

Control effect of functional strength training for aerobics sports injury

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Abstract

Objective: The study was carried out to improve scientificity in aerobics training, reduce sports injury and boost further development of aerobics.

Methods: In the study, 1000 aerobics athletes from sports colleges were selected as research subjects. In this study, the prevention and treatment effect of functional strength training on calisthenics injury was analyzed. The research subjects were given functional strength training (including training under stable conditions, training under unstable conditions) for three months and then followed up for three months. After the training, the performance of the subjects in the calisthenics training was analyzed by using the functional movement test scale.

Results: The results showed that the 1000 surveyed aerobics athletes had good motion stability and flexibility after functional strength training. Although 94 (9.4%) athletes had deficiency in some sport function, no serious sports injury was caused.

Conclusion: As can be known from the study, for aerobics athletes, functional strength training can strengthen general strength training, further improve aerobics athletes' motor coordination ability, control ability, stability ability, enhance overall strength of athletes, thereby effectively preventing sports injuries.

Keywords: Functional strength training, Aerobics sports injuries, Control effect. (JPMA 70: 94 [Special Issue]; 2020)

Introduction

Aerobics is a kind of whole-body exercise with mid-to-low intensity, which mainly trains the cardiopulmonary function and aerobic endurance quality of the practitioners.¹ Aerobics poses high demands for athletes' strength, hence strength quality training is crucial to aerobics athletes.

In the process of aerobics training, to achieve better results, athletes usually undertake a lot of high load, highly difficult training, and constantly challenge their own limits to make breakthrough.^{2,3} However, such training manner lacks scientificity, which may result in a series of sports injuries, severely affecting athletes' body movement ability. Therefore, how to better prevent injury in aerobics has become an important issue for coaches and athletes.⁴⁻⁷ Survey results show that, aerobics athletes are particularly prone to knee injuries and wrist injuries (see Figure-1 and Figure-2), and the main types of injury are closed soft tissue injury and active ligament strain.⁸

Functional strength refers to strength to improve overall operational capability and efficiency of whole body muscles, which emphasizes stable supporting role of torso region and small muscle groups around the joints. Functional strength training originates from rehabilitation medicine theory in foreign countries. In

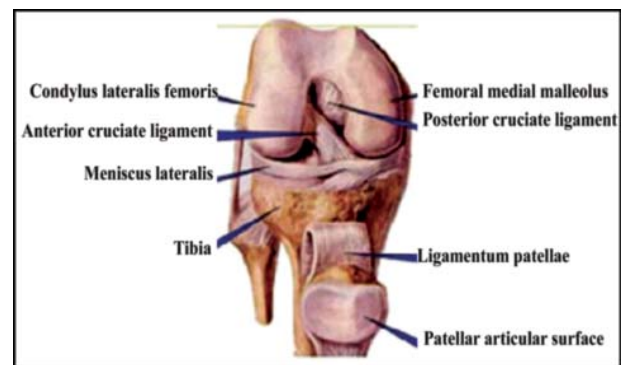


Figure-1: Common positions of knee injury.

competitive sports, rehabilitation training is dominant, based on which the term of professional rehabilitation training is generated.⁹ Functional training is a form of training including acceleration, stability, deceleration operation mode in three-dimensional movement. Precise definition of functional strength training means training to improve athletes' core muscle strength and small muscle group strength with the purpose of improving overall athletic ability of athletes.¹⁰⁻¹³ So far, recognized and accepted functional strength training modes mainly include suspension training method, vibration strength training method, core strength training method, etc. Functional strength training focuses on the training of athletes' core strength, multi-joint strength, and small muscle group strength (see Figure-3), as well as complete kinematic chain effect of the body.¹⁴

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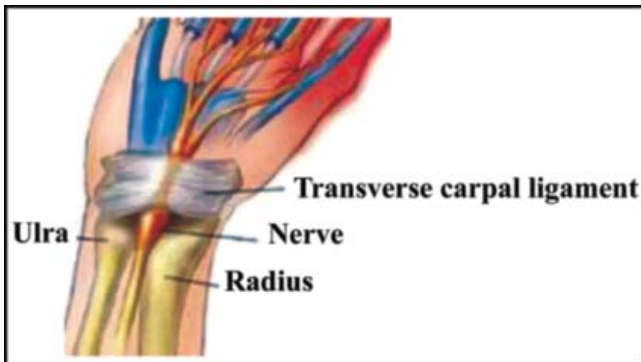


Figure-2: Common positions of wrist joint injury.

Functional strength training focuses on the improvement of overall muscle energy level, attaches importance to the role of stabilizing muscles around joints, and emphasizes the multiple dimension training of multiple joints. Through reviewing a large number of literature, it can be known that long-term adherence to functional strength training can effectively help athletes improve movement stability and flexibility. When faced with some sudden movement risks, athletes can make rapid response, thereby reducing probability of sports injury.¹⁵ In order to fully understand the effect of functional strength training on the prevention and treatment of calisthenics injuries, the injuries and athletic ability levels of 1000 calisthenics who received functional strength training were tracked, analyzed and comprehensively evaluated.

Subjects and Methods

In this experimental study, 1000 students majoring in

aerobics from 25 sports colleges and universities were enrolled as the research subjects from September to December, 2014. The inclusion criteria of the sample was that all the students had good physical quality, without serious liver and kidney dysfunction or coagulation system diseases. The selected subjects included 437 males and 563 females, with age ranging between 14 and 21 years. The average age was (16.7 ± 1.3) years, average height was (165.64 ± 44.36) cm, average weight was (55.43 ± 31.47) kg and average term of aerobics training was (2.17 ± 0.14) years. The training equipment used in the study included Swiss ball, medicine ball, annular elastic band, simple suspension sling, bell, sandbag and so on. All the research subjects involved in this study had the right to know, and signed the informed consent.

Training Methods: During the research period (January to March 2014), in addition to professional training courses, the 1000 selected athletes needed to do three additional functional strength exercises every Monday, Wednesday and Friday (which can be arranged according to the students' schedule), with each training time controlled in 30-50 minutes. In this study, functional strength training was divided into two parts: training under stable conditions and training under unstable conditions.^{16,17} The training mainly aimed at athletes' upper limb, trunk part, lower limbs.

Training under stable conditions: (1) upper limb: headstand against the wall, push-ups, stride support, etc.; (2) trunk: V up, prone back up, hip twist, side waist up, waist side support; (3) lower extremity: leapfrog, continuous abdomen jump, halve squat with.

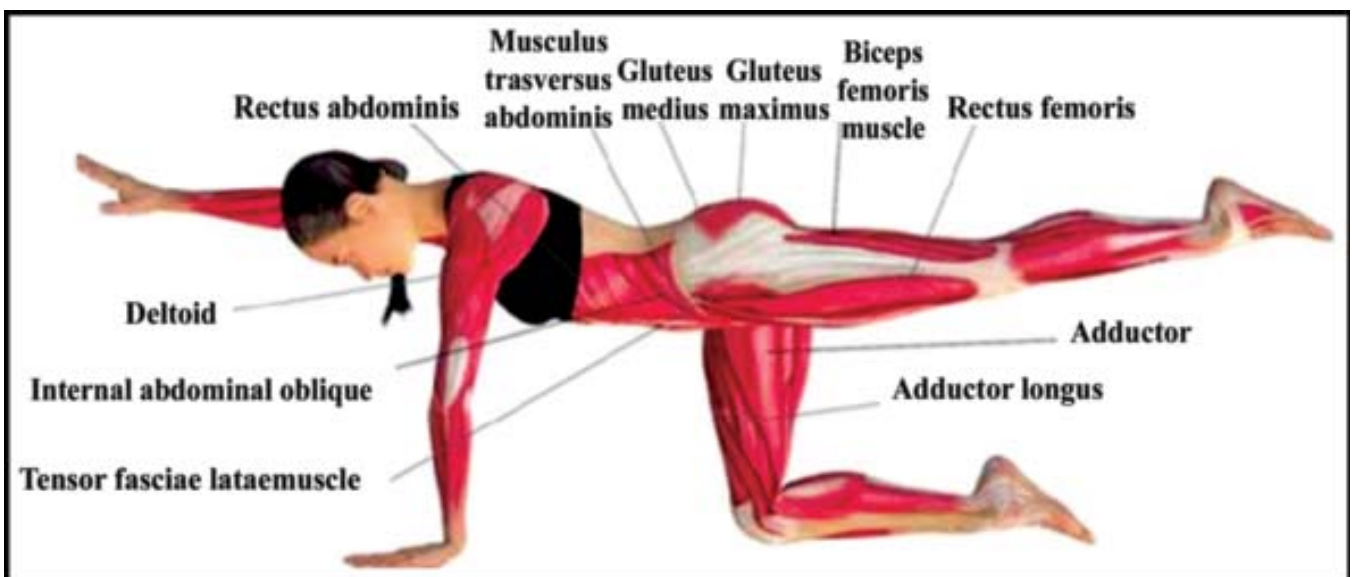


Figure-3: Key positions of strength training.

Training under unsteady conditions: (1) upper limb: suspensory push-ups, suspensory pull up exercise, push-ups with hands grasping ball; dumbbell lift while sitting on Swiss ball; (2) trunk: suspensory side stay, push-ups with feet on Swiss ball; (3) prone knees resistance exercise, one leg squat on Swiss ball, resistance and stretching knee exercise in sitting posture.

After training for consecutive three months, symmetry, body movement weak chain, limitations of athletes were investigated and assessed with functional motion test scale. The Scale included a total of seven exercise capacity tests.^{5,18,19} Based on progress of athletes, there are 3 ranks in every movement: 3 points, 2 points, 1 point, with a total of 21 points. 14 points represents the passing line. Test movements include: (1) deep squat with hands lifting bar; (2) hurdle with single knee lifted; (3) split squat with rod held at the back; (4) measurement of the distance between hands with rod held at the back; (5) supine straight leg raise; (6) stability push-ups in the core area; (7) front support balance stand. The above are the contents of research approved by the IRB, and these indicators are used as a reference to evaluate the results.

Statistical Method: SPSS 21.0 statistical software was used for data analysis and processing. The count data were expressed by (n,%) and verified by chi-square, and measurement data were expressed by ($x \pm s$) and verified by t test. The difference was considered statistical significant when $P < 0.05$.

Results

The results showed that the 1000 surveyed aerobics athletes had good motion stability and flexibility after functional strength training. Although 94 (9.4%) athletes had deficiency in some sport function, no serious sports injury was caused.

The average score of 1000 aerobics athletes' actions is as follows:

Deep squat with hands lifting bar: (2.07 ± 0.76) points;

Hurdle with single knee lifted: (2.14 ± 0.69) points;

Split squat with rod held at the back: (1.92 ± 0.72) points;

Measurement of the distance between hands with rod held at the back: (1.62 ± 0.91) points;

Supine straight leg raise: (1.93 ± 0.67) points;

Stability push-ups in the core area: (1.77 ± 1.12) points;

Front support balance stand: (1.65 ± 0.86) points.

There were significant improvements in the above results

compared with the situation before functional strength training. The difference was considered statistical significant when $P < 0.05$.

Discussion

Functional strength refers to the strength that emphasizes the stabilizing and auxiliary effect of small muscle groups around the trunk and each joint for the purpose of improving the overall working ability and efficiency of the muscles of the whole body. Functional strength training originates from the theory of rehabilitation medicine in foreign countries. In competitive sports, it mainly focuses on the rehabilitation training of athletes, based on which the term of professional rehabilitation training is generated through years of development.⁷ Functional training includes acceleration, stabilization and deceleration modes of motion in three-dimensional direction. The accurate definition of functional strength training refers to the training aiming at improving the overall movement ability of the body muscles of the athletes, and strengthening core muscle strength and the strength of the small muscles that assist the stabilization of the joints.⁸ At present, the functional strength training methods mainly include suspension training method, vibration strength training method and core strength training method.

Functional movement test in the study is an injury prediction system originated from field of physiotherapy and rehabilitation. It consists of a reliable seven-step observation system, through observation and analysis of which, the limitations and asymmetry of movements can be recognized and classified. Limitations and asymmetry of basic movements will weaken functional training and physical training effects, thus increasing the risk of sports injury. Athlete injury is largely due to poor coordination, high muscle tension, or large partial load caused by compensatory movement. Functional movement test is a method to test body flexibility and stability. There is a strong correlation between the test scores and the ability to prevent injuries. Through collection and statistical analysis of relevant data, theoretical basis can be provided for preventing sports injuries and improving athletes' athletic performance.

After three months of functional strength training, test performance of 1000 aerobics athletes in the study was significantly improved. After functional strength training, motor sense of 1000 research objects was significantly improved. Before the training, 337 athletes had motion pain, but after functional strength training, motion pain of 296 athletes gradually disappeared, and exercise capacity was improved significantly as well. In addition, there was

a significant improvement in 1000 athletes' indicators such as average body motion function level, sports stability, which fully confirms effectiveness of functional strength training.

Conclusion

To sum up, functional strength training can significantly reduce risk of sports injuries for aerobics athletes, improve athletes' body control ability, coordination ability, movement stability, flexibility under unsteady conditions. Functional strength training is of great significance for preventing aerobics athletes' sports injury and improving their ability level.

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