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## Study on keeping track of taekwondo players' stamina and cultivating the training ability

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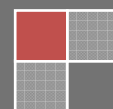
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### ABSTRACT

Cultivating taekwondo players' ability to keep track of their stamina is crucial to the improvement their physical constitution. It reveals the shortcomings of the individual stamina and makes the training more targeted. This study made thorough analysis on all aspects by conducting an experiment with a certain number of taekwondo players as target samples and made a comparison of the test results before and after the stamina training. First, this study made an analysis of players' all index figures by comparing and analyzing the stamina results before and after the training to demonstrate the importance of stamina training. Second, this study made an analysis of the results of isokinetic measurement on knees and other analysis of peak torque test results and isokinetic test results. Third, this study made a detailed analysis of stamina training methods and means and worked out effective training processes and training programs, so as to enable taekwondo players to have the ability of keeping track of their stamina.

### KEYWORDS

Taekwondo; Keeping track of stamina; Training ability; Cultivation methods; Exploratory study.



## INTRODUCTION

Keeping track of the stamina and cultivating the training ability are crucial to players' physical constitution and athletic ability and beneficial for keeping the balance of physical constitution and unleashing more physical potential. This thesis made detailed discussions from perspectives of stamina test results before and after the training, isokinetic measurement on players' knees results and training methods and means, which will be conducive to forming a better training system for taekwondo players.

### THE ANALYSIS OF STAMINA TEST RESULTS BEFORE AND AFTER THE TRAINING

#### Test results before and after the physical training

Before the physical training, all selected taekwondo players took stamina tests. There were 12 items and all the figures were recorded and processed with data processing software. The stamina test results of the selected taekwondo players before and after the training are shown in TABLE 1 and TABLE 2.

**TABLE 1 : Female players' test results before the training**

	N	Min	Max	$\bar{x}$	Sd
body anteflexion in sitting position	8	4.00	17.00	9.31	4.61
parallel split	8	12.3	21.60	17.01	3.41
medicine ball throw	8	7.3	12.85	9.59	1.94
standing long jump	8	2.12	2.29	2.21	0.06
bench press	8	25.00	55.00	37.50	9.26
weight bearing squat	8	95.00	130.00	118.13	14.62
left knee lifting for 20 seconds	8	46.00	51.00	48.88	1.73
right knee lifting for 20 seconds	8	47.00	59.00	52.50	4.78
1-minute sit-ups	8	53.00	69.00	59.63	5.80
100-meter run	8	14.70	15.98	15.13	0.38
800-meter run	8	160.00	177.00	169.75	5.85
3000-meter run	8	805.00	824.00	812.00	6.80
4x10-meter shuttle run	8	10.67	11.30	11.11	0.20
mean values $\pm$ standard deviation ( $\bar{x} \pm s$ )					

Judging from the results, the selected taekwondo players have done well in all 12 items and their physical constitution has also been largely improved ( $P < 0.05$ )<sup>[1]</sup>. With the target of major shortcomings of players' physical constitution, the training programs have been adjusted. All the taekwondo players were asked to finish the tests with proper attitude and efforts. After a certain period of training, all players' physical constitution has been improved with different degrees. Besides, the injured players have recovered and were able to obtain the general training. TABLE 1 and TABLE 2 clearly show that the players' physical constitution was not good enough before the training. And comparing the test results after the long-time training with the ones before, it's clear that the fastest-improved items of female taekwondo players are body anteflexion in sitting position, parallel split, backward medicine ball throw, bench press, weight bearing squat and 800-meter run, with the percentage of 32%, 22%, 16%, 18%, 8% and 8% respectively. And the fastest-improved items of male taekwondo players are also body anteflexion in sitting position, parallel split, backward medicine ball throw, bench press, weight bearing squat and 800-meter run, with the percentage of 37%, 16%, 9%, 12%, 5% and 6% respectively. The mean value of correlation coefficient of all the items is  $r \geq 0.9$ ,  $P < 0.05$ . The figures of the taekwondo players' test items during and after the training were processed with professional data processing software and therefore the difference has experimental significance<sup>[2]</sup>.

#### The analysis of strength test results

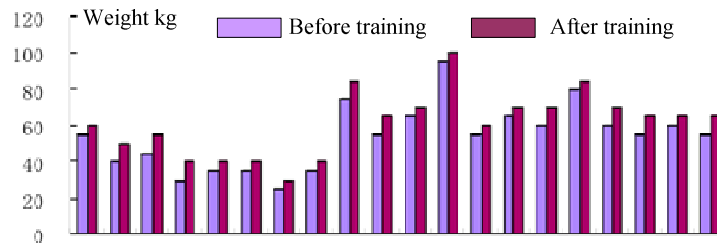
Strength training aims at enabling skeletal muscle to overcome internal and external resistance and therefore to enhance people's strength. It's a basic factor of human constitution and also crucial to skills and moves and other sports abilities. The reason why taekwondo players have to receive strength training is to enable them to finish several major moves that require strength and to improve their footwork with the strength of legs. The strength can be combined with relative skills, which helps the players stand strikes<sup>[3]</sup>. Taekwondo players are required to have comprehensive skills and abilities instead of just one aspect. If the player only focused on one aspect, other aspects would be limited. There are various kinds of moves in taekwondo and different kinds of strength are required to finish these moves. Therefore, the training methods have to be diverse to allow the players to improve their strength in a comprehensive and balanced way. In other words, strength is the major form of players' physical constitution and also a precondition for the effective use of other moves or strategies. As

taekwondo becomes more popular and competitive, the players have to be well-developed in all aspects. So the players need to be well-coordinated with different skills and strategies, so as to unleash the comprehensive strength during the general training and contests. Still, if 2 players' skills and abilities are on the same level, the stronger one has the advantage and better chance to win<sup>[4]</sup>. In this sense, strength is related to a player's performance. Therefore, a player's strength is related to the result of a contest. The results of taekwondo players' stamina after the training are shown in Figure 1.

**TABLE 2 : Male players' test results before the training**

	N	Min	Max	$\bar{x}$	Sd
Body anteflexion in sitting position	12	1.50	16.00	9.96	5.53
Parallel split	12	18.00	28.10	21.95	3.69
Medicine ball throw	12	10.10	19.60	16.20	2.59
Standing long jump	12	2.42	2.79	2.59	0.12
Bench press	12	55.00	95.00	65.00	12.43
Weight bearing squat	12	120.00	150.00	134.17	8.21
Left knee lifting for 20 seconds	12	43.00	54.00	49.08	3.60
Right knee lifting for 20 seconds	12	42.00	58.00	51.50	4.66
1-minute sit-ups	12	35.00	65.00	54.42	9.37
100-meter run	12	11.92	13.85	12.61	0.53
800-meter run	12	151.00	175.00	161.17	7.18
3000-meter run	12	795.00	820.00	803.75	7.01
4x10-meter shuttle run	12	10.00	11.00	10.50	0.32

Mean values  $\pm$  standard deviation ( $\bar{x} \pm s$ )

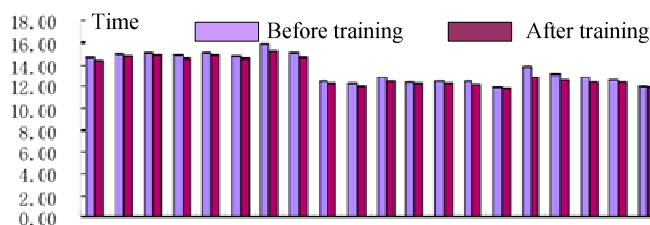


**Figure 1 : The results of bench press before and after the training**

**The analysis of speed test results**

Speed shows one's ability of fast movement or finishing a certain move within the shortest time. The standard of speed for taekwondo players is higher and they are required to have better ability to finish a certain move within the shortest time. Fast speed is a basic requirement in taekwondo, which is important in the training or contest with time limits. The training on speed includes the movement of footwork, the speed of reactions and the velocity of strikes. In taekwondo training and contests, the body appearance speed is more important. And the speed of reactions refers to a player's fast reaction to certain circumstances and makes the right decisions. Genetic inheritance is rather importance in the speed of reactions. The training on speed can unlock a player's potential in this respect. And the hit speed lies in proficiency of certain moves, strength of strikes, agility and coordination<sup>[5]</sup>.

100-meter run is a means to improve players' absolute velocity. Beside, players' reaction speed and their leg strength were all trained and improved, so as to increase players' speed. The results of speed test after the strength training are shown in Figure 2.



**Figure 2 : The results of 100-meter run before and after the training**

Figure 2 clearly shows the results of 100-meter run before and after the training. And the training on speed didn't have clear effects on the results of 100-meter run. It indicates that players pay enough attention to their leg strength, which is helpful to players' explosiveness. Among the results of male players' 100-meter run, the best one is 11.9 seconds while most players' results are between 12 to 13 seconds. The best female result is 14.7 seconds while the rest stay between 14.8 to 15.8 seconds.

### THE ANALYSIS OF THE RESULTS OF ISOKINETIC MEASUREMENT ON KNEES

#### The results of peak torque test

The strength of knees is a decisive factor in a player's performance in taekwondo contest. For example, a player needs one leg to support the kick and also needs to bend the knee to slow down when getting down to the ground after the jump, which works as a brake to the whole move. If a player's knees are not strong enough in a very competitive contest and his or her knees cannot work as a brake after the move, he or she will get injured and it finally lead to failure in the contest. In this sense, the strength of knees is very important for taekwondo players and the training on the strength of knees before the contest justified the theories mentioned above<sup>[6]</sup>. A medical test was conducted to test the strength of the players' knees and a machine test was also conducted to find out the actual improvement of strength of players' knees after the training, so as to give effective feedback about training methods and means. The information from the training was processed the professional data processing software and the data of speed test before and after the experiment are all shown in TABLE 3.

**TABLE 3 : The analysis of sample T with peak torque test in different angles of isokinetic measurement on knees before and after the training**

	angular velocity	N	$\bar{x}$	standard deviation	r	t	P
1	Flexor In Centripetal 60°/s before the training	20	79.30	30.401	0.884	4.422	<0.05
	Flexor In Centripetal 60°/s after the training	20	93.35	26.569			
2	Flexor In Centripetal 300°/s before the training	20	70.85	25.913	0.992	10.738	<0.05
	Flexor In Centripetal 300°/s after the training	20	79.65	27.446			
3	Flexor Eccentric 60°/s before the training	20	169.45	37.717	0.996	17.073	<0.05
	Flexor Eccentric 60°/s after the training	20	184.65	39.553			
4	Flexor Eccentric 300°/s before the training	20	180.00	50.387	0.996	11.552	<0.05
	Flexor Eccentric 300°/s after the training	20	193.65	52.925			
5	Flexor In Centripetal 60°/s before the training	20	135.10	25.369	0.992	17.260	<0.05
	Flexor In Centripetal 60°/s after the training	20	149.10	26.907			
6	Flexor In Centripetal 300°/s before the training	20	98.25	34.460	0.995	13.343	<0.05
	Flexor in centripetal 300°/s after the training	20	110.05	36.101			
7	FLEXor eccentric 60°/s before the training	20	146.90	28.405	0.993	13.406	<0.05
	Flexor eccentric 60°/s after the training	20	160.65	31.243			
8	Flexor eccentric 300°/s before the training	20	130.45	31.482	0.997	13.234	<0.05
	Flexor eccentric 300°/s after the training	20	141.35	34.325			

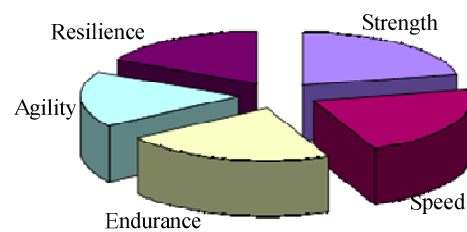
#### The analysis of isokinetic measurement results

TABLE 3 shows the speed of taekwondo players after the training on their knees and the peak torque of largest force when muscles contract in various angles, which indicates the ability of largest muscle contraction. The data in TABLE 3 was collected from different kinds of sports tests and muscle movements in various angular velocities. TABLE 3 demonstrates the comparative analysis of peak torque test in different angles of isokinetic measurement on knees before and after the training. All the information was processed and analyzed by statistics software programs and the players' isokinetic measurement results were all T-tested. With various centrifugal and centripetal angles, the mean values of peak torque all increased respectively. Extensor in centrifugal 60°/S and flexor in centripetal 60°/S had the largest increase. Quadriceps is responsible for the stretching of knees while ischiocrural is responsible for the bending of knees. By the data analysis of isokinetic measurement results before and after the stamina training, quadriceps and ischiocrural both became stronger after the training and the strength of knees were also increased. When the angular velocity was at 60°/S during the test, the strength of a player's knees reaches the biggest. When the angular velocity was at 300°/S during the test, the speed of a player's knees, the explosiveness, reaches the biggest.

## METHODS AND MEANS OF STAMINA TRAINING

In taekwondo training, the training methods and their functions and features should be fully aware. Besides, coaches should also pay close attention that how different training sections influence players' body functions and physical abilities. This will play a positive role in keeping taekwondo players' physical constitution balanced and give better guidance to keeping track of players' stamina. In building the stamina training system for taekwondo, it's necessary to combine the features of taekwondo to the training methods and make the methods and means well-targeted and practical. For example, special training programs like aerobic endurance training and reaction speed training can be included into stamina training to make the effects reach the fullest. The training could also help build players' ability of self-test, enabling them to realize the shortcomings and fair judgments to the problems. So interim conclusion about training methods and means can be reached and it finally leads to the comprehensive improvements of players' physical constitution and all kinds of abilities.

There are 2 kinds of strength training in taekwondo's strength training: the special strength training and the general strength training. The latter one usually doesn't adopt the means and methods of special training because it aims at improving players' body functions and skills in a systemic way<sup>[7]</sup>. The former one takes special training programs as the basics and focuses on the special skills of players, enabling them to enlarge the sport range, which is the foundation of improvements of various abilities. Transitional strength training includes speed, endurance, resilience and flexibility. All these aspects are coordinated and can mutually reinforce each other (shown in chart 3).



**Figure 3 : Parts of stamina training**

## CONCLUSION

This thesis gave a detailed research of keeping track of taekwondo players' stamina and cultivating the training ability, with the focuses of analysis of the results of isokinetic measurement on knees and stamina test results before and after the training. Then this thesis gave a further discussion of how these studies apply to the building of players' stamina monitoring system and therefore improve players' training ability.

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