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Research on the Effective Methods of Pilates for Ballerinas to Enhance "Core Muscle Group"

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Abstract: Pilates is an emphasis on coordinate core muscle group control of the whole body movement, in the process of long-term development, gradually found pilates can be combined with ballet basic training, form of ballet dancer body and promote the development of it can improve ballet dancer's body quality, enhance the capacity of technical skills, is the important supplement of gihon ballet teaching. In the teaching method of classical ballet, it is pointed out that ballet is an art that strives to get rid of gravity more than other types of dance. In maintaining the balance and stability of the body in the dance, ballet dancers have more formidable challenges. Ballet movements are mostly centered on the "core". The strong core muscles can help the ballet dancer better control the stability, speed and balance of the body. Therefore, it is necessary to carry on the core strength auxiliary training. In this paper, the training methods of pilates are summarized and sorted out. The function of pilates on the core of ballet dancers will be analyzed from its training methods, and the advantages of pilates in the core training of ballet dance will be analyzed, so as to make ballet training more scientific and efficient.

Keywords: Pilates; The Core Muscles; Ballet Dancer.

1. Introduction

Ballet originated in the Italian Renaissance. As one of the representatives of classical court dances in Europe, we can deeply feel the cultural atmosphere of the Italian Renaissance. For ballet, its main feature is that actresses usually perform in the form of tiptoe, so it is also called tiptoe dance. Pilates is a training system which was discovered by Joseph Huberts Pilates of Germany in the early 20th century, and improved and balanced body function through breathing and smooth movements. It is mainly composed of mat pilates, small instrument training and venue training. In recent years, Pilates has been paid attention to and recognized by many ballet companies at home and abroad and introduced into training, which is recognized as the exclusive auxiliary training for dancers and athletes. According to relevant data, the American Ballet School in 1926 (renamed new york City Ballet in 1948) happened to be in the same building as the studio founded by Pilates, which had a close relationship between them. Lauren Anderson, the chief of Houston Ballet, said: "Pilates is inseparable from dance, and it is the best form to improve the core strength of dancers." [1] Compared with other kinds of dances, ballerinas' own balance and physical stability are faced with the challenge of high center of gravity and small supporting surface, and the most important thing to improve balance and physical stability is to strengthen the training of core muscles and strengthen the support and fixation of muscles for movements. Strong core muscles are also the basis for ballerinas to show perfect technical skills. From the anatomical point of view, the core muscle group mainly covers the area below the shoulder joint and above the hip joint, including all the muscle groups in the abdomen, back, pelvis and hip, among which rectus abdominis, transverse abdominis, external and internal oblique muscles and erector spinae play a key role. Most human movements are movements in which multiple joints and muscle groups of the body participate together. Among them, the core muscle group is the most important link in the whole biological chain of human movements. It is the axis connecting the limbs and the head, which plays a connecting role. It can maintain balance and stability during human movements and is responsible for controlling the body. "The strength of the core muscles and the ability of muscles to coordinate work have an impact on the control ability of the body's center of gravity, the change of posture, the transmission of force between limbs, the speed and direction of body movement." [2] Therefore, this paper takes Pilates training as an example, and discusses and studies the methods and functions of ballet dancers to improve their core muscles in three training directions of Pilates. The problems to be solved include how Pilates "core strength" training can improve the physical quality of ballet dancers and the advantages of this training compared with basic ballet training. Through the analysis, it is hoped that dancers can pay attention to the training of small muscle groups and understand the importance of body core strength to dance.

2. Cushion Training of Perceptual Core Muscles

Pilates is one of the dance-assisted trainings which are well-known in Europe and America, while mat-faced Pilates refers to a body training method in which the human body devotes itself to the mat with its own weight. Under the premise of following the principles of Pilates training, it aims at improving the strength of the dancers' core muscles, improving the body control ability, optimizing the body muscle arrangement, and preventing and treating physical injuries in advance, which is an effective way of joint physical and mental training.

2.1. Accurate Abdominal Training

Abdominal muscles, as an important body tissue of the human body, play an important role in stabilizing the trunk and maintaining balance in the process of ballet dancer's movement, and are also the fulcrum of limb movement. Strong core muscles are also the basis for ballet dancers to show perfect technical skills. The transverse abdominis muscle,

which is located in the deepest part of the abdomen, maintains the stability of the waist and sacroiliac joints by increasing the intra-abdominal pressure, and can drive the surrounding core muscles to send force. From the mechanical point of view, the abdominal musculoskeletal structure will gain kinetic energy from the ground reaction force and gravity to a greater extent, reduce energy consumption and maintain physical strength during ballet movements. However, in the daily ballet training, it is rare to see the specialized exercises in the core parts of the human body. Usually, the common sit-ups and back muscles are used for training, but this kind of mechanical ups and downs can't flexibly exercise all the core muscles. The pad pilates reduces the supporting surface of the body and the ground, and adopts flexible posture training methods to mobilize the deep core muscles to participate in the exercise process in an all-round way to strengthen the core stability of the dancer.

In Pilates abdominal training, the commonly used movements are: jackknife (all-round core training and coordination increase), hundred (improving breathing and enhancing immunity), hamstring stretching exercise, plate support, circular rotation and T-type challenge exercise. Take jackknife as an example, the action description: the upper body lies flat on the cushion surface, and the legs are straight and close together to drive the abdomen and buttocks off the ground and perpendicular to the ground; When the hips fall and the legs are 25 degrees off the ground, the head is lifted and the upper abdomen is rolled up, and the arms are lifted to form a straight line with the legs; Inhale when lifting and exhale when falling; Training purpose of Jackknife action: This action requires the limbs to move together with the core muscles, which can exercise the core muscles in all directions and exercise the coordination of the body at the same time. Target muscles: rectus abdominis, oblique muscles inside and outside abdomen, transverse abdominis, gluteus maximus and latissimus dorsi.

Pilates can achieve the training purpose by changing the training position and causing the resistance of the body center of gravity. For example, in practice, raise your arms to increase extra strength (hold your head, cross your chest, and raise your head), raise or lower your legs, and bend to straighten to increase the resistance of your legs. In the process of exercise, dancers need to cooperate with breathing to complete their movements and achieve better results. Breathing is also one of the six core requirements of Pilates. Through long-term practice, Pilates can shape abdominal lines and enhance dancers' flexibility, control, balance and coordination.

2.2. Controlled Back Training

Pilates, also known as control, helps to strengthen the deep muscle strength of the back by emphasizing the precise control process, and helps to carve the back muscles through control. Pilates, as an aerobic exercise, is mainly done on the mat or auxiliary equipment with breathing. The main method adopted is sit-up and back-up, which is also commonly referred to as "back muscle" exercise, but Pilates exercise is not only mechanical ups and downs, but also many exercises that need the coordination of various small muscle groups, such as the cooperation of the left upper limb and the right lower limb or the left lower limb of the right upper limb.

Take the back rotation in Pilates training as an example: the body lies flat on the mat, simulating the standing posture, placing two palms on the forehead, the legs are the same width as the hip joint, contracting the abdomen, adjusting the breathing, lifting the head, leaving the chest and shoulders off the ground, rotating to the upper right and lifting the left leg at the same time; The reverse side is the same, repeat the action for 10 times; The training purpose of back rotation action: while exercising the cooperation ability and coordination of upper and lower limbs, concentrate the strength of the body on the waist, back and buttocks, strengthen the stability of the core muscles in the middle section, enhance the muscle strength of buttocks and carve back lines. Target muscles: latissimus dorsi, iliopsoas, shoulder muscles, erector spinae, internal and external oblique muscles, gluteus maximus and gluteus medius.

Pilates low back training has rich movements and high replacement frequency. In the process of control, it can exercise the muscles of the dancer's waist and back, and strengthen the small muscles and ligaments near the spine, which improves the dancer's trunk performance ability. While sculpting the beautiful back curve, the powerful muscles also protect the spine, which solves the problems of lumbar muscle strain caused by the repeated movement mode of ballet, and also enables ballet dancers to present better stage effects.

3. Small Instrument Training to Activate Core Muscles

Pilates training is divided into two types: mat training and equipment training. Among them, the equipment is divided into two types: large equipment and small equipment. The small equipment includes a series of rich and varied sports equipment such as Pilates ring, baby bucket, elastic belt, Swiss ball and foam roller. Pilates gadgets are unstable in the training process, and the unstable conditions created by gadgets are multi-dimensional and multi-directional. This uncertain factor is determined by different gadgets. Different gadgets have different textures, such as balance pads, baby buckets, Swiss balls, etc. What they have in common is that they are all arc-shaped surfaces, and arc-shaped objects are smaller than square-shaped objects, and they are extremely unstable and difficult to fix. This can effectively stimulate the dancer's muscle contraction, effectively help improve the body's balance ability, grasp the stability of the body in the tiny support surface, and improve the movement constancy.

3.1. Elastic (Pulling) Band Improves Muscle Elasticity

Elastic belt, a small instrument in Pilates, can enhance resistance and conduct multi-dimensional and flexible resistance and traction training for muscles. Trainers can adjust the elasticity according to their own different needs, and increase the load on the muscles that need to be practiced. elastic belt can give training a variety of choices and changes through his own control.

Plié movement in ballet requires the muscle strength of hip joint to fix the middle part of the body and pelvis, so as to maintain the stability of the body when doing the movement. The reinforcement of hip muscles can keep the spine stable to a greater extent. In small instrument training, elastic belt is used to train plié to increase the resistance, and interference simulation is used to increase the strength of muscle groups and improve the quality of movements: one side of elastic belt is wrapped around one ankle, wrapped around the legs in an S-shape, passed through the knee, and the other side is held in the hand; Prepare your legs and feet, and keep your upper

body upright; , legs and knees straight; Exhale and do plié to resist elastic belt resistance; Repetition; When inhaling, the knees are straight and the trunk is stretched upward. Training purpose: to exercise the core balance, strengthen the hip muscle strength, and train the feeling of upward tightening of the rotation force on the inner side of the legs. Training muscles: gluteus maximus, hip psoas, hip internal and external rotation, hip flexion, rectus abdominis, medial thigh, rectus femoris and medial and lateral thigh muscles.

Figure 1. Plié training

Elastic belt's principle conforms to the essence of muscle elasticity, avoids the massive growth of muscles, and strengthens the strength while exercising the ballet muscle lines. This resistance environment caused by elastic belt improves the position and sensory function of flexion and extension muscles to the greatest extent, and at the same time improves the quality of muscle elasticity, explosiveness and flexibility, improves muscle strength, and enhances the technical ability and flexibility of ballet dancers.

3.2. Pilates Hemisphere Lifting Action Constancy

One of the most difficult things that ballerinas have to overcome in their performances is the sense of balance. Because stepping on the pointe shoes makes the supporting surface of the body smaller, it is difficult to find the balance of the body, which requires strong core muscle ability to help the body maintain balance. Therefore, ballet dancers need to have the ability to control the core muscles of the body and adjust the balance of the body at the same time. "Balance refers to the ability of the human body to maintain stability. It is the ability of the body to automatically adjust and maintain a stable state in various actions or postures under relatively static or dynamic conditions." [3] is the basic premise to complete complex dance movements and difficult technical skills. When performing on stage, especially when it is necessary to complete complex movements and difficult technical skills, ballet dancers will lose their balance, affect their movements, and make the dance show a big discount if their body strength is not properly controlled, but their body muscles are not controlled and adjusted in time. Moreover, in the ballet performance, the difficult jumping action requires the dancers to keep a certain time in the air and show elegant and dignified posture, which requires the core muscles in the middle section to explode and be strong, so as to give people a kind of light and noble comfort. In 2009, Teacher Gao Juanmin suggested that the ballet dancer's core stability can improve the problems that are difficult to coordinate in the movements such as rotation and jumping.

Swiss balls in gadgets also have a special effect on the stability of training core strength. Take the action shoulder bridge as an example to prepare posture: lay your upper body flat on the ground, bend your knees together and step on the Swiss balls. Action description: Inhale and keep still. When exhale, leave your hips off the ground and slowly lift them up from the coccyx to the thoracic vertebra. The knee joint to the trunk of your body are diagonal. When inhaling for the second time, continue to extend your body, and when exhaling, slowly fall from the thoracic vertebra and return to the preparation posture. Training purpose: Unstable state strengthens the strength of core muscles and thigh and hip muscles. Target muscles: rectus abdominis, transverse abdominis, hip muscle, iliopsoas muscle and hamstring muscle.

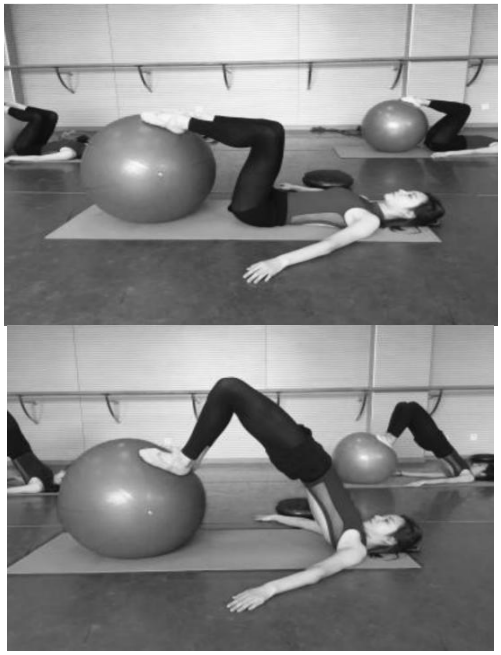

Figure 2. Swiss ball training

In the training of Pilates small instruments, the Swiss ball has the characteristics of instability. Under such unstable training, the training difficulty is obviously improved, and at the same time, it is closely combined with the needs of ballet majors. By using the particularity of ball instability, the ballet dancer's control of his own center of gravity and the ability of cooperation and coordination between muscles are strengthened, which also shows that the training of Pilates small instruments can meet the professional needs of ballet dancers more than other trainings.

4. Optimize the Reorganization Training of Core Muscles

Common big instruments include Pilates bed, Cadillac bed, universal chair, ladder barrel, orthotics and so on. Among them, the widely used instrument Pilates Bed is mainly composed of skateboards, springs, cables, wooden frame beds and other parts, which can be used in combination or alone. The diverse combination of parts provides flexible exercise methods, and practitioners can choose exercises with appropriate intensity according to their own abilities and needs. Among them, skateboarding exercises the core stability, and the unstable structure makes the movement more difficult; The rope helps the practitioner to master the movements

quickly and make the Pilates bed more controllable to ensure the accuracy of the movements; The rope adjustable lifter provides resistance and strength of different gears, which makes muscle training and sculpture more effective. In addition, the equipment can also enhance muscle explosive force and exercise body flexibility and coordination. Cadillac bed provides the resistance of different gears for the exerciser by adjusting the spring. In order to meet the individual needs of the exerciser, half-slide rail and full-slide rail devices are also set up to train the weak links of muscles. The track structure combined with the spring can increase the movement range and instability during exercise, which can better improve the core muscle ability of the practitioner.

4.1. Resistance Training to Enhance Muscle Explosive Force

The resistance training of Pilates bed has more resistance characteristics because of the existence of springs, which is more in line with the aesthetic pursuit of muscle lines in dance. It develops the ballet dancer's local body movements more pertinently. From the point of view of training methods, Pilates bed training is an elastic resistance formed by the resistance of springs, and load-bearing resistance is also a common method in dance training. The traditional method is to bind sandbags at the ends of limbs, such as kicking to increase the weight of legs. However, the weight of sandbags combined with gravity puts a great load on ballet dancers, and the resulting leg muscles are strong, which also violates ballet dancers' extremely high aesthetic requirements for figure. If training is not correct, it will easily lead to potential safety hazards such as muscle strain. The former is obviously more suitable for training. The sandbag weight-bearing training makes the dancers constantly change the dimension of muscles during repeated training, making the muscles lumpy and causing muscle injury. The Pilates bed enhances the resistance by using the principle of additional resistance of springs and stimulating muscles without increasing the dimension of muscles. The elastic resistance training can not only improve the training intensity of dancers, but also significantly improve the explosive force and endurance of muscles, which also conforms to the principle of long lines of muscles in ballet aesthetics, so that ballet dancers can realize greater value in the training process.

Take Pilates Bed Action Dreams as an example: Lie on your back on the Pilates Bed, bend your legs together and stay in mid-air, and put ropes on your hands to straighten up and make preparations at 90 degrees perpendicular to your body. Action Description: Take a deep breath. When exhaling, tighten your abdomen. Press your hands down to push the skateboard and straighten your legs but don't touch the floor. Lift your shoulders and head to lengthen your spine. Repeat the action while keeping breathing smooth. You can also keep your legs straight or pat alternately to increase the pressure on your abdomen. Training purpose: to improve the flexibility of spine, strengthen the strength of abdominal core muscles, effectively distribute muscle work, and enhance muscle explosive force through elastic resistance. Target muscles: rectus abdominis, transverse abdominis, internal and external oblique abdominis, erector spinae, latissimus dorsi.

Figure 3. *Pilates bed training*

Ballet dancers not only need to push the ground quickly, but also need to keep their bodies in the air and show elegant dancing state when they complete the jumping action in the dance movement. According to the principle of spine movement and axial extension of Pilates bed, the muscles on both sides of the spine contract inward without changing the height of the abdomen on the basis of the extension of the central axis. Dancers can emphasize the accuracy and slowness of movement according to the training of Pilates bed, and the internal and external body experience promotes the dancers' perception and strengthening of the body. Regardless of Pilates' instrument training or mat training, we can design movements similar to basic dance training to assist dancers' training. Pilates bed can also be combined with the basic training of ballet to design a variety of auxiliary training such as squatting, jumping, opening, etc. These trainings are not only the supplement of basic ability, but also promote the efficiency and effect of ballet dancers in completing difficult technical skills.

4.2. Unstable Training to Tap the Inherent Potential of Muscle Groups

In the basic training of ballet, whenever you come into contact with a new movement, in order to strengthen the muscle strength when you do it, you will do a lot of repeated training for this movement from easy to difficult, from single to complex. For example, when you are doing grand ballet jeté, you are required to keep the body and trunk stable when the power leg kicks through jet é. However, the most common mistakes in this movement are the body shaking in the opposite direction, the bending of the main leg, jumping over, being taken out by the power leg, unstable standing and so on. The most important thing is the problem of body stability. In repeated kicking exercises, the essence of the problem is the lack of leg muscles and core strength, and the incorrect position of force can not stabilize the body when doing the movement, and even repeated training can not meet the requirements.

Reformer bed can make more than 500 kinds of training changes by using the detailed structure of sliding bed, spring, pull rope and pedal, which can improve muscle ability to the greatest extent and in all directions, strengthen training effect,

and especially effectively train core muscles. Taking back muscle training as an example, the preparation posture: the body is flat on the sliding bed, the crotch is placed on the edge of the sliding bed, the legs are bent and the knees are close together, the feet are placed on the handlebar at the back of the bed, and the hands are bent and placed on both sides of the sliding bed. Action Description: Inhale and keep still. When exhale, push your legs straight. When the sliding bed moves, lift your hands and upper body to form a diagonal line with your crotch. Keep still when inhaling, bend your legs when exhaling, and slowly fall down. Advanced action: pull two pull ropes at the front of the bed with both hands, and hang your legs straight and close in the air. When pulling the drawstring backwards with both hands, slowly lift the upper body and keep inhaling, and when exhaling, loosen the drawstring and slowly drop the body. Training purpose: to train the control strength of back muscles and strengthen the stability of trunk. Target muscles: iliopsoas, quadratus lumborum, gluteus maximus, rectus abdominis and oblique abdominis.

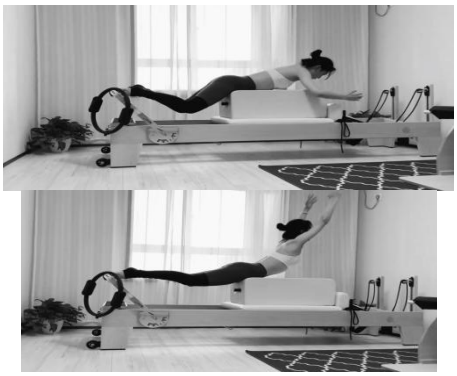

Figure 4. Back muscle training

Reformer bed is based on the mat pilates, and through the special function of instrument design, it uses the instability and resistance in the training to exercise the deep core muscle group, and at the same time stimulates the large muscle group, which not only has comprehensive muscle exercise, but also aims at the promotion of local muscles, which well solves the muscle difference under a long-term training mode. Because of the uneven distribution of using force, the secondary muscle group is ignored, but the main muscle group keeps intensive training, thus forming. Pilates equipment can stimulate the secondary muscles more strongly than before after training, improve the muscle strength and training efficiency of the secondary muscles, better tap the internal potential of the muscles and improve the physical quality of ballet dancers.

5. Conclusion

As a student majoring in dance, we should establish a correct concept of scientific training and absorb the correct training methods to better assist dance itself, and good basic ability is the basis of action technology. In view of the benefits of Pilates training for dancers, Pilates should be supplemented as an auxiliary training in the usual training, which is of great value to the control and expressive force of dancers' limbs. Therefore, dancers should deepen their understanding and attention to the importance of Pilates training, which is of great value to assist dancers' training.

References

[1] Gao Minjuan. The application value of Pilates training in dance teaching [J]. Journal of zhejiang vocational academy of art, 2015(6).

[2] Wu Xinyi. Application of physical and mental training in dance practice teaching [J]. Journal of Beijing Dance Academy, 2016(1).

[3] Ding Siyao. On the role and advantages of Pilates in ballet training [J]. Dance Art, 2018(12).

[4] Jiang Jin. Functional Exploration of Pilates Dance Auxiliary Training [J]. Dance, 2017(5):86-87.

[5] tenderness. On the auxiliary role of Pilates in dance training-from the perspective of sports human science [J]. Journal of Beijing Dance Academy, No.4, 2011.

[6] Ding Siyao. The role of Pilates in improving the professional quality of ballet students [J]. Yihai, No.10 in 2018.

[7] Gong Lulu. Progress in the application of Pilates in strengthening core muscle strength and promoting rehabilitation [J]. Contemporary Sports Science and Technology, No.15, 2017.

[8] Ma Ziyi. Research on Pilates Training for Dancers on Mat [D]. Shanghai Normal University, 15, 2017.

[9] Tang Xiaona, Sun Li. Pilates Hemisphere Training on Dance Control and Rotation Ability [J]. Journal of Dalian University, 2014(5)

[10] Wang Yang. Experimental study on the influence of Pilates core strength training on the basic quality of sports dance [J]. Hebei Normal University, 2013.

[11] Wen Xin. Experimental Research on the Pilates Core Strength Training Method for Ballet Majors [A]. Journal of Beijing Dance Academy, 2010(03).

[12] Tracy Morgan Handzel. Core training for improved Performance [J]. NSCN'S Performance Training Journal, 2003.

[13] David G.Behm, Kenneth Anderson, Robert S.Curnew. Muscle Force and Activation Under Stable and Unstable Conditions [J]. J Strength Cond Res, 2002(3).

[14] Li Yongming. Research on Ballet and Teaching Theory [M]. People's Publishing House, 2007.

[15] Long Yinpei, Xu Erchong. Introduction to Dance Art [M]. Shanghai Music Publishing House, 2015.

[16] Gentleness. Research and explore the theory and practice of human science in dance training [M]. Minzu University of China Press, 2017.

[17] Yang Ou. Principles and methods of dance strength training [M]. Shanghai Music Publishing House, 2013.