Feasibility Analysis of Auxiliary Training Device for Backhand Turnover Based on Middle School Tumblers

Xiaoping Gou[1, a], WanJun Zhang[2, 3, 4, b, *], Jingxuan Zhang[2, c] Jingyi Zhang[3, d] and Jingyan Zhang[4, e]

[1]School of Physical Education, Longdong University, Qingyang 745000, China

[2]Qingyang Xinyuan Engineering Company Limited, Gansu 745000, China

[3]Lanzhou Industry and Equipment Company Limited, Gansu 730050, China

[4]Xi'an Jiao tong University, 710049, Shaanxi, China

[a]gouxiaoping12@sohu.com, [b]gszwj_40@163.com, [c]gszhangwj40@163.com, [d]tszhangwj40@163.com, [e]1165 43048@qq.com

*Corresponding author

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Abstract: As the traditional teaching method of back handspring requires teachers' personal protection, the burden of protection and assistance is heavy, students' extra-curricular training after leaving the protection is easy to cause neck injuries, the concept of the whole teaching process is unclear, the abdomen is too tense, the direction is not straight, the pushing hand is unable to tuck in the abdomen, it is not timely, the back handspring is crooked or there is a twist error when being more skilled. For this reason, a special auxiliary training device for tumbler back handspring is designed and manufactured, which can improve students' interest in learning and effectively prevent sports injuries. Using literature, mathematical statistics and experimental methods, the feasibility of invention authorization for patented products is analyzed. Data and experiments show that the auxiliary training device for tumblers' back handspring plays a positive role in developing students' spatial imagination and quickly establishing action concepts, and is also an effective means to cultivate students' innovative thinking.

1. Introduction

At present, the development of flexible training equipment is scarce. Flexible quality is a major physical quality [1-3]. The research on human flexibility training equipment at home and abroad is insufficient. At present, the traditional technique of backward handspring is: standing with the arms raised forward, bending the knees slightly, bending the hips and sitting back, swinging the arms back naturally, and moving the center of gravity back [4-13]. When the body loses balance back, the two arms quickly swing back, push the ground, raise the head (to see the hands) and spread the chest and abdomen. The body is fully flexed back, then flips back and then supports the ground with both hands. The rebound force of handstand in the opposite direction is used to push the shoulder and push the hand, tuck in the abdomen and lift the waist, and the feet fall upright [14-18].

As the traditional teaching method of back handspring requires teachers' personal protection, the burden of protection and assistance is heavy, students' extra-curricular training after leaving the protection is easy to cause neck injuries, the concept of the whole teaching process is unclear, the abdomen is too tense, the back handspring is crooked or there is a twist error when being more skilled. For this reason, a special auxiliary training device for tumbler back handspring is designed and manufactured, which can improve students' interest in learning and effectively prevent sports injuries. Using literature, mathematical statistics and experimental methods, the feasibility of invention authorization for patented products is analyzed. Data and experiments show that the auxiliary training device for tumblers' back handspring plays a positive role in developing students' spatial imagination and quickly establishing action concepts, and is also an effective means to cultivate students' innovative thinking.

A method of cross-fork training is to sit on the carpet [19-22] and sit on the Qianqulashen ligament. Lanzhou Industry and Equipment Co. Ltd, Lanzhou University of technology Zhang Wanjun studied some model identification control systems [23-33] of flexible training equipment and control methods. Since the practitioner does not have forward sliding power on the ground, the front of the ground is not able to stretch the cross fork [34]. Another method of horizontal fork training [35-36] is to open the hip fork vertically down. Because the training intensity [37] is too large, muscle pain can not be trained for a long period of time. The effect of training is effectively improved because of the forward force of gravity when the leg is bent forward on the slope [38].

This article specially designed and made a kind of tumbler back handspring auxiliary trainer, which can improve students' interest in learning and effectively prevent sports injuries. Using literature, mathematical statistics and experimental methods, the feasibility of invention authorization for patented products is analyzed.

2. Structural characteristics of tumbler turns his back

The three-dimensional structural diagram of the tumbler back handspring auxiliary trainer is shown in Fig.1. The instrument has simple structure and convenient

Manufacture. It is easy to popularize and popularize, auxiliary training can effectively reduce sports injuries, and extra-curricular training is safer and more reliable.

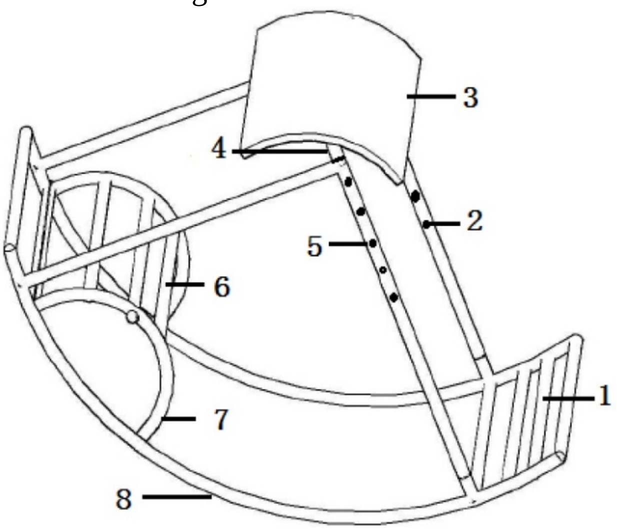

Figure 1. Three-dimensional structure diagram of tumbler back handspring auxiliary trainer.

As can be seen from the figure, the tumbler back handspring auxiliary trainer comprises the following structure: 1. Foot pedal; 2, casing lifting hole; 3. Supporting waist plate; 4. Lifting rod; 5, bolt; 6. Handle the rod; 7. Semi-circular tube; 8. Arc tube.

By way of example, the utility model relates to a sports auxiliary training device, namely a tumbler back handspring auxiliary training device, which is characterized in that: an exerciser stands on a foot pedal 1, stands with his back to the waist support plate 3, starts to stand w ith his two arms raised in front, bends his knees slightly, bends his hips and sits back, naturally swings his two arms back and shifts his center of gravity back. When the body loses balance back, the two arms quickly swing back, pedal to the ground, raise his head (see hands) to spread his chest and abdomen, fully flexes his body back, and flies through the low air. The straight arms of both hands quickly swing their hands to pick up the waist and lower the bridge.

Physical diagram of the tumbler's back handspring auxiliary trainer, as is shown in Fig.2.

Figure 2. Physical diagram of the tumbler's back handspring auxiliary trainer.

Tumbler's back handspring auxiliary trainer photo, as is shown in Fig.3.

Figure 3. Tumbler's back handspring auxiliary trainer photo.

As the center of gravity of the body moves backward, the curved tube 8 rolls backward. After picking up the waist and lower the bridge, both hands grasp the semicircular tube handle 6. They use the rebound force of handstand in the opposite direction to push against the shoulder and push the hand, tuck in the abdomen and lift the waist, and the feet fall to the ground to stand upright. The auxiliary training device for tumblers to turn back their hands plays a positive role in developing students' spatial imagination and quickly establishing action concepts, and is also an effective means to cultivate students' innovative thinking.

3. Operational methods of tumbler back handspring auxiliary trainer

The purpose of dynamic and static training is realized. According to the response of physiological load, practitioners can control the angle of opening hip from forward to backward when the turbine decelerates during hip training in time and effectively. The practitioner can continue the hip flexibility stretch training.

3.1 Dynamic stretching on hip flexibility training instruments

The practitioner sits on the hip joint training device, and completes a dynamic stretch. After one training, all kinds of kicking exercises were done on the ground. The excitement of the body was maintained, the muscle viscosity was reduced, and a group of training process was completed.

3.2 Static stretching on hip flexibility training instruments

The practitioner sat on the hip joint training machine, stretched static, controlled for 15-30 seconds, and finished a stretch. According to the psychological and physiological responses of the students, it can be found that the muscle contraction period after intensive stretching is generally about 3 days, and the muscle relaxation period is generally left in a week.

4. Research methods

4.1 Documentation method

Refer to the literature of hip joint sports training equipment at home and abroad, and the patent information of the Patent Office of the State Intellectual Property Office.

4.2 Mathematical statistics

All the data obtained in the experiment are input into the computer. The normal distribution experiment, homogeneity test of variance, one-way test of variance, covariance test and T test are carried out by SPSS16.0 software. Significant level $P < 0.05$ showed significant difference, $P < 0.01$ showed significant difference, $P > 0.05$ showed no significant difference. The experimental results were analyzed horizontally and vertically.

4.3 Experimental method

From September 2016 to June 2018, the experiment lasted for 7 months. The experiment lasted 32 weeks in two semesters. The training time was 30 minutes and the total training time was 16 hours. By using variance analysis, it conforms to the normal distribution law and can be experimented.

4.4 Experimental environment

The experimental site is Longdong University, and the in door temperature is 25-35 degrees Celsius.

Figure 4. Gymnastic room of Longdong University.

5. Results and analysis

5.1 Analysis of experimental data before and after experiment in different groups

In May 2018, the design, modification and manufacture of the product of the invention were completed, and the simulation training of the product was carried out.

In our lab, analysis of experimental data before and after experiment in different groups .Our lab, as is shown in Fig.5.

Figure 5. Our lab.

The basic idea of K-S test is to compare the theoretical cumulative frequency distribution of sequential categorized data with the empirical cumulative frequency distribution of observations, to find their maximum deviations, and then to test whether the deviations occur accidentally at a given significance level. The results are shown in Table 1.

Table.1. Kolmogorov-Smirnov test for single sample (n=94).

	The experimental group (cross fork before training)	Control group (cross fork before training)
N	50	44
Mean value of normal parameter	27.9200	29.3636
Standard deviation of normal parameters	1.17279E1	1.13057E1
P value (double tail)	.610>α=0.05	.863>α=0.05

The results showed that the P values were greater than > alpha = 0.05, so the samples were considered to be independent from the normal population. Test experiment simulation diagram 1,2and 3, as is shown in Fig.6, 7and Fig.8.

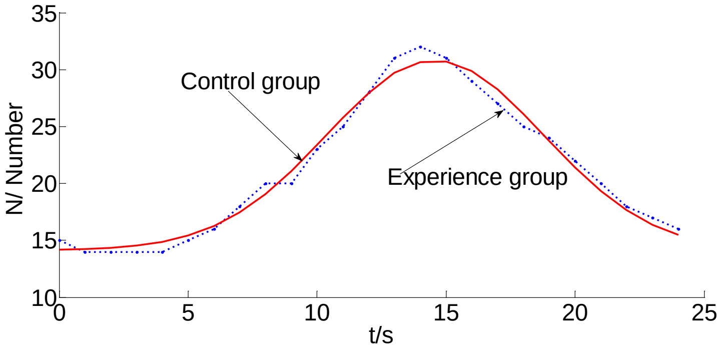

Figure 6. Test experiment simulation diagram 1.

Jonckheere-Terpstra test was performed on the data before and after crossing. Jonckheere-Terpstra test is used to test whether multiple independent samples come from the same population. The results are as follows:

Table.2. Jonckheere-Terpstra test.

	Cross fork front	Cross fork
Level classification number	2	2
J-T observation statistics	1.115E3	1.468E3
J-T mean value	1.100E3	1.100E3
J-T standard deviation	131.875	131.871
P value (double tail)	.909>α=0.1	.005<α=0.05

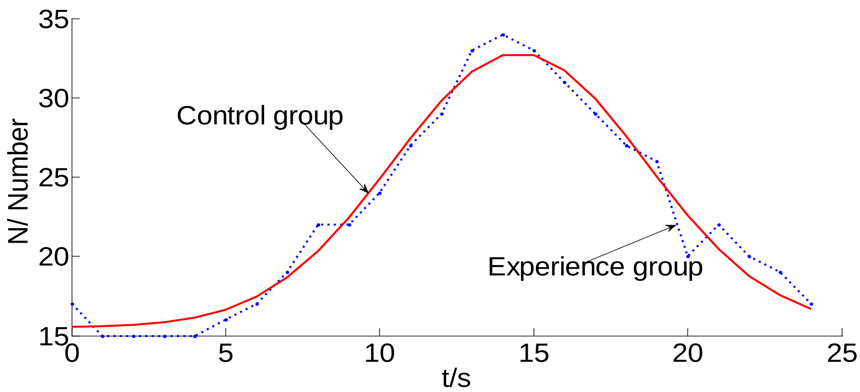

Figure 7. Test experiment simulation diagram 2.

It can be seen from the results that there is no significant difference between the control group and the experimental group before the training, and the p value is much greater than 0.1.

Table.3. Comparison table before and after crossing training between two groups (n=94)

project	Before experiment	After experiment	T	P
	$\overline{X} \pm S$	$\overline{X} \pm S$		
Experience group	29.36+1.13	14.82+1.72	17.72	* *
Control group	27.92+1.73	22.85+1.54	9.42	*

Note: * P > 0.05, * P < 0.01.

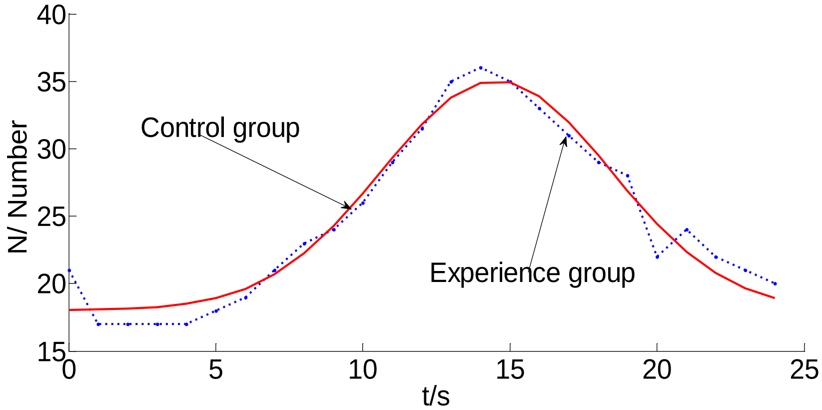

Figure 8. Test experiment simulation diagram 3.

Through the analysis of data before and after the experiment, it is found that the training with invented hip instruments has significant effect. It can be seen from table 3. Before the experiment, the independent sample t test was carried out in the experimental group and the control group, and the test result was P=0.475, so there was no significant difference (P>0.05); after the experiment, the control group and the experimental group were tested by independent sample t test, P=0.00000, and there was a very significant difference between the two groups (P<0.01). After the experiment, P = 0.0000, the control group had a very significant difference before and after the experiment, indicating that the control group experiment had a very significant difference. Experiments show that the auxiliary training device for tumblers' back handspring plays a positive role in developing students' spatial imagination and quickly establishing action concepts, and is also an effective means to cultivate students' innovative thinking.

6. Summary

(1) This article specially designed and made a kind of tumbler back handspring auxiliary trainer, which can improve students' interest in learning and effectively prevent sports injuries. Using

literature, mathematical statistics and experimental methods, the feasibility of invention authorization for patented products is analyzed.

(2) Data and experiments show that the auxiliary training device for tumblers' back handspring plays a positive role in developing students' spatial imagination and quickly establishing action concepts, and is also an effective means to cultivate students' innovative thinking.

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Author: Gou Xiaoping, male, born in 1978 with a bachelor's degree, Qingyang Science and Technology Commissioner, Patent Commissioner, and Venture Tutor of Longdong University, has obtained more than 580 authorized patents, three papers published by EI and one monograph published..

Communication author: Zhang Wanjun, male (1986-), Doctor of Engineering (Doctor of Engineering, Bachelor of Law, Bachelor of Management, etc.), Professor-level (senior) Senior Engineer, Senior Economist, Mechanical Engineer (China Institute of Mechanical Engineering, Evaluation by Examination Center of the Ministry of Education of the People's Republic of China), Senior NC Craftsman (Chinese). Evaluation by Ministry of Human Resources and Ministry of Social Security of the Republic of China), Senior Members of China Mechanical Engineering Society, Senior Members of China Agricultural Mechanical Engineering Society, Senior Members of China Agricultural Engineering Society, Senior Members of China Electrical Engineering Society, Senior Members of China Computer Society, Senior Members of China Testing Society, Members of China Development Association (Governor), Fourth Annual Invention Society of Gansu Province Members, directors and members of the board of directors; members of the Standing Council of the Committee of Experts (Standing Committee of the Committee of Experts), who are mainly engaged in the research of NC processing technology, precision manufacturing equipment technology and new energy. Up to now, more than 500 patents have been authorized for inventions and utility models, and more than 60 academic papers have been published in core and above journals, among which more than 40 papers have been retrieved in three major journals: 40 papers SCI/EI/ISTP. E-mail: gszwj_40@163.com.

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