Feasibility analyzing for shoulder joint training device promoting in primary and secondary schools

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Abstract

The shoulder joint is the most flexible joint in the human body. There are shoulder joint training devices in the fitness squares, which are divided into two kinds of single-disc and double-disc. People handle the rings to carry out shoulder training by two hands. The exercise value is not up to the purpose of shoulder joint flexibility training. The primary and secondary school is the most critical period for the development of the flexible quality. The schools are lacking the special device for the flexibility training, which leads the poor flexibility of the students and can't achieve the expected teaching effect. In order to solve this problem, here designs and produces the shoulder joint training device. This invention patent has been authorized. The feasibility of the product takes the way of literature, mathematical statistics and experiment to carry out comparative analysis and research. The experimental results show that: using the shoulder joint training device has a remarkable effect.

Keywords: transportation planning, model, strategy

1 Research objective

At present, there are only a few shoulder joint flexibility training devices in the world. The shoulder joint training devices equipped in the exercise plaza are divided into single-disc and double-disc. People handle the rings to carry out the shoulder, turning which has little fitness value. Especially for the sports professionals, this has no actual fitness effect. It can't achieve the purpose of the shoulder joint flexibility training.

The primary and secondary school is the most critical period for the development of the flexible quality. It is found in the flexibility test of the freshmen of the Institute of Physical Education that: in the physical education of the primary and secondary schools, teachers don't pay enough attention to the flexibility training. The bad body flexibility directly affects the teaching effect of the college gymnastics, the martial arts and the track and field.

The new invented sports devices are in response to the call of the Ministry of Education. The physical education teachers should constantly innovate to promote the education reform in the new situation. The overall requirement of fully implementing the quality education has an obvious effect to the teachers on changing the teaching concept, improving the teaching methods and optimizing the teaching strategy. We should cultivate the ability of innovation of the students and teachers in practice, improve the teaching quality of the physical education, promote the use of the shoulder joint training equipment and better play the inquiry learning ability of the physical education teachers. Installing large quantities of shoulder joint training devices in the community fitness square and the primary and secondary schools will improve the body flexibility of everybody. Improving the flexibility of the shoulder joint can better promote the motion range of the joint, which will effectively prevent the sports injury and promote people's physical quality.

1.1 STRUCTURAL CHARACTERISTICS OF SHOULDER JOINT TRAINING DEVICE

The device is as below (See Figure 1): 1) right holding point, 2) turnstile, 3) bearings, 4) seat, 5) disc, 6) sliding sleeve for left hand, 7) sliding sleeve, 8) slider, 9) circlip, 10) lifting hole, 11) supporting rod, 12) base, 13) structure of fixed frame for supporting rod.

1.2 TRAINING AND OPERATING METHOD OF SHOULDER JOINT FLEXIBILITY TRAINING DEVICE

The way of using the shoulder joint flexibility training device is: according to the different practitioners, adjusting the height of the device before training to choose in the five different heights, and according to the different heights of the practitioners, adjusting the position of the rotation point bearing to select the appropriate height and to meet the needs of children and adults. The practitioner sits in the chair. His right arm straightly stretches out to hold the right holding point. His left arm straightly stretches out to hold the sliding sleeve for the left hand on the turnstile. There is a scale on the turnstile, which helps the practitioner observe his flexible data in the training. This gives the practitioner a definite objective. Then the practitioner can formulate a scientific training plan to improve his shoulder joint flexibility step by step and improve his motion range and joint flexibility, which will help him lay a solid foundation for his lifelong career in sports.

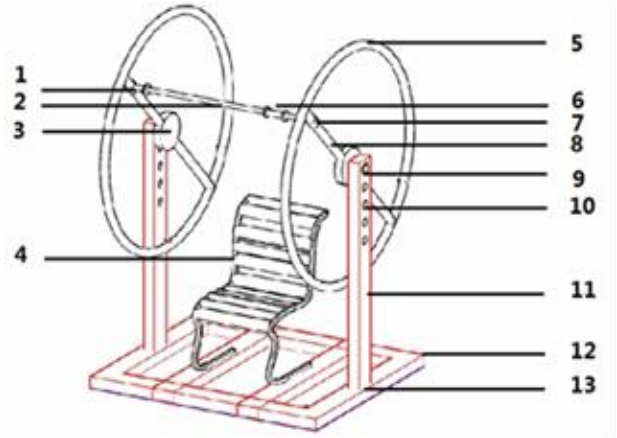

FIGURE 1 Diagram of joint training device

1.3 TECHNICAL SCHEME OF SHOULDER FLEXIBILITY TRAINING DEVICES

The characteristics of the adopted technical scheme in this invention are that: the two ends of the turnstile with meter scale are respectively connected with a sliding sleeve, which are fixed on the radius sliding rods of the rotating disks, and the two sliding sleeves can freely slide on the two sliding rods. In the column of the fixed points of the supporting rods of the base fixed frame, here designs a kind of 20mm holes. The centers of the adjacent lifting holes on the supporting rod are away from 100mm. So, the vertical height between the first hole and the fifth hole can be increased to 400mm. According to the height of the practitioner, there are five different sockets can be taken. Untying the circlip behind the rotational bearing to arrange the two rotating discs in the suitable lifting holes and clamping with the circlip, the training can be started. These completely solve the schemes for the training of children and adults. The training device can adapt to more training crowds.

FIGURE 2 Photo of two hands rod handling circling shoulder flexibility training

1.4 SKELETAL MUSCLE COMPOSITION AND MOTION FEATURES OF SHOULDER JOINT

The shoulder joint is composed of the glenoid of the caput humeri and scapula, which is a typical ball and socket joint. It can do the flexion, stretch, contraction, exhibition, rotation and circumduction. The shoulder joint can complete seven movements: flexion, stretch, abduction, adduction and external rotation, internal rotation and rotation.

2 Research methods

2.1 LITERATURE

Here refers to the documents of shoulder joint physical training devices in and abroad, and accesses to the patent data of the State Intellectual Property Office and Patent Office. The patent is applied in January 2012 and authorized in March 2014. The product name is: two handed circling distance measurer for shoulder flexibility training. The patent authorization proclamation No. is CN 102526967 B; the utility model patent No. is: CN 202590252 U; the appearance patent authorization proclamation No. is: CN 302155351S.

2.2 MATHEMATICAL STATISTICS

All the obtained data in the experiment will be put into computer for normal distribution test, variance homogeneity test, single factor variance test, covariance test and T test by SPSS16.0. Here uses the standard value + standard deviation to express. If the level of significance value $P<0.05$, it means there is a significant difference. If $P<0.01$, it says that there is a quite significant difference. And if $P>0.05$, it indicates there is no significant difference. It will do horizontal and vertical analysis on the experimental results.

The gymnastics students of 2012 in college of physical education joined the test. Before the test, we randomly sampled 6 groups of 94 students as the experimental objects. There were 50 students in the experimental group to form 3 natural groups, which used the shoulder joint training device; and there were 44 students in the control group to form 3 natural groups, which only used the conventional practice method in physical education for flexible training, such as wood sustaining shoulder pressing, two persons back to back shoulder pressing and circling with wands shoulder turning.

2.3 EXPERIMENT

From September 2012 to June 2013, there was the experiment for about 7 months (except the two months for winter vacation), which involved in 32 weeks in two semesters. The students were trained every week. The training was for about 30 minutes in the preparation time before class every time, which is summarized to 16 hours. In September 2012, we tested the data of the circling with two handling of different groups of students before the experiment. They were tested for 3 times to choose the best record. The data were analyzed by variance. The results were in accordance with the normal distribution, which were

experimental. On June 10th, 2013, we tested all the students after the experiment, which were tested by the teachers personally. The test also lasted for 3 times to choose the best record. The recorder recorded the best results of the test. The 6 groups of students were tested for 1 hour each time.

2.4 EXPERIMENTAL ENVIRONMENT

The experimental site was the gymnastics room of the Longdong University. The indoor temperature was 25°C-35°C.

2.5 EXPERIMENTAL DEVICE

The experimental device for training and testing is called two handed circling distance measurer for shoulder flexibility training. The patent authorization proclamation No. is: CN 102526967 B. The appearance patent authorization proclamation No. is: CN 302155351S. In April 2012, the design transformation and manufacture of the product was completed. We carried out simulated training on the products. Through repeated transformation, specifications of the device were determined. The safety and comfort of the device were further improved, and reached the feasibility for the experiment.

2.6 TESTING INDEX AND METHOD

The specific method of the two handed circling shoulder turning is to turn the shoulders with wands in two hands to circle. It requires straightly stretching the ancon joint, and shoulders rotating at the same time. Then it uses tape to measure the distance between the parts of the hand between the thumb and the index finger. The results use cm as the unit length and half adjusts after the decimal point. Taking 3 tests, the best result is used as the result of the test.

3 Result and analysis

3.1 EXPERIMENTAL DATA OF DIFFERENT GROUPS BEFORE AND AFTER EXPERIMENT

Through the obtained data before and after the experiment, the mathematical statistics variance analysis was carried out on 94 gymnastics students of 2012.

The comparison and analysis were carried out on the shoulder joint training situations of the experimental group and control group before and after the experiment (independent samples T test and paired T test)

TABLE 1 Table 1 comparison table of the shoulder joint training results of two groups before and after experiment (n=94)

Item	Before experiment	After experiment	*T P*
	$\overline{X} \pm S$	$\overline{X} \pm S$	
Experimental group	83.3556+ 2.1565	16.4	* *
Control group	91.2500+ 2.0063	9.083	* *

Note:* P < 0. 05， * * P< 0. 01.

3.2 ANALYSIS OF EXPERIMENTAL DATA RESULTS OF THE TWO GROUPS BEFORE AND AFTER EXPERIMENTAL

Through the experimental data analysis, it was found that using the device would get a significant effect.

From Table 1, we knew that, before the test, the independent samples t test was performed to the experimental group and the control group, and the test result was P=0.367. There was no significant difference (P>0.05), which meant that the shoulder flexibility of the two groups of students were similar before the experiment. After the test, we carried out the independent samples t test on the control group and the experimental group, and p=0.007. There was very significant difference between the two groups (P<0.01). And comparing the average value of the two groups after the test, we found that the average value of the experimental group is smaller than that of the control value, which meant that after the test, the shoulder flexibility of the experimental group and the control group was significantly different, and the experimental group was better than the control group. Respectively carrying out the paired t test on the experimental group and the control group before and after the experiment, we got p=0.0000 in the control group. There was significant difference before and after the experiment, which said that after the training, the flexibility of the control group also changed significantly. In the experimental group, we got P=0.0000. There was quite significant difference (P<0.01), which suggested that after the training, the flexibility of the experimental group changed significantly. Therefore, we knew from the above that the shoulder joint flexibility of both the experimental group and the control group changed after the shoulder joint flexibility training. But the change of the experimental group is more significant, which illustrated that using the shoulder joint training device can more significantly improving the flexibility of the shoulder joint.

4 Conclusion and suggestion

4.1 CONCLUSION

The flexibility of the students in the northwest is Poor. Through the practice in the 7 months by the shoulder joint training device, their flexibility has remarkable progress.

This experiment can improve the participators' degree of flexibility. Maybe caused by that the participators never receive special systematic training, so that the stretching training for the 32 weeks produces more profound stimulation on the beginners.

4.2 SUGGESTION

We suggest carrying out some warm-up exercise like jogging before the shoulder joint flexibility exercise to avoid muscle strain and other adverse consequences.

In order to improve the physical quality of the whole population, we suggest promoting this device. The device can be put into the communities, the fitness squares and the primary and secondary schools across the country to improve the body flexibility of the whole population.

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References

[1] Yang J, Luo J-x 2013 Developing Teaching Materials *Overseas English* **04** 48-52
[2] Jian Lin 2013 Application of Computer Technology in Sport Data Statistics *Chinese sport* **19**(4) 489-502
[3] Shital N Parikh 2002 Bone graft substitutes in modern orthopedics. *Biomaterials* **25**(11) 1301-9
[4] Zhang L, Pan H 2001 Research on the index of strength and flexibility quality of great vigorous and graceful callisthenic athletics *Journal of Physical Education* **03**(2) 25-30
[5] Zhou G, Yin J 2012 Influence of Vibration Training on Ability of Shoulder Flexion and Extension of Tennis Players *Journal of Wuhan Institute of Physical Education* **12**(2) 232-45
[6] Chang Y, Wang X 2005 Comparative Analysis on Effects of PNF Stretching and Static Stretching Techniques on Improving Flexibility of Hip Joint for Hurdle Athletes *Journal of Beijing Sport university* **11** 193-202
[7] Lv X, Duan Z, Wu Y 2004 Investigation to Relationship between Isokinetic Strength of Hip Joint, Knee Joint and the Capacity of Sprint and Broad Jump *Journal of Beijing Sport university* **09**(1) 109-18
[8] Huang C, Gao S 2004 The Effects of Static Stretching and PNF Stretching on Flexibility in College Females *Journal of Fujian Normal University (Natural Science Edition)* **03**(2) 232-45
[9] Huang C, Huang Y 2004 The Effect of PNF on Improving Flexibility *Journal of Quanzhou Normal University* **4**(9) 227-38
[10] Gou X, Xiong Z 2012 Invention and Application Research of shoulder joint training device *Science & Technology of Stationery & Sporting Goods* **5**(1) 109-18
[11] Gou X Shoulder joint training device for physical flexibility China Patent CN302155351S 2012 10-31
[12] Gou X, Xiong Z, Tian H Two handed circling distance measurer for shoulder flexibility training China Patent: CN102526967A 2012-07-04
[13] Yuan M, Gou X, Xiong Z Arm Wrist Training Apparatus, China Patent: CN202538261U 2012-11-21

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