

## DEVELOPING FLEXIBILITY IN YOUNG 12—14 YEAR OLD AIKIDO ATHLETES

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The problem of insufficient effectiveness of basic aikido techniques due the low level of musculoskeletal apparatus flexibility in young aikidoists was identified. The article considers the possibility of flexibility development as part of the physical education of aikido athletes at the course of training. Recommendations for developing flexibility aimed at improving of effectiveness of the aikido techniques performance including evasive techniques are offered. As a result of the experiment it was established that the efficiency of physical training increased in the aikido practitioners who had the flexibility development techniques included in the training course.

**Keywords:** *flexibility, training stage of preparation, effectiveness of Aikido technique.*

**Relevance.** In all martial arts and combat sports, flexibility facilitates performing movements and techniques with the maximum amplitude appropriate for the given technique without loss of effectiveness [5]. The analysis of seminars, examinations and festivals in children and adults revealed that the state of flexibility in adults and children is low, while the mastery of technical aikido techniques in black belt athletes is higher. Therefore, aikido masters who lack flexibility perform techniques with an incorrect amplitude, compensating for these insufficiencies by exerting excessive force. By demonstrating these techniques at festivals, master classes, training sessions and general seminars, beginners and experienced aikido practitioners learn to perform wrong amplitude of the techniques and then continue demonstrating the incorrect performance of the movements. Therefore, it is relevant to develop flexibility in all stages of aikido training to develop movements performance effective in terms of efforts and to improve the effectiveness of applying aikido techniques. Instructors and coaches also have to apply flexibility building exercises with their trainees. With the principle of demonstration, trainees will improve their technique more quickly and increase the amplitude of their movements.

**Introduction.** Along with coordination abilities, flexibility is one of the leading physical qualities in Aikido. Underestimation of the proper development of flexibility in the students leads to an increase in the frequency of injuries, which can significantly slow down the progress of mastering aikido techniques. Without the proper development of this physical skill Aikido practitioners will not be able to master the technical section of “Randori” (free-style practice)

as at this level it is necessary to perform techniques (kihon-waza), body-striking techniques (atemi-waza) as well as counter techniques (kaesi-waza) quickly and dynamically against multiple opponents. Without the appropriate level of flexibility, it is not possible to apply a defensive move and evade the opponent’s attack.

Performing the Kaeshi-waza set of techniques requires a well-developed range of moves with a high level of flexibility. This will allow you to adjust to the attacker’s strength by occupying his point of gravity and finish the technique with a throw or submission hold [4]. Good flexibility allows to perform evasive techniques (ukemi, tobi-ukemi) and evade pain effectively, with subsequent execution of counter-techniques.

In order to perform evasive technique successfully, an aikido practitioner needs a flexible and “stretched” body, otherwise at the moment of contact, muscles may be stretched or even bones may be broken [3]. Unfortunately, many aikido masters who demonstrate various techniques do not show how they assist their students by performing evasive technique, given that aikido consists not only of using sets of movements but also of applying “evasive actions” [2].

Due to the developed flexibility of the lower limbs, the master is able to demonstrate kicking, defending against kicking and evasive techniques. At festivals and seminars, not many masters show techniques of defending against kicking. This implies that the trainees do not know how to assist in the execution of evasive techniques against kicks with lower limbs and do not have a sufficient level of flexibility development due to the lack of flexibility exercises in the instructors’ teaching methodology. The aikidoist’s body must be flexible enough. Flexibility greatly af-

fects the quality of an aikidoist’s attacks and defences [4]. The higher the level of flexibility of an Aikido practitioner, the better the execution of techniques and the better the effectiveness of defensive actions enables the use of countermoves.

In this regard, the authors have developed special sets and stances for the development of flexibility of aikido trainees during the training stage to improve technical skills more effectively. By improving the mobility of the joint and ligament apparatus, aikido will be able to perform techniques with greater amplitude, increase mobility of movement while assisting and performing techniques, increasing the efficiency of striking techniques and the potential for mastering more advanced techniques.

**Organization and methods of research.** The analysis of the data obtained from examinations for the next degree of technical mastery, seminars and performances at aikido festivals has revealed that the technical training of aikido practitioners of technical degree 5—3 kyu (training stage) needs to be improved. It was also discovered that the physical qualities that determine the effectiveness of aikido techniques are flexibility, as well as special and general endurance, but without proper development of flexibility the technique cannot be performed quickly, or it will be performed with the wrong amplitude and will cause damage. It is also worth noting that good flexibility makes the technique more economical and therefore less effort is expended, hence the intensity of the techniques will increase.

To determine the optimum training modes aimed at developing flexibility, we conducted a twelve-week experiment. The study was conducted in the Municipal Budgetary Institution for Supplementary Education “Centre for Children and Youth”. (Moscow region, Noginsky district, Elektrougli).

Boys aged 12–14 took part in the pedagogical experiment. Several motor tests were conducted to determine the level of flexibility development in aikido athletes of this age group. Two groups (15 boys in the control group and 15 boys in the experimental group), relatively homogeneous in composition and level of fitness, were identified on the basis of the test results.

The control group was trained according to the traditional methods based on the Aikido program, while the experimental group was trained according to a special method designed by the authors, aimed at developing the flexibility of aikido practitioners. Both groups trained 4 times a week for 2 hours each. The experimental methodology included the performance of sets and stances, as well as preliminary techniques and techniques that require an increased level of flexibility development.

**The results of the study and their discussion.** In order to identify the impact of the experimental technique on the development of flexibility of aikidoists, at the beginning and at the end of the study in the control and experimental groups, tests were conducted to identify the level of flexibility development (Table 1—4).

Table 1

**The results of testing aikidoists of the control group before the experiment**

Full name	Tests for the level of flexibility development assessment.												Average value
	1	2	3	4	5	6	7	8	9	10	11	12	
B-i	8	14,0	13,5	7,4	7,2	7	7,8	6	31	30	13,7	6,5	12,68
B-r	8	13,6	13,3	8,5	7,0	14	8,6	13	18	16	14,3	6,8	11,76
D-m	8	13,9	13,2	7,9	7,1	11	7,9	10	25	20	14,1	6,9	12,08
Z-m	8	13,5	13,1	6,8	7,5	3	8,2	1	21	21	13,8	6,1	10,25
K-v	8	13,7	13	8,1	7,7	7	8,3	6	24	25	13	6,5	11,69
K-d	10	14,5	14	8,5	6,9	12	7,8	11	7	8	14,5	7	10,10
M-s	6	13,1	12,8	7,5	8,1	5	8,3	3	9	11	13	6,4	8,60
M-m	8	13,8	13,4	7,6	8,2	7	8,8	3	17	18	14	6,6	10,45
M-i	8	14,5	13,2	7,8	8,4	6	9,2	2	34	34	13,2	6,5	13,07
R-m	4	12,9	12	4,9	9,0	2	9,5	1	38	40	12,5	5,6	12,62
F-m	6	13,3	12,5	5,5	8,9	2	9	1	40	37	12,6	5,7	12,79
Kh-e	8	13,3	13	7,9	7,8	10	8,4	10	13	13	13	6,7	10,34
Ch-i	10	14,6	14,9	8,9	7,9	14	8	14	18	16	14,4	6,9	12,30
Sh-n	8	13,4	13,3	6,9	8,5	5	9,4	3	23	23	12,9	6,2	11,05
Sh-d	8	13,2	13,4	7,9	8,3	6	9,1	3	26	26	13,1	6,4	11,70
<b>Average value</b>	<b>7,73</b>	<b>13,69</b>	<b>13,24</b>	<b>7,47</b>	<b>7,90</b>	<b>7,40</b>	<b>8,55</b>	<b>5,80</b>	<b>22,93</b>	<b>22,53</b>	<b>13,47</b>	<b>6,45</b>	<b>11,43</b>

Table 2

**The results of testing aikidoists of the control group before the experiment**

Full name	Tests for the level of flexibility development assessment												Average value
	1	2	3	4	5	6	7	8	9	10	11	12	
B-a	8	14,3	14,1	7,9	8,2	6	8,6	5	15	13	13,5	6,6	10,02
G-n	6	13,2	13,3	6,9	8,6	3	8,3	3	10	9	13,4	6,4	8,43
K-ya	8	13,4	13,5	7,9	8,7	5	7,9	5	14	14	13,6	6,5	9,79
K-m	10	15,9	15	8,5	6,1	13	7,1	12	7	7	15	7,5	10,34
K-v	8	13,5	13,7	7,2	6,9	9	8	8	13	13	13,8	6,7	10,07
K-n	8	13,9	13,9	8,1	7,0	6	8,2	5	18	18	14	6,4	10,54
M-v	6	13,3	13	5,9	8,5	5	8,8	2	30	28	13,5	6,1	11,68
N-v	6	13,0	13	5,5	8,9	3	9,1	2	37	35	12,5	5,9	12,58
P-m	6	13,3	13,5	6,6	8,8	5	8,8	3	35	32	12,7	6	12,56
P-a	6	13,2	13,1	7,5	8,7	4	8,7	2	30	29	13	5,9	11,76
S-t	8	14,2	13,9	8	7,0	12	7,5	9	27	23	14,2	6,5	12,53
Kh-m	6	13,5	13	6,4	7,8	5	7,9	3	28	27	12,9	5,9	11,37
Sh-a	10	14,4	14,5	8,2	6,9	12	7,7	11	23	23	14,7	6,6	12,67
Sch-a	8	13,6	13,5	8,3	8,7	8	7,7	7	21	21	13,8	6,4	11,42
Yu-e	10	14,9	14,5	7,8	6,8	7	7,6	6	4	8	14,4	6,7	8,98
<b>Average value</b>	<b>7,60</b>	<b>13,84</b>	<b>13,70</b>	<b>7,38</b>	<b>7,8</b>	<b>6,87</b>	<b>8,13</b>	<b>5,53</b>	<b>20,80</b>	<b>20,00</b>	<b>13,67</b>	<b>6,41</b>	<b>10,98</b>

Table 3

**Test results of the aikido players of the control group after the experiment**

Full name	Tests for the level of flexibility development assessment.												Average value
	1	2	3	4	5	6	7	8	9	10	11	12	
B-i	8	14,1	13,56	7,4	7,1	7	7,7	6	30	30	14	6,6	12,62
B-r	8	13,6	13,35	8,5	7,0	14	8,4	13	18	16	14,3	6,9	11,76
D-m	8	13,9	13,26	7,95	7,1	11	7,8	10	24	20	14,1	6,9	12,00
Z-m	8	13,5	13,14	6,9	7,5	4	8,1	2	19	21	14	6,2	10,28
K-v	8	13,7	13,1	8,1	7,7	7	8,2	6	23	24	13,7	6,5	11,67
K-d	10	14,5	14,4	8,5	6,8	12	7,8	11	7	8	14,5	7	10,13
M-s	7	13,3	12,9	7,5	8,0	6	8,3	3	9	11	13,2	6,6	8,82
M-m	8	13,8	13,4	7,6	8,2	7	8,8	3	17	18	14	6,6	10,45
M-i	8	14,5	13,3	7,8	8,4	6	9	3	32	34	13,2	6,5	12,98
R-m	6	12,9	12,4	4,9	8,7	3	9,2	3	36	40	13	5,8	12,91
F-m	7	13,4	12,6	5,7	8,7	4	9	4	38	37	13,3	5,8	13,21
Kh-e	8	13,5	13	7,9	7,8	10	8,4	10	13	13	13	6,7	10,36
Ch-i	10	14,6	14,9	8,9	7,9	14	8	14	18	16	14,4	6,9	12,30
Sh-n	8	13,4	13,4	6,9	8,3	6	9	4	23	23	13,1	6,3	11,20
Sh-d	8	13,2	13,4	7,9	8,1	7	8,9	5	24	25	13,4	6,4	11,78
<b>Average value</b>	<b>8,00</b>	<b>13,73</b>	<b>13,34</b>	<b>7,50</b>	<b>7,82</b>	<b>7,87</b>	<b>8,44</b>	<b>6,47</b>	<b>22,07</b>	<b>22,40</b>	<b>13,68</b>	<b>6,51</b>	<b>11,50</b>

At the end of the experiment aikido athletes of both groups were tested to determine the increase in performance in control exercises (Table 5), as is practiced in other sports [1].

By analyzing the flexibility indicators, we identified an increase in performing control exercises indicators in both groups. However, the indicators of the experimental group increased significantly, except for tests 5, 7, 9, 10, as in these tests, the smaller the index, the better. In test 5, the mobility of the shoulder

joint was assessed by the distance between the hands when twisting the stick: the smaller the distance, the greater the flexibility of this joint, and vice versa. In Test 7, the subject performed the crab position exercise ("Bridge"). The value (in cm) was measured from the heels to the fingertips of the subject's hands. The smaller the distance, the higher the level of flexibility, and vice versa. In tests 9 and 10, the subject was asked to do a split. The level of mobility in the hip joints was assessed by the distance from

Table 4

**Test results of aikido players in the experimental group after the experiment**

Full name	Tests for the level of flexibility development assessment.												Average value
	1	2	3	4	5	6	7	8	9	10	11	12	
B-a	10	14,6	14,6	8,3	7,7	8	8,1	7	12	9	14,2	6,9	10,03
G-n	8	13,9	13,9	7,9	8,1	7	7,8	5	8	6	14,3	7	8,91
K-ya	8,7	14,0	13,8	8,9	8,2	7	7,5	8	11	9	14,5	6,6	9,77
K-m	10	15,9	15	8,7	5,9	14	6,5	13	0	0	15,2	7,6	9,32
K-v	8,5	14,2	13,7	8,4	6,4	10	7,4	10	9	8	14,6	6,7	9,74
K-n	8	13,9	13,8	8,3	6,5	9	8	8	14	10	14,7	6,6	10,07
M-v	8,1	14,1	13,9	7,2	7,2	8	8,1	6	18	15	14,5	6,5	10,55
N-v	8,3	14,3	15	7,5	8,1	7	8,2	6	20	19	13,6	6,4	11,12
P-m	8,5	13,3	13,6	8,6	8,1	8	8	7	24	21	14	6,4	11,71
P-a	8,1	13,2	13,5	8,7	8,2	8	8,1	6	21	18	14,1	6,2	11,09
S-t	10	14,2	13,9	8,9	6,6	12	7,2	12	20	16	15	6,6	11,87
Kh-m	8	14,1	13,5	8,4	7,2	5	7,1	6	22	18	14,1	6,7	10,84
Sh-a	10	14,9	14,9	8,2	6,7	14	7,2	14	23	14	15	6,8	12,39
Sch-a	8	14,2	14	8,8	7,9	11	7,3	11	15	10	14,9	6,9	10,75
Yu-e	10	15,2	15	8,8	6,5	10	7	12	0	0	15,1	7,5	8,93
<b>Average value</b>	<b>8,81</b>	<b>14,27</b>	<b>14,14</b>	<b>8,37</b>	<b>7,3</b>	<b>9,20</b>	<b>7,57</b>	<b>8,73</b>	<b>14,47</b>	<b>11,53</b>	<b>14,52</b>	<b>6,76</b>	<b>10,47</b>

Table 5

**Comparison of flexibility and joint mobility indicators from the experiment**

	Control exercises	Test group		P
		CG	EG	
1.	Mobility of the cervical spine	8 ± 0,26	8,81 ± 0,23	P ≤ 0,05
2.	Mobility of the wrist joint	13,73 ± 0,13	14,27 ± 0,18	P ≤ 0,05
3.	Mobility of the elbow joint	13,34 ± 0,16	14,14 ± 0,15	P ≤ 0,05
4.	Mobility of the shoulder joint 1	7,5 ± 0,27	8,37 ± 0,13	P ≤ 0,05
5.	Mobility of the shoulder joint 1	7,82 ± 0,16	7,3 ± 0,21	P ≤ 0,05
6.	Spinal column mobility 1	7,87 ± 0,91	9,2 ± 0,68	P ≤ 0,05
7.	Spinal column mobility 1	8,44 ± 0,13	7,57 ± 0,13	P ≤ 0,05
8.	Assessment of flexibility of the posterior surface of the thigh, hamstring, lower back, and gluteal muscles	6,47 ± 1,04	8,73 ± 2,99	P ≤ 0,05
9.	Mobility of the hip joint 1	22,07 ± 2,36	14,47 ± 7,77	P ≤ 0,05
10.	Mobility of the hip joint 2	22,40 ± 2,45	11,53 ± 6,51	P ≤ 0,05
11.	Mobility of the knee joint	13,68 ± 0,14	14,52 ± 0,47	P ≤ 0,05
12.	Mobility of the ankle joint	6,51 ± 0,1	6,76 ± 0,39	P ≤ 0,05

the floor to the pelvis (coccyx). A centimeter ruler was used to measure inclinations in tests 6 and 8, and a goniometer was used to measure the angle in degrees in the other tests.

**Conclusions:**

1. The aikido training process at the training stage should be based on the involvement of new techniques aimed at increasing the level of flexibility development. The proposed methods and techniques showed high efficiency in the participants in the experimental group. According to the control tests, we see a marked improvement in joint mobility in the experimental group.

2. A targeted increase in the total number of exercises aimed at the development of flexibility has a positive impact both on the quality of technical skills of aikido practitioners and on the level of their functional preparedness for training load. Based on hip joint mobility scores, the experimental group had a 6,33 and 8,47 decrease in distance to the floor, while the control group had only a 0,86 and 0,13 decrease in distance to the floor. This allows us to draw a conclusion about a higher level of flexibility development in the aikido athletes from the experimental group.

3. The application of techniques and exercises for the development of mobility of the joint and

ligament apparatus, Aikido trainees increased flexibility indicators, which significantly affects the physical fitness of aikidoists. As a result, Aikido trainees at the training stage will be able to improve their technical skills and master more complicated techniques in the future.

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## PHYSICAL CULTURE. SPORT. TOURISM. MOTOR RECREATION

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### Развитие гибкости юных айкидоистов 12—14 лет

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Выявлена проблема недостаточной эффективности использования базовой техники айкидо в связи с невысоким уровнем развития гибкости суставно-мышечного аппарата юных айкидоистов. В статье рассмотрена возможность развития гибкости в физическом воспитании айкидоистов на тренировочном этапе подготовки. Предложены рекомендации по развитию гибкости для повышения эффективности использования страховки при ассистировании и выполнении техники айкидо. В результате проведенного эксперимента установлено повышение эффективности физической подготовки айкидоистов тренировочного этапа подготовки, занимающихся по методике развития гибкости.

**Ключевые слова:** *гибкость, тренировочный этап подготовки, эффективность техники айкидо.*

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