

## RESEARCH ON EFFECTS OF SPORTS AS AN AUXILIARY THERAPY TO PATIENTS WITH ANXIETY

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### SUMMARY

**Background:** According to the survey data in 2019, the period prevalence of anxiety disorders in China has reached 4.98%, and the rate of depression and anxiety disorders is close to 7%. When anxiety and depression problems become more severe nowadays, sports as a way of improving patients' physical condition and meanwhile alleviating mental problems, have been proposed and aroused more attention.

**Subjects and methods:** This study carries out a *t* test by three steps using SPSS 18.0 analysis tool. The three steps are pre-intervention testing, sports therapy, and post-intervention testing. Two groups of subjects were tested before and after sports therapy and their scores were collected based on different scale of each item.

**Results:** After sports therapy, the SAS scores of the experimental group and the control group were significantly different at the level of 0.001 ( $t = 9.674, P = 0.000$ ). The total BDI scores of the experimental group and the control group were significantly different at the level of 0.01 ( $t = -2.828, P = 0.015$ ). The total PSTR scores of the experimental group and the control group were significantly different at the level of 0.001 ( $t = -7.71, P = 0.000$ ). The SCL-90 data of the experimental group and the control group were significantly different at the level of 0.05 ( $t = -2.507, P = 0.028$ ).

**Conclusions:** After intervention of sports therapy, the subjects' anxiety decreased to a mild anxiety level, depression to a mild level, and stress to a moderate level. The proportion of subjects with obvious psychological problems had decreased. Physical exercise turns out to have positive effects in alleviating anxiety, depression, and stress.

**Key words:** sports therapy - anxiety - therapy effects - depression level

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### INTRODUCTION

Generalized anxiety, also known as generalized anxiety disorder (GAD), is a chronic anxiety disorder characterized by persistent significant nervousness, accompanied by autonomic nervous function excitement and hypervigilance (Rudaizky & MacLeod 2014). This kind of anxiety has nothing to do with any specific surroundings, but is generally caused by excessive worry. The typical manifestation is often excessive worry or show worries about certain problems in daily life, such as worrying about unpredicted illnesses or accidents on oneself or on their families/relatives, and excessive worry about one's economic condition, about work or social ability (Hofmeijer-Sevink et al. 2012). This nervousness, excessive worry or frustration is an overreaction to the real situation. Patients always feel unbearable of this overreaction, but unable to get rid of it. Symptoms often include autonomic hyperfunction, motor tension and excessive vigilance (Bareket-Bojmel et al. 2021). Generally, the anxiety symptoms of GAD patients are changeable, including a series of physical and psychological problems. Patients with generalized anxiety disorder often have some specific shared facial or body appearances such as twisted facial muscles, frowning, nervous posture, and restlessness, even

trembling, pale skin, and sweating on palms, soles of feet, and armpits (Drake & Kearney 2008). Generalized anxiety disorder is very common in our life and affects 3% to 5% of the population just within one year. It is often related to stress, and usually starts in childhood or adolescence, but also starts at any age. The survey in this paper shows that the contemporaries' anxiety includes, but is not limited to the following aspects, failure to meet expectations in their study or career development, financial pressure, unsatisfactory intimate relationships and unsatisfactory on one's looks, difficulty in achieving personal value, loss of presence, difficulty in raising children, health problems, etc. Among these issues, peer competition, external pressure, and social anxiety further aggravate people's anxiety (Pizzie & Kraemer 2019). The stronger the perception of uncertainties and the lower the tolerance, the more anxiety a person feels (Viana et al. 2018).

According to data released by the State Council Information Office, the prevalence of anxiety disorders in China has reached 4.98% in 2019, and disorders of both depression and anxiety have reached nearly 7%. A study by the University of Washington in the United States and the University of Queensland in Australia shows that the global increase of major depression and anxiety disorders are respectively 28% and 26% in 2020. Prevalence in countries that are subject to severe impact

of COVID-19 has risen sharply. Among them, women and young people are the most affected groups. With the increasing popularity of anxiety and depression, it is urgent to find scientific and effective ways to relieve anxiety and the symptoms (Santomauro et al. 2021).

The standard treatment for anxiety disorders today is cognitive behavioral therapy (CBT) and psychotropic drugs. However, these drugs usually have side effects. People with anxiety disorders often do not respond to medications. While during the long waiting period of CBT symptoms may get worse (Booth & Tekes 2019). Sports and exercise, as a solution for anxiety and depression, has aroused more and more attention. A study by University of California, Davis (UCD) found that half an hour to one hour's vigorous exercise will significantly increase the content of neurotransmission in one's brain such as glutamate and GABA (Holzman et al. 2014). Glutamate and GABA are the most common neurotransmitters in the brain, which are very important for signal communication between brain neurons. The increase of these two neurotransmitters after exercise may be one of the causes that relieve depression and anxiety. Neurotransmitter's enhancement effect brought by sports and physical exercise lasts for a long time, even more than a week (Kalvin et al. 2020). In addition, sports can also provide additional effects as social interaction, which is extremely beneficial for people suffering from anxiety or depression. This paper explores the auxiliary effects of sports therapy on patients with anxiety disorders from multiple perspectives (Booth & Tekes 2019).

## SUBJECTS AND METHODS

The study is divided into three steps referring to pre-intervention testing (SAS-BDI-PSTR-SCL90), sports intervention treatment, and post-intervention testing (SAS-BDI-PSTR-SCL90).

Subjects selected for this study are measured patients with moderate or more severe level of anxiety disorder. There is a total of 26 people, with 14 males and 12 females between 20 to 30 years old. 26 subjects were randomly divided into two groups. The experimental group received a two-month sports intervention treatment, and the control group did not receive any treatment. A *t* test was carried out using SPSS 18.0 to measure the scores of the two groups before and after sports therapy.

### Test and analysis tool

Self-Rating Anxiety Scale (SAS), which was compiled by William W.K. Zung, is a psychological scale used to measure the degree of anxiety and its changes during treatment. SAS uses a 4-level score, which mainly evaluates the frequency of symptoms defined by different items.

Baker Depression Self-Rating Scale (BDI). Beck Depression Inventory was compiled by Aaron T. Beck,

an American psychologist in the 1960s. This tool is a self-rating scale containing 21 items, and uses a 4-level score to mainly assess the degree of various depressive symptoms that the subjects are troubled with. It is applied for adults with depressive symptoms and reflects a more accurate degree of subjective depression. It is usually used by psychological clinics and psychiatric clinics during the treatment of hospitalized patients.

Psychological Stress Scale (PSTR) scale was compiled by A.L. Edwards, Swiss psychologist in 1983. His theory is based on the psychological stress factor proposed by German psychologist Murray in 1968, which is used to test people's stress in life and work.

Symptom Checklist 90 (also referred to as SCL-90), is known as Self-reporting Inventory. This scale is compiled by L.R. Derogatis and shares 90 items, using 10 factors to reflect 10 different psychological symptoms. It contains a broad variety of psychiatric symptoms from feelings, emotions, thoughts, consciousness, behavior to personal habits, interpersonal relationships, eating and sleeping condition, etc.

## RESULTS

SAS statistical indicator is considered as the total score. After the evaluation is completed by self-evaluators, a standard score is obtained, which is the integer of the sum of 20 items' scores multiplied by 1.25. The higher the standard score, the more severe the symptoms. Generally, those with a sum of 50 scores or less are considered normal; those with 50 to 60 scores are mildly anxious, those with 61 to 70 moderately anxious, and those above 70 are severely anxious. The number of negative items indicates how many items that the subject did not respond to. The number of positive items indicates how many items that the subject responded to. Comparison of SAS data before and after sports therapy is shown in Table 1. *t* test results of SPSS on paired subjects are shown in Table 2. As shown in Table 1 and Table 2, before sports therapy, the total SAS scores of experimental group and control group were not statistically significant ( $t = -0.591, P = 0.566 > 0.05$ ), and both groups were in moderate or severe interval. However, after sports therapy there was a significant difference in anxiety between experimental group and control group at the level of 0.001 ( $t = -9.674, P = 0.000 < 0.001$ ). The anxiety of experimental group was reduced to mild level, and control group had no significant change.

BDI statistical indicator is considered as the total score. In this scale, scores from 0 to 4 represent no depressive symptoms, 5 to 7 represent mild depressive symptoms, 8 to 15 represent moderate symptoms, and 16 to 39 represent severe symptoms. Test results of BDI data before and after sports therapy are shown in Table 3.

**Table 1.** Comparison of SAS data before and after intervention treatment

No.	Before intervention treatment		After intervention treatment	
	Experimental group	Control group	Experimental group	Control group
1	67	67	60	67
2	75	70	52	73
3	74	72	56	68
4	73	68	53	65
5	67	75	50	68
6	70	67	51	74
7	66	71	52	70
8	69	74	50	68
9	65	66	59	67
10	67	72	50	72
11	75	71	54	67
12	69	67	58	65
13	67	74	55	72

**Table 2.** SAS data of *t* test on paired subjects

	Mean	Std. Deviation	95% CI		<i>t</i>	<i>df</i>	<i>Sig.</i>
			Lower	Upper			
Before the experiment	-0.76923	4.69315	-3.60527	2.06681	-0.591	12	0.566
After the experiment	-15.0769	5.61933	-18.4727	-11.6812	-9.674	12	0.000

**Table 3.** *T* test results of BDI data on paired subjects

	Mean	Std. Deviation	95% CI		<i>t</i>	<i>df</i>	<i>Sig.</i>
			Lower	Upper			
Before the experiment	0.15385	5.84303	-3.37706	3.68476	0.095	12	0.926
After the experiment	-4.38462	5.59074	-7.76307	-1.00616	-2.828	12	0.015

As shown in Table 3, before sports therapy, the total BDI scores of experimental group and control group were not statistically significant ( $t = 0.095, P = 0.926 > 0.05$ ). While after sports therapy, the depression level of experimental group decreased. Further, there was a significant difference in depression between experimental group and control group at the level of 0.01 ( $t = -2.828, P = 0.015 < 0.01$ ).

There are totally 50 items in PSTR psychological stress scale. The total score is the sum of scores by each item after the test. A total score of 42 or lower indicates that the subject reflects a light pressure, which needs to be increased accordingly. A total score of 43 to 65 indicates a moderate pressure, and 65 to 81 means heavy stress, which needs to be reduced accordingly. 82 to 92 indicates excessive stress, which means the physical and mental health of the subject is being damaged, following potential interpersonal problems. A total score of 93 or higher means that the subject is going through in a highly severe stress response. Both of its body and mind suffer from stress injuries and the subject needs to turn to professional psychotherapists for treatment. The comparison of PSTR data before and

after sports therapy is shown in Table 4. *T* test results of SPSS on paired subject are shown in Table 5. As shown in Table 4 and Table 5, before sports therapy, the total PSTR scores of experimental group and control group were not statistically significant ( $t = -0.774, P = 0.454 > 0.05$ ), and stress level was generally high. While after sports therapy, there was a significant difference of the pressure between experimental group and control group at the level of 0.001 ( $t = -7.71, P = 0.000 < 0.001$ ). Pressure of experimental group was reduced to a moderate level, and pressure of control group had no significant changes.

According to Chinese normal perception, if the total score of SCL-90 exceeds 160, it means that there is a slight psychological problem with the subject who may need a further diagnosis. If the total score is greater than 200, it indicates that there are outstanding psychological problems with the subject. If greater than 250, there are severe problems. Comparison of SCL-90 data before and after sports therapy is shown in Table 6. *T* test results of SPSS on paired subjects are shown in Table 7.

**Table 4.** Comparison of PSTR data before and after intervention treatment

No.	Before intervention treatment		After intervention treatment	
	Experimental group	Control group	Experimental group	Control group
1	79	70	64	71
2	82	70	57	68
3	87	79	65	78
4	74	86	50	86
5	79	89	63	89
6	70	70	54	69
7	87	92	70	93
8	74	88	58	88
9	70	72	47	70
10	79	87	53	89
11	80	85	57	85
12	81	71	63	70
13	70	78	52	79

**Table 5.** *T* test of PSTR data on paired subjects

	Mean	Std. Deviation	95% CI		<i>t</i>	<i>df</i>	<i>Sig.</i>
			Lower	Upper			
Before the experiment	-1.92308	8.95788	-7.33627	3.49011	-0.774	12	0.454
After the experiment	-21.6923	10.14384	-27.8222	-15.5625	-7.71	12	0.000

**Table 6.** Comparison of PSTR data before and after intervention treatment

No.	Before intervention treatment		After intervention treatment	
	Experimental group	Control group	Experimental group	Control group
1	215	218	190	213
2	278	271	234	268
3	249	181	211	177
4	192	185	159	191
5	183	253	148	261
6	249	196	211	196
7	256	236	220	244
8	245	227	202	223
9	218	220	177	220
10	205	216	176	208
11	271	253	243	258
12	200	214	155	222
13	259	199	217	201

**Table 7.** *t*-test of SCL-90 data on paired subjects

	Mean	Std. Deviation	95% CI		<i>t</i>	<i>df</i>	<i>Sig.</i>
			Lower	Upper			
Before the experiment	11.61538	36.1191	-10.2112	33.44194	1.159	12	0.269
After the experiment	-26.0769	37.50436	-48.7406	-3.41327	-2.507	12	0.028

As shown in Table 6 and Table 7, before sports therapy, the total score of SCL-90 between experimental group and control group was not statistically significant ( $t = 1.159$ ,  $P = 0.269 > 0.05$ ). To be specific, 84.5% of the subjects have outstanding

psychological problems. 23.1% have serious psychological problems. After sports therapy, SCL-90 data of experimental group and control group show a significant difference at the level of 0.05 ( $t = -2.507$ ,  $P = 0.028 < 0.05$ ). Among the experimental group, the

proportion of subjects with outstanding psychological problems decreases to 53.8%, the proportion with serious problems decreases to 0. For control group, there was no significant change.

## DISCUSSION

According to the test data obtained before intervention, patients with moderate or severe anxiety have depressive symptoms to a certain degree. They show a generally high level of stress and have outstanding psychological problems (84.5%). After they receive intervention of sports therapy, their anxiety was reduced to mild level and depression to a mild level, and stress to a moderate level. Proportion of subjects with outstanding psychological problems was reduced to 53.8%. The above-mentioned data show that sports therapy has excellent positive effects in alleviating anxiety, depression, stress, etc. (Hovenkamp-Hermelink et al. 2019).

The mechanism that sports therapy improves mental health has unknown uncertainties to a large extent. The same for psychotherapy and medication. Antidepressant therapies are most likely to work based on an integrated effect of various treatments, including changes in thoughts, emotions, and brain pathways after treatment. Or these therapies may function as a placebo to achieve desired effects just because patients believe they are beneficial to their symptoms (Hannesdottir et al. 2018). In this study, part of the subjects when conducting the second self-evaluation, may pay too much attention to their physical condition and consciously make positive choices about certain items in the test. In this way, the results due to subjective influence are not sufficient to reflect the actual pros and cons of the therapy. In addition, the deficiencies of the scale and the test itself affect the experiment results. Subjects may misunderstand the items in the scale. Misinterpretation may happen in the translation of the questionnaire. Definition of one concept is often different from individuals. The self-rating scale itself reflects the compiler's definition of the concept, while the test results reflect the subjects. Both may lead to deviations.

## CONCLUSIONS

Existing research has shown that sports therapy has positive effects on anxiety as an auxiliary treatment, which cannot be ignored. Patients with anxiety can take various physical exercises, such as aerobic exercise, resistance training, physical and mental exercises, etc. (Gutin et al. 2002). It is better to participate in any sports or physical exercises than do nothing. For those without much experience of sports or physical exercise, they can start from an initial level step by step and then work out towards a recommended method of standard exercises (Shayne et al. 2012). In addition, in most studies on anxiety disorders, patients are required to do

exercise through a guided exercise program or a supervised program combined with indoor exercise. Therefore, they can seek assistance from fitness professionals to plan daily exercise tasks. Professional trainers provide supervision when patients start their exercise. For any other concerns or specific situation, patients can consult a medical staff about their sports therapy or physical exercise to ensure that their anxiety will not deteriorate. They can also accept recommendations about the most safe and suitable way to exercise (Pangkahila et al. 2016).

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**Contribution of individual authors:**

Lin Cai: wrote original draft, participated in literature search and analyses, evaluations and manuscript preparation, as well as wrote the paper.

Shaofeng Wang, Zengsong Huang & Qi Zhou: conception and design of the manuscript and interpretation of data, participated in revising the article and gave final approval of the version to be submitted.

## References

1. Bareket-Bojmel L, Shahar G & Margalit M: COVID-19-related economic anxiety is as high as health anxiety: findings from the USA, the UK, and Israel. *International Journal of Cognitive Therapy* 2021; 14:566-574
2. Booth RW & Tekes B: Individual differences in anxiety and worry, not anxiety disorders, predict weakened executive control: preliminary evidence. *International Journal of Psychology and Psychological Therapy* 2019; 19:337-344
3. Drake KL & Kearney CA: Child anxiety sensitivity and family environment as mediators of the relationship between parent psychopathology, parent anxiety sensitivity, and child anxiety. *Journal of Psychopathology and Behavioral Assessment* 2008; 30:79-86
4. Gutin B, Barbeau P, Owens S, Lemmon CR, Bauman M, Allison J, Kang H & Litaker MS: Effects of exercise intensity on cardiovascular fitness, total body composition, and visceral adiposity of obese adolescents. *American Journal of Clinical Nutrition* 2002; 75:818-826
5. Hannesdottir DK, Sigurjonsdottir SB, Njardvik U & Ollendick TH: Do youth with separation anxiety disorder differ in anxiety sensitivity from youth with other anxiety disorders? *Child Psychiatry & Human Development* 2018; 49:888-896
6. Hofmeijer-Sevink MK, Batelaan NM, van Megen H, Penninx BW, Cath DC, van den Hout MA & Balkom

- A: Clinical relevance of comorbidity in anxiety disorders: a report from the Netherlands Study of Depression and Anxiety (NESDA). *Journal of Affective Disorders* 2012; 137:106-112
7. Holzman JB, Valentiner DP & McCraw KS: Self-focused attention and post-event processing: relevance to social performance anxiety and social interaction anxiety. *Journal of Cognitive Psychotherapy* 2014; 28:72-82
  8. Hovenkamp-Hermelink JHM, van der Veen DC, Voshaar RCO, Batelaan NM, Penninx BWJH, Jeronimus BF, Schoevers RA & Riese H: Anxiety sensitivity, its stability and longitudinal association with severity of anxiety symptoms. *Scientific Reports* 2019; 9:1-7
  9. Kalvin CB, Marsh CL, Ibrahim K, Gladstone TR, Woodward D, Grantz H, Ventola & Sukhodolsky DG: Discrepancies between parent and child ratings of anxiety in children with autism spectrum disorder. *Autism Research* 2020; 13:93-103
  10. Pangkahila EA, Adiputra N, Pangkahila W & Yasa I: Balanced physical exercise increases physical fitness, optimize endorphin levels, and decrease malondialdehyde levels. *Bali Medical Journal* 2016; 5:145-149
  11. Pizzie RG & Kraemer DJM: The Academic Anxiety inventory: evidence for dissociable patterns of anxiety related to math and other sources of academic stress. *Frontiers in Psychology* 2019; 9:2684-2704
  12. Rudaizky D & MacLeod C: Anxiety reactivity and anxiety perseveration represent independent dimensions of anxiety vulnerability: an in vivo study. *Anxiety Stress and Coping* 2014; 27:361-375
  13. Santomauro DF, Herrera AMM, Shadid J, Zheng P, Ashbaugh C, Pigott DM & Ferrari AJ: Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet* 2021; 398:1700-1712
  14. Shayne RK, Fogel VA, Miltenberger RG & Koehler S: The effects of exergaming on physical activity in a third-grade physical education class. *Journal of Applied Behavior Analysis* 2012; 45:211-215
  15. Viana AG, Woodward EC, Hanna AE, Raines EM, Alfano CA & Zvolensky MJ: The moderating role of anxiety sensitivity in the co-occurrence of anxiety and depression symptoms among clinically anxious children. *Journal of Experimental Psychopathology* 2018; 9:2043808718791049

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## STUDY ON PRIVACY PROTECTION AND MENTAL HEALTH STATUS OF PATIENTS WITH DEPRESSION

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### SUMMARY

**Background:** The purpose of this research is to understand mental health status of depressed patients at different stages, and to balance the conflict between the right to use medical data and the patients' right of claim, whilst maximizing the exploitation and utilization of data on the basis of protecting patient privacy.

**Subjects and methods:** From October 2021 to November 2021, 750 online questionnaires have been sent out to those who report being diagnosed with depressive disorder and those in a state of depression. Of the 750 questionnaires, 677 are received. To study the cognition of medical information security and its influencing factors, SPSS 26.0 has been used in this paper for frequency analysis, variance analysis, correlation analysis, and regression analysis.

**Results:** The results show that the regression coefficient of information security policy equals 0.339 ( $t = 6.377$ ,  $P = 0.000 < 0.01$ ), which indicates that information security policy has a significant positive effect on security perception. Besides, the regression coefficient of privacy leakage experience equals 0.428 ( $t = 7.708$ ,  $P = 0.000 < 0.01$ ), implying that privacy leakage experience has a significant positive effect on security perception.

**Conclusions:** The survey suggests that, during the treatment, patients who suffer from depression will experience different psychological changes, so that targeted nursing interventions should be given to the patients according to their psychological characteristics. Medical data sharing plays a key role in reducing medical costs and in helping patients obtain high-end diagnosis and treatment resources. However, the rights and interests of depressed patients will be greatly threatened under the circumstance of weak awareness of privacy protection for patients, lack of medical information security regulations and inadequate policy supervision measures.

**Key words:** depression - medical big data - data sharing - the right to privacy - mental health

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### INTRODUCTION

Depressive disorder is one of the most common psychiatric illnesses. It is difficult to diagnose in clinical practice and pathological research due to its unclear etiology, complicated pathogenic factors, and unknown pathogenesis. Along with the arrival of the digital society, some organizations around the world have put a tremendous amount of effort into building information technology infrastructure, to support the management and analysis of patient data involved in clinical and translational research (Cohen & Mello 2019). Although researchers are eager to contribute to the diagnosis and treatment of depression through artificial intelligence algorithms, such widespread use of open databases depends on the level of protection of patients' private information (Xu et al. 2021). On the one hand, the main purpose of big data application is to predict the future by researching and sorting out a large amount of data and discovering the inherent laws among them (Mayer-Schönberger et al. 2013). Data related to disease information formed during diagnosis and treatment is of great significance for clinical trials and scientific research. Besides, representative large-scale data sets are not only expected to promote the development of medical artificial intelligence companies, but also the health of patients (Price & Cohen 2019). On the other hand, the "exclusive use principle" of the data economy determines that if data

must be collected, it should only be used for specific purposes (Boehme-Nebler 2019). However, the advent of the medical big data era has promoted data sharing among different industries and infringement behaviors in a stealthier way, which may cause unknown damage to patient privacy and raise their concerns.

From a psychological perspective, privacy is not a state, but a complex and dynamic process, by which people decide whether and how much to open up to others, and selectively manage their personal data. The patients' right to privacy under the Internet Health refers to the personal right enjoyed by patients themselves. Medical institutions, medical personnel and all relevant personnel involved in patient information under the Internet Healthcare are required to protect patients from illegal infringement of patient privacy that is legally grasped in the whole medical process. Compared with patients' privacy information of traditional medical, depressed patients in medical big data are confronted with a special challenge in privacy protection. Such challenge is caused by the particularity of the subject of rights, the diversity of sensitive information and the incomplete supervisory system. A survey found that more than 70% of people consider the existence of privacy policies and data encryption necessary (Jiang & Li 2018). However, in academic studies on patient privacy in the context of medical big data, there are few discussions on