Pedagogical tests for assessing the physical preparedness of the students practicing Muay Thai

Zhang X.^{1BCE}, Tambovskij A.N.^{2AE}, Cherkashin I.A.^{3,4ACE}, Krivoruchenko E.V.^{3BDE}, Ohlopkov P.P.^{3BCE}

¹Teaching Office of Panjin Campus, Dalian University of Technology, China

²Moscow State Academy of Physical Culture in Moscow Region, Malakhovka, Russia

³Institute of Physical Culture and Sports, North-Eastern Federal University in Yakutsk, Russia

⁴Yakut State Agricultural Academy, Russia

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Abstract

Purpose: detection of significant pedagogical tests for assessing the physical preparedness of the students practicing Muay Thai.

Material: it was performed the pedagogical testing of students athletes (n=32) of the lightweight categories specializing in Muay Thai (n=8 – weight category to 51 kg; n=14 – weight category to 54 kg; n=10 – weight category to 57 kg). Testing was directed to receiving indicators of the general and special physical preparedness of Muay Thai boxers.

Results: Connections between indicators of the general and special physical preparedness of athletes were defined. It was revealed 16 significant tests for assessment of the general physical preparedness of students. Tests consist of five groups: running, jumping, with weight, on coordination, on flexibility. The combined 3-minute test is developed for determining the level of special physical preparedness of athletes. The test consists of 9 exercises. It includes elements of punching technique of Muay Thai. Reliability and informational content of the test were proved mathematically (correlation coefficients of results of two measurements was in the range from $r=0,79$ to $r=0,86$ with significance $p < 0,05$).

Conclusions: Management of training process of Muay Thai boxer students is based on a basis of objective information on their physical preparedness. The main requirement of obtaining this information is the availability of means of carrying out a research without considerable expenses of time and the diagnostic equipment.

Keywords: Muay Thai, physical preparedness, sports training, pedagogical control

Introduction

The International Olympic Committee on December 6, 2016, previously recognized Muay Thai as the Olympic sport. The Muay Thai can gain final recognition and become a part of the Olympic Games program in 2019 [1]. This prospect induces athletes to increase results of the competitive activity. This also forces experts to look for new ways to increase in efficiency of the training process.

Muay Thai experts note that physical activity in athletes' training process is the base of Muay Thai boxers' skills [2, 3]. However, the literature provided data concerning receiving information on the general physical preparedness of athletes. In the same time, the special physical preparedness is still unstudied [3, 4]. Nowadays there is no scientifically based control system of athletes' physical preparedness practicing Muay Thai [5]. Authors suggest applying tests for other types of striking martial art [5, 6] to the identification of indicators of this or that physical quality.

It is recommended to apply the following running tests during control: 30 m run, 100 m run, 3000 m run. It is recommended to apply the following tests to the assessment of force of the girdle of the superior extremity: push-ups, pull-ups [3, 4]. Other researches devoted to the endurance of Muay Thai boxers; the special test was developed as a result of these researches [3]. The group of tests for determination of force and high-speed and power abilities of athletes in Muay Thai are the following:

standing long jump, bench pressing, front squats, stuffed ball put, 4 kg shot put [7]. The test exercises for determination the flexibility are the following: forward and cross splits; bridge training; body bending from a sitting position or from a standing position on a gymnastic bench [8]. It should be noted that authors didn't check informational content and significance of tests. A number of authors during control focus on testing only one or two physical qualities [9]. In other research, it is recommended to apply a choice reaction test [10]. Authors determined that the high informational content of the test allows to recommend it as screening at selection of prospective athletes in "striking" martial arts styles – karate, tae kwon do, hand-to-hand fight, etc. The researches devoted to judo [11, 12] and Greco-Roman style [13] suggest applying special tests for sports selection. The authors give preference to psychophysiological tests for elite athletes [14]. The authors point to the importance of tests' application during the selection of young athletes [15, 16].

The Muay Thai belongs to striking martial arts [17]. During the competitions, athletes work in the submaximum zone of power. It leads to considerable indicators of accumulation of a lactate in blood, high values of an oxygen debt. Therefore manifestation of working capacity in Muay Thai boxers [18] substantially depends on the level of special endurance.

We revealed that the question of physical preparedness control of athletes is unstudied and require further researches. We haven't revealed special exercises which application will allow to obtain information of athletes preparedness without additional diagnostic equipment.

For determination of the level of physical preparedness and identification of perspective of Muay Thai boxer athletes, it is necessary to pick up a complex of test exercises for assessment of the general and special physical preparedness. We have studied questions of testing of physical preparedness in other sports: taekwondo [19], boxing [20], kickboxing [21, 22], mixed martial arts [23, 24], karate [25, 26]. It has allowed selecting tests by means of which it is possible to estimate comprehensively the general physical preparedness of students athletes.

The hypothesis of a research is the assumption that control of students' physical preparedness in Muay Thai training will be more effective by applying a complex of significant pedagogical tests.

The purpose of the research is the detection of significant pedagogical tests for assessment of students' physical preparedness in Muay Thai.

Material and methods.

Participants. 32 students athletes of the lightweight categories practicing Muay Thai participated in a research (n=8 – weight category to 51 kg; n=14 – weight category of 54 kg; n=10 – weight category of 57 kg). The age range of athletes was 19 – 22 years. Sports qualification was the I category. Student-athletes before performed the researches have undergone inspection in medical a clinic. Athletes were allowed to training and were almost healthy. The student-athletes gave the written consent to participation in researches.

Organization of a research.

The research was conducted on the basis of North-Eastern Federal University (Yakutsk, Russia). It was performed the pedagogical testing, processing of the received results of testing, the analysis of the competitive activity of athletes.

The complex of tests for determination the general physical preparedness included the following exercises: 30 m in motion (s); 150 m in motion (s); 300 m in motion (s); 1000 m from a standing start (min, s); standing long jump (m); standing triple jump (m); 5-fold hopping in place on the right foot (m); 5-fold hopping in place on the left foot (m); standing vertical jump (touching with the right hand, cm); standing vertical jump (touching with the left hand, cm); standing long jump back in the direction of the movement (m); 4 kg shot put below-forward (m); 4 kg shot put below-back (m); bench pressing (kg); pull-up (quantity of times); 50% reproduction of force of the right and left wrist with visual and without visual analyzer (kg); body bending from a sitting position (cm); body bending forward from a standing position on a gymnastic bench (cm). The developed combined 3-minute test applied to assessment of special physical preparedness. It included 9 exercises:

- two-sided double punches: left hand jab – right leg body strike (quantity of combinations);
- two-sided double punches: right hand jab – left leg body strike (quantity of combinations);
- one-sided combinations of straight right knee strikes, left knee strikes (quantity of strikes);

- two-sided combinations of straight strikes by knees (quantity of strikes);

- three-punches combinations of hands: straight left hand punch – straight right hand punch – side left-hand punch (quantity of combinations);

- one-sided combinations of side strikes by the left leg, right leg (quantity of strikes);

- two-sided combinations of strikes by elbows: straight strikes by the left elbow – by the right elbow – side strikes by the left elbow – by the right elbow – side roundhouse strike by the right elbow (quantity of combinations).

In the first day, the general physical preparedness was tested. In the second day, the special physical preparedness was tested. For identification of the general physical preparedness indicators the athletes alternately performed test tasks. They began with the coordination and running exercises directed to speed definition. Then athletes performed jumping exercises. The last in the block of exercises were tests for definition the endurance and force indicators. We revealed that testing was preceded by a preliminary traditional warm-up. The day before athletes had a training of low intensity. The complex of test tasks for definition the general physical preparedness indicators included 23 exercises.

For determination of the significance of combined 3-minute test repeated researches were conducted in 7 days devoted to the reproducibility test of testing results.

The technique of testing performance consisted of the following. Athletes performed warm-up. Then athletes in boxing gloves and focus mitts on command continuously (within 3 min) performed a set of exercises: 9 tasks (punches, combinations of punches are performed on a bag). Each exercise was performed during 20 s. The trainer signaled about time. Testing time was calculated considering the round duration (3 min). The athlete should perform as much as possible physical actions according to a task in the available time.

Statistical analysis. Processing of experimental material was performed by means of integrated statistical and graphics packages – IBM SPSS, Statistics-22, Excel. It was defined average values, a standard deviation, Brave-Pearson correlation coefficient. The correlation analysis of the general and special physical preparedness indicators was performed for the definition of significant pedagogical tests of physical preparedness of students.

Results.

It is selected the complex of pedagogical tests for assessment of physical preparedness of the students athletes practicing Muay Thai. The complex included not difficult tests in performance in the coordination plan. These tests don't demand special readiness for their performance. It was considered the age of athletes and a stage of sports improvement in selection of pedagogical tests. However the importance of these exercises hasn't been proved yet. Therefore selection of significant tests is made for assessment of physical preparedness of Muay Thai boxers in two stages. On the first stage by the analytical way on the basis of the theoretical analysis

Table 1. Tests for definition the general physical preparedness indicators of the students practicing Muay Thai (selected by the analysis of scientific and methodical literature)

Tests				
Run	Jump	With weight	On coordination	On flexibility
30 m in motion, s	Standing long jump, m	Shot put below-forward (4 kg), m	50% reproduction of force of the right wrist with visual analyzer, kg	Body bending (hands forward) from a sitting position, cm
150 m in motion, s	Standing triple jump, m	Shot put below-back (4 kg), m	50% reproduction of force of the left wrist with visual analyzer, kg	Body bending forward from a standing position on a gymnastic bench, cm
300 m in motion, s	5-fold hopping in place on the right foot, m	Dynamometry of wrist (right, left), kg	50% reproduction of force of the right and left wrist without visual analyzer, kg	–
1000 m standing start min, s	5-fold hopping in place on the left foot, m	bench pressing, kg	50% reproduction of force of the left wrist without visual analyzer, kg	–
–	Standing vertical jump, touching with the right hand, cm	pull-up, quantity of times	Standing long jump back in the direction of the movement, m	–
–	Standing vertical jump, touching with the left hand, cm	–	–	–

of references, on the second – by mathematical (after processing of the received results of pedagogical testing on the basis of the correlation analysis).

Testing has allowed obtaining information on the development of the following physical qualities:

- speed (running test – 30 m in motion);
- high-speed endurance (running tests: 150 m and 300 m in motion);
- general endurance (running test – 1000 m standing start);
- force (tests with weight: bench pressing, pull-up);
- high-speed and power abilities [jumping tests: Standing long jump; Standing triple jump; 5-fold hopping in place on the right foot; Standing vertical jump, touching with the right/ left hand. Tests with weight: 4 kg shot put below-forward, below-back];
- coordination and proprioceptive sensuality (standing long jump in the direction of the motion, 50% reproduction of force of the left and right wrist with (without) visual analyzer);
- flexibility (body bending from a sitting position; body bending forward from a standing position on a gymnastic bench).

For significant objective assessment of the general physical preparedness, it is necessary to define indicators of special physical preparedness. We developed a set of exercises and an algorithm of conducting pedagogical testing of special physical preparedness of students. It was

based on the general exercises of the punching technique of Muay Thai.

Tests for identification of indicators of special physical preparedness of students are presented in table 2. Repeated researches in 7 days shown that coefficients of correlation of results of two measurements were in range from $r = 0,79$ to $r = 0,86$ with significance of $p < 0,05$; ($n = 64$). It demonstrates the high reliability of testing results. Therefore, the developed combined test of special physical preparedness is reliable.

The analysis of the pair correlation of special physical preparedness indicators (results of testing) shown that they have an average and high communication among themselves (tab. 3). Value of correlation was in range from $r = 0,49$ ($p \leq 0,05$) to $r = 0,90$ ($p \leq 0,01$). The obtained data demonstrate that all nine exercises in the combined test are interconnected among themselves.

The correlation analysis of the general and special physical preparedness indicators allowed to reveal how indicators connected among themselves in pedagogical tests. Thus, the correlation pleiades presented in figures 2, 3 show tests with high and average coefficients of correlation. 300 m run in motion and Standing vertical jump touching with the left hand correlate only at coefficient not higher than 0,3 ($p < 0,05$). It demonstrates the weak connection between indicators of these exercises and special physical preparedness. Indicators in the shot put below-forward correlate with two (strong connection)

Table 2. Tests for definition the indicators of special physical preparedness of the students practicing Muay Thai (author's development)

Test	The registered indicator
two-sided double punches: left hand jab – body straight right knee strike in 20 s	Quantity of combinations
two-sided double punches: right hand jab – body straight left knee strike in 20 s	Quantity of combinations
one-sided combinations of straight right knee strikes in 20 s	Quantity of strikes
one-sided combinations of straight left knee strikes in 20 s	Quantity of strikes
two-sided combinations straight knee strikes in 20 s	Quantity of strikes
three-punches combinations of hands: straight left hand punch – straight right hand punch – side left hand punch in 20 s	Quantity of combinations
one-sided combinations of side strikes by left leg in 20 s	Quantity of strikes
one-sided combinations of side strikes by right leg in 20 s	Quantity of strikes
two-sided combinations of strikes by elbows: straight strikes by the left elbow – by the right elbow – side strikes by the left elbow – by the right elbow – side roundhouse strike by the right elbow in 20 s	Quantity of combinations

and with three (average connection) indicators of special physical preparedness tests (fig. 2).

It should be mentioned that the strongest connection is revealed between special physical preparedness indicators and exercises on coordination and proprioceptive sensuality (tab. 4). It is strongly connected with indicators in such exercises as 50% reproduction of force with and without visual analyzer; standing long jump back in the direction of the movement; exercises for definition of indicators of explosive strength (4 kg shot put below-forward); high-speed and power abilities (Standing long jump, standing vertical jump, 5-fold hopping in place on the left and right foot); athletes' strength (pull-up, bench pressing).

It is necessary to apply only indicators with average and high correlation interrelation among all set of test exercises during testing of physical preparedness of athletes. These exercises are grouped and presented in table 5.

Discussion.

We have developed the 3-min combined test of special physical preparedness. It is defined the correlation interrelation of the general and special physical preparedness indicators. The significant pedagogical tests for assessment of the general physical preparedness of the students practicing Muay Thai are revealed on this basis.

In scientific and methodical literature there are no data concerning tests of special physical preparedness of Muay Thai boxers. Duration of a round in Muay Thai is 3 minutes. During this time the athlete has to perform all punching technical actions. Therefore the 3-minute combined test developed by us included general exercises of all types of the punching technique of fists, elbows, legs, and knees. The correlation analysis of the general and special physical preparedness indicators performed by us allowed revealing significant pedagogical tests for the students practicing Muay Thai.

Our results are confirmed with data of other authors of [3, 5, 7, 8] concerning the need to apply for assessment:

- a speed of Muay Thai boxers – 30 m run in the motion;
- force – bench pressing and pull-up;
- high-speed and strength abilities – horizontal and vertical standing jumps (Standing long jump and standing vertical jump), shot put below-forward;
- flexibility – body bending forward from a standing position on a gymnastic bench.

We have revealed not effective exercises for the definition of the general physical preparedness indicators of students practicing Muay Thai. They are following: 300 m run in the motion (high-speed endurance); Standing triple jump, Standing vertical jump with touching of a the left hand (high-speed and strength abilities); throwing shot put below-back (explosive force); body bending forward (hands forward) from a sitting position (flexibility); dynamometry of the right and left wrist. The correlation analysis performed by us indicates a weak connection between these exercises and of special physical preparedness indicators ($r \leq 0,270$, $p < 0,05$).

It is expanded the data concerning estimates of high-speed and general endurance and coordination [1, 3]. The following running tests are significant: 150 m in the motion, 1000 m standing start. The following tests with the application of a hand dynamometer are significant for the definition of coordination abilities indicators and proprioceptive sensuality: 50% reproduction of force of the right and left wrist with (without) visual analyzer. The standing long jump back in the direction of the movement significantly estimates coordination abilities.

The comparative analysis of other similar researches shown:

- we revealed only several pieces of research devoted to the physical training of Muay Thai. Researches of other authors show the development of only one or two physical qualities of athletes in Muay Thai. The tests offered by

Table 3. Correlation connection between special physical preparedness indicators (results in pedagogical testing) of students practicing Muay Thai

Test	left hand jab body side right leg strike (quantity of combinations)	left hand jab body side right leg strike (quantity of combinations)	Right hand jab – body side left leg strike (quantity of combinations)	One-sided combinations of straight right knee strikes (quantity of strikes)	One-sided combinations of straight left knee strikes (quantity of strikes)	One-sided combinations of straight left knee strikes (quantity of strikes)	Two-sided combinations of straight strikes by knees (quantity of strikes)	Left hand jab – right hand jab – side left hand strike (quantity of combinations)	One-sided combinations of side strikes by the left leg (quantity of strikes)	One-sided combinations of side strikes by the right leg (quantity of strikes)	One-sided combinations of side strikes by the right elbow – side strikes by the left elbow – by the right elbow (quantity of combinations)	One-sided combinations of side strikes by the right elbow – side strikes by the left elbow – by the right elbow (quantity of combinations)
Left hand jab – body side right leg strike (quantity of combinations)	1,00	0,90**	0,76**	0,59**	0,88**	0,54**	0,25	0,22	0,27	0,22	0,27	0,27
Right hand jab – body side left leg strike (quantity of combinations)	0,90**	1,00	0,71**	0,61**	0,79**	0,49*	0,09	0,11	0,28	0,11	0,28	0,28
One-sided combinations of straight right knee strikes (quantity of strikes)	0,76**	0,71**	1,00	0,63**	0,53**	0,54**	0,45*	0,19	0,47*	0,19	0,47*	0,47*
One-sided combinations of straight left knee strikes (quantity of strikes)	0,59**	0,61**	0,63**	1,00	0,60**	0,56**	0,69**	0,47*	0,22	0,47*	0,22	0,22
Two-sided combinations of straight strikes by knees (quantity of strikes)	0,88**	0,79**	0,53**	0,60**	1,00	0,73**	0,19	0,04	0,15	0,04	0,15	0,15
Left hand jab – right hand jab – side left hand strike (quantity of combinations)	0,54**	0,49*	0,54**	0,56**	0,73**	1,00	0,12	0,21	0,08	0,21	0,08	0,08
One-sided combinations of side strikes by the left leg (quantity of strikes)	0,25	0,09	0,45*	0,69**	0,19	0,12	1,00	0,68**	0,27	0,68**	0,27	0,27
One-sided combinations of side strikes by the right leg (quantity of strikes)	0,22	0,11	0,19	0,47*	0,04	0,21	0,68**	1,00	0,22	1,00	0,22	0,22
Straight strikes by the left elbow – by the right elbow – side strikes by the left elbow – by the right elbow – side roundhouse strike by the right elbow (quantity of combinations)	0,27	0,28	0,47*	0,22	0,15	0,08	0,27	0,22	1,00	0,22	1,00	1,00

Note: *- p≤0,01; ** - p≤0,05

Fig. 1. The correlation pleiade with high degree of interrelation of the general and special physical preparedness indicators of the students practicing Muay Thai: 1 – left hand jab – right leg body strike; 2 – right hand jab – left leg body strike; 3 – one-sided combinations of straight right knee strikes; 4 – one-sided combinations of straight left knee strikes; 5 – two-sided combinations of straight strikes by knees; 6 – straight left hand punch – straight right hand punch – side left-hand punch; 7 – one-sided combinations of side strikes by the left leg; 8 – one-sided combinations of side strikes by the right leg; 9 – side strikes by the right elbow – side strikes by the right elbow – by the right elbow – side strikes by the right elbow.

Fig. 2. The correlation pleiade with average and weak degree of interrelation of the general and special physical preparedness indicators of the students practicing Muay Thai: 1– left hand jab – right leg body strike; 2– right hand jab – left leg body strike; 3– one-sided combinations of straight right knee strikes; 4– one-sided combinations of straight left knee strikes; 5– two-sided combinations of straight strikes by the left leg; 6 – two-sided combinations of straight strikes by the right leg; 7 – side left-hand punch – straight right hand punch; 8 – side right-hand punch – straight left hand punch; 9 – side strikes by the right elbow – by the right elbow strike by the right elbow; 10 – side strikes by the left elbow – by the left elbow strike by the left elbow.

Table 4. Correlation connection between the special and general physical preparedness indicators (results in pedagogical testing) of students practicing Muay Thai ($r \geq 0,57$, $p < 0,05$)

The tests reflecting special physical preparedness	The tests reflecting the general physical preparedness
Two-sided double punches: left hand jab – right leg body strike	30 m in motion, 150 m in motion, standing long jump, 5-fold hopping in place on the right foot, shot put below-forward, pull-up, 50% reproduction of force with visual analyzer (right)
Two-sided double punches: right hand jab – left leg body strike	standing long jump, 5-fold hopping in place on the left foot, shot put below-forward, pull-up, 50% reproduction of force with visual analyzer (right), 50% reproduction of force without visual analyzer (left)
One-sided combinations of straight right knee strikes	30 m in motion, standing long jump, shot put below-forward, bench pressing, standing long jump back in the direction of the movement, 50% reproduction of force with visual analyzer (right), 50% reproduction of force without visual analyzer (left)
One-sided combinations of straight left knee strikes	standing vertical jump (right), shot put below-forward, bench pressing, pull-up, standing long jump back in the direction of the movement, 50% reproduction of force without visual analyzer (left)
Two-sided combinations of straight strikes by knees	150 m on in motion, 5-fold hopping in place on the right foot, shot put below-forward, bench pressing, pull-up, 50% reproduction of force with visual analyzer (right), 50% reproduction of force without visual analyzer (right)
Three-punches combinations of hands: straight left hand punch – straight right hand punch – side left-hand punch	5-fold hopping in place on the right foot, bench pressing, 50% reproduction of force with visual analyzer (right), 50% reproduction of force with the visual analyzer (left), 50% reproduction of force without visual analyzer (right)
One-sided combinations of side strikes by the left leg	1000 m standing start, standing long jump, standing vertical jump (right), pull-up, standing long jump back in the direction of the movement, body bending forward from a standing position on a gymnastic bench, 50% reproduction of force with the visual analyzer (left), 50% reproduction of force without the visual analyzer (right)
One-sided combinations of side strikes by the right leg	Pull-up, a long jump from the place a back in the direction of the movement, reproduction of 50% of force with the visual analyzer (left), reproduction of 50% of force without visual analyzer (right)
Two-sided combinations of strikes by elbows: straight strikes by the left elbow – by the right elbow – side strikes by the left elbow – by the right elbow – side roundhouse strike by the right elbow	standing long jump back in the direction of the movement, a back in the direction of the movement, standing vertical jump (touching of the right hand)

us for control of physical preparedness of athletes were carried out on the basis of results of researches in others of types of striking martial arts. But researches on the determination the importance of these tests for Muay Thai hasn't been conducted;

– in Muay Thai athletes performed punches with fists, elbows, knees, legs. During a combat rivals can work in a clinch, also apply throw methods, reaps [1]. In other types of striking martial arts, the athlete performs punches only with hands (boxing) or hands and legs (kickboxing, karate) [27]. Therefore it is completely undesirable to apply tests to the assessment of physical preparedness, borrowed from other types of single combats. It is necessary to apply significant tests to develop the training programs

on the basis of reliable assessment of Muay Thai boxers readiness;

– the importance of the pedagogical tests offered by other authors isn't proved mathematically;
– there are no research works devoted to testing of special physical preparedness in Muay Thai.

The advantages of our research are the following:

– comprehensive complex assessment of the general and special physical preparedness that allows paying attention to development gap of components of physical preparedness;

– availability of conducting pedagogical testing by the trainer without application of the additional diagnostic equipment;

Table 5. Significant pedagogical tests for definition of the general physical preparedness indicators of the students practicing Muay Thai

Groups tests	Tests (units of measure)	Physical qualities and abilities
Running	30 m in the motion, (s)	speed
	150 m in the motion (s)	High-speed endurance
	1000 m standing start (min, s)	endurance
Jumping	standing long jump (m), 5-fold hopping in place on the right foot (m), 5-fold hopping in place on the left foot (m), standing vertical jump (touching with the left hand) (cm)	High-speed and power abilities
	4 kg shot put below-forward (m)	High-speed and power abilities
With weight	bench pressing (kg), pull-up (quantity of times)	power
	50% reproduction of force of the right wrist with visual analyzer (kg); 50% reproduction of force of the left wrist without visual analyzer (kg), 50% reproduction of force of the right wrist without visual analyzer (kg), 50% reproduction of force of the left wrist with visual analyzer (kg)	Proprioseptivny sensitivity
On coordination	standing long jump back in the direction of the movement (m)	coordination
On flexibility	body bending forward from a standing position on a gymnastic bench (cm)	flexibility

– the received data of physical preparedness tests of students athletes practicing Muay Thai allow trainers: to control efficiency of training programs; to introduce timely amendments in process of sports preparation taking into consideration a condition of athletes. The advantage is the possibility of forecasting of sports results of athletes;

– it is shown the positive influence of the developed pedagogical tests for assessment of physical preparedness of Muay Thai boxers for competitive results. Students regularly passed test during the preparatory period of a year training cycle. These students have successfully spent a competitive season. Throughout 4 competitions (Championships of Sakha Republic, Far Eastern Federal District, International Tournament, Russian Cup) have won 6 gold, 3 silver, and 10 bronze medals.

Conclusions.

1. Management of training process of students practicing Muay Thai is based on a basis of objective information on their physical preparedness. However, the main requirement of obtaining this information is the availability of means to carry out a research without considerable expenses of time and the diagnostic equipment.

2. It is revealed significant tests for assessment of the general physical fitness of the students practicing Muay Thai. The complex of significant tests includes 16 exercises referred to five groups: running, jumping, with weight, on coordination, on flexibility. The combined 3-minute test is developed for the determination of the level of special physical fitness of students practicing Muay Thai. It consists of 9 exercises, the including elements of the punching technique of Muay Thai. Reliability and informational content of the test have been proved mathematically (coefficients of correlation of results of two measurements was in the range from $r = 0,79$ to $r = 0,86$ with significance $p < 0,05$).

Conflicts of interest

The authors declare that there is no conflict of interests.

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Information about the authors:

Zhang X.; <http://orcid.org/0000-0002-3848-2688>; Teaching Office of Panjin Campus, Dalian University of Technology; NO.2 Dadong Road, New District of Liaodong Bay, Pajin City, Liaoning Province. Post code: 124221, China.

Tambovskij A.N.; <http://orcid.org/0000-0001-6485-0790>; Moscow State Academy of Physical Culture in Moscow Region; ul. Shosseynaja, 33, 140032, Moscow Region, Malakhovka, Russia.

Cherkashin I.A.; <http://orcid.org/0000-0002-3015-3003>; Institute of Physical Culture and Sports, North-Eastern Federal University in Yakutsk; ul. Belinskogo, 58, Yakutsk, 677000, Republic of Sakha (Yakutia), Russia; Yakut State Agricultural Academy in Yakutsk, Russia; ul. Sergelyakhskoye shosse, 3rd km, house 3, Yakutsk, 677007, Republic of Sakha (Yakutia), Russia.

Krivoruchenko E.V. (Corresponding author); <http://orcid.org/0000-0002-3477-8801>; churapcha_lena@mail.ru; Institute of Physical Culture and Sports, North-Eastern Federal University in Yakutsk, Russia; ul. Belinskogo, 58, Yakutsk, 677000, Republic of Sakha (Yakutia), Russia.

Ohlopkov P.P.; <http://orcid.org/0000-0002-5268-4681>; Institute of Physical Culture and Sports, North-Eastern Federal University in Yakutsk; ul. Belinskogo, 58, Yakutsk, 677000, Republic of Sakha (Yakutia), Russia.

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