

# A Meta-analysis of the Effect of Tai Chi on the Improvement of Mental Health in Drug Addicts

Shunjie Wu

Southwest University, College of Physical Education, Chongqing, 400700, China  
1050568774@qq.com

## ABSTRACT

**OBJECTIVE** To systematically evaluate the intervention effect of taijiquan and taijiquan-derived taijiquan rehabilitation exercises in traditional Chinese medicine exercises on psychological rehabilitation therapy for drug addicts. **METHODS** PubMed, Web of science, Cochrane Library, Embase, China Knowledge Network (CNKI), Wanfang Database (WANFANG), and Wikipedia database were searched for randomized controlled trials on taijiquan therapy intervention for mental health of drug addicts. The quality of the literature was evaluated using the Cochrane Risk Assessment Tool, and meta-analysis was performed using RevMan 5.3 software. **RESULTS:** A total of 9 papers were included. Meta-analysis results showed that: tai chi improves depression among forced drug addicts, and the difference between the experimental results of the experimental group and those of the control group was statistically significant (MD=-5.79, 95% CI: -7.88, -3.69,  $P<0.00001$ ); taijiquan improved anxiety better than the control group, with a statistically significant difference (MD=-4.39, 95% CI: -7.24, -1.53,  $P=0.003$ ); taijiquan improved obsessive-compulsive disorder better than the control group, with a statistically significant difference (MD= -0.26, 95% CI: -0.46, -0.07,  $P=0.007$ ); Taijiquan improved hostile symptoms better than the control group, with a statistical difference (MD=-0.27, 95% CI: -0.54, -0.01,  $P=0.04$ ); Taijiquan improved phobia better than the control group with statistical difference (MD=-0.14, 95% CI: -0.26, -0.01,  $P=0.03$ ). **CONCLUSION** Tai chi can improve the mental health of drug addicts, which is evident in the improvement of anxiety, depression, obsessive-compulsive disorder, hostility, and phobia.

## KEYWORDS

Tai chi; Drug addicts; Mental health; Meta-analysis

## 1. INTRODUCTION

Drugs are one of the recognized harms in society, drugs make people addicted by destroying the reward mechanism of the brain, drug addiction damages people's physical health, mental health, and behavioral health, making people unable to carry out normal social activities. According to the 2022 China Drug Situation Report, by the end of 2022, there were 1.124 million drug users and 71,000 new drug users. Among them, 416,000 abused heroin, 585,000 met methamphetamine, and 32,000 abused ketamine. In addition, there are various varieties of abuse, and the harm of abuse substitutes appears [1]. Drug craving is the core symptom of drug addicts, and drug craving is an important indicator to evaluate the effect of drug rehabilitation [2]. At present, the traditional methods of drug rehabilitation are mainly drug substitution therapy, psychological intervention, cognitive therapy and other treatments to reduce drug craving. In recent years, it has been found that exercise can also reduce drug craving, in a variety of exercise intervention methods, traditional Chinese medicine exercise Tai Chi has the characteristics of softness, coordination, coherence and roundness, is a way of movement through the body and mind, in recent years research has also found that Tai Chi has the

effect of relieving drug craving of drug addicts. In view of this, this study will systematically evaluate the physical and psychological improvement of Tai Chi on drug addicts, and provide a reference for the implementation and promotion of Tai Chi intervention in drug rehabilitation.

## **2. INFORMATION AND METHODS**

### **2.1. Literature Search Strategy**

The search was conducted by adding "subject headings" and "free words". The search databases included domestic databases: CNKI, Wanfang Database, and Weipu Database. Foreign databases: PubMed, Web of science, Cochrane Library. The search terms in Chinese are: Tai Chi, Tai Chi, Tai Chi Aerobics, Drug Abuse, Drug Addiction, Compulsory Drug Rehabilitation, Heroin, Methamphetamine, Heroin, Methamphetamine, Marijuana, Randomized Controlled Experiments, etc.

English search terms are Tai Ji, Taijiquan, Tai Chi, tai chi body-building exercise, drug users, drug dependence, drug addiction, Substance-Related Disorders, heroin, amphetamine, cocaine, randomized controlled trial, random, control, trial.

### **2.2. Selection Criteria**

Inclusion criteria: 1) Research subjects: drug addicts, 2) Intervention methods: Tai Chi and Tai Chi rehabilitation exercises, 3) Control group: conventional intervention treatment methods (psychotherapy, radio gymnastics, drug therapy, etc.) 4) Observation indicators: 5) Study type: randomized controlled trial (RCT). Exclusion criteria: 1) duplicate literature, 2) review literature, systematic reviews, conference literature; 3) Literature with inconsistent or large differences in research indicators 4) Non-randomized controlled experiments. 5) RCTs that are not solely using Tai Chi interventions. 6) Literature for which data are not available.

### **2.3. Literature Screening and Data Extraction**

In the literature selection process, the two researchers strictly followed the established standards and carefully screened each piece of data. In the event of a dispute, we will discuss it in depth or seek the professional opinion of a third researcher. The data extraction work is also meticulous, covering key information such as the first author, year of publication, duration of intervention, sample size, key points of observation, and frequency of intervention, to ensure the comprehensiveness and accuracy of the data.

### **2.4. Literature Quality Evaluation**

For review of document quality, we used a well-established meta-analysis system for the quality of the literature, which was carefully conducted by two researchers using the Cochrane risk of bias assessment tool. In the event of a dispute, a third researcher will be involved in the decision-making to ensure the objectivity and impartiality of the evaluation results.

### **2.5. Statistical Methods**

In this study, ravman 5.3 software will be used for meta-analysis to assess the heterogeneity of the literature by  $\chi^2$  test and  $I^2$  test. When the  $I^2$  value is less than 50% and the P value is greater than or equal to 0.10, the heterogeneity is low, and the pooled statistics can be calculated using the fixed-effect model. However, when the  $I^2$  value is greater than 50% and the P value is less than 0.10, it means that heterogeneity is high and subgroup analysis may be required and some studies are excluded to observe changes in heterogeneity. If heterogeneity persists, a random-effects model may be considered. Finally, when the P value is less than 0.05, it indicates that the difference is statistically

significant. Through the above methods, we can more objectively assess the heterogeneity of the literature and draw statistically significant conclusions.

### 3. RESULTS

#### 3.1. Literature Search Results and Basic Characteristics of Included Literature

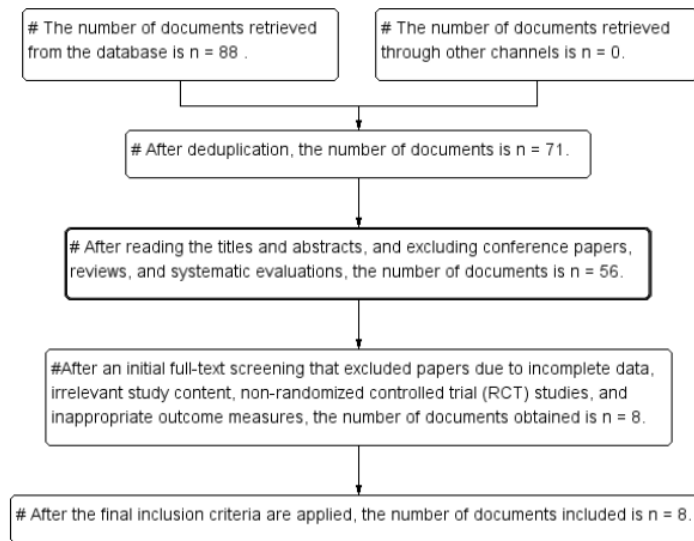
A total of 88 articles were initially reviewed, and after rigorous screening, 8 of them met the criteria for inclusion in the meta-analysis. Among these 8 articles, 7 are in Chinese and 1 in English. The detailed process of literature screening is shown in Figure 1. The basic characteristics of the included studies are shown in Table 1.

**Table 1.** includes the basic characteristics of the literature

Included literature	Sample size (Experimental group/control group).	Experimental group Methods of intervention	Control group Methods of intervention	Intervention period/week	frequency	Outcome measures
LI Jing, 2023 [15]	Male: 84/84	shadowboxing	Psychological education and rehabilitation training	16	3 times/week, 60min/time	《SCL-90》
Zheng Qianwen, 2021 [17]	Female: 20/20	shadowboxing	Sanda/control group	16	3 times/week, 60min/time	《SCL-90》
WANG Qi, 2021 [16]	Female: 24/25	shadowboxing	Radio gymnastics, finger exercises, dancing, etc	12	3 times/week, 30min/time	《SAS》, SDS Depression Self-Assessment Form
ZHENG Qixuan, 2019 [18]	M: 25/27	Tai Chi exercises, routines and exercises	Broadcast gymnastics	12	5/week, 60min	《SAS》, SDS Depression Self-Assessment Form
Zhu et al., 2018 [14]	Female: 37/12	shadowboxing	Radio gymnastics, sign language exercises	24	For the first three months, 5 times/week, 60min; After three months, 3 times/week, 60min	SDS Depression Self-Assessment Form
Geng Jingjing et al., 2016 [13]	Female: 30/27	Tai Chi rehabilitation exercises	Radio gymnastics, sign language exercises, self-study	12	5/week, 45min	《SCL-90》
GENG Jingjing, 2016 [19]	Female: 37/12	Twenty-four styles of Yang's Taijiquan	Radio gymnastics, sign language exercises	24	For the first three months, 5 times/week, 60min; After three months, 3 times/week, 60min	《SCL90》, 《SDS》
Wang fei 2015 [10]	Male: 30/28	shadowboxing	Rehab radio exercises	12	5/week, 45min	《SCL-90》

### 3.2. Included in the Literature Quality Evaluation

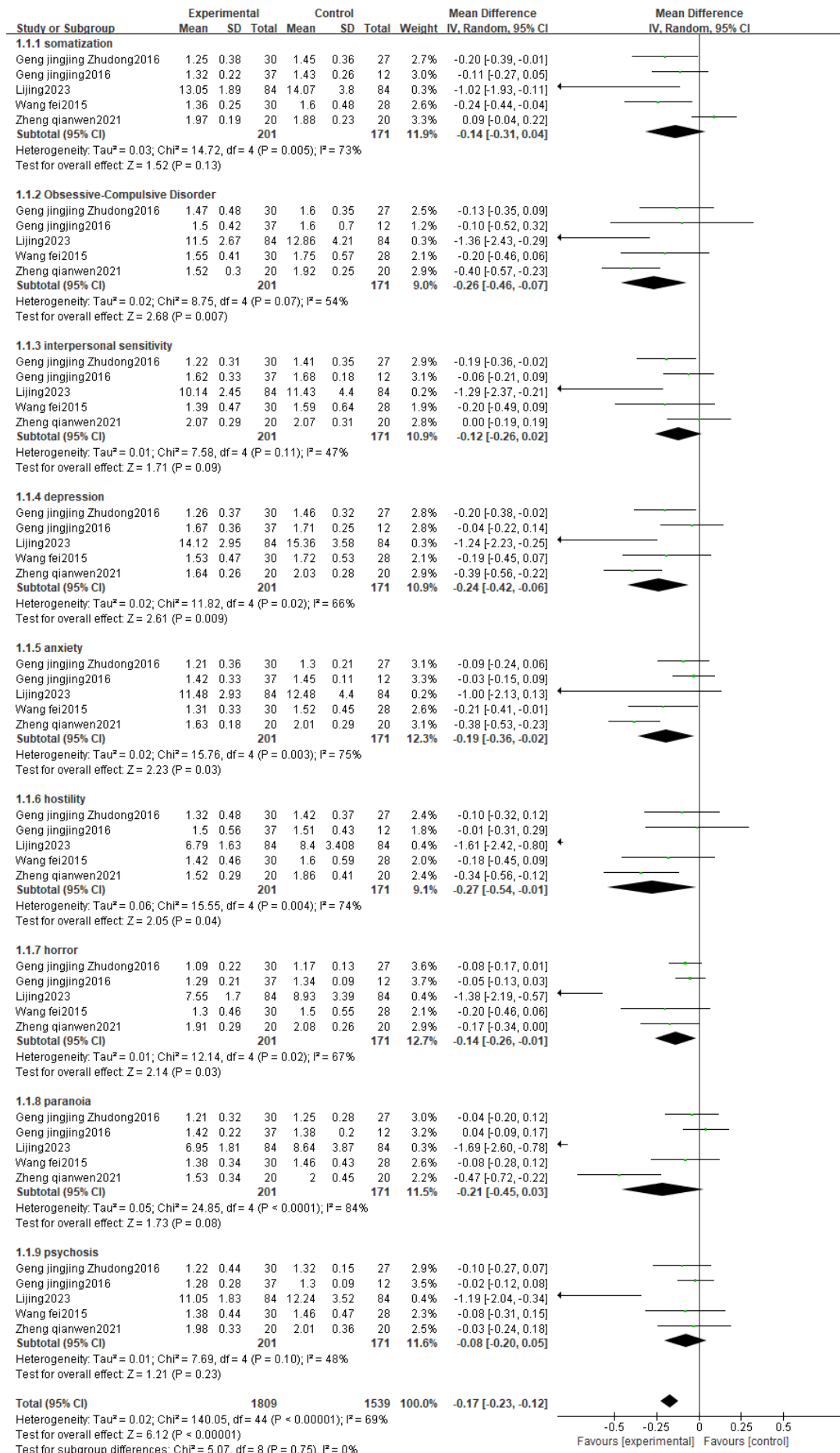
Eight studies were included using the Cochrane risk of bias assessment tool for review of literature quality, and all eight studies indicated that the baseline was comparable and all used random assignment, of which 7 studies (Zhu et al, 2018; Li Jing 2023; Wang Qi 2021; Wang Fei 2015; Geng Jingjing and Zhu Dong 2016; Geng Jingjing 2016; Zheng Qixuan 2019) used computer random assignment, and 1 paper (Zheng Qianwen 2021) used digital random allocation, and the intervention method was special, so it could not ensure the blinding of implementers and subjects, so the blinding method was evaluated as high risk, and the blinding of outcome data was not mentioned, and the evaluation was unknown. However, the data of the included literature were complete, and the intervention methods of the control group were specifically described, and the overall quality of the literature was high. The quality evaluation of the included literature is shown in Figure 2.



**Figure 1.** Literature screening process

	Zhu et al.2018	Zheng qixuan2019	Zheng qianwen2021	Wang qi2021	Wang fei2015	Li jing2023	Geng jing jing2016	Geng jingjing,Zhudong2016	
Random sequence generation (selection bias)	+	+	+	+	+	+	+	+	
Allocation concealment (selection bias)	+	?	?	?	?	?	?	?	
Blinding of participants and personnel (performance bias)	+	+	+	+	+	+	+	+	
Blinding of outcome assessment (detection bias)	+	?	?	?	?	+	?	?	
Incomplete outcome data (attrition bias)	+	+	+	+	+	+	+	+	
Selective reporting (reporting bias)	+	+	+	+	+	+	+	+	
Other bias	+	+	+	+	+	+	+	+	

**Figure 2.** Literature quality evaluation



**Figure 3.** Forest plot of the effect of Tai Chi on the SCL-90 score of drug addicts

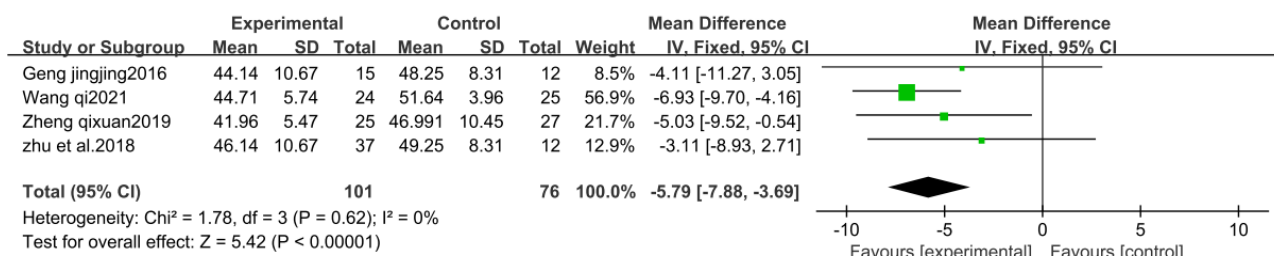
### 3.3. Results of Meta-Analysis

#### 3.3.1. Effect of Tai Chi on SCL-90 scores in drug addicts

Global mental health assessment was performed using the SCL-90 Symptom Self-Rating Scale. Five studies (n=372) were included in the analysis to compare the mental health intervention effects of Tai Chi rehabilitation therapy with traditional rehabilitation therapy in the control group (Li Jing 2023, Zheng Qianwen 2021, Geng Jingjing 2016, Geng Jingjing and Zhu Dong 2016, Wang Fei 2015). The overall heterogeneity was high among the five studies ( $I^2 = 69\%$ ,  $p < 0.00001$ ), so a random-effects model was used for analysis. The results showed that compared with conventional rehabilitation methods, Tai Chi intervention could reduce the somatization score (MD=-0.14, 95%CI: -0.31, 0.04,  $P=0.13$ ), obsessive-compulsive disorder score (MD=-0.26, 95%CI: -0.46, -0.07,  $P=0.007$ ), and interpersonal relationship sensitivity score (MD=-0.12, 95%CI: -0.26, 0.02,  $P=0.09$ ), depression score (MD=-0.24, 95%CI: -0.42, -0.06,  $P=0.009$ ), anxiety disorder score (MD=-0.19, 95%CI: -0.36, -0.02,  $P=0.03$ ), hostility score (MD=-0.27, 95%CI: -0.54, -0.01,  $P=0.04$ ), terror score (MD=-0.14, 95%CI: -0.26, -0.01,  $P=0.03$ ), paranoid score (MD=-0.21, 95%CI: -0.45, 0.03,  $P=0.08$ ), psychopathic score (MD=-0.08, 95%CI: -0.20, 0.05,  $P=0.23$ ) See Figure 3.

#### 3.3.2. Effect of Tai Chi on SDS scores of drug addicts

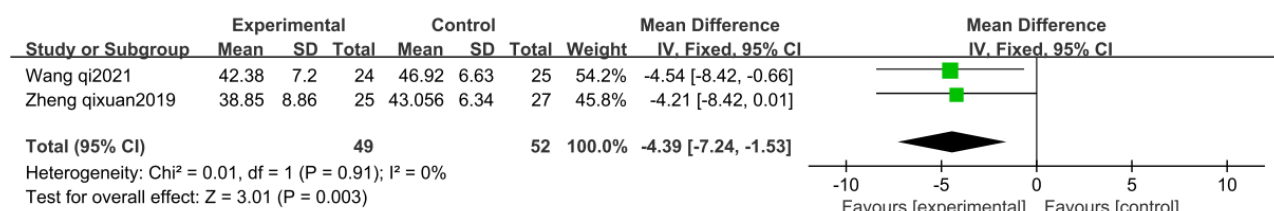
Depression was assessed using the SDS Depression Self-Rating Scale. Four studies (n=177) were included in the analysis to compare the effect of Tai Chi rehabilitation therapy with traditional rehabilitation therapy in the control group on depression in drug addicts (Zhu et al. 2018, Wang Qi 2021, Geng Jingjing 2016, Zheng Qixuan 2019). The homogeneity between groups was high ( $P=0.62$ ,  $I^2=0\%$ ), so a fixed-effect model was used for analysis. The results showed that Tai Chi reduced depression scores compared with conventional rehabilitation therapy (MD=-5.79, 95%CI: -7.88, -3.69,  $P < 0.00001$ ). See Figure 4.



**Figure 4.** Forest plot of the effect of Tai Chi on the SDS score of drug addicts

#### 3.3.3. Effect of Tai Chi on SAS scores of drug addicts

Anxiety disorders were assessed using the SAS Anxiety Self-Rating Scale. Two studies (n=101) were included in the analysis to compare the effect of Tai Chi rehabilitation therapy with traditional rehabilitation therapy in the control group on the intervention of anxiety disorder in drug addicts (Wang Qi 2021 and Zheng Qixuan 2019). The homogeneity between the groups was good ( $P=0.91$ ,  $I^2=0\%$ ), so a fixed-effect model was used for analysis. The results showed that Tai Chi rehabilitation therapy reduced anxiety scores (MD=-4.39, 95%CI: -7.24, -1.53,  $P=0.003$ ). See Figure 5.



**Figure 5.** Forest diagram of the effect of Tai Chi on the SAS score of drug addicts

### **3.4. Publication Bias Assessment**

There were 8 < 10 articles included in this study, which were not suitable for funnel plot line publication bias testing, and there may be potential risk of publication bias.

## **4. DISCUSS**

Tai Chi may influence the mechanism of promoting mental health improvement in drug addicts

### **4.1. Mechanism of Drug Addiction**

Drug addiction mechanism: the main biological basis of drug addiction is the brain reward system, the United States Institute of Drug Dependence proposed the neural circuit theory of drug addiction in 2006, dividing the brain region of addiction into four addiction circuits: reward pleasure, learning and memory, inhibitory control and behavioral motivation. According to this theory, abnormally activated reward circuits may lead to damage to memory circuits, which in turn may further reinforce the abnormalities of reward circuits. Repeated drug use can lead to the formation and solidification of conditioned reflexes, further enhancing the motivation to use drugs [3]. From the perspective of neurophysiological mechanism, the dopamine system, as a natural desire circuit, motivates us to survive and reproduce; Drugs, as an unnatural way, can disrupt the balance of the normal functioning of the brain. With the continuous release of dopamine, the body's reward mechanism is activated, and this reward mechanism controls addiction. In the long run, the desire of drug addicts will not stop, the brain will lose the ability to excite, and the desire circuit will become smaller and smaller, and then the manifestations of drug addiction will appear [4].

### **4.2. Tai Chi May Affect The Mechanism of Promoting Mental Health Improvement in Drug Addicts**

Sports, as a long-standing form of leisure, have long been regarded as an excellent way to regulate physical and mental health. In today's society, many scholars such as Ma Lianzhen, Lian Xuelin and Wang Chen have deeply studied its important role in regulating individual psychological emotions. For the special group of drug addicts, exercise has shown significant therapeutic effects. For people who have been addicted to drugs for a long time, their physiological functions and psychological state have suffered serious erosion. Exercise, on the other hand, is like a good medicine that penetrates deep into their bodies, erasing those addictive memories and repairing the reward system that has been damaged by drugs. Not only that, through exercise, the physical fitness of drug addicts can also be significantly improved, negative emotions can be regulated, and the confidence to return to society is also increased bit by bit [4]. It is worth mentioning that scholars such as Ma Qiang and Zheng Tinglei also pointed out that in the process of exercising, drug addicts can experience an unprecedented sense of satisfaction, which will stimulate their love for sports, and then make them more actively participate in exercise, so as to achieve the best rehabilitation effect [5]. In addition, the research of Lu Chunxia, Dong Weixin and others has also revealed the deep connection between exercise and mental health. They found that as drug addiction deepened, the humoral immunity of addicts gradually declined, which in turn affected their mental health. Exercise intervention, on the other hand, can effectively reduce the depression of addicts and improve their mental health by activating the level of humoral immune stress. Exercise intervention, a seemingly simple approach, plays a pivotal role in the practice of drug rehabilitation [6]. Lei Zhijun, Zou Zhibing, Pi Yihua and others spoke highly of this, believing that exercise is not only a booster for the physical rehabilitation of drug addicts, but also an important bridge for their psychological recovery. For female drug addicts, exercise also has a therapeutic effect that cannot be ignored. The research of Liu Ziyin, Zhang Qing and Zhao Peng showed that the physical, psychological and social adaptability of female drug addicts was significantly improved through reasonable exercise intervention [8]. In summary, sports play an

indispensable role in improving the mental health of drug addicts and promoting their better reintegration into society. We should further explore and improve the ways and means of sports drug rehabilitation, so that more people can benefit from it.

Studies have shown [9] that Tai Chi, as an ancient form of physical and mental exercise, has been shown to have a significant effect on the rehabilitation of drug addicts in recent years. After 12 weeks of Tai Chi training, the drug addicts' thirst for drugs was significantly reduced, the risk of relapse was also reduced, the glucose and lipid metabolism function was effectively regulated, and the body and mind gradually returned to a healthy state. During the six-month Tai Chi training, the depression and paranoia of the detoxifiers were significantly improved [4], and their hearts were more calm. The three-month Tai Chi training has a positive effect on the physical and mental health of the people who are forcibly isolated for drug rehabilitation, which can not only improve their physical fitness, but also improve their mental health [10]. Tai Chi is undoubtedly an ideal means of drug rehabilitation training, which can effectively promote the mental health of drug addicts and help them better integrate into society and lead a normal life.

### **4.3. Analysis of the Effect of Tai Chi on Improving the Mental Health of Drug Addicts**

The scourge of drugs not only erodes people's physical bodies, but also causes serious damage to mental health. After taking drugs, the haze of anxiety and depression often hangs over the mind, and social barriers follow, which can lead to endless suffering. And it is these bad psychological states that have become the main inducement for drug addicts to return to the abyss. Therefore, in the process of drug rehabilitation, it is particularly important to improve the mental health level of drug addicts, and it has always been the top priority of drug rehabilitation [11]. Drugs cause profound damage to the nervous system and body functions of the human body, and by stimulating the release of monoamine transmitters, people develop an inseparable mental dependence. Long-term addiction to it, brain neurons are damaged, and cognitive, emotional, behavioral and volitional disorders may occur, which is the evil result of drugs and the root cause of our resolute fight against it [12].

The body of a long-term drug addict seems to have reached some tacit agreement with the drug, and once the drug dose is reduced or interrupted, it will trigger a series of uncomfortable reactions, which we call drug withdrawal symptoms. Behind this symptom, there is actually a double dependence on drugs. On the one hand, there is physical dependence, that is, physiological needs. When the drug no longer works, the patient's body will have various reactions, such as increased blood pressure, insomnia, anxiety, etc., which are all strong calls of the body to drugs. On the other hand, there is psychological dependence, which is more complex and penetrates deep into the central nervous system of the person, causing people to have a strong craving for drugs. Driven by this craving, patients will desperately seek, crave, and use drugs, forming a vicious circle that causes serious physical and mental damage [10]. Drug addiction is a huge stumbling block, which not only seriously affects the physical health of drug addicts, but also makes their mental health fragile. Compared with ordinary people, drug addicts face more complex and widespread psychological problems, which seriously hinder their recovery process and make it difficult for them to reintegrate into society. Therefore, we must face up to the problems caused by drug addiction and actively seek solutions to help these patients get back on their feet.

The essence of Taijiquan lies in the integration of heart, mind, qi and strength. The heart and the mind are together, the mind and the qi are together, and the qi and the strength are combined, which is the "inner triad" of Taijiquan, so that the will, qi and energy are harmonious and unified, and work together. In the process of Tai Chi practice, we pursue emotional stability and peace of mind, which helps to dissolve the bad emotions in the body and mind, and achieve peace and harmony in the mind [13]. This study used a meta-analysis method to explore the effect of Tai Chi on the improvement of the psychological state of drug addicts. Under the analysis of a random-effects model, Tai Chi performed well in the treatment of psychological conditions (SCL-90) in drug addicts, significantly

better than the control group. After the intervention of Tai Chi rehabilitation therapy, the somatization, depression, anxiety, phobia, paranoia, and hostility factors in the experimental group showed significant improvements, especially in the somatization, anxiety, hostility, and paranoid factors, and the differences were extremely significant. The results fully show that Tai Chi rehabilitation therapy can effectively assist the psychological rehabilitation process of drug addicts and significantly improve their mental health. Tai Chi is not only a boxing technique, but also a way of self-cultivation, which helps drug addicts rebuild their healthy personality and return to a better life.

Tai Chi, an ancient form of martial art, is now a unique form of healing. In the sound of elegant music, the drug addicts stretched their bodies slowly and naturally, immersed in slow and gentle movements, and their hearts were gradually filled, getting rid of the intrusion of emptiness and loneliness. This practice process not only reduces psychological pressure, but also provides them with a harbor of spiritual sustenance. More importantly, Tai Chi is a collective activity, in which drug addicts communicate and encourage each other, promote interpersonal communication and enhance social adaptability. This lays a solid foundation for them to better integrate into society and lead a normal life after they are released from prison [13]. Tai Chi, with its low intensity and ease of operation, has become an ideal choice for long-term exercises. Not only does it have a significant effect on depression, but it also has a positive impact on overall health [14]. Several studies have shown that Tai Chi rehabilitation therapy is effective in improving the symptoms of anxiety and depression in drug addicts. However, we should also note that there are still many differences in the current research on Tai Chi rehabilitation therapy, and whether its intervention effect is the same for every drug addict still needs further in-depth research. We look forward to more relevant research in the future to provide more comprehensive guidance for the recovery of drug addicts.

## REFERENCES

- [1] 2022 China Drug Situation Report <http://cyberpolice.mps.gov.cn/wfjb/html/flfg/20230704/4739.shtml>
- [2] Zhang Zeping, Wang Xiaoli, Nanyang, et al. Chinese Journal of Drug Dependence, 2022, 31(05):380-385. DOI:10.13936/j.cnki.cjdd1992.2022.05.013.
- [3] Wang Yiyi, Zhang Qing, Zhao Peng. Contemporary Sports Science and Technology, 2023, 13(01):13-16+22. DOI:10.16655/j.cnki.2095-2813.2208-1579-9935.
- [4] Ma Lianzhen, Lian Xuelin, Wang Chen, et al. A review of the influence mechanism of exercise intervention on drug addicts in different periods [J]. Wushu Research, 2022, 7(08):122-126. DOI:10.13293/j.cnki.wskx.009667
- [5] Ma Qiang, Wen Xuan, Zheng Tinglei. Effect of VR exercise intervention mode on the physical rehabilitation effect of drug addicts [J]. Chinese Journal of Applied Technology, 2023, 23(4):391-395402.
- [6] Lu Chunxia, Dong Weixin, Guo Yin, Long Jiayi, Zheng Lan. Mechanism of action of exercise-activated humoral immunity to alleviate negative emotions in methamphetamine addicts [J]. China Sports Science and Technology, 2023, 59(6):26-36.
- [7] Lei Zhijun, Zou Zhibing, Pi Yihua. Contemporary Sports Science and Technology, 2023, 13(30):20-24. DOI:10.16655/j.cnki.2095-2813.2023.30.006.
- [8] LIU Ziyin, ZHANG Qing, ZHAO Peng. Effect of exercise intervention on relapse tendency of female drug addicts [J/OL]. Sports Research:1-8 [2024-03-12]. <http://kns.cnki.net/kcms/detail/31.1194.G8.20230801.0946.002.html>.
- [9] Zhang Ling, Zhu Wenfei, Zhang Longhai, et al. Effects of Tai Chi exercise on drug craving, attention bias and health and physical fitness of drug addicts[C]//Chinese Sports Science Society. The 13th National Sports Science Conference Abstract Collection - Special Report (Physical Fitness and Health Branch). [Publisher unknown], 2023:3. DOI:10.26914/c.cnkiyh.2023.065414.
- [10] Wang Fei. Study on the effect of Tai Chi exercise on the rehabilitation of people in compulsory isolation for drug rehabilitation [D]. Shanghai University of Sport, 2015.
- [11] A R W, F G K. The development and maintenance of drug addiction. [J]. Neuropsychopharmacology: official publication of the American College of Neuropsychopharmacology, 2014, 39(2):254-62.
- [12] Fu Yipin. Journal of Qiqihar Medical College, 2014, 35(24):3631-3632.
- [13] Geng Jingjing, Zhu Dong, Xu Ding. Effect of Tai Chi rehabilitation exercises on the rehabilitation of female drug addicts in compulsory isolation [J]. Chinese Journal of Sports Medicine, 2016, 35(11):1048-1051. DOI:10.16038/j.1000-6710.2016.11.011.

- [14] Dong Z, Guobin D, Ding X, et al. Long-Term Effects of Tai Chi Intervention on Sleep and Mental Health of Female Individuals With Dependence on Amphetamine-Type Stimulants. [J]. *Frontiers in psychology*, 2018, 91476.
- [15] Li Jing. Study on the effect of Tai Chi training on the psychological rehabilitation of male compulsory training personnel [D]. Instructor: Zhu Dong. Shanghai University of Sport, 2023.
- [16] Wang Qi. Effect of Tai Chi on mental health and craving of methamphetamine-dependent people [D]. Instructor: Wu Zhengping; WU Xiaoyang. Shanghai University of Sport, 2021.
- [17] Zheng Qianwen. Experimental study on the effect of martial arts exercise on the mental health of women who are drug dependent on withdrawal [D]. Instructor: Tao Ping. Northeast Normal University, 2021.
- [18] Zheng Qixuan. Study on the intervention of Tai Chi exercise on physical constitution and drug craving of people who are on strong abstinence [D]. Instructor: Wu Dong. Beijing Sport University, 2019.
- [19] Geng Jingjing. A study on the effect of Tai Chi on the physical and mental rehabilitation of female synthetic drug addicts in Shanghai [D]. Instructor: Zhu Dong. Shanghai University of Sport, 2016.