© Eurasian Journal of Sport Science 2021; 1(2): 124-130
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The effectiveness of the formation during the experiment of the accuracy of the impact on the right and left foot when exposed to the load on the rotational movement in taekwondo at the age of 15-16 years

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Abstract
Purpose: It consists in studying the dynamics of changes in the course of pedagogical experience of the accuracy of kicks under the influence of body rotation to the left and right in 15-16 year old taekwondo athletes. Taekwondo athletes aged 15-16 years, consisting of 12 people from the control and experimental groups, were involved in pedagogical practice classes held for 7 months.
Methods: In the practice of taekwondo training, the specialized technical and vestibulosomatic exercises developed by us were carried out using questionnaires, video recordings, operational strength, statistic chronometry (time to maintain balance), vestibulo chronometry (maintaining balance during rotational movement exercises), pedagogical experience, mathematical and statistical methods in the technique of improving the accuracy of the pulse and its stability by extremely effective means.
Results: A block of tests designed to assess the effectiveness of specific physical and technical training in the practice of taekwondo training, including the ability to maintain balance in a reduced position of the base surface (leaning on the right and left leg or in the yeop chage position) and the effectiveness of specific movements (strokes) after exposure to rotational exercises, their objectivity is confirmed by the Uzbekistan Taekwondo WT Association of and registered as intellectual property by the IP CONSULTING CENTER (certificate № 003351). This block of tests was introduced into the practice of training taekwondo wrestlers.
Conclusion: The Based on the application of this block of tests during training, it was proved that the physical and technical training of young taekwondoists affects the stability of balance (static and dynamic balance), which plays an extremely important role in taekwondo, the accuracy of movements (right and left foot strike). It turned out that the accuracy of hitting the body with the left foot, especially when exposed to turning it to the right, can drop sharply. Such case is based on the fact that these taekwondo practitioners have a vestibular analyzer that controls the function of maintaining balance, which develops extremely “weakly”.

Keywords: 15-16-year-old taekwondo fighters, body rotation, right and left foot strikes, vestibular analyzer, balance maintenance.

Introduction

It is known that when performing tactical maneuvers in taekwondo competitions, the elements of turns or body rotations in different directions are repeated many times. According to experts, such twisting movements directly affect the vestibular analyzer, causing a "wiggle" reaction. As a result, this situation leads to a loss of balance coordination and a sharp decrease in the accuracy of movements(1,2,3,4,5). It is likely that if taekwondists have the opportunity to maintain dynamic balance with regular formation with the help of vestibulokinetic exercises (exercises on the spot, on circular turns while walking or running), the accuracy of the strokes performed during yeop chage, ap-chagi, will be stabilized.

Methods

New pedagogical tests, modified and developed to ensure the accuracy of the research results, were conducted in the form of a "test retest" with the participation of a large number of young taekwondo athletes (68 people) and student taekwondo athletes (55 people). During the tests, standardized technological requirements were met. This process was carried out with the participation of “expert coaches” appointed by Uzbekistan Taekwondo WT Association. The informativeness of the tests was confirmed by the act of the Uzbekistan Taekwondo WT Association and issued by the IP CONSULTING Center in the property (certificate № 003351). The research results were comparatively analyzed in different stratification order using mathematical and statistical methods (n, min, max, x, z, l, r), and their reliability was revealed.

Results and discussion

The results showed that the number of precise strokes to the dummy's head from a place with the right foot out of 6 chances without moving the body in a circular direction was expressed in the control group 4.5 ± 0.53 times before the experiment, after the experiment this indicator was 5.1 ± 0.59 or the rate of increase in the accuracy of the stroke was only 0.6 times ($P < 0.05$). In the experimental group (EG), these

indicators were demonstrated by 4.3±0.6 and 5.6±0.77 times, respectively, or the 10-month rate of increase in the accuracy of strikes was increased by 1.3 times (P<0.001) (see tables 4,5). When the same test was performed with the left leg, the accuracy of the stroke was 3.3±9.36 times in the control group (CG) before the experiment, 3.6±0.38 times after the experiment, or the increase in accuracy was expressed 0.3 times (P>0.05). In the EG, this indicator was 3.5±0.48 times before the experiment, at the end of the experiment it was 4.5±0.6 times or the accuracy increased to 1.0 times (P<0.001).

right foot in the EG, which has regular support of special experimental exercises developed by us in the course of its preparation, increased by 1.3 times by the end of the experiment, the accuracy of kicks performed with the left foot increased by 1.4 times. Another important element worth attention in this regard is that if before the experiment CG recorded an asymmetric difference of 1.6 times between the right and left legs and the accuracy of the kick, then after the experiment it was found that this difference increased to 1.8 times, or the degree of asymmetric difference was expressed by 0.2 times. In other words, it can be noted that in CG, the

Table 1. An increase in the accuracy of hitting the dummy's head with a foot after the load of turning the body 15 times to the left in 15-16 year old taekwondo athletes belonging to the control and experimental groups (n=12).

Tests	Group	Before the experiment			After the experiment			Growth rates		t	P
		$\overline{X}$	σ	V %	$\overline{X}$	σ	V %	absolute	relative		
Kicking the dummy's head without turning the body (6 chances/times): - on the right leg	CG	4.5	0.53	11.78	5.1	0.59	11.57	0.6	13.33	2.62	<0.05
	EG	4.3	0.6	13.95	5.6	0.77	13.75	1.3	30.23	4.61	<0.001
- on the left leg	CG	3.3	0.36	10.91	3.6	0.38	10.56	0.3	9.09	1.99	>0.05
	EG	3.5	0.48	13.71	4.5	0.6	13.33	1	28.57	4.51	<0.001
Asymmetric difference	CG	1.6			1.8			0.2	12.50		
	EG	1.7			1.1			-0.6	35.29		
After turning the body 15 times to the left, kicking the dummy on the head (6 chances/times): - on the right leg	CG	2.5	0.27	10.80	2.8	0.3	10.71	0.3	12.00	2.57	<0.05
	EG	2.8	0.38	13.57	3.6	0.48	13.33	0.8	28.57	4.53	<0.001
- on the left leg	CG	1.3	0.17	13.08	1.5	0.19	12.67	0.2	15.38	2.72	<0.05
	EG	1.6	0.23	14.38	2.1	0.3	14.29	0.5	31.25	4.58	<0.001
Asymmetric difference	CG	1.6			1.3			-0.3	18.75		
	EG	1.4			0.9			-0.5	35.71		

It can be seen that in CG, which was engaged in traditional training, the accuracy of hitting both on the right leg and on the left leg did not grow quickly, and these indicators respectively amounted to 0.6 and 0.2 times. At the same time, the accuracy of kicks with the

accuracy of the left foot strike is formed much slower than the accuracy of the right foot strike.

If we take into account that all the taekwondoists participating in the study are right-handed, then we can safely admit that both when practicing strokes in traditional

training with 15-16-year-old taekwondists, and when improving them, priority is given mainly to the leading right leg. This situation is manifested in the fact that the technique of strikes and their accuracy are not formed in the same symmetrical proportions in training. In turn, the approach to the process of training and improvement in such a methodical procedure limits the scope of technical and tactical techniques and causes a heavy load on the leading leg, thereby provoking increased symptoms of exhaustion in the leg muscles.

Alternatively, the asymmetric difference observed between the accuracy of Strokes performed on the right and left leg in EG, which was regularly maintained by special blocks of exercises developed by us during its preparation during the experiment, was almost indistinguishable from the accuracy of strokes recorded on CG before the experiment, and amounted to 1.3 times. But by the end of the experiment, the asymmetric difference between the accuracy of strikes in this group (EG) was reduced by 0.6 times, or the same difference was reduced by 1.1 times. In other words, the accuracy of the kicks inflicted with the left foot under the influence of experimental exercises used in EG was as close as possible to the exact number of blows performed with the right foot. So, it can be noted that the experimental exercise, which was developed by us and used in EG, has the property of progressive effectiveness.

This conclusion was also made based on the results of a study of the accuracy of right and left foot strikes with the effect of turning the body 15 times in different directions (left and right) in these groups. In particular, after turning the body 15 times to the left, the accuracy of hitting the dummy's head with the right foot dropped to 2.5± 0.27 times before the start of the experiment in the control group. After the experiment, the accuracy of strikes (2.8 ± 0.3 times) increased to 0.3 times, respectively (P>0.05). In EG, however, this indicator differs sharply before the experiment and was 2.8± 0.38 times higher. But by the end of the experiment, the accuracy of measuring the right foot strike in this group increased to 3.6±0.48 times (P<0.001) and the accuracy of measuring the stroke increased to 0.8 times.

Turning the body 15 times to the left, the accuracy of left foot strikes was 1.3±0.17 times before the experiment in the CG, 1.5±0.19 times after the experiment, or a 10-month increase in the accuracy of strikes was 0.2 times (P<0.05). In EG, these indicators were recorded with 1.6± 0.23 and 2.1±0.3 times, respectively, or the rate of increase in the accuracy of strikes in this group reached 0.5 times (P<0.001).

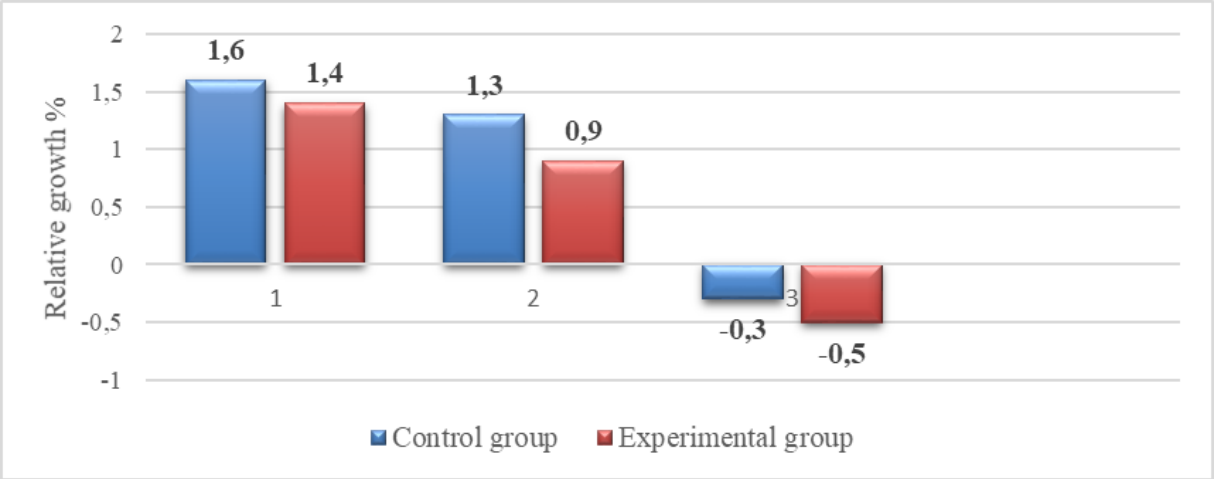


Figure 1. The rate of symmetrization by the end of the experiment is a fixed asymmetric difference between the accuracy of the right and left foot strikes in the control and experimental groups. Note: 1 - before the experiment; 2 - after the experiment; 3 - the degree of symmetry of the asymmetric difference;

It can be seen that the accuracy of the strikes performed on the left leg ("uncomfortable" leg) in the EG, which was regularly engaged in experimental exercises during the experiment, by the end of the experiment approached the accuracy of the kicks performed with the right leg.

The recorded asymmetric difference between the accuracy of the kicks by the right and

left foot was also demonstrated by positive indicators of the change in EG. For example, such an asymmetric difference in CG was 1.6 times before the experiment, 1.3 times after the experiment, while in EG, these indicators were equal to 1.1 times at the beginning of the experiment, by the end of the experiment, the asymmetric difference recorded initially was 0.8 times symmetrical (see figures 1, 2).

It turns out that the initially observed asymmetric difference between the accuracy of kicks performed with the right and left feet at the end of the experimental exercise used in the orded results were not demonstrated by sharply different indicators. However, after turning the body 15 times to the right, the indicators of accurate blows with the right and left foot on the head of the dummy differed sharply from the accuracy of the blows inflicted with the right and left foot after turning the body to the left.

In particular, it was noticed that the accuracy of the kick with right foot after turning the body to the right dropped sharply both before the experiment and after turning the body to the left (see tables 1, 2).

For example, the number of precise

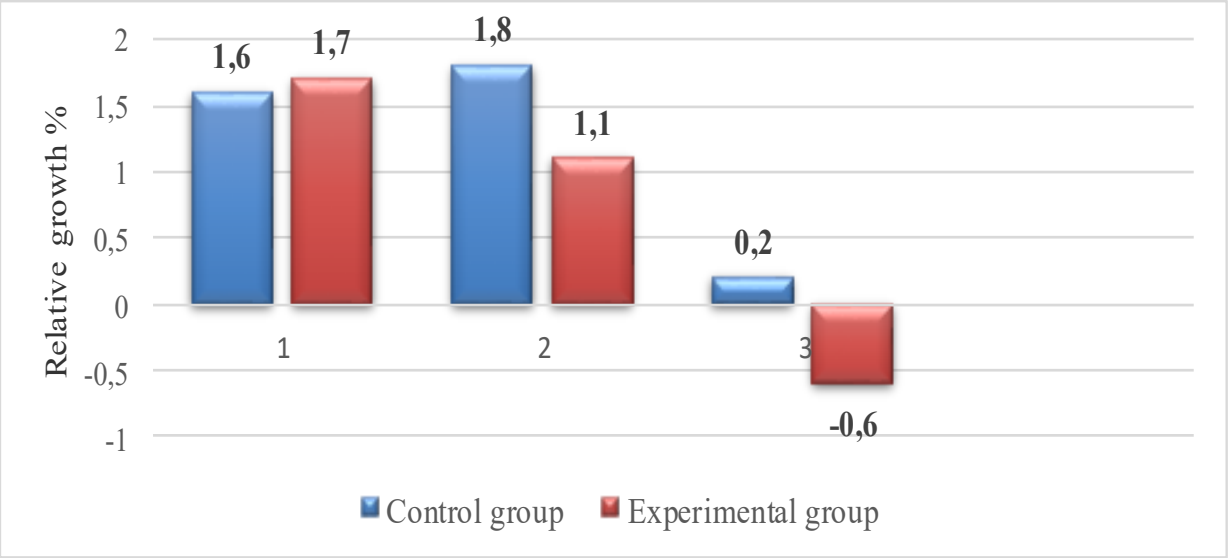


Figure 2. After turning the body 15 times to the left in the control and experimental groups, the recorded asymmetric difference between the accuracy of right and left foot strikes after the end of the experiment is the rate of summarization . Note: 1 - before the experiment; 2 - after the experiment; 3 - the degree of symmetry of the asymmetric difference;

EG was maximally symmetrical by the end of the experiment. Thus, it can be safely noted that the experimental complex of significant special exercises used in this group brought the number of kicks inflicted by the left ("uncomfortable") leg closer to the number of accurate blows performed by the right ("comfortable") leg.

Progressive directional results recorded in a calm state (without turning the body) and with the accuracy of right and left foot strikes after turning the body to the left or convenient side were also observed in the accuracy of blows received after loading the body to the right or unfavorable side. In this regard, it is worth recognizing that in a calm state, that is, when reapplying the test to assess the accuracy of hitting the dummy's head (target) with the right and left foot without turning the body, the rec-

strikes inflicted with the right foot was 1.5±0.17 times before the experiment, 1.7±0.19 times after the experiment in CG. The growth rate of accurate strikes was expressed by 0.2 times, respectively ($P<0.05$). While in EG, the accuracy of the kicks inflicted with the right foot, before the experiment, was expressed by sharply different indicators and was 1.8±0.24 times higher. However, the accuracy of right foot strikes in this group increased by 2.3±0.3 times by the end of the experiment, and the growth rate of the number of accurate strikes reached 0.5 times ($P<0.001$).

The accuracy of the strikes inflicted with the left foot decreased in CG from 0.7±0.12 times before the experiment and after the experiment from 0.8±0.13 times. The rate of increase in the accuracy of strikes was expressed by 0.1

Table 2. An increase in the accuracy of hitting the dummy's head with a foot after the load of turning the body 15 times to the right in 15-16 year old taekwondo athletes belonging to the control and experimental groups (n=12).

Tests	Group	Before the experiment			After the experiment			Growth rates		t	P
		$\overline{X}$	σ	V %	$\overline{X}$	σ	V %	absolute	relative		
Kicking the dummy's head without turning the body (6 chances/times): - on the right leg	CG	***4.3***	**0.42**	**9.77**	**4.8**	**0.46**	**9.58**	**0.5**	**11.63**	**2.78**	**<0.05**
	EG	*4.5*	0.53	11.78	5.6	0.65	11.61	1.1	24.44	4.54	<0.001
- on the left leg	CG	*3*	0.35	11.67	3.3	0.38	11.52	0.3	10.00	2.01	>0.05
	EG	*3.8*	0.47	12.37	4.7	0.57	12.13	0.9	23.68	4.22	<0.001
Asymmetric difference	CG	*1.3*			1.5			0.2	15.38		
	EG	*1.4*			0.9			-0.5	35.71		
After turning the body 15 times to the left, kicking the dummy on the head (6 chances/times): - on the right leg	CG	*1.5*	0.17	11.33	1.7	0.19	11.18	0.2	13.33	2.72	<0.05
	EG	*1.8*	0.24	13.33	2.3	0.3	13.04	0.5	27.78	4.51	<0.001
- on the left leg	CG	*0.7*	0.12	17.14	0.8	0.13	16.25	0.1	14.29	1.96	>0.05
	EG	*0.8*	0.15	18.75	1.1	0.19	17.27	0.3	37.50	4.29	<0.001
Asymmetric difference	CG	*0.9*			0.7			-0.2	22.22		
	EG	*0.8*			0.5			-0.3	37.50		

times. This means that taekwondo practitioners of this group, who continue to engage in traditional training, can recognize that the accuracy of the left foot strike is formed extremely sluggishly.

The median relative growth rates during the pedagogical experiment was 10.86% in the control group and 23.33% in the experimental group (2.15 times more than in the control group), the arithmetic mean values of the results of all tests that evaluated the accuracy of 15-16-year-old taekwondo athletes by kicking a dummy in the head after turning the body 15 times to the right.

Alternatively, during the experiment, it was noted that the accuracy of left foot strikes increased from 0.8±0.15 times to 1.1±0.19 times in EG, where there was regular support for the experimental significant exercises developed by us (P<0.001), or the accuracy of such strikes increased by 0.3 times. The asymmetric difference of these indicators was also symmetrical twice (0.4 times). The results of the pedagogical experiment, which were analyzed in the comparative analysis above, showed that traditional training with 15-16-year-old taekwondoists, first of all, kicks that are applied by the foot, taekwondoists are more accurate, mainly on the leading leg (right leg), while on the "weak" leg (left leg), they can perform extremely sluggish. The results of the 10-month pedagogical experience again allow us to admit such cases that the accuracy of strikes inflicted by the right and left foot in CG, which continued to engage in traditional training during the experiment, did not grow in symmetrical proportions, both in a calm state by the end of the experiment, and when turning the body to the right and left. It was especially noticed that the accuracy of the left foot strike in the effect of turning the body to the right (an unfavorable side for right-handers) it turned out to be ex-

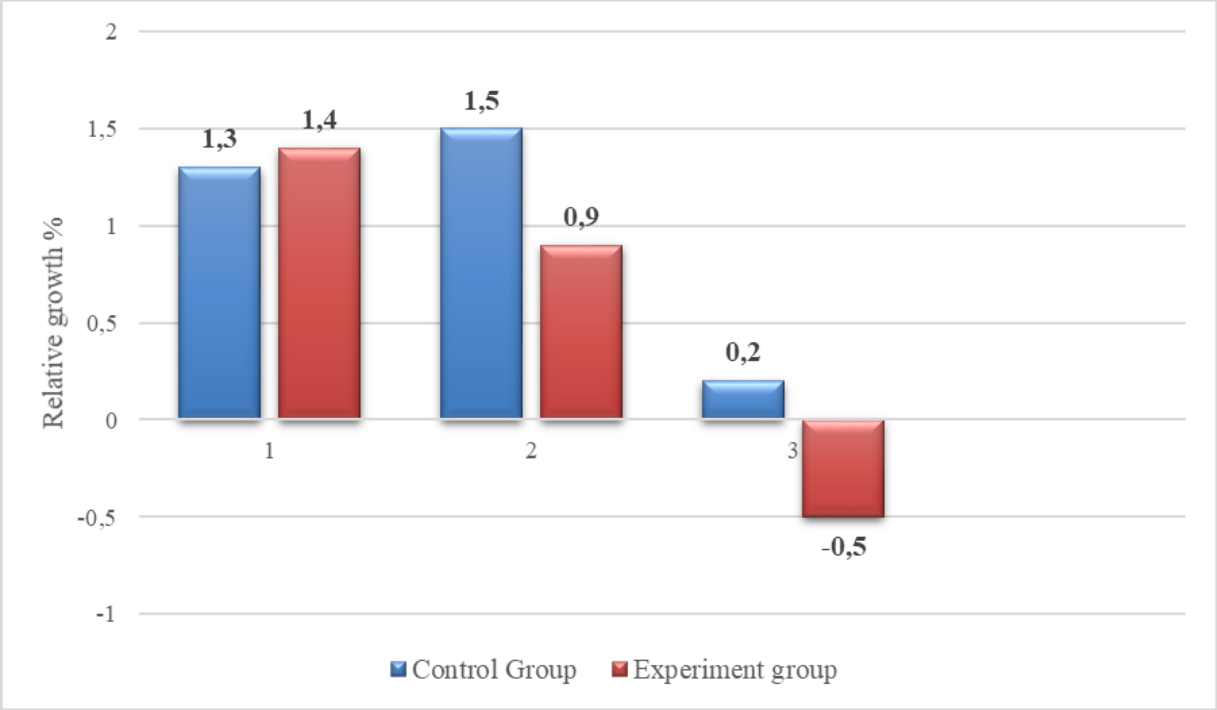


Figure 3. The rate of symmetrization by the end of the experiment is a fixed asymmetric difference between the accuracy of the given right and left foot strikes in the control and experimental groups. Note: 1 - before the experiment; 2 - after the experiment; 3 - the degree of symmetry of the asymmetric difference;

tremely sluggish. At the same time, in the EG, which regularly performed special experimental exercises developed by us during the experiment, it was found that all of the above indicators changed in a progressive direction.

Conclusion

Based on the results of the comparative analysis above, a number of conclusions can be drawn.

Firstly, for young CG taekwondo practitioners practicing traditional training, the accuracy of striking with 6 attempts with the right foot in an equal position before the experiment was 4.5+0.53 times, but at the end of the experiment this indicator increased to 5.1+0.59 times. In EG, who regularly performed vestibulosomatic exercises aimed at increasing the stability of equilibrium during the experiment, these values were expressed as 4,3+0,60 - 5,6+0,77 three times, respectively.

Secondly, before the experiment, it was noticed that the accuracy of hitting on the right and left legs decreased sharply in both groups with the effect of turning the body to the left, especially to the right, which was unfavorable for right-handers. But at the end of the experiment, it was noted that the young taekwondo athletes in EG, who were engaged in experimental meaningful training during this period, had an effective increase in the accuracy of strikes on both the right leg and the left leg, despite performing under the influence of rotational movement.

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