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Development of flexibility in 17–18-year-old Savat boxers

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ABSTRACT

French Savate boxing is growing in popularity in Ukraine, making the study of physical qualities, such as flexibility, essential for athletic success. Flexibility is a critical factor in executing complex, coordinated strikes in Savate. This study aimed to assess the flexibility levels of 17- to 18-year-old Savate boxers and explore methods to enhance it. The research was conducted at Lesya Ukrainka Volyn National University in Lutsk with ten healthy students aged 17-18, who had 1-2 years of Savate training experience and voluntarily participated with informed consent. The flexibility of the participants was evaluated using tests for shoulder joint mobility, hip joint mobility, and overall flexibility through specific exercises. The study involved theoretical research, practical assessment, and the implementation of an experimental flexibility training method. The results showed significant improvements ($p<0.05$) in flexibility specific to Savate boxing, leading to better execution of complex strikes such as Chasse frontal, Chasse lateral, and Chasse tournant during sparring sessions. The findings highlight the importance of targeted flexibility training in improving athletic performance in Savate boxing. This experimental method demonstrated effectiveness and has potential for broader application in the training of Savate fighters.

KEYWORDS

Flexibility; Savate; Methodology; Tests; Students

1. INTRODUCTION

In the world of martial arts, there is an active search for the most effective methods, techniques, and exercises that develop the main professional qualities of athletes in this discipline – flexibility, control, and dexterity. The definition of French savate boxing at the international level took place in 1924 at the Olympic Games in Paris; in 2008, the International Federation of University Sports, FISU recognised savate, which made it possible to hold the first world championship of this sport in France in 2020.

In recent years, savate has gained particular popularity around the world and in the territory of Ukraine. Savate is a martial art and a modern competitive sport that requires dexterity, flexibility and control (Podrigalo et al., 2017). One of the critical skills of savate boxers is flexibility because kicks are performed with a significant amplitude of movements while using the connection of the athletes' arms and legs, which requires them to have a high level of motor skills (Rovniy et al., 2018; Tropin et al., 2021a).

According to scientists, martial arts is a unique complex of techniques that ultimately allow one to defeat an opponent or inflict maximum damage on him. A wrestler can achieve this goal with the help of not only lightning-fast physical training but also the concentration of the spirit.

Functional training of savate boxers improves their physical characteristics, including flexibility during a fight. Continuous and interval training are distinguished, which, combined with spiritual development, allow you to achieve maximum competition results (Girinathan & Lillypuspam, 2019).

Most techniques with the feet can be performed in motion, jumping, from a turn, and when changing the stance. They are allowed to perform blows at all three levels of the body. In matches at amateur championships, all kicks must be performed technically flawlessly, and the advantage is brought by high kicks and combined series, which bring a more significant number of points (Savchenko & Lukina, 2016; Korobeynikov et al., 2022).

Given the complexity and volume of technical actions in this sport, flexibility is one of the critical motor skills that must be brought to a high level through training. For savate boxers, optimal flexibility of the whole body is necessary (Sanzharova et al., 2018). It should not be forgotten that, in addition to striking, flexibility is also essential for performing various evasions, deviations, breaking the distance and everything else that involves mobility in combat. Therefore, the development of flexibility in savate boxers should be relevant.

An exciting type of French sport is boxing-savate, the history of which began in the 19th century. Savate is an effective method of self-defence and an opportunity to develop an athlete's appropriate physical qualities. Savate is not only an exciting type of oriental sport but also an effective way of self-defence and excellent physical development of athletes. Modern principles of the organisation of French boxing made it possible to surpass the results of Korean taekwondo and Japanese karate.

Scientific research in the field of savate shows that martial arts are not only a particular set of exercises and techniques that help defeat the enemy or inflict maximum damage on him but also aim at spiritual development and self-control. The researchers' data show that savate combines elements of English martial arts and kicking techniques, which requires perfect flexibility of the body and mind (Guillaume & Georges, 1986).

The critical components of savate are ethics, learning, aesthetics, and efficiency. The mind is the main factor in fighting in savate, which requires explicit psychomotor coordination of movements from the athlete, especially flexibility and body balance, combined with perseverance and courage (Maillet, 1987; Konovalchuk, 2024).

According to the researchers, the formation of the bat's motor qualities is essential to prevent injuries to athletes during training and directly at competitions. The most frequent causes of boxers' injuries during training are insufficiently correct organisation of exercises, namely, inappropriate loads in magnitude and direction (Holokha et al., 2021). The formation of the flexibility of the body in savate can be disturbed due to the unstable position of the fighter, insufficient mastery of falling techniques during the fight in training and competition, the use of incorrect methods of putting the opponent off balance during the fight, incorrect foot action in the complex of techniques, unjustified relaxation of the body during the performance of the main sparring matches (Romanenko et al., 2021).

The researchers concluded that the critical movement qualities of savate athletes are achieved through the correct organisation of training and competitions, the use of appropriate material and technical equipment, conducting training and competitions in periods of favourable weather and sanitary conditions, observing the rules of medical examination and forming a precise discipline of boxers (Hrebik, 2016; Traumatism, 2022; Konovalchuk et al., 2024).

The development and improvement of body flexibility during training and competition for savate boxers takes a leading place, according to the authors, in connection with the need to create

conditions for the prevention of severe injuries that can lead to mutilation or even death, for example, concussion due to a knockout or knockdown of a boxer (Bakiko et al., 2019), various absolute and relative injuries of the upper, lower limbs (Ananchenko et al., 2018).

Studies of the leading indicators of the physical properties of boxers indicate that height, bone and muscle mass are essential (athletes with higher height, bone and muscle mass and indicators of total metabolism have better performance results) (Tatlibal et al., 2022).

Scientists systematically search for opportunities to check the leading indicators of boxers; in particular, it is necessary to note the diagnostic system, which consists of 21 motor and 8 motor tests, with the help of which it was indicated that boxers with better coordination, who can effectively change the direction of their body, use fast movements of their body parts, can achieve much better results compared to athletes with worse coordination indicators (Kalač & Gontarev, 2014).

The study aims to investigate the development of flexibility in 17–18-year-old savate boxers. The tasks of the research are the evaluation of the results of unique methods of testing young athletes: the test for determining the mobility of the joints (shoulder, hip), the test "bridge from the lying position", which makes it possible to conclude the degree of development of the main strength characteristics of savates– flexibility, control, dexterity.

2. METHODS

2.1. Participants

The study was conducted at LesyaUkrainkaVolyn National University in Lutsk. Ten healthy students, aged 17–18, who practice in the French Boxing Savate section voluntarily agreed to participate in the experiment. The athletes have 1–2 years of sports experience. All of them were assigned the same experimental task. Informed consent was obtained from all participants in this experiment.

The experimental technique involved the use of unique means. The content of special exercises was determined by the need to develop the flexibility characteristic of French savate boxing. These were exercises on the bridge: bending the neck on the bridge with the touch of the shoulder blades and bending in the back with the touch of the carpet with the nose, transitions (from the "triangle" position, jump to the bridge and back), running (from the "triangle" position, circle the torso to the right and left), getting up from a rack to a bridge (with insurance, on a gymnastic wall, independently). Exercises with weights were also used (neck flexion and extension on the bridge

with a pancake, bending and twisting of the body with a pancake to the right and left); overcoming the resistance of elastic objects (imitation of performing technical actions with elastic rubber (picking up an opponent, turning to throw a "pinwheel", through the thigh, kidneys under the arm), lifting the trunk into a sitting position from a lying position, extending the trunk from a sitting position to a lying position).

Scientific research was carried out by the ethical standards of the responsible human rights committee, with the approval of the Department of Education and Science of the executive body of the Lutsk City Council.

2.2. Tests

The following research methods were used to solve the set goal: a test to determine the mobility of the shoulder joints, a bridge from a lying position, and a hip joint mobility test. In the training process of the experimental group, special exercises for the development of flexibility were introduced, and the control group practised according to the current programme for Junior High School.

Test to determine the mobility of the shoulder joints

Equipment: gymnastic stick, ruler. *Conducting the test*: The test participant lies on his stomach, legs together straight, hands forward with a gymnastic stick, and grips at shoulder width. At the command "You can!" the participant, without bending at the hip joints, without bending the elbow joints and without raising the head from the floor, raised the gymnastic stick as high as possible. *Result:* The height of the stick raised above the floor was determined (Platonov, 2020; Tropin et al., 2021b). The results were compared with the average results presented in Table 1.

Table 1. Assessment of shoulder joint mobility, cm

Result	Points
50,5	5
45,5	4
40,5	3
30,5	2
20	1

Bridge from a lying position

Equipment: gymnastic mat, centimetre ruler. *Conducting the test*: From lying on the back, feet pulled up to the buttocks, hands resting at shoulder level near the head, perform the bridge.

General instructions and comments: The exercise was performed smoothly. The position of the bridge was maintained for 2 seconds. *Result:* The distance between the palms and heels was measured (Zagura, 2001; Danyshchuk et al., 2022).

Test to determine the mobility of the hip joints

Conducting the test: The test participant stands with his back to the gymnastic wall. The athlete holds the wall at shoulder level with his hands. A vertical bar is attached to the wall behind which centimetre divisions are applied (from bottom to top). At the command "You can!" the participant performs transverse splits. The smallest distance from the inguinal area to the floor is registered on the measuring bar (Saienko & Michelman, 2010; Tropin, 2017; Ananchenko et al., 2020).

Result: The hip joints' mobility amplitude is determined in centimetres. Estimates of mobility indicators in the hip joints when performing transverse splits are given in the Table 2. General instructions and remarks: When performing transverse splits, you can grab the crossbars of the gymnastic wall with your hands (Chertov & Boychenko, 2023; Yu & Boychenko, 2023).

Table 2. Normative estimates of mobility indicators in the hip joints when performing transverse splits, cm

Mobility in the joints, cm	Points	Mobility in the joints, cm	Points	Mobility in the joints, cm	Points
48-47	0,4	30-29	4,0	12-11	7,6
46-45	0,8	28-27	4,4	10-9	8,0
44-43	1,2	26-25	4,8	8-7	8,4
42-41	1,6	24-23	5,2	6-5	8,8
40-39	2,0	22-21	5,6	4-3	9,2
38-37	2,4	20-19	6,0	2-1	9,6
36-35	2,8	18-17	6,4	0	10,0
34-33	3,2	16-15	6,8		
32-31	3,6	14-13	7,2		

2.3. Statistical Analyses

Statistical analysis of the obtained data between indicators of physical fitness was performed using the statistical programme SPSS (version 22). The indicators of descriptive statistics were determined: the arithmetic mean of the variation series ($\bar{x}$), the error of the arithmetic mean (m), the square deviation (S), and the coefficient of variation (V). Comparison and determination of the reliability of differences between individual groups using Student's t-test, with a significance level of at least 0.05.

3. RESULTS

Table 3 shows the average statistical data for testing the flexibility of avatars in the 17–18 age group after implementing the experimental method. The results indicate that the shoulder girdle strength of French Savate boxing fighters is high.

Table 3. Indicators of flexibility of savaters in the age group of 17–18 years after the experiment, cm

Test	$\bar{x}$	m	S	V
Lifting the hands, cm	41,3	0,4	2,5	6,6
Bridge, cm	12,5	0,1	2,1	5,9
Transverse twine, cm	12,4	0,2	4,1	10,7

The average mobility index of the shoulder joints of the examinees was 41.3 cm. According to the rating scale, this indicator corresponds to a rating of 5 and is a high result in this test. When the athletes performed the bridge to determine the mobility of the spine back, an indicator was obtained, which was 24% according to the index assessment of the flexibility of the spinal column, which is evaluated by 9 points on a 10-point scale. The mobility of the respondents' hip joints is assessed as high, as the average statistical indicator of this quality was 7.6 points on a 10-point scale.

After the introduction of the experimental technique for the development of flexibility in the training process of the savaters of the control group (CG), it was established that in the test for lifting the arms, their result was 38.5 cm after the introduction of the experimental technique (Tables 4, 5). The increase occurred by 1.3%, 0.5 cm ($p<0.01$). In the experimental group (EG), this indicator increased by 3.7 cm, which is the percentage ratio of 8.9% ($p<0.01$).

Table 4. Indicators of flexibility in CG savaters before and after the experiment, cm

Indicators	before	after	increase in results, %	t	P
Lifting the hands, cm	38,0	38,5	1,3	2,1	<0,05
Lean left, right, cm	13,0	13,0	1,0	1,9	>0,1
Bridge, cm	27,0	25,0	8,0	3,3	<0,01
Transverse twine, cm	22,0	19,0	15,0	2,8	<0,001

The most minor changes in CG were recorded in left and right tilts (13 cm). The increase in spine flexibility was 1% ($P>0.1$). In the EG, after the implementation of the experimental technique,

the result of 12.5 cm in both directions was recorded in the performance of the tilt test to the left and the right; this indicator increased by 0.5 cm, which was 4% (P<0.01).

Table 5. Indicators of flexibility in EG savaters before and after the experiment, cm

Indicators	**Pre**	**Post**	**Increase in results, %**	**t**	***p***
Lifting the hands, cm	37,6	41,3	8,9	4,0	<0,01
Lean left, right, cm	13,0	12,5	4,0	3,1	<0,01
Bridge, cm	27,0	24,0	12,5	4,2	<0,001
Transverse twine, cm	22,3	12,4	71,0	4,62	<0,001

After the end of the experiment, when performing the bridge, CG athletes recorded a result of 25 cm; this indicator increased by 2 cm compared to the results before the start of the experiment, which is an 8% increase (P<0.001). In EG, the mobility index of the spine back to the beginning of the experiment was 27 cm, and after the introduction of the experimental method, it was 24 cm. The result of EG beginner athletes increased by 12.5%, which is 3 cm (P<0.001).

After the end of the experiment, a result of 19 cm was recorded when transverse splits were performed in CG athletes. This indicator increased by 15% compared to the result before the experiment and was 3 cm (P<0.001). In EG, the mobility index of the hip joints before the introduction of the experimental method was 22.3 cm, and after the end of the experiment, it was 12.4 cm. The result of testing the mobility of the hip joints increased by 71%, which was 9.9 cm (P<0.001).

4. DISCUSSION

Certain features of avatars' increased flexibility are primarily related to their age-related development patterns. The training effect gives the best results in age periods when there is a natural increase in the rate of flexibility development (Michelman & Detchenia, 2012; Holokha et al., 2022; Pashkov & Pyrozhenko, 2023).

Research has established that martial arts athletes have a low level of physical development and fitness at the initial stage of training. Bachinskaya & Koshcheev (2010) point out that such a tendency is present in other DYSSH. Many factors influence this problem: low motivation of athletes and an unformed value attitude to independent physical exercises.

At the end of the pedagogical experiment, in which the experimental methodology for developing such a physical quality as flexibility was used, a tendency to increase the studied indicators was observed: the growth rates when performing all test exercises increased significantly compared to the control group. The positive dynamics of the development of flexibility are provided by the purposeful influence of physical exercises on those leading functional systems of the body, which are responsible for the manifestation of this quality. The obtained research results confirm the results of previous researchers (Panov & Tropin, 2019) regarding the effectiveness of implementing special exercises in martial arts classes.

5. CONCLUSIONS

In conclusion, implementing special exercises in training sessions contributes to the development of flexibility in savate athletes. The experimental methodology included the stages of improvement of the flexibility of savaters of the age group of 17–18 years, determined by us, with the corresponding tasks, means, methods of their development and parameters of physical exertion by the periodisation of the annual training of fighters in French savate boxing. After the implementation of the experimental methodology for the development of flexibility, there was an increase in results within the range of 1–15%. The most significant changes were made in the transverse twine and the bridge.

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CONFLICTS OF INTEREST

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