

The Influence of SAQ Training on the Change-of-direction Movement Ability of College Basketball Players

Yunlong Fang

Chongqing Chemical Industry Vocational College
Chongqing 401123, China
E-mail: fangylyunlong@hotmail.com

Received: March 12, 2025

Accepted: November 17, 2025

Published: September 30, 2026

Abstract: In this paper, 20 male basketball varsity team players were divided into a control group adopting conventional agility training and an experimental group adopting speed, agility, and quickness (SAQ) training. The two groups of players were for their change-of-direction movement ability before and after the eight-week training. The test content included T-shape running test, Nebraska agility test, Illinois test, and zigzag dribble and layup comprehensive test. The results showed that SAQ training could effectively improve the players' change-of-direction movement ability.

Keywords: Basketball movement, Change-of-direction movement, SAQ training, Agility.

Introduction

In modern basketball, the change-of-direction movement ability is undoubtedly one of the key factors that determine the outcome of a game. With the improvement of the rhythm of basketball game and the intensity of confrontation [4, 15], players not only need to have advantages in speed and strength but also need to have excellent flexibility and change-of-direction movement ability to cope with the ever-changing situation on the court. The change-of-direction movement ability is not only an individual skill of the players [3, 6] but also an important basis for the whole team to formulate game tactics and strategies. Using the change-of-direction movement technique, players can get more offensive and defensive opportunities on the court and thus gain more advantages in the game [7, 14]. In modern competitive sports, speed, agility, and quick reaction ability are often the decisive factors in determining the outcome [2]. Speed, agility, and quickness (SAQ) training method mainly covers the training of the above three objectives. Speed training can improve the individual's reaction speed, displacement speed, and action speed through sprinting, variable speed running, and other training means, so as to help the individual reach a higher speed in a short time and maintain the speed advantage in the race. Agility training focuses on fast, flexible, and coherent movement of the body, aiming at improving the adaptability of individuals in complex and changeable sports scenes [9]. Quickness training can improve the competitive level of individuals by simulating the needs of rapid response in competitive scenes. SAQ training comes from players' needs for speed, agility, and quick reflexes. It uses a variety of training methods to improve players' ability to react quickly and flexibly in a variety of complex and changing situations. Taskin and Bicer [12] used proprioception training program to enhance students' athletic ability. Thurlow et al. [13] studied the effects of repeated-sprint training (RST) on athletes' physical health and physiological adaptation. They found that running-based RST can effectively enhance physical fitness and physiological adaptation. Singh et al. [10] used agility training to improve players' gait stability.

Case analysis

Subjects

Twenty male basketball varsity team players were divided into two groups: a control group adopting conventional agility training and an experimental group adopting SAQ training.

Training program

The players in the two groups were respectively trained in three phrases for eight weeks, and their respective training plans are shown in Table 1. The control group underwent conventional agility training, while the experimental group underwent SAQ comprehensive training [8] on this basis. The specific content of each training item in the table are as follows. The speed-quality training of the control group included fast high-knee lift, 25 m $\times$ 3 sets; lunge jump, 10 times $\times$ 3 sets; drop-start run, 10 m $\times$ 3 sets. Footwork agility training included forward and backward shuffle steps, side-to-side line changes, forward and backward steps, side-to-side steps, in-place shuffle steps, side-to-side hip sway, and in-place hip rotations. The above movements were compared in sequence. Change-of-direction movement training included straight backstep into sprint, 30 m $\times$ 3 sets; backstep into a 45° sprint, 3 sets; M-shaped sliding step, 3 sets. Response ability training included containment opponent training, 3 sets; grid mirror sprint training [5], 3 sets; command-based chase training, 3 sets. Strength training included push-ups, 20 times $\times$ 3 sets; reverse crunch, 20 times $\times$ 3 sets; wall-supported calf raises, 20 times $\times$ 3 sets.

Table 1. Training schedule

Training phase	Time	Control group	Experimental group
Adaptation training phase	week 1	Speed quality + change-of-direction movement + response	Speed quality + change-of-direction movement + response
	week 2	Footwork agility + change-of-direction movement + response	Footwork agility + change-of-direction movement + response
Consolidation training phase	week 3	Speed + change-of-direction movement + response + strength training	Speed + change-of-direction movement + response + explosive power training
	week 4	Footwork + change-of-direction movement + response + strength training	Footwork + change-of-direction movement + response + explosive power training
	week 5	Change-of-direction movement + footwork agility + strength training	Change-of-direction movement + footwork + explosive power training
Intensive training phase	week 6	Speed quality + response	Speed + response + explosive power + SAQ integrated training
	week 7	Footwork agility + response	Footwork + response + explosive power + SAQ integrated training
	week 8	Change-of-direction movement + speed quality	Change-of-direction movement + speed + explosive power + SAQ integrated training

The speed quality training of the experimental group included fast wall punch training, $30\text{ s} \times 3$ sets; hurdle training, $10\text{ m} \times 3$ sets; variable speed running training, $28\text{ m} \times 3$ sets. Footwork agility training included ladder quick steps, ladder high knees, ladder single-leg butt kicks, ladder single-leg in-and-out, and ladder skater steps. The above movements were performed in sequence. Change-of-direction movement training included T-shaped turning training, 3 sets; X-shaped movement training, 3 sets; marker barrel rotating running, 3 sets. Response ability training included one-on-one training, $30\text{ s} \times 3$ sets; rapid ball reception training, $10\text{ times} \times 3$ groups; rapid pole touch training, $10\text{ times} \times 3$ sets. Explosive power training included push-ups + lateral ball pushing, $10\text{ times} \times 3$ sets; wall-facing overhead ball throwing, $10\text{ times} \times 3$ sets; squat jumps, $10\text{ times} \times 3$ sets. The SAQ integrated training was carried out for five sets in a basketball court. The training steps are as follows: the player started from below the basket, sprinted quickly in a straight line to the right to the three-point line, and walked along the side of the court using the method of small steps and hip rotation within consecutive circles until reaching the midline of the court. He then used the forward slide step to pass through four marker barrels in a Z-shaped route and used the backward slide step to pass through another four marker barrels to reach the three-point line on the other side. Afterwards, he sprinted quickly in a straight line to the restricted area and then used the backward running to move to the midpoint of the baseline. He then moved to the three-point line on the right side, used the small backward steps and crossover step to cross the small hurdles, jumped over the box with both feet, and touched the marker barrels using moving side steps to reach the three-point line of the opposite half-court. Finally, he used the backward running to pass through five marker barrels in a Z-shaped route and returned to the starting point.

Test scheme

The players in the control group and the experimental group were tested for the change-of-direction movement ability before and after training [11]. The specific content of each test plan is presented in Fig. 1.

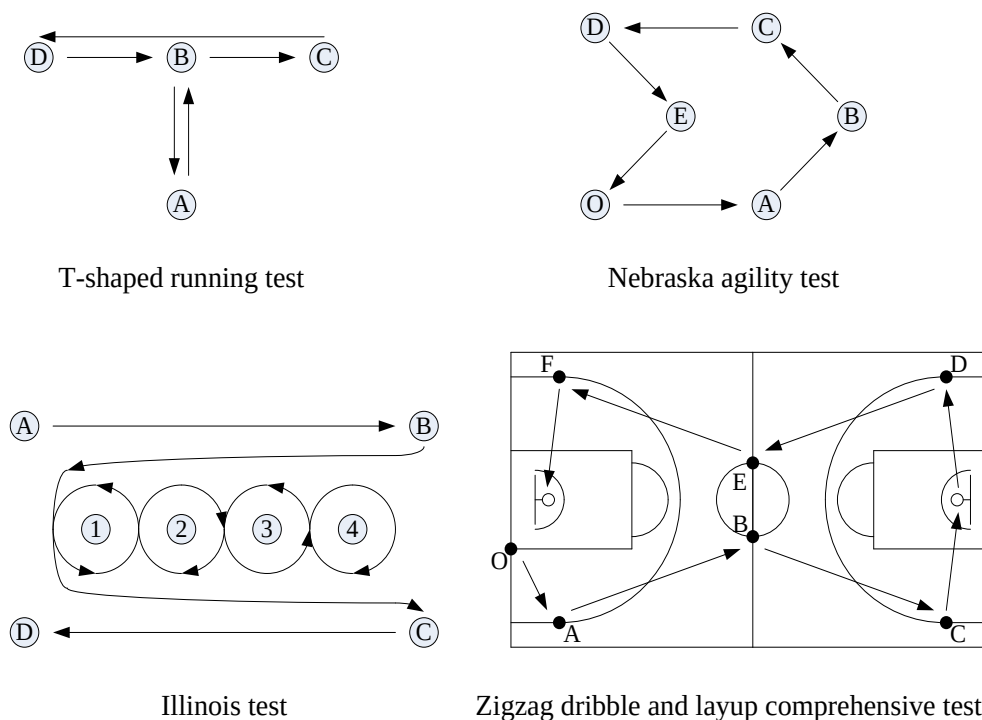


Fig. 1 Site layout of the four test schemes

T-shaped running test: The test site layout is shown in “T-shaped running test” in Fig. 1. The distance between marker barrels A and B was 10 m, and the distance between marker barrels C and D was also 10 m. At the beginning of the test, the subject sprinted to point B after hearing the starting signal at point A, moved to point C, D, and B successively by using the side slide step, and finally used the backward step to return to point A. In the whole process, three timekeepers timed the player and calculated the average time. In addition, the test was carried out twice, and the best average time was taken.

Nebraska agility test: The test site layout is shown in Fig. 1. The spacing between mark barrels B and E, A and C, C and D, A and O was all 10 m. At the beginning of the test, the player quickly sprinted to point A after hearing the instruction at O, then moved to point B and point C in turn by the side slide step, moved to point D by the backward step, moved to point E, and then sprinted back to point O. In the whole process, three timekeepers timed the player and took the average time. In addition, the test was carried out twice, and the best average time was taken.

Illinois test: The site layout of this test is presented in Fig. 1. The spacing between mark barrels A and B, C and D was 10 m, and the spacing between A and D, B and C was 5 m. The distance between mark barrels 1, 2, 3, and 4 was 3 m. The subject sprinted from A to B, then sprinted to point 1, bypassed points 1, 2, 3, and 4, then returned to point 1, and then moved to point C and then D. Three timekeepers recorded the time throughout the process and calculated the average time. In addition, the test was carried out twice, and the best average time was taken.

Zigzag dribble and layup comprehensive test: The test venue was arranged as shown in Fig. 1. Point O was located at the junction of the bottom line of the basketball court and the right side of the restricted area, A, C, D, and F were on the three-point line, and B and E were at the intersection of the midfield line and the circle. At the beginning of the test, after receiving the instruction, the player dribbled quickly to point A, B, and C. After turning the dribble at point C, the player accelerated to layup in the direction of the basket. After getting the rebound, he quickly moved to point D, changed to cross-leg dribble to move to point E, changed to behind-the-back dribble to move to point F, turned around at point F, and accelerated to layup. In the whole process, three timekeepers recorded the time and calculated the average time. In addition, the test was conducted twice, and the best average time was taken [1].

Mathematical statistics

SPSS software (IBM corporation) was used to conduct statistical analysis on the collected data, and the independent t-test was also used. Initially assume that the SAQ training method can effectively improve the players' change-of-direction movement ability.

Test results

As shown in Table 2, in the T-shaped running test, the p -value of time difference between the control group and the experimental group before training was 0.674, indicating that the difference between them was not obvious. After training, the p -value of the two groups showed that the experimental group was significantly lower. In addition, the p -value of the experimental group before and after training also indicated that the time consuming of the experimental group was significantly reduced after training.

Table 2. Results of the control group and the experimental group in the T-shaped running test before and after training

	Control group/s	Experimental group/s	<i>p</i> -value between different groups
Pre-training	10.75 ± 0.42	10.77 ± 0.41	0.674
Post-training	10.76 ± 0.41	10.41 ± 0.23	0.011
<i>p</i> -value before and after training	0.689	0.013	

Note: A *p*-value less than 0.05 indicates a significant difference at the level of 5%

As shown in Table 3, in the Nebraska agility test, the *p*-value of the difference in time spent between the two groups before training was 0.159, which was not significant. After training, the *p*-value of the two groups showed that the experimental group was significantly lower. In addition, the *p*-value of the experimental group before and after training also indicated that the time consuming of the experimental group was significantly reduced after training.

Table 3. Results of the control group and the experimental group in the Nebraska agility test before and after training

	Control group/s	Experimental group/s	<i>p</i> -value between different groups
Pre-training	13.42 ± 0.18	13.26 ± 0.16	0.159
Post-training	13.39 ± 0.14	12.45 ± 0.15	0.013
<i>p</i> -value before and after training	0.178	0.011	

As shown in Table 4, in the Illinois test, the *p*-value of the difference in time spent between the two groups before training was 0.689, indicating that the difference between them was not significant. After training, the *p*-value of the two groups showed that the experimental group was significantly lower. In addition, the *p*-value of the experimental group before and after training also indicated that the time consuming of the experimental group was significantly reduced after training.

Table 4. Results of the control group and the experimental group in the Illinois test before and after training

	Control group/s	Experimental group/s	<i>p</i> -value between different groups
Pre-training	15.54 ± 0.16	15.55 ± 0.12	0.689
Post-training	15.53 ± 0.12	12.54 ± 0.08	0.011
<i>p</i> -value before and after training	0.874	0.012	

As shown in Table 5, in the Zigzag dribble and layup comprehensive test, the *p*-value of time difference between the two groups before training was 0.875, suggesting that the difference between them was not obvious. After training, the *p*-value of the two groups showed that the experimental group was significantly lower. In addition, the *p*-value of the experimental group before and after training also indicated that the time consuming of the experimental group was significantly reduced after training.

Table 5. Results of the control group and the experimental group in the Zigzag dribble and layup comprehensive test before and after training

	Control group/s	Experimental group/s	<i>p</i> -value between different groups
Pre-training	20.23 ± 0.89	20.12 ± 0.85	0.875
Post-training	20.16 ± 0.68	19.23 ± 0.75	0.009
<i>p</i> -value before and after training	0.975	0.011	

Discussion

Against the backdrop of the rapid development of modern competitive sports, basketball, as a high-intensity and highly confrontational team ball sport, places higher demands on the comprehensive physical fitness of players. Among them, the change-of-direction movement ability during movement, an important indicator for measuring a player's agility and reaction speed, plays a decisive role in the game. College basketball players are at a crucial stage in the development of their competitive abilities. Their physical fitness not only affects the improvement of their tactical skills but also directly influences the potential for their future professional development. SAQ training, as a comprehensive training integrating speed, strength, coordination, and neuromuscular control, is widely used in the physical fitness training of various sports events. The purpose of SAQ training is to comprehensively improve the athletes' nerve reaction speed, movement conversion efficiency, and body control ability, so as to effectively enhance their adaptability in complex competition environments. In this paper, a case analysis was conducted on 20 male basketball players from the school team. During the analysis process, the 20 players were evenly divided into a control group and an experimental group. The control group adopted conventional agility training, while the experimental group adopted SAQ training. The training of the two groups lasted for eight weeks respectively. Moreover, both groups of players underwent change-of-direction movement ability tests before and after the training. Before receiving the training, there was no significant difference in the change-of-direction movement ability between the two groups. After the training, there was still no significant change in the control group compared to before the training, while the experimental group showed a significant improvement compared to before the training and was also significantly higher than the control group. The reasons for the above results were analyzed. The purpose of the T-shaped running test is to test the player's ability to stop suddenly and accelerate under changing conditions. The purpose of the Nebraska agility test is to evaluate the player's acceleration and deceleration ability and change-of-direction speed. The purpose of the Illinois test is to test the player's ability to continuously change the direction and trajectory of movement during rapid change-of-direction movement. The purpose of the Zigzag dribble and layup comprehensive test is to detect the player's change-of-direction movement ability during actual basketball dribbling and layups. Players who received regular agility training simply exercised the flexibility of their lower limb footwork, which mainly played a role in physical

fitness training. In contrast, the experimental group added SAQ training to the regular agility training. This not only enhanced physical fitness but also specifically targeted the improvement of footwork flexibility. As a result, the change-of-direction movement ability of the experimental group was significantly improved.

Conclusions

In this paper, 20 male basketball varsity team players were divided into two groups: the control group adopting conventional agility training and the experimental group adopting SAQ training. The two groups of players were tested for the change-of-direction movement ability before and after the eight-week training. It was found that there was no significant difference between the two groups of players before the training. After training, the change-of-direction movement ability of the experimental group was significantly greater than that of the control group. There was no significant difference in the change-of-direction movement ability in the control group before and after training, but the ability of the experimental group was significantly greater than that of the control group after training.

References

1. Bittel A. J., D. C. Bittel, L. J. Tuttle, M. J. Strube, M. J. Mueller, W. T. Cade, D. R. Sinacore (2015). Explanators of Sarcopenia in Individuals with Diabetes, *Journal of Geriatric Physical Therapy*, 40(2), 86-94.
2. Bokkasam N., I. Lillypushpam (2020). Effect of Plyometric and Circuit Training on Selected Agility and Flexibility Among Engineering College Volleyball Players, *International Journal of Physical Education, Sports and Health*, 5(2), 221-225.
3. Freitas-Junior C. G., L. S. Fortes, T. M. Santos, G. R. Batista, P. Gantois, P. P. Paes (2021). Effects of Different Training Strategies with a Weight Vest on Countermovement Vertical Jump and Change-of-direction Ability in Male Volleyball Athletes, *The Journal of Sports Medicine and Physical Fitness*, 61(3), 343-349.
4. Holmberg P. M. (2015). Agility Training for Experienced Athletes, *Strength and Conditioning Journal*, 37(3), 93-98.
5. Kumar G., A. Shukla, A. Chhoker, R. Thapa (2021). Identification of Factors Determining Winning in Men's and Women's Beach Volleyball: A Logistical Regression Approach, *Physical Education Theory and Methodology*, 21(1), 26-35.
6. Miramonti A. A., J. T. Cramer, N. D. M. Jenkins, Z. M. Gillen, B. D. McKay, T. J. Leutzinger (2017). Effects of Speed and Agility Training on Combine Performance in Young Male Athletes, *Medicine and Science in Sports and Exercise*, 49, 968.
7. Mota T., J. Afonso, M. Sa, F. M. Clemente (2022). An Agility Training Continuum for Team Sports: From Cones and Ladders to Small-sided Games, *Strength and Conditioning Journal*, 44(1), 46-56.
8. Omar A., J. Saleem, K. Mutasm, A. Sofyan (2021). Effects of Speed Agility Quickness Training Program on Explosive Power and Handball High Jump Shot Accuracy, *Journal of Management Information and Decision Sciences*, 24(S1), 1-12.
9. Pradana R. A., I. Maulang, A. A. Gondo (2020). Effect of Ladder Drill Training Toward Agility Level Among Basketball Players, *Journal of Physics: Conference Series*, 1529(3), 1-5.
10. Singh A., A. Sathe, J. S. Sandhu (2018). Effect of a 6-week Agility Training Program on Spatiotemporal Parameters in Gait Cycle of Indian Taekwondo Players, *Indian Journal of Physiotherapy and Occupational Therapy – An International Journal*, 12(4), 6-10.
11. Sudhan S. G., D. Chandrasekaran, S. S. Selvam, C. Sivakumar (2018). Abdominal Muscle Strengthening and Cardiovascular Responses, *International Journal of Research in Pharmaceutical Sciences*, 9(4), 1434-1440.

12. Taskin C., Y. S. Bicer (2015). The Effect of an Eight-week Proprioception Training Program on Agility, Quickness and Acceleration, Turkish Journal of Sport and Exercise, 17(2), 26-30.
13. Thurlow F., M. Huynh, A. Townshend, S. J. McLaren, L. P. James, J. M. Taylor, M. Weston, J. Weakley (2024). The Effects of Repeated-sprint Training on Physical Fitness and Physiological Adaptation in Athletes: A Systematic Review and Meta-Analysis, Sports Medicine, 54(4), 953-974.
14. Wang B., E. Xie, P. Liang, T. Liu, J. Zhu, G. Qin, X. Su (2024). Transforming Performance: The Impact of an 8-week Complex Training Program on Strength, Power, and Change of Direction in Female Basketball Athletes, Medicine, 103(24), e38524-73.
15. Young W. B., B. Dawson, G. J. Henry (2015). Agility and Change-of-direction Speed are Independent Skills: Implications for Training for Agility in Invasion Sports, International Journal of Sports Science & Coaching, 10(1), 159-169.

Yunlong Fang, M.Sc.

E-mail: fangylyunlong@hotmail.com



Yunlong Fang, born in January 1989, graduated from Chongqing University, Chongqing, China with a M.Sc. degree in July 2016. He is working at Chongqing Chemical Industry Vocational College as a lecturer. Currently, the main focus of his work is physical education.



© 2026 by the authors. Licensee Institute of Biophysics and Biomedical Engineering, Bulgarian Academy of Sciences. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).