These professional courses and teachers are quite different from the basic knowledge system in the previous learning stage. University has higher requirements for learning ability (Cheng et al. 2020). In terms of the teaching form, it is far different from that in middle schools neither. The curriculum in colleges covers more subjects, and in each period, students face different choices of courses. Further, examination time between long-term courses and short-term courses is not fixed, and there are higher requirements for students' self-control in learning (Bayram & Bilgel 2020). College students are totally lost by these unfamiliar transitions and have no idea of what to do. They feel confused. They can't find the key points of a course. At the same time, the adoption of a new academic performance system, followed by English tests, computer skill tests, post-graduate entrance examination and other skill-oriented tests, also overwhelm college students. With all the above-mentioned reasons, college students are facing tremendous learning pressure.