Analysis of the movement process and error causes of “front sweeping leg” in Wushu routine

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Abstract: This paper takes the analysis of the movement process and the causes of errors of the Wushu routine “front sweeping leg” as the research object, through the use of literature, interviews, image measurement and mathematical statistics to divide the completion route and movement phase of the front sweeping leg, and to understand the stability of the body center of gravity, the importance of limb coordination, the influence of sweeping angle speed on the movementThe influence of the left knee external rotation on the forward sweep, and the influence of friction in the forward sweep. Finally, it analyzes the causes of the pre sweep leg movement errors in Wushu routines. The purpose of this paper is to provide reference for the scientific training of front sweeping and provide theoretical basis for the practice course of Wushu routine.

Key words: Wushu routines; Front sweep; Action; fault

As a traditional sport, Wushu has experienced thousands of years in the history of the Chinese nation, and has a positive role in strengthening the body and mind. Wushu has a good mass base in China. In order to inherit and develop the national characteristics of Wushu, we need to vigorously promote scientific research and technology. As the basic leg technique of Wushu, front sweeping is also a frequently selected action in the arrangement of Wushu routines. However, due to the difficulty in mastering the center of gravity of the front sweep movement, if there is a mistake in the Wushu routine exercise, it will have a great impact on the athletes, which will have a certain impact on the subsequent movements of the Wushu routine, and even lead to injury in the movement and affect the score of the game. Due to the high difficulty and low success rate of front sweeping, athletes will have fear, so the frequency of front sweeping in Wushu routine selection gradually decreases, and athletes tend to choose some simple leg techniques with high success rate. According to the current research situation, scholars have less analysis on the forward sweep back technical action, and there is no complete scientific and technological essentials. Athletes can only improve the success rate of the forward sweep leg action by their own exploration and repeated practice in daily training. In addition, in the preparation stage of the paper, a large number of experimental data were analyzed. Thus, it is more favorable for the development of front sweeping in Wushu, making Wushu movements more scientific and standardized, improving the success rate of front sweeping and avoiding sports injuries.

1 research object and method

1.1 research object

The research object is the process of leg sweeping before Wushu routine and the causes of errors.

1.2 research methods

1.2.1 documentation method

The data source of this article is mainly the research on the process of leg sweeping before Wushu routine and the causes of errors in recent years on CNKI. Through in-depth study, we can master the theoretical research basis of this article.

1.2.2 image measurement method

The research is based on the leg sweeping movement before the Wushu routine of the municipal sports school athletes, Li Mingliang, Li Ye, Zhang Ziming, Wang Tianyu and sun Haodong. According to the shooting requirements of Ariel analysis system, this study uses digital video camera for 3D fixed-point shooting. Experiments were carried out on five athletes. Each athlete carried out five complete front leg sweeping exercises. After shooting a complete motion video, video editing and format conversion were carried out by using the sound and picture software, and then the video was digitally analyzed by Ariel analysis system.

1.2.3 mathematical statistics

The important information data obtained from the actual measurement and interviews are analyzed and processed using excel2010 table.

2 research results and analysis

2.1 leg sweeping movement process before Wushu routine

In order to better analyze the front leg sweeping action, the front leg sweeping action is divided into steps: starting with the heel of the left foot, placing it outward through the toe, then using the forefoot as the pivot, the left leg becomes the support leg after full squat, and finally completing the front leg sweeping action for one and a half weeks.

2.2 division of completion route and action phase of front leg sweeping

In order to more thoroughly analyze the process of front leg sweeping action, the front leg sweeping action is analyzed by using 3D digital video camera, which is divided into six phases. At the end of each phase, the six phases are divided according to the angle. The first phase is the start of leg sweeping 0-90 degrees; The second phase is 90-180 degrees; The third phase is 180-270 degrees; The fourth phase is 270-360 degrees; The fifth phase is 360-450 degrees; The sixth phase is 450-540 degrees.

2.3 analysis on the causes of leg sweeping errors before Wushu routine

2.3.1 analysis of the relationship between height and stride length

According to the survey, there is a close correlation between the stride length and height. With the increase of height, the stride length will gradually decrease. Taking the maximum angle as an example, Li Mingliang is the highest in height, and the maximum angle of the stride length is 101 °, while Li Ye is the lowest in height, and the maximum angle of the stride length is 109 °. It can be seen that height and stride length are closely practiced. Therefore, when the front sweep is completed, height has a direct impact on the completion of the action. In the front sweep, if the stride length is too small, the inner muscle of the thigh cannot be fully extended. At the beginning of the front leg sweep, if people of different heights do not start with their own height, it is easy to cause improper coordination of waist twisting and span building during the next sweep, which will lead to unsmooth sweep and even interruption of sweep. In addition, when the starting stride and height do not match, it will also lead to insufficient pre stretching of muscle fibers, unable to play the active muscle tension, reduce the sweeping speed, and make the movement speed and fluency poor.

2.3.2 stability analysis of body center of gravity during front leg sweep

Table 1 included angle between two legs at the end of each phase of front leg sweeping process (n=5)

name	First phase	Second phase	Third phase	Fourth phase	Fifth phase	Sixth phase
Limiangming	100 °	52 °	47 °	34 °	31 °	23 °
Li Ye	108 °	52 °	43 °	30 °	29 °	22 °
Zhang Ziming	102 °	53 °	48 °	34 °	30 °	24 °
Wangtianyu	106 °	56 °	43 °	23 °	21 °	20 °
Sunhaodong	104 °	55 °	48 °	33 °	28 °	24 °

In the experiment, the included angle between the two legs of five athletes in the six phases of front leg sweeping was counted. Table 1 shows that the overall data changes. In the process of completing the action, the included angle between the two legs of five athletes gradually decreases, because with the reduction of the degree, the speed in the process of leg sweeping will be enhanced and the speed of action completion will be improved. In addition, as the included angle decreases, the body support can be stabilized. In the process of front sweeping, keep the balance of the body, so in the front sweeping, support the leg to the full squat state, and then try to make the heel of the support leg close to the thigh root of the support leg. Only by keeping the center of gravity of the body stable, can the athletes improve the speed of the forward sweep. When body balance cannot be maintained, the included angle between the two legs and the angle between the trunk and the ground will play a role in maintaining the stability of the center of gravity.

2.3.3 analysis of limb coordination in front sweep

Table 2 Statistics of changes in body coordination center of gravity during front leg sweeping

name	Center of gravity displacement change	Center of gravity velocity change	Completion time
Limiangming	0.36-0.24mm	0-0.2mm/ms	2.87s
Li Ye	0.40-0.17mm	0-0.3mm/ms	3.08s
Zhang Ziming	0.46-0.20mm	0-0.5mm/ms	3.47s
Wangtianyu	0.44-0.16mm	0-0.3mm/ms	3.06s
Sunhaodong	0.46-0.17mm	0-0.4mm/ms	3.21s

In the process of finishing the front sweep, limb coordination is mainly to maintain the stability of the center of gravity, so as to better complete the movement smoothly. It can be seen from table 2 that in terms of limb coordination, controlling the displacement of center of gravity and the change of center of gravity speed through limb coordination can greatly improve the fluency of front sweeping. In the forward sweep, the head and torso need to actively twist to the left rear of the body, and the arm should cooperate with the corresponding swing. In this movement, only when the head, arms and body rotate vigorously together can the sweeping movement be accelerated. During the completion of the front sweep, the test table shows that the body and limb coordination can well control the center of gravity. On the contrary, if the limbs are not coordinated, the center of gravity will change too much, and then the movement will not be completed smoothly.

2.3.4 sweep angle speed analysis

Table 3 average angular velocity of each phase during front leg sweeping (n=5)

name	First phase	Second phase	Third phase	Fourth phase	Fifth phase	Sixth phase	Duration
Limiangming	10.112Rad/s	14.762Rad/s	14.762Rad/s	13.881Rad/s	11.455Rad/s	7.878Rad/s	0.77s
Li Ye	10.121Rad/s	13.198Rad/s	13.482Rad/s	10.126Rad/s	9.775Rad/s	8.363Rad/s	0.86s
Zhang Ziming	11.595Rad/s	12.902Rad/s	12.905Rad/s	11.959Rad/s	10.411Rad/s	9.776Rad/s	0.81s
Wangtianyu	10.112Rad/s	13.286Rad/s	13.287Rad/s	11.553Rad/s	10.013Rad/s	8.376Rad/s	0.84s
Sunhaodong	11.054Rad/s	14.143Rad/s	14.142Rad/s	12.838Rad/s	10.322Rad/s	9.057Rad/s	0.79s

Through the analysis of the photos of each time phase of the front sweep leg, it is found that the angular velocity of each time phase is different. Taking one radian as the unit, the radian taken in unit time is the angular velocity, as shown in Table 3, which is the average

angular velocity of each phase. It can be seen from table 4 that the average angular velocity of the athletes in the six time periods presents a peak change, and the starting speed is higher than the speed at the end. With the completion of the action, the greater the rotation angle, the slower the rotation speed gradually decreases. At the beginning of the sweep rotation, due to inertia, the second and third time periods' speed is higher than the first time period, but from the fourth time period, the speed gradually decreases, Until the final movement stops, it is not only a process from motion to stillness, but also a process of gradual reduction of power. Therefore, during the completion of the front sweep, it is necessary to control the rotational speed and angular speed in the second and third phases to ensure the integrity and fluency of the movement and maintain good body balance.

3 conclusions and suggestions

3.1 conclusion

In the process of front sweeping leg, the starting stride at the initial stage is closely related to the height. It is necessary to maintain the position of the center of gravity, take the upper body of the athlete as the rotation axis, and the rotation power mainly comes from the rapid contraction of muscles. The center of gravity is stable, and the sweep is more smooth. The lower the center of gravity, the more stable the athlete's body, the higher the quality of leg sweeping before completion.

The front leg sweeping action requires the coordinated movement of the head, arms and body, so that each link can cooperate to complete the action. The speed of sweeping angle is the fastest when it is 90-270 degrees. The speed of sweeping angle needs to be increased. By increasing the torque, try to buckle inside the toe and retract when completing the action. The external rotation and friction of the left knee also have an important impact on the quality of the front sweep.

The friction between the sweeping leg and the ground directly affects the sweeping speed, and then affects the quality of the total work. The causes of the forward sweep movement errors include the athletes' lack of mastery of technical essentials and the influence of physical quality.

3.2 suggestions

Wushu Athletes' usual training needs to strengthen the training of the center of gravity of front sweeping legs, such as core strength training and balance training, so as to improve the stability of the body when sweeping legs, keep the center of gravity unchanged, and ensure that the center of gravity remains at a good level from the beginning of rotation to the completion of the movement.

Strengthen the training of physical quality, mainly strength training, improve the physical strength of athletes, so as to enhance the strength of athletes' waist, legs, ankle and other parts. At the same time, through strength training, the initial speed at the initial stage of rotation is maintained to complete the subsequent leg sweeping.

Wushu athletes should pay attention to the key points of technical movements, adopt scientific training methods, strengthen the learning of key points of movements, deeply understand the various influencing factors in the front sweeping movement, avoid the problems that affect the completion of movements, improve the coordination of all aspects of the body, and improve the quality of movements.

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