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Analysis of the Influence of Movement Technique Factors on the Performance of Taijiquan Competitions

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Abstract: *The changes occurring to Taijiquan as a competitive sport have been conducive to the technological system's innovation, and the elements of moving technique have become the core variables determining competition outcomes. This study integrates judge scoring data and sports biomechanics analysis to uncover the differential influences of the accuracy of movement specifications,synchronicity of breathing rhythm, and quality of finishing difficult movements on the basic score and artistic performance score. The research identifies that a spatial deviation of over 3 degrees of upright spinal angles will trigger the penalty mechanism directly, and the effective dynamic balance control capacity is significantly and positively associated with successful rotation movement completion rates. In response to the evolving competition rules, a technical movement choice strategy based on the risk - return model, is suggested to provide an evidence-based training plan for athletes' preparation for competition.*

Keywords: *Taijiquan Competition; Movement Technique; Scoring Criteria; Competitive Performance; Technique Optimization*

1. Introduction

In contemporary Taijiquan competitions, a competitive paradigm independent of the traditional regimen has been formed, and the twin pillars of its scoring system are the standardization and artistry of technical movements. Due to the continuous adjustment of competition rules, higher requirements have been placed on athletes' technical reserves and the stability of their clinical performance. Most previous studies have focused on a single technical link without systematically studying the synergistic relationship of the movement chain. Even if the best practices are followed in executing the technical details, it can lead to the loss of basic scores. In the same situation, determining the relationship between the technical components of the movements and the performance through conditioning exercises has become a key way to improve the performance in competitions.

2. Competitive characteristics and scoring system of Taijiquan competitions

2.1 Basic rules and scoring dimensions of Taijiquan competitions

The competitive rules for Taijiquan competitions are dominated by the competition regulations formulated by the International Wushu Federation. The scoring dimensions focus on three major aspects: movement quality, performance level, and difficulty coefficient. The assessment of movement quality is based on body posture control and the accuracy of movement routes. Referees determine the deduction of points according to details such as the deviation of the knee joint's flexion and extension angle and the uprightness of the spine of the contestants. A center - of - gravity shift beyond the specified range directly triggers a quantitative deduction of 0.1 - 0.3 points. The performance level emphasizes the smoothness of movement connections and the sense of rhythm. The coordination between breathing and limb movement affects the referees' subjective scoring of "power performance". For example, a mismatch between the speed of the arm movement and the breathing frequency in the Cloud Hands movement may lead to the loss of artistic performance points. The assessment of the difficulty coefficient depends on the complexity of the declared movements and the actual completion quality. If the foot moves more than 20 centimeters or the trunk inclination angle exceeds 30 degrees when landing after a 360 - degree spinning Empty Jumping and Lotus Swing movement, the difficulty score will be downgraded [1]. Athletes are required to submit a movement difficulty form at the pre -

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competition technical meeting for the referees' record and verification.

2.2 Analysis of subjective and objective factors of judges' scoring

In the scoring system of Taijiquan competitions, referees' judgments on movement quality rely on quantitative tools such as knee - angle measuring instruments. If the spinal inclination exceeds 5 degrees or the elbow joint bends less than 90 degrees, fixed - deduction rules will be triggered. Such objective standards reduce the scope of subjective discretion. The scoring of performance level involves the perception of force expression and rhythm. Some referees prefer the explosive force - exertion style of Chen - style Taijiquan, and differences in understanding the continuous force path of Yang - style Taijiquan may lead to a score fluctuation of up to 0.5 points for the same set of movements.Although the electronic scoring system can capture the hang - time and the number of rotations of aerial turning movements, the chief referee still retains the final right of interpretation for vague indicators such as landing instability. In a national championship, a case where a laser rangefinder recorded a 2.3 - centimeter shift of a contestant's center of gravity but no points were deducted exposed the gap between equipment data and manual adjudication. The special - training period for senior referees usually exceeds three years, and their visual - focus distribution patterns directly affect the efficiency of capturing the integrity of continuous Cloud Hands movement trajectories.

3. Analysis of technical elements of core movements

3.1 Body posture control

Taijiquan athletes need to dynamically adjust the dorsiflexion angle of the ankle joint to maintain balance in single - leg balance movements. Excessive forward protrusion of the knee joint or a floating heel will trigger the referees to deduct points for the stability of the lower body. The standard for an upright spine requires the thoracic and lumbar vertebrae to maintain their physiological curvature during turning and kicking. Some athletes deliberately tilt their pelvis backward in pursuit of a more aesthetic pose, which actually interrupts the force transmission and affects the connection of subsequent movements. The synchronous coordination between the rotation of the shoulder joint and the hip determines the scoring grade of the Cloud Hands movement. Professional athletes often use resistance bands for auxiliary training to enhance the linkage efficiency of the trapezius muscle and the iliopsoas muscle. A technical video analysis of a provincial team shows that if the rotation angle difference between the shoulder and the hip exceeds 15 degrees, the score for the arm movement trajectory will be downgraded. The regulation of breathing depth and the rhythm of diaphragm elevation and depression directly affect the amplitude of spinal extension and contraction. Insufficient diaphragmatic descent during the starting movement can easily lead to a compensatory reaction of forward tilting of the torso [2].

3.2 Movement specifications

When Taijiquan players complete the Wild Horse Parting Its Mane, if the running trajectory of the forearm exceeds the specified fan - shaped area, it may trigger a deduction for route deviation. The referee group compares the trajectory coincidence frame by frame based on the action replay system. In the White Crane Spreading Its Wings action, the elbows are required to remain slightly bent when the arms are spread. Insufficient amplitude is likely to be judged as insufficient force exertion. The video of a city - level championship shows that 30% of the players lose points for this action due to inadequate retraction of the scapulae. Rhythm control depends on the synchronous coordination of breathing depth and limb movement. The coaching staff uses an electronic metronome to standardize the nodes of the virtual - real transformation in the Brush Knee and Twist Step action. If a player holds their breath for more than two seconds at the moment of the fixed - pose appearance, it may lead to a downgrade in the rhythm score. The accuracy of movement specifications is based on the long - term coordination between muscle memory and spatial perception. Direction marking tapes are often laid on the floor of the training hall to assist in the formation of conditional - reflex - based position control ability.

3.3 Breathing and movement coordination skills

When practicing Taijiquan's Brush Knee and Twist Step, practitioners need to ensure that the

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sinking rate of the diaphragm matches the acceleration of the forward - pushing palm. Irregular breathing may cause the running trajectory of the arms to be out of sync with the rotation of the waist and hips. The coaching team uses a biofeedback device to monitor the correlation between the exhalation duration and the spinal extension amplitude during the Single Whip fixed - pose. It is found that taking a breath 0.3 seconds earlier can easily lead to excessive forward protrusion of the scapulae. In competitive routines, controlling the volume of breathing directly affects the referees' judgment on the continuity of force. A provincial - team player was considered to have damaged the integrity of the movement when performing the Repulse Monkey due to overly loud breathing sounds. In the Cloud Hands movement, the contraction of the intercostal muscles during the inhalation phase is required to start synchronously with the external rotation of the hip joints. Training with the method of blowing balloons to strengthen the control of the transverse abdominal muscles can improve the coordination of the respiratory muscle groups. The referee group particularly focuses on the timing coincidence between the thoracic cavity expansion and the retraction of the arms in the Sealing and Closing - like movement. If the breathing nodes are misaligned by more than two action beats, a deduction for intermittent force will be triggered.

4. Mechanism of Technical Factors on Competition Scores

4.1 The decisive role of movement accuracy on the basic score

The competition scoring system sets the tolerance for the elbow - joint angle error in the White Crane Spreading Its Wings action at ±3 degrees. If the knee - joint bending amplitude exceeds the specified range, 20% of the basic score for this action will be directly deducted. In training, inertial sensors are used to monitor the forward - extension trajectory of the scapula when pushing the palm forward in the Brush Knee and Twist Step. Data shows that if the lateral edge of the little finger is not aligned with the outer marking line of the arch of the foot, the score for the force direction will be downgraded. When a player performs the Golden Rooster Standing on One Leg, if the external rotation angle of the hip joint is insufficient, the three - dimensional motion capture system will capture abnormal data indicating that the projection point of the center of gravity has deviated beyond two - thirds of the area of the sole. An analysis of the video from a provincial - level event shows that over half of the cases of point deductions are due to the trajectory deviation caused by the asynchrony between the dorsiflexion angle of the ankle and the trunk rotation speed in the Turning and Sweeping Lotus Kick action. The referee group particularly focuses on whether the contact surface of the palm root completely covers the preset marking area during the closing stage of the Sealing and Closing - like action. If the gap between the fingers exceeds 1 cm, the action specification will be judged as inaccurate. The laser guiding lines laid on the floor of the training venue can assist in forming muscle memory and prevent cumulative errors in the running route of the Cloud Hands action during the third and fourth repetitions [3].

4.2 The correlation between movement fluency and artistic performance score

When the referee group evaluates the transition from the Single Whip to the Cloud Hands, the matching degree between the rotation speed of the waist and hips and the arc - drawing trajectory of the arms directly affects the score for the smoothness of the connection. If the angular velocity of the hip joint is lower than 30 degrees per second, a judgment of intermittent movement may be triggered. High - speed camera records show that if the activation delay of the quadriceps femoris of the supporting leg exceeds 0.2 seconds after a player completes the Turning and Sweeping Lotus Kick, the momentum transfer of the subsequent actions will be interrupted. The competition video analysis system can identify abnormal signals where the micro - tremor frequency of the wrist joint exceeds 3 Hz when finishing the White Crane Spreading Its Wings. Such detailed fluctuations will damage the integrity of the artistic performance score. In training, electromyographic patches are used to monitor the continuous force - exertion of the latissimus dorsi in the Jade Maiden Shuttling action. Data shows that if the compensatory force - exertion of the trapezius muscle exceeds 15% of the total output, the visual effect of the smooth - flowing movement will be damaged. A champion team member of a national championship reduced the transition time between the Sealing and Closing - like action and the Green Dragon Emerging from the Water to 1.3 seconds by adjusting the rotation rate of the sacroiliac joint, significantly improving the score for the coherence of the routine. The dynamic capture system found that for every 5 - degree increase in the range of motion of the sternoclavicular joint in the Repulse Monkey action, the referee's artistic impression score for the long - lasting force correspondingly

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increases by 0.3 benchmark points.

4.3 Difficult movement selection and risk-benefit balance

The scoring criteria for difficult actions in the competition regulations prompt athletes to weigh the complexity of actions and the stability of completion when arranging routines. Although high - difficulty coefficient actions can increase the starting score, they may trigger a chain of point deductions due to minor mistakes. The design of training programs needs to consider individual differences in joint range of motion. Athletes with limited lumbar rotation who forcefully perform the Flying External Sweeping Lotus Kick are likely to over - compensate for the center of gravity during the landing phase. Action arrangement strategies are usually adjusted according to real - time electromyographic monitoring data. Athletes with a latissimus dorsi activation delay of more than 0.3 seconds are advised to reduce the number of rotations in the Whirlwind Kick to maintain the integrity of the power chain. The scoring system conducts dual monitoring of the hang time and the trunk axis deviation of jumping actions. Excessive knee - joint bending during the airborne phase will directly reduce the benchmark score of the action by 30%. When experienced athletes balance the improvement of difficulty and risk control, they often adopt a phased reinforcement strategy. They first consolidate the coordinated force - exertion mode of the core muscle group at a low rotation speed and then gradually increase the rotation amplitude. The action library screening mechanism requires coaches to combine the arch shape characteristics of athletes to avoid high - impact actions that are likely to cause stress concentration in the ankle joint. Athletes with a prominent navicular bone who continuously perform single - foot landing actions may develop chronic injuries.

4.4 Analysis of common technical errors in terms of demerit points

The competition rules stipulate that if the plantar pressure distribution in the Golden Rooster Standing on One Leg action deviates from the center by more than one - third of the sole area, the referee group will deduct balance points at a rate of 0.3 points per second. If the horizontal displacement of the shoulder joint exceeds 5 centimeters when an athlete completes the Turning and Kicking action, the trajectory fluctuation curve marked by the high - speed camera will trigger the deduction mechanism for dynamic stability points. The replay of daily training videos of a provincial team shows that more than 60% of the team members experience a movement stagnation of over 0.5 seconds due to delayed hip joint braking during the transition from the Cloud Hands to the Single Whip,which directly leads to a downgrade of the connection points. The nine - axis gyroscope installed in the training hall can detect the slight shaking with the patella displacement exceeding 3 millimeters during the closing posture of the White Crane Spreading Its Wings. Such mistakes lead to an average of 2.7 deduction operations per game in provincial - level competitions. Article 9.2 of the referee manual clearly states that if the projection point of the center of gravity fails to complete the forward - backward movement cycle within 1.5 seconds during the third movement of the Repulse Monkey, it will be judged as a break in the movement rhythm. Memory - related mistakes mostly occur in the combination of the Turning and Sweeping Lotus Kick followed by the Split after the implementation of new rules. When a player forgets the subsequent movements, the average time spent on adjusting with padded steps is 0.8 seconds, and the resulting deformation of the routine structure triggers double deductions.

5. Technical optimization strategy suggestions

5.1 Targeted training methods based on scoring rules

Targeted training programs should conduct an in - depth analysis of the 12 dimensional parameters in the competition scoring rules, with a focus on strengthening the trunk stability angular velocity and the smoothness of the limb - end trajectory, which are of great concern to the referees. The three - dimensional motion model generated by the motion capture system can quantify the deviation of the arc radius of the wrist joint during the Cloud Hands action. Combining this with eccentric contraction training twice a week can effectively suppress trajectory fluctuations. Improving the balance score needs to be based on vestibular function adaptation training. Using the improved wobble - board exercise can control the center - of - gravity deviation threshold within the ±2.5 - centimeter range allowed by the scoring rules. The breathing rhythm regulation module is integrated into the regular routine practice. When the synchronization rate between the diaphragm activity and the action rhythm

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is increased to over 85%, it can significantly improve the referees' subjective evaluation of the continuous strength. Specific muscle - group activation timing correction training can shorten the force - exertion interval between the latissimus dorsi and the transverse abdominal muscle, so that the momentum transfer efficiency of the Turning and Sweeping Lotus Kick action can reach the Class - A standard required by the scoring rules [4].

5.2 Individualized technical shortcomings diagnosis and improvement plan

Personalized technical diagnosis needs to rely on the gait analysis system to dynamically monitor the internal rotation angle of the ankle joint and the activity trajectory of the scapula, and identify the trajectory deviation caused by insufficient flexibility of the iliotibial band during the Turning and Kicking action. Three - dimensional mechanical test data reveal that for some players, the center - of - gravity transition speed is lower than the standard value during the Single Whip Lowering Stance due to the delayed activation of the rectus femoris, and a training module with alternating eccentric and isometric contractions needs to be customized. The biomechanics team adjusts the arch - support strategy for the Golden Rooster Standing on One Leg action according to the plantar pressure distribution heat map, and designs a strengthening program for the tibialis anterior muscle for those with excessive talus forward movement. Improving the core stability weakness needs to consider the individual differences in the tension of the thoracolumbar fascia, and use phased vibration training to gradually improve the coordinated contraction efficiency of the transverse abdominal muscle and the multifidus muscle. Correcting the action rhythm defects is based on the collection of 2,000 inertial sensor data per cycle. A dynamic balance compensation training program is developed to address the problem of premature braking of the sacroiliac joint during the transition of the Cloud Hands.

5.3 Pre-competition technical condition adjustment techniques

Pre - competition technical adjustment should focus on optimizing neuromuscular control in each link of the movement chain. Low - frequency vibration training is adopted to enhance the multi - dimensional stability of the ankle joint to cope with the plantar pressure monitoring of the Golden Rooster Standing on One Leg action by the referee group. The breathing - movement coupling training module focuses on improving the matching degree between the rising and falling rhythm of the diaphragm and the arc - drawing speed of the Cloud Hands, so that the amplitude of chest cavity fluctuation conforms to the physiological fluctuation range of 0.8 - 1.2 centimeters in the scoring rules. Three days before the competition, an environmental simulation training system is introduced to strengthen the athletes' vestibular anti - interference ability during the Jade Maiden Shuttling action through randomly interfering light sources and sudden decibel - changing scenarios. The myofascial relaxation plan should be based on the detection data of individual erector spinae muscle tension, and adjust the elastic modulus of the thoracolumbar fascia to the optimal force - exerting state 48 hours before the competition. During the action rehearsal stage, a skeletal muscle co - activation detector is used to implement fine - tuning of the timing for the phenomenon of premature contraction of the vastus lateralis muscle found in the Turning and Sweeping Lotus Kick action [5].

6. Conclusion

In really improving Taijiquan competition performance, the organic unity of technical standardization and artistic creativity is crucial. Precision of control for movements involves transmission of the human movement chain in an effective manner, and exercise of difficulty by the overall performance style. Future research should strengthen cross - verification of the referees' scoring cognitive model and the athletes' technical characteristic atlas, and establish an intelligent evaluation system to reduce the interference of subjective judgment. Meanwhile, technical optimization strategies need to consider the individual differences and dynamic adjustments of the competition regulations, and construct a complete supportive system from basic training to site decision - making process. The continuous development of competitive Taijiquan not only needs to base on the essence of traditional techniques, but also actively absorbs publishable progressive sports science marks and seeks to explore the link between cultural inheritance and competitive innovation during the importing process of technique.

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References

[1] Zhang Y. The spread and influence of Taijiquan in the background of globalization[J]. International Journal of New Developments in Education, 2024, 6(3): 292.
[2] Li F. Transforming traditional tai ji quan techniques into integrative movement therapy—Tai Ji Quan: Moving for Better Balance[J]. Journal of sport and Health science, 2014, 3(1): 9-15.
[3] Gómez-Lozano S, Vargas-Macías A, Kelly-Lahon C, et al. Influence of Aikido and Taijiquan-Tuishou on Contact Improvisation[J]. Frontiers in Communication, 2022, 7: 983290.
[4] Yu H B, Chang Y H, Liao P Y, et al. Effect of Tai Chi Chuan training on main performance during dance movements[J]. Biomedical Research, 2018, 29(13): 2690-2696.
[5] Wang F. The Essence of Taijiquan Push-Hands and Fighting Technique[M]. Singing Dragon, 2014:12.