Application of Warm-Up Exercise Based on Intelligent Body Data Analysis Model in Taijiquan Exercise

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Abstract: Taijiquan originated in China. It is deeply rooted in the fertile land of the Chinese nation. Taijiquan belongs to the world. Taijiquan, a martial arts sport, has been widely praised by people around the world. Since the 1980s, governments at all levels and the general public have become increasingly aware of the protection of Taijiquan, an ancient cultural system, and governments at all levels have formulated corresponding protection measures and activities with Taiji culture as the theme. It has held 11 international Taijiquan exchange conferences in various parts of China. Various Taijiquan doormen and folk inheritance organizations have also increased their dissemination and promotion. In the course of Taijiquan practice, many people have a situation of knee joint pain. In response to this situation, combined with the intelligent body data analysis model, the ways and means of Taijiquan practice are improved.

1. Introduction

Taijiquan has a remarkable effect on the treatment of various chronic diseases. Tai Chi requires calm and natural exercise, so that part of the cerebral cortex can enter a state of protective inhibition and can be rested. At the same time, practicing Tai Chi can also play an active mood and play a regulating role in the nerve center. The long-term practice of Taijiquan can not only restore and improve brain function, but also eliminate various chronic diseases caused by neurological disorders. In addition, there are data showing that long-term practice of Taijiquan has a significant effect on the treatment of cardiovascular diseases, enhancement of cardiopulmonary function, and relief of neck, shoulder, and back pain.

Taijiquan pays great attention to the use of “meaning” and “Qi” to guide the movement of the movement. Through the use of Qi and Qi, it guides the movement of the body posture and thus drives the whole body's bones, joints and muscles. Taijiquan emphasizes that on the basis of gentle and slow, round and coherent, it requires the movement to be relaxed and flexible, so that the whole body muscles and joints can use their ideas to guide the limbs to stretch out as far as possible. This allows muscles, joints and soft tissues to be exercised, which not only maintains the joint flexibility of the practitioner, but also plays a good preventive and therapeutic role in spinal skeletal malformations, arthritis, and muscle atrophy. Taijiquan exercises can exercise muscles around the knees, especially the quadriceps, semi-bond muscles, semi-membrane muscles, and biceps. The lower extremity muscle atrophy and joint stiffness after the removal of lower extremity fractures can promote the restoration of lower extremity function. Taijiquan requires “gas sinking into Danita” and consciously uses abdominal breathing to increase the depth of breathing, which is conducive to improving respiratory energy and blood circulation. Taijiquan emphasizes the unity of body and mind. Through easy and gentle exercise, people's meridians and meridians can be unimpeded, metabolism can be strong, and physical fitness and function can be enhanced. Taijiquan can enhance the strength and knee stability of the knee muscles, especially the quadriceps. It also found that the knee angle is basically not affected by the length of the thigh or the length of the calf. It was concluded that regular Taijiquan exercise by the boxer can enhance the strength of the knee muscle group. And knee stability. The continuous spiral arc movement of Taijiquan exercises makes the muscles, sacs, and joint ligaments around the joints well exercised, enhancing the stability, flexibility, and flexibility of the joints; It also enhances metabolism and improves the blood supply to muscles and skeletal muscles. Therefore, the shape, structure and function of the

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bone produce good changes. The protein matrix of the bone increases, improving the anti-bending and anti-collision ability of the bone. Regular exercises can also prevent and control osteoporosis, skeletal malformations and other diseases. Taijiquan exercises can effectively prevent and control joint dislocation, inflammation, and sprains. They can also play a very good health care role for the elderly, such as inconvenient walking and weak legs and feet.

Taijiquan professors and most practitioners believe that there are indeed people who have practiced Taijiquan for a period of time and have pain in the knee joint. However, it is not due to Taijiquan, but the practitioners themselves do not get the method and do not understand the reason. “Confusion training”, “blind practice”, coupled with a long period of no correction, over time, such problems occur. The knee joint pain before practicing Taijiquan is highly correlated with the occurrence of knee pain during practice. The “boxing age” of practicing boxing increased, and the proportion of knee pain of Taijiquan practitioners gradually decreased. Some practitioners believe that their knee joint pain is mainly caused by unsuited and unskilled initial stage. Irregular movement and incorrect posture are the main causes of knee joint pain during Taijiquan practice. Inadequate preparation is also a major cause of knee pain in Tai Chi practitioners. There were significant differences in the incidence of knee joint pain in different preparation time and practice, and the incidence of knee pain in 16 min and above was significantly reduced. Poor strength of quadriceps, especially centrifugal control, is an important cause of knee joint pain. The significant increase of knee weight moment and muscle moment in Taijiquan exercises is the main mechanical mechanism of knee joint injury. Taijiquan coaches develop jogging or fast walking, trunk and limb joint activities, and stretching; Step up, step backwards, step aside, and practice Taijiquan for a total time of not less than 20 minutes. Special preparation activities are recorded as videos, and Tai Chi practitioners are instructed to practice before each practice. Combined with the quadriceps centrifugal muscle strength and centrifugal control exercises 3 times a week, the degree of knee pain in Taijiquan practice was effectively reduced. The knee pain score during the exercise was 4.30 people 1.18 down to 1.30 people 1.33(one issue), 4.25 is 0.79 down to 1.50 people 1.29. The main factors of knee joint pain in Taijiquan practice are preparation activities, centrifugal muscle strength and centrifugal control ability of quadriceps.

2. Experimental Procedure

Preparation activities can speed up the body's blood circulation, make the joints flexible, and prepare the body for the following movements to avoid damage. The preparatory activities for the elderly before performing the complete routine of Taijiquan should start with leg exercises. First, jog or run in place to preheat the body, then perform knee joint loops, squat and other exercises, and then kick and press the leg. Do not use hard pull, fierce, strong kick and other methods. The preparatory activities of Taijiquan have its own particularity. It is usually a combination of preparatory activities and basic skills training. After the elderly exercise the legs, they can practice the basic leg method of Taijiquan in combination with breathing. As above, step back, step forward, and take the centre of gravity, cloud hand, etc.. After the body is slightly hot, they will perform a series of routine exercises. It is recommended that the elderly use the Baduanjin exercise as a preparatory part before the Taijiquan exercise, because the Taijiquan itself requires action and breathing to cooperate. The Baduanjin contains qigong content, and the Baduanjin consists of eight different movements. Each movement corresponds to different body movements and combines different mental activities to exercise the internal organs of the human body. Its movements are simple, easy to learn, and require deep, long, and even breathing. These are very similar to the requirements of Taijiquan. Therefore, Baduanjin is used as a preparation for Taijiquan practice. It not only preheats the various joints of the practitioner, but also allows the practitioner to eliminate miscellaneous thoughts from the mind, and is fully prepared for Taijiquan practice.

Preparation activities are targeted physical exercises before formal exercises and competitions. Their main functions include two aspects: reducing sports injuries and improving sports performance. The preparatory activities of Taijiquan have its particularity. It is usually necessary to combine preparatory activities and basic skills training. In this study, by reviewing literature and

interviewing Taijiquan coaches, the special preparations for Taijiquan are jogging or fast-walking for 10 minutes, shoulder, elbow, wrist, callus, knee, joint movement, trunk buckling, and cross-step rotation and stretching. 5 minutes, Step up, step backwards, step aside, practice for 5 minutes in situ, and the total time is not less than 20 minutes of preparation activities. The special preparation activities were recorded as video. The experimental group subjects first watched video learning, and then the special preparation activities of the experimental group were performed by special personnel. Make sure the subject is familiar with the practice action specification, action intensity, duration and practice frequency. Special preparation activities required participants in the experimental group to practice before each practice. The special preparatory activities emphasize not only the warm-up process of preparatory activities, but also jogging and joint activities of the trunk and limbs, and also emphasize the close connection with Taijiquan sports as above, retrogression, lateral step, and in situ. Therefore, in the course of the intervention, it was recognized by the subjects and received good experimental results.

The traditional warm-up exercise starts with jogging on the playground and a rhythmic arm jog. Jogging can be a warm-up or a full-body joint to avoid unexpected pressure in the game. After jogging three laps, the runner returns to the ground and begins several times, moving the leg joints and improving leg strength. The next action, the hind leg support, the front leg raises the leg and extends to the outside. The left and right legs alternately perform this action, moving the joints, and improving the flexibility and stability of the body. Next, the legs stand in front of each other, the knees bend, the hind legs fall backwards, and the weight of the body drops. Then there's the Sprint, the change to run, the trot, and then the practice with the ball, with the ball running, to make the body excited. The traditional warm-up method takes 20-25 minutes.

3. Results and Discussion

For dynamic balance tests, use Nexusl first. 71 Named the collected Marke: Point and deleted the trajectory, then imported the processed data into Visual 3D(C-motion, America) software, and established a static model based on static data files. Define the model's bilateral calf and bilateral foot links. Use l0Hz for Marke: point Butterworth 4 low pass filter processing, use 50Hz for 3D pressure gauge data Butterworth 4 low pass filter processing.

In this study, the period of squatting movement under the balance plate is defined as the minimum angle of the dominant side foot joint in the sagittal surface to the next minimum value, and the time of the kinematics data in the squatting process is standardized. The step joint angle is defined as the relative angle change of the dominant lateral foot relative to the calf. The one-legged HOP jump test intercepted from the moment of landing to 3 seconds after landing (all subjects were observed to be stable within 3s). For squat tests, superior leg squat tests, and single-foot HOP jump tests, observe the balance plate pressure (COP) trajectory in the cycle and the offset distance between the centre in the direction of the X axis and the Y axis of the laboratory coordinates, in which the single foot HOP jump test, The subjects were required to jump as far as possible in line with the direction of the X axis of the laboratory coordinates. For the closed eye continuous vertical jump test, observe the left and right foot trajectory, the subject's offset distance is defined as the left and right foot offset distance, and the offset angle is defined as the angle between the two feet and the line formed before and after the test.

Repeated variance analysis before and after intervention in control group and intervention group, the significant level was a = 0.05, the data obtained by the experiment are all expressed in the form of “mean ± standard deviation.”

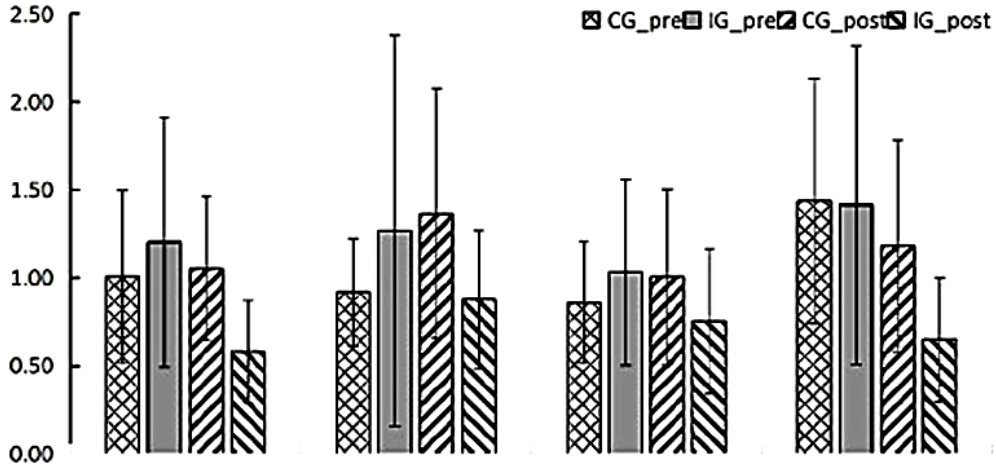

Fig.1 Comparison of Joint Motion Threshold between Control Group and Intervention Group

In order to compare the difference between the control group and the intervention group in the left and right joint motion threshold, the repeated measurement variance analysis of the test results is shown in Table 1. Left knee flexure, extension, right knee flexure and extension in the intervention factors showed significant differences, but also in the intervention and group interaction showed significant differences. Therefore, we use the simple effect test to investigate the differences between different groups before and after the intervention. The results showed that there was no significant difference between the control group and the intervention group. After intervention, the threshold of the right knee movement in the intervention group was 0.88 is 0.39, control group 1.37 is 0.71, the intervention group was significantly smaller than the control group ($P < 0.05$) The threshold value of the right knee and left knee extension movement in the intervention group was significantly smaller than that of the control group ($P<0.01$).

Table 1 Comparative Statistics Of Joint Movement Threshold between Control Group and Intervention Group(Before and after Intervention)

	Before intervention		After intervention	
	CG group	IG group	CG group	IG group
Bend	1.06±0.73	1.16±0.59	1.13±0.48	0.66±0.33
stretch	0.98±0.29	1.33±1.01	1.44±0.69	0.93±0.42
Bend	0.92±0.39	1.12±0.66	1.09±0.55	0.79±0.52
stretch	1.39±0.92	1.51±0.83	1.25±0.77	0.74±0.42

In order to compare the difference between the control group and the intervention group in the stability of single foot jump before and after the intervention, the results were repeatedly measured by variance analysis. X-and Y-offset distances show significant differences in the intervention factors, as well as in the interaction between the intervention and the group. Therefore, we use the simple effect test to investigate the differences between different groups before and after the intervention. The comparison between the control group and the intervention group before and after the COP shift (Table 2) shows that after the intervention, the intervention group shifted the distance in the Y direction (2. 58 is 0. 61) To be significantly less than ($P = 0. 045$) Control group (3. 78 people 1. 72); In the X direction, the intervention group was smaller than the control group but there was no significant difference.

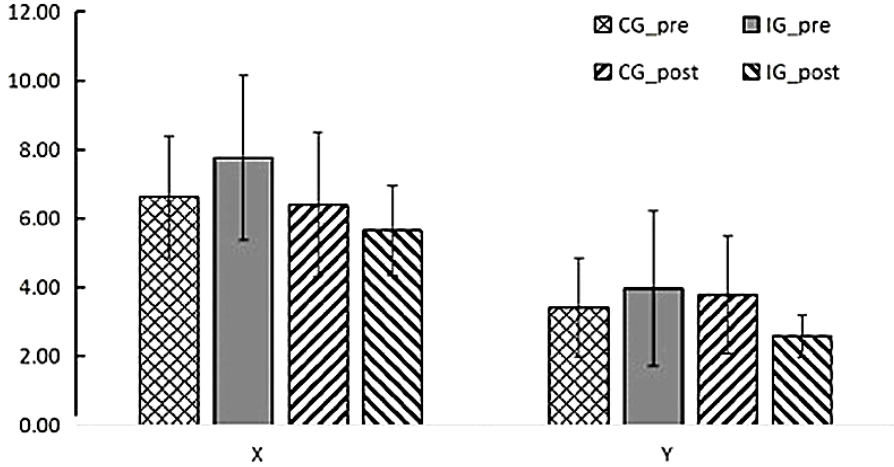

Fig.2 One Foot Jump Test Cop Offset

Table 2 Control Group And Intervention Group One-Foot Jump Cop Offset Comparative Statistical Table in X, y Direction (Before and after Intervention)

	Before intervention		After intervention	
	CG group	IG group	CG group	IG group
X direction(cm)	6.84±1.82	7.49±2.67	6.66±2.83	5.76±1.77
Y direction(cm)	3.77±1.28	4.05±2.29	3.98±1.49	2.84±0.66

In order to compare whether there was significant difference in stability between the control group and the intervention group, repeated variance analysis was performed. X-and Y-offset distances show significant differences in the intervention factors, as well as in the interaction between the intervention and the group. Therefore, we use the simple effect test to investigate the differences between different groups before and after the intervention. As shown in Table 3, there was no significant difference between the X and Y directions of the control group and the intervention group before the intervention, indicating that there was no significant difference between the stability of the intervention group and the control group before the intervention. After the intervention, the X-direction offset distance, the intervention group is significantly smaller than ($P<0.05$) Control group, and intervention group offset distance in Y direction (3.70 people 1.48) smaller than control group (4.34 people 1.62) It can be seen that in the balance plate squat action, after intervention, the offset distance of the intervention group was smaller than that of the control group.

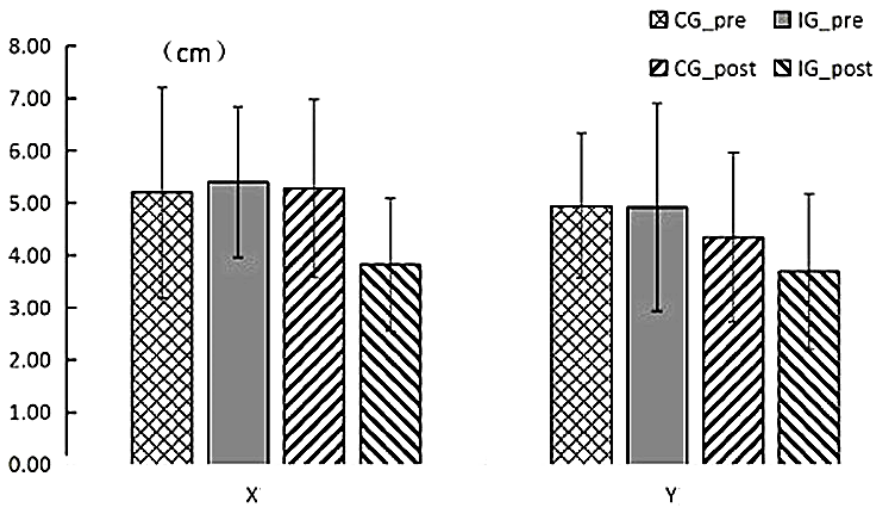

Fig.3 Squat Test Cop Offset under Balance Plate

Table 3 the Comparative Table of the Offset of Cop in the X, y Direction in the Balance Plate of the Control and Intervention Groups

	Before intervention		After intervention	
	CG group	IG group	CG group	IG group
X direction(cm)	6.74±1.62	7.79±2.43	6.37±2.38	5.38±1.45
Y direction(cm)	3.97±1.18	4.25±2.25	3.56±1.44	2.93±0.45

Body sensation is usually assessed by measuring joint position and movement perception. This experiment measures joint motion perception and foot joint movement perception. The potential role of mechanical receptors in joint function has been discovered more than 100 years ago by clinicians and researchers. These proprioceptors consist of joint mechanical receptors and nerve fibres and are widely distributed in joint capsules, ligaments, and muscle bonds. The human body senses each movement of muscles, muscle bonds, joints, and ligaments through the proprioception, shortening, relaxing, and tightening different situations, allowing the cerebral cortex to integrate complex processing analysis and create conditions. Through training, the individual can improve the ability of muscle movement analysis, accurately judge the exercise time, improve the individual's consciousness, and thus improve the control and accuracy of the movement. In addition, stepping on joints is an important joint for human movement. In competitive sports and recreational sports, many projects are closely related to the function of stepping on joints. The state of stepping on joints directly determines the level of competition among athletes. The strength and control ability of athletes directly affect their completion of leaps in training and competition. Sprint and stop techniques are stable, accurate, and easy to damage joints.

4. Conclusion

The purpose of this study is to investigate the effects of FIFA11 + comprehensive warm-up training on the lower limbs, the sensation of the joint and the ability to balance the body. We randomly divided the 30 participants into control and intervention groups. The control group trained or warmed up before the game followed the traditional warm-up method without any changes. The intervention group performed a 12-week, 2-3 times a week F workers FA1b comprehensive warm-up training. Prior to the intervention, all subjects were pre-tested, followed by a post-test after 12 weeks of intervention. An independent sample T test was performed on the pre-test data of two groups of subjects, and the difference between the two groups was observed. An independent sample T test was performed on the post-test data of the two groups of subjects to observe whether there was any difference between the two groups after the intervention. The pre-test and post-test data of the intervention group and the control group were paired with the sample T test, and it was observed that there were no significant differences in the effects of the two warm-up methods on the subjects 'knee, joint movement sensation and physical dynamic balance ability.

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