



Influence of Psychological Supervision on Athletes' Compliance, Mental Elasticity Characteristics and Acute Stress Disorder in Traumatic Fracture Rehabilitation Training

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Abstract

Background: We aimed to explore the effect of psychological supervision on rehabilitation training compliance, mental elasticity characteristics, and acute stress disorder.

Methods: From March 2018 to March 2020, 128 athletes with traumatic fractures in Zhoukou Sports Club in China were divided into two groups using the random number table method, The intervention group (64 athletes) received psychological supervision during the rehabilitation training, while the control group (64 athletes) without psychological supervision. The rehabilitation training compliance in the two groups was observed, and the mental elasticity characteristics and acute stress disorder changes were compared between the two groups before and post-intervention.

Results: The compliance rate during postoperative rehabilitation training in the intervention group is 92.19%, which was significantly higher than 73.44% in the control group ($P < 0.05$). Compared with the scores before intervention, the CD-RISC score and SASRD score of the two groups were significantly lower than the scores post-intervention. The SMFA function and vexation indexes of the intervention group in three months after operation were significantly lower than those of the control group ($P < 0.05$). The QOL scores of the intervention group in social, environmental, psychological, and physiological fields were significantly higher than those of the control group in three months after operation ($P < 0.05$).

Conclusion: The implementation of psychological supervision for athletes with traumatic fractures could improve rehabilitation training compliance, increase the level of mental elasticity, and relieve acute stress disorder.

Keywords: Psychological supervision; Sports traumatic fracture; Mental elasticity characteristics; Acute stress disorder

Introduction

Sports traumatic fractures are fractures caused by the individual due to improper movement posture during exercises. The injured limbs are manifested as swelling, pain, bruising, limited activity, and so on. Some serious injuries may even occur,

such as limb distortion, rotation, shortening, and other deformities (1). Complete or incomplete fractures of the affected limb, accompanied by bone friction sound or false joint phenomenon in the process of movement, some patients may al-



so cause tendon, blood vessels, nerve, and other parts of the injury due to fractures. Due to the characteristics of professionalism and difficulty, there is a high incidence of sports traumatic fracture for athletes. They need to receive timely surgical treatment and experience a long recovery period after the operation. Moreover, they need to cooperate with reasonable rehabilitation training to obtain satisfactory rehabilitation effects (2). Due to the long period of postoperative rehabilitation, patients are prone to anxiety, tension, and other negative emotions, which harms postoperative rehabilitation.

Because of the unpredictability and abruptness of sports traumatic fractures, it can not only damage the cognitive function and body of athletes but also affect their psychological defense line and cause serious stress response (3). However, for individuals, not all of them have stress disorders or psychological problems when they encounter adversity or setbacks, and some of them can quickly adapt to the stress response after it appeared in the body. In psychology, this ability to quickly and effectively adapt to stress for individuals is called "Mental Elasticity". "Mental Elasticity" is the focus of psychological research recently. The American Psychological Association defines it as "the adaptive process of an individual in the face of threat, tragedy, adversity, trauma, or other major stress, which is the ability to recover as soon as possible and maintain mental health in the face of difficulties" (4). Good mental elasticity can reduce and prevent the occurrence and symptoms of stress disorder to a certain extent (5). If the patients with stress disorders are not treated timely and effectively, it causes delayed stress disorder or even irreversible psychological disease. Numerous relevant studies show that compared with healthy subjects, patients with traumatic fractures have significantly higher scores in hostility, anxiety, fear, and other aspects, and their stress response disorder become more severe with the gradual course of the disease (6, 7).

In this study, the athletes suffering from traumatic fractures were studied to explore the effects of psychological supervision on rehabilitation train-

ing compliance, mental elasticity characteristics, and acute stress disorder, and to analyze the role of psychological supervision in the rehabilitation of patients to provide a reference for clinical rehabilitation treatment.

Literature Review

Traumatic fractures of athletes are mostly treated by surgery. Although surgery is an effective means to treat traumatic fractures, patients tend to have poor emotions after surgery. Negative emotions, such as depression and anxiety, co-existed with psychological stress disorder in 70% of patients after traumatic fracture (8). Traumatic fractures often cause patients to be in an unstable state of the body, which will make the body more prone to stress, such as post-traumatic stress depression or chaotic interpersonal relationships, which will affect the body's psychological recovery (9). The important risk factors for stress disorder in patients with traumatic fractures are pain degree and mental elasticity (10). Therefore, it is necessary to strengthen and improve the mental elasticity level of patients through corresponding psychological interventions to reduce the occurrence of acute stress disorder and improve the prognosis and rehabilitation.

Because the negative emotion and psychological stress disorder of patients with traumatic fracture after surgery have adverse effects on postoperative rehabilitation, doing a good job on postoperative psychological intervention for patients to expedite postoperative rehabilitation is important. Psychological intervention such as positive self-talk, counseling, and written emotional path promoted the athletes' positive emotional state and persistence in rehabilitation and accelerated the recovery of athletes after injury (11). Providing psychological intervention along with postoperative rehabilitation treatment can improve the prognosis and rehabilitation of patients with traumatic fractures (12). Lacefield et al. (13) showed that for fracture patients with severe anxiety, the treatment compliance is improved under the condition of soothing music and progressive muscle training, which then relieves anxiety and other negative emotions and expedite postopera-

tive recovery. For patients with traumatic fractures with severe stress disorder, social support and routine postoperative rehabilitation training intervention can improve their anxiety and fear of prognosis, improve the level of mental elasticity, and promote prognosis and rehabilitation (14). For patients with traumatic fractures, psychological intervention can control negative emotions, improve the mental elasticity of patients, and avoid the occurrence of acute stress disorder (15). Therefore, reasonable physical exercise and psychological supervision play an important role in improving the physical and psychological status of athletes with traumatic fractures after surgery. To keep athletes with traumatic fractures in a good psychological condition, this study implements a psychological supervision intervention to explore the effect of psychological supervision on rehabilitation training compliance, mental elasticity characteristics, and acute stress disorder.

Methods

Research objects

The subjects of the study were 128 patients with sports traumatic fractures from March 2018 to March 2020 at Zhoukou Sports Club in China.

Inclusion criteria were as follows: confirmed the type and location of fracture by imaging examination, 18-25 years old, fracture caused by sports, no other organ injury, the patients know and agree to the study, and voluntarily signed the informed consent. Exclusion criteria were as follows: the patients with other serious physical diseases and with a history of anxiety, depression, and other mental illness.

We adopted a random number table method to divide them into two groups: the control group and the intervention group. There were 64 patients in the control group, 34 males and 30 females aged 19~23 (average age 21.20 ± 1.75) years, including 24 tibiofibular fractures, 12 humerus fractures, 11 femoral shaft fractures, 7 calcaneus fractures, 6 patella fractures, and 4 other fractures; there were 64 patients in the intervention group, 36 males and 28 females aged 20~24

(21.51 ± 1.86) years, including 22 tibiofibular fractures, 15 humerus fractures, 10 femoral shaft fractures, six calcaneus fractures, seven patella fractures, and four other fractures. There was no significant difference in the general data between the two groups ($P > 0.05$).

This study was approved by the Ethics Committee of Zhoukou Normal University of China.

Procedures

Both groups received timely surgical treatment for fractures. The intervention group received psychological supervision during postoperative rehabilitation training, while the control group received routine rehabilitation training after surgery without psychological supervision. The psychological supervision is completed by professional psychological consultants, and the intervention time of psychological supervision is three months.

The psychological supervision method comprises the following

1) Supporting psychological intervention, taking the initiative to communicate with patients, improving the trust of patients in psychological consultation teachers through communication skills, and encouraging patients to talk more about their ideas, psychological consultation teachers should listen carefully and fully understand the feeling of patients. Through communication with patients, they can understand their social support and living conditions, especially their doubts and worries about surgery and postoperative rehabilitation, patiently answering the doubts of patients, relieving patients' negative emotions through positive language, and helping them establish a positive coping style. The supportive psychological interventions were performed during postoperative ward rounds, once a day, with an intervention time of five minutes at a time.

2) Cognitive-behavioral intervention, the attending physician is responsible for explaining fractures and surgery knowledge to patients, correcting the incorrect cognition of patients, and improving the cognition level of fracture and sur-

gery of patients. It emphasizes the relationship between psychological factors and postoperative pain and anxiety, wherein patients can realize that unreasonable cognition is the root cause of bad emotions, and correct cognition helps eliminate bad emotions. Meanwhile, it is conducive to reducing postoperative pain and expediting the process of postoperative rehabilitation. The cognitive-behavioral interventions were performed on the first day after surgery, on the first day before leaving the hospital, and at each follow-up session, with an intervention time of 20 minutes at a time.

3) Relaxation training, the rehabilitation personnel will organize patients to conduct relaxation training and guide patients to breathing deeply, meditation, and other training methods to relax their mind and body, and relieve negative emotions. The relaxation training was performed once on the first day after surgery and the first day before leaving the hospital, with an intervention time of 20 minutes at a time. After the patient is discharged from the hospital, the patient is required to practice at home and try to do it once a day.

4) Social support intervention, communicate with patients and their families, explain postoperative rehabilitation training methods, tell patients to insist on completing the rehabilitation training, ask patients' family members to assist from the side, and give supervision. Teach family members of patients to encourage patients more, give them more positive suggestions, and try to accompany patients to conduct meditation and relaxation training in the natural environment. In daily life, the patients' family members and friends should care more about the patients, communicate with them, explain daily interesting things to them, and build a harmonious family atmosphere, in which the patients can maintain a healthy and good attitude. Encourage patients to listen to light and beautiful music, or read favorite books, or watch light-hearted films to distract their attention from their illness and relieve their anxiety.

Evaluation tool

1) The compliance of postoperative rehabilitation training was evaluated in both groups. Do exercise 2 or more times a day according to the advice of doctor, each exercise time is not less than 15min, which will be judged as good compliance, and those who fail to meet this standard are judged as poor compliance. Compliance = number of cases with good compliance/total number of cases with good compliance \times 100%.

2) Before intervention (1d after surgery) and post-intervention (three months after surgery), the Chinese version of Connor- Davidson resilience scale (CD-RISC) was used to evaluate the mental elasticity characteristics of patients (16). The scale contained 25 survey items, including four items of optimism, eight items of strength, and 13 items of tenacity. Each item is scored 0 to 4 points, and 100 is full marks. The better the psychological elasticity, the higher the score is.

3) Patients with acute stress disorder were assessed by using the Chinese version of the Stanford Acute Stress Response Questionnaire (SASRQ) (17). There were 30 items in the questionnaire, and each item was scored 0 to 5 points with a total score of 150 points. The more severe the acute stress disorder is, the higher the SASRQ score is.

4) The Short Musculoskeletal Function Assessments (SMFA) (18) was used to evaluate the bone function and daily life ability at 3 months after surgery. The scale was evaluated from four aspects of motor ability, arm/hand function, emotional state, and daily living activities, with a total of 46 items and adopted 5-level scoring method. The lower the score, the better the recovery of bone function and daily living ability is.

5) The Quality of Life (QOL) (19) was used to evaluate the quality of life of patients at three months after surgery, which included four aspects of the social field, environmental field, psychological field, and physiological field. The higher the score, the better the quality of life is.

Statistical treatment

The SPSS 20.0 software (Chicago, IL, USA) was used for statistical processing research data,

wherein the counting data was expressed as percentage (%), data comparison was conducted by χ^2 test, the measurement data was expressed as $\bar{x} \pm s$, and data comparison was conducted by t -test. If the result is $P < 0.05$, the difference has no statistical significance.

Results

Compliance during rehabilitation training

The compliance during postoperative rehabilitation training in the intervention group was 92.19%, which was significantly higher than 73.44% in the control group ($P < 0.05$) (Table 1).

Table 1: Comparison of postoperative rehabilitation training compliance between the two Groups

Group	Statistic	Good	Bad	Proportion/%
Intervention group (n=64)		59	5	92.19
Control group (n=64)		47	17	73.44
	χ^2 value			7.904
	P-value			0.005

Mental elasticity characteristics

There were no significant differences in scores of CD-RISC roughness, strength, and optimism between the two groups before intervention. Compared with before the intervention, the scores of toughness, strength, and optimism in the two

groups were significantly lower after the intervention, and the positive coping score in the intervention group after the intervention was significantly lower than that in the control group ($P < 0.05$) (Table 2).

Table 2: Comparison of CD-RISC scores between two groups before and post-Intervention ($\bar{x} \pm s$, score)

Group	Time	Statistics	Toughness	Strength	Optimism
Intervention group (n=64)	Before intervention		35.69±4.58	28.74±3.45	13.29±2.08
	Post-intervention		18.74±2.52	14.23±2.18	6.14±1.18
		t-value	25.940	28.444	23.919
		P-value	<0.001	<0.001	<0.001
Control group (n=64)	Before intervention		35.71±4.25	28.68±3.24	13.21±2.04
	Post-intervention		26.59±3.18*	21.54±2.59*	9.03±1.35*
		t-value	13.745	13.771	13.670
		P-value	<0.001	<0.001	<0.001

Note: Compared with the control group post-intervention, * $P < 0.05$

Acute stress disorder

There were no significant differences in scores of separation symptoms, avoidance, repeated experience, irritability symptoms, and social function

impairment in SASRD between the two groups before intervention. Compared with before the intervention, the scores of separation symptoms, avoidance, repeated experience, irritability symp-

toms, and social function impairment in both groups were significantly lower after the intervention, and the positive coping score of the inter-

vention groups after the intervention was significantly lower than that of the control group ($P < 0.05$) (Table 3).

Table 3: Comparison of SASRQ scores between two groups before and post-Intervention ($\bar{x} \pm s$, score)

Group	Time	Statistics	Separation symptoms	Avoidance	Repeated experience	Irritability symptoms	Social function impairment
Intervention group (n=64)	Before intervention		31.05±5.12	23.09±4.12	22.39±3.89	22.61±3.58	7.63±1.41
	Post-intervention		10.25±1.09	6.47±2.25	6.03±1.58	6.18±1.42	1.26±0.34
		t-value	31.788	28.323	31.172	34.128	35.135
		P-value	<0.001	<0.001	<0.001	<0.001	<0.001
Control group (n=64)	Before intervention		31.12±5.08	23.15±4.05	22.45±3.81	22.57±3.48	7.58±1.34
	Post-intervention		21.36±1.87*	15.87±2.54*	14.29±2.43*	13.61±2.51*	4.26±0.89*
		t-value	14.424	12.183	14.446	16.706	16.511
		P-value	<0.001	<0.001	<0.001	<0.001	<0.001

Note: Compared with the control group post-intervention, * $P < 0.05$

Rehabilitation effect of musculoskeletal function

The function and vexation indexes of SMFA in the intervention group were significantly lower

than those in the control group at three months after the operation ($P < 0.05$) (Table 4).

Table 4: Comparison of SMFA scores at three months after the surgery between the two groups ($\bar{x} \pm s$, score)

Group	Statistics	Function index	Vexation index
Intervention group (n=64)		28.52±3.73	23.67±1.26
Control group (n=64)		33.01±3.15	45.54±3.61
	t-value	7.357	45.758
	P-value	0.000	0.000

Quality of life

The scores of QOL in the social field, environmental field, psychological field, and physiological field in the intervention group at three

months after the surgery were significantly higher than those in the control group ($P < 0.05$) (Table 5).

Table 5: Comparison of QOL at three months after the surgery between the two groups ($\bar{x} \pm s$, score)

Group	Statistics	Social	Environmental	Psychological	Physiological
Intervention group (n=64)		15.36±1.42	16.61±2.21	15.87±2.64	15.72±1.72
Control group (n=64)		11.36±1.57	11.53±1.38	12.17±1.36	11.83±1.54
	t-value	15.116	15.598	9.967	13.480
	P-value	0.000	0.000	0.000	0.000

Discussion

The recovery of limb function after traumatic fractures is closely related to rehabilitation training. Scientific and reasonable rehabilitation training can effectively promote the recovery of limb function in patients with traumatic fractures after surgery. Whether patients can strictly follow the doctor's advice for rehabilitation training after surgery directly affects the quality of rehabilitation training and influence the effect of postoperative rehabilitation. However, the psychological state is a key factor affecting the compliance of rehabilitation training, and a good psychological state is helpful to improve the compliance of patients with rehabilitation training (20). The results in Table 1 showed that the compliance of patients with the rehabilitation training in the intervention group who received psychological supervision was 92.19%, which was significantly higher than 73.44% in the control group ($P < 0.05$). This finding is consistent with the data reported by Li (21), indicating that psychological intervention can improve the compliance of patients with traumatic fractures for postoperative rehabilitation training because psychological supervision for patients after surgery can help patients in doing a good job in psychological construction, accept the fact that postoperative rehabilitation is a long-term process, which can reduce the anxiety of patients on postoperative rehabilitation. Moreover, the cognitive intervention can make patients fully realize the importance of postoperative rehabilitation training, consciously conducting rehabilitation training in accordance with the doctor's advice.

Tables 2 and 3 showed that the CD-RISC score and SASRQ score of patients in the intervention group were significantly lower than those in the control group post-intervention, which indicates that psychological supervision can significantly enhance the mental elasticity of athletes and reduce the state of acute stress disorder. This finding coincided with the results from Chen (22) because the patients with better mental elasticity can face up to fear events at the same time to

relieve stress. Therefore, providing psychological counseling intervention for patients with traumatic fractures after surgery and adjusting their mental elasticity can stimulate their confidence in treatment and help athletes return to the competition. Furthermore, the mental elasticity is similar to the body's "immune protection system", which can effectively reduce the adverse reactions and chain effects caused by acute post-traumatic stress disorder, improve the resistance and confidence of patients, and promote the positive and relaxed response. It can effectively improve the level of mental elasticity of patients, improve training compliance, and expedite the rehabilitation for patients with traumatic fracture under the guidance of specialized medical staff by adjusting the training progress according to the condition and injury of the patients and performing targeted rehabilitation exercise and psychological care (23). Anxiety and depression would reduce the patients' confidence in treatment, weaken their enthusiasm, and cause the disorder of the neuroendocrine and immune systems at the same time, thus affecting the level of mental elasticity (24). This may be because psychological supervision can effectively guide patients to accept the reality, actively face the rehabilitation process after fracture, reduce the occurrence of anxiety, depression, and other negative emotions, promote patients to face rehabilitation training with a positive attitude, enhance the level of mental elasticity, and reduce the state of acute stress disorder. Therefore, it shall provide enough psychological supervision interventions, such as psychological intervention, cognitive-behavioral intervention, relaxation training, and social support intervention to the patients with traumatic fractures after the intervention to promote the rehabilitation of patients.

Tables 4 and 5 showed that the SMFA function and vexation index in the intervention group were significantly lower than those in the control group after the intervention. This indicated that the implementation of psychological supervision could effectively relieve the anxiety and depression of patients with traumatic fractures, promote the skeletal function recovery of the affected

limb, and improve the postoperative rehabilitation effect. In terms of quality of life, the QOL scores in the social field, environmental field, psychological field, and physiological field in the intervention group were significantly higher than those in the control group three months after surgery. The result coincided with the results from Mao et al. (25) which indicated that psychological supervision can effectively improve the quality of life of patients with traumatic fractures. The implementation of psychological supervision improved the compliance of patients for rehabilitation training, enhanced their mental elasticity, avoided the prognosis of acute stress disorder and guided patients in actively coping with postoperative rehabilitation and expedite the postoperative rehabilitation process, and improve the postoperative rehabilitation effect, which can make patients fit into social life more quickly, recovering to their living conditions before surgery, and the quality of life of patients will be significantly increased (26).

Conclusion

The implementation of psychological supervision for athletes with traumatic fractures can effectively improve compliance with rehabilitation training, improve the level of mental elasticity, relieve acute stress disorder, promote rehabilitation of bone function, and improve quality of life after surgery, which has significant application advantages.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The authors declare that there is no conflict of interests.

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