

Original Article

Factors influencing the effectiveness of attacking and defensive actions of boxers and fencers of young age

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Abstract:

The aim of the study is devoted to determine factors that affect the optimization of attacking and defensive actions time of boxers and fencers (rapier) of adolescence. Methods: analysis of scientific and methodological literature, chronometry, psycho-physiological and pedagogical testing, video recording, expert evaluation, mathematical and statistical methods of data processing. Materials: young boys aged 14-15 years took part in the research (16 boxers and 16 fencers who were at the stage of specialized basic training in the children's & youth sports school). Their experience in sports was 5-6 years.

As a result it is experimentally established: in the main part of training session the periodic keeping and enhancement of excitation of the nervous system by a set of physical exercises, performed with high and maximum intensity (running with acceleration at a distance of 3-10 meters, jumpings up, imitating exercises), affects the decrease of attacking actions time. The tempo of actions in duels of young fighters influences on the effectiveness of defensive actions: when fights are held at high tempo, the number of boxers' blows or fencers' touchés that reach the target increases; but when fights are conducted at optimal tempo, number of such blows or touchés decreases significantly and the number of reflected blows by boxers and touchés by fencers increases (thus the number of effective defences by young fighters increases).

Conclusions: in order to improve the effectiveness of attacking and defensive actions, young athletes in boxing and fencing should master the ability to excite the neuromuscular system, effectively conduct training and competitive fights at optimum tempo.

Key Words: attack, blow, defence, excitation, optimization, tempo, touché.

Introduction

The sporting result in boxing and fencing depends on the number of accurate blows and touchés that have reached the target (Busol, 2011, Taratorin, 1998).

The boxing fight can be completed ahead of time by the way of knockout. For the safety of athletes in the Olympic (amateur) boxing since 1992 were introduced atraumatic gloves, the design of whose does not allow to tightly clench the fist, and the shock part of such glove falls on the phalanxes of fingers, which affects a significant decrease of the impact force (Taratorin, 1998). If during the period of boxers' competitions at 1952-1988 Olympic Games the average number of knockouts were 24, then after the introduction of atraumatic gloves in the period 1992-2016 the average number of knockouts became 2. The force of blows in the amateur boxing is gradually losing its priority as a mean to achieve victory over the opponent. Thus, during the boxers' competition at the 2004 and 2012 Olympics, there were no knockouts, in 2008 one knockout was recorded, in 2016 two knockouts were recorded (Nykytenko & Nikitenko, 2017). The boxing style, based on the technical and tactical skill of athletes, confidently occupies a leading position in this sport.

Two types of martial arts – amateur boxing and fencing became much closer today. There is a need for bilateral borrowing of individual effective components of the theory and practice of young athletes' training in these martial arts.

Scientists have established that in competitive activities of highly skilled boxers, with increasing of combat density the effectiveness of attacking actions increases, but at the same time the effectiveness of protective actions decreases (Kiselev, 2006; Shiryaev, 2002). The fact that the effectiveness of defensive actions of boxers decreases with increase of the number of blows inflicted by the opponent, testifies to the need for additional studies to determine factors that have influence on formation of the competitive activity effectiveness of young fighters.

Competitive fights of boxers and fencers require a high level of perfection of such special-preparatory exercises, which determine the timeliness and speed of reaction to actions of an opponent, the speed of attack

and defence, and are as important factor for achieving success in combat sports (Taratorin, 1998; Tyshler & Movshovich, 2007; Shynkaruk & Ulan, 2016).

With the development of action quickness, an important condition is the optimal state of excitability of athlete's central nervous system, which can be achieved only if those who engaged are not fatigued with previous activities (Tyshler, 2007).

It can be assumed that one of factors preventing the fatigue of young athletes is ability to fight at optimal tempo, and thereby improving the effectiveness of defensive actions. It is expedient to establish experimentally the effectiveness of two variants of fights of young boxers and fencers: to determine the number of accurate blows and touchés that reached the target when conducting fights both at optimal and at high tempo.

Thus, there is a need to identify factors that affect the effectiveness of attacking and defensive actions, as an indicator of the effectiveness of boxers' and fencers' competitive activities.

Aim of the research is to determine factors influencing the optimization of attacking and defensive actions of boxers and fencers of youthful age.

Material & methods

Methods: theoretical analysis and generalization; chronometry; psycho-physiological and pedagogical testing; video recording; expert evaluation; methods of mathematical statistics.

In the research 14-15 years old boys with sports experience of 5-6 years took part: 16 boxers and 16 fencers (rapier), who were at the stage of specialized basic preparation of the children & youth's sports school of Lviv city.

In order to determine comparative characteristics separately in each kind of martial arts (boxing and fencing), following indicators were recorded: time of attack of boxer blow or fencer touché from a long distance, excitation of the athlete nervous system (by thresholds of the critical frequency of light flashes), the tempo of fights by the total number of performed blows or touchés, defensive actions by the number of accurate blows or touchés.

Time of attacking actions of boxers and fencers was determined by using a five-channel electronic timer (in milliseconds) equipped with neon lamps (Savchin, 2003). Advantage of the device: the distance for execution of boxers' blows or fencers' touchés is established individually by means of mechanical levers and contacts.

The proportionality coefficient of a distance of attacking blow or touché is 0,65. It is determined by the ratio of the arithmetic mean of the long distance indicators and the body length of participants in these studies. The distance for the boxer's attacking blow or a fencer's touché was determined individually by multiplication the length of each participant's body on a coefficient of proportionality 0,65. Each participant had mechanical contact at the level of iliac bone to begin counting time of the attacking action (a long-distance blow from boxer or a fencer's touché). By touching the target with a glove or a rapier, the countdown of action time was completed.

To investigate the dependence of athletes' attacking actions speed from the level of their nervous system excitation, next indicators were determined by repeated testing: time indicators of boxers' blows and fencers' touchés from a long distance; excitation indicators of visual analyzer – thresholds of the critical frequency of light flashing (Savchin, 2003). In the first testing, which was performed independently – without a signal, – after a standard warming-up, time indicators of a boxer's or a fencer's attacking action were recorded. The second testing was carried out after additional excitation of nervous system of athletes. To stimulate excitation of nervous system of boxers or fencers, a set of following exercises had been used with high and maximum intensity: running with acceleration at a distance from 3 to 10 meters, jumpings up, imitating of blows or touchés. Having completed a set of exercises to excite nervous system of athletes, time of each athlete attacking action had been recorded after the signal of a neon lamp, which was placed on the target of a training apparatus, equipped with a five-channel electronic milliseconds timer (Savchin, 2003).

Competitive fights were held to determine the impact of the bout tempo on the effectiveness of defensive actions of young boxers or fencers. 16 boxers were divided into four groups (by four boxers in each group) in terms of body weight. Each boxer took part in six fights: separately 3 bouts at optimal tempo, as well as 3 bouts at high tempo. Thus, totally boxers conducted 48 bouts: 24 bouts at optimal tempo and 24 fights at high tempo. Similarly, 16 fencers were divided into four groups according to their preparedness indicators. Each participant conducted six matches: three duels separately at optimal and at high tempo. Totally fencers conducted 48 duels. The tempo of fights has been determined with using of video recording by scoring the number of blows or touchés. High tempo of a duel is when the combatant unceasingly performs attacking actions. Optimal tempo of a fight is when sportsman distributes such a number of actions (attacking movements and pauses for restoration), which allows him to maintain their high efficiency. The main aim of fights was to protect combatants themselves from boxers' blows or fencers' touchés, and to outscore rivals in the number of precise attacking and counter-attacking actions. Fights at optimal and high tempo were held separately in adjacent microcycles.

Independent experts in boxing (two judges of the national category) and in fencing (two judges of the international category), by using video recordings of bouts, have fixed the number of accurate blows (or touchés) that reached the target, and determined effectiveness of defensive actions depending on tempo of fights.

Results

It has been established that the state of excitation of nervous system positively influences on time of performing of boxers' blows or fencers' touchés (as it shown in Table 1). Excitation of nervous system of athlete was determined by the critical frequency of light flashing (Savchin, 2003), which has been stimulated by a set of motor exercises in the main part of training session.

Attacking blow (or touché) on the signal is performed with significantly shorter time (namely higher speed) after preliminary motor exercises, which were held to stimulate excitation of athlete nervous system, than independently without a signal and in a state of low excitement (Table 1). Thus, stimulation of excitation of young athlete nervous system by using a set of motor exercises in the main part of training session, affects the optimization of time of boxer' blow or fencer' touché during attack.

Table 1

Indicators of attack time of boxers and fencers, which performed independently after a standard warming-up, as well as on the signal of neon lamp after conducting a set of exercises to excite the nervous system

Groups of fighters	Testing indicators	Attack without a signal (start of performance is independent)		Attack by the signal (start of performance after excitation of nervous system with a complex of motor exercises)		P
		Mean	Std. dev.	Mean	Std. dev.	
Boxers (n = 16)	Time of attack (milliseconds)	498	84	467	98	< 0,05
	Critical frequency of light flashing (Hz)	41	2	43	3	< 0,05
Fencers (n = 16)	Time of attack (milliseconds)	668	120	613	85	< 0,05
	Critical frequency of light flashing (Hz)	40	3	42	4	< 0,05

In order to determine the impact of the tempo of attacking actions on the effectiveness of defensive actions, totally 48 boxing fights and 48 fencing matches were held separately at the optimal and high tempo (as it shown in Table 2).

After conducting boxing fights at the optimal rate such results were obtained. The average arithmetic value (Mean) of the total number of blows in bouts with optimal tempo is 17 blows less than at high tempo fights. The number of blows that have reach the target is 31 blows less than at high tempo fights. The number of effective defences (parried blows) is 14 more than at high tempo fights.

Table 2

Indicators of competitive activity of boxers and fencers of youthful age

Indicators of competitive activity	High tempo of fights		Optimal tempo of fights		Differ-ence	P
	Mean	Std. dev.	Mean	Std. dev.		
Boxers (n = 16)						
Total number of blows per bout	74	8	57	10	17	< 0,01
The number of accurate blows reaching the target	56	14	25	12	31	< 0,001
Number of reflected blows (defensive actions)	18	10	32	7	14	< 0,01
Fencers (n = 16)						
Total number of touchés per duel	42	11	27	10	15	< 0,01
The number of accurate touchés reaching the target	31	9	8	3	23	< 0,001
Number of reflected touchés (defensive actions)	11	5	19	6	8	< 0,01

In fencing duels such results were obtained. The average arithmetic value (Mean) of the total number of touchés in duels with optimal tempo is 15 touchés less than at high tempo duels. The number of touchés that reach the target at optimal tempo is 23 touchés less than at high tempo duels. The number of effective defences (parried touchés) is 8 more than at high-tempo duels.

The number of boxers' blows and fencers' touchés that have reached the target testifies to the statistically reliably smaller number of them during fights at the optimal pace than in fights with high tempo (Table 2). The

totality of the motor actions of boxers and fencers in fights at the optimal tempo affects the optimization of athletes' defensive actions to a greater extent than conducting fights at high tempo.

Thus, fights of young boxers or fencers which conducted at optimal tempo, is one of factors, that make better influence on the effectiveness of defensive actions of these young athletes.

Discussion

The general theory of sports indicates that during the period of high natural rate of growth of young athletes' physical abilities it is inappropriate to plan exercises with high intensity and short pauses of rest, as well to conduct training sessions and competitions with heavy loadings (Platonov, 2015).

The process of athletes training is carried out on the basis of certain principles, rules, scientific and methodological provisions (Ozolin, 2004). One of the main provisions for the training of athletes is individualization. The principle of individualization in theory and practice of sports is the development of pedagogical principle of accessibility. The principle of accessibility provides for the level of individual abilities of young athletes.

The nature of individual characteristics of young athletes is due to biological causes, mental processes and level of their physical development. An important factor in the young athletes training is keeping of the optimal state of their body systems (Volkov, 1984, Ozolin, 2004, Platonov, 2015). Investigations of boxers special working capacity in different age groups indicate a significant difference in indicators of quantity and force of blows in specialized tests (Klitschko & Savchin, 2000).

Boxers from 16-17 years of age at the stage of specialized basic training have indicators of special endurance (number and force of blows per time unit) significantly greater than boxers of 14-15 years old at the stage of preliminary basic training (Shiryaev, 2002). During trainings of young athletes it is necessary to take into account the difference in level of their preparedness from athletes of older age groups. To prevent the negative impact of increased loadings on the body of young athlete, an individual approach and individualization of the training system for young athletes are necessary.

Our study confirms the negative impact of large loadings on the sporting results of young fighters: when boxers or fencers conduct bouts at high tempo the effectiveness of defensive actions (namely the number of parried blows or touchés) is statistically significantly lower than when fights are conducted at optimal tempo.

Thus, conducting fights at optimal tempo positively influences on the increase in effectiveness of defensive actions of young fighters: it teaches young athletes to the rational conducting of competitive bouts, and increases the reliability of their defence against attacking rivals.

Conclusions

During the main part in the training session of boxers or fencers of adolescence, a periodic increase in the excitation of their nervous system by using a set of physical exercises, that are performed with high and maximum intensity (running with acceleration at a distance of 3-10 meters, jumpings up, imitating exercises), affects a reliable reduction of the attack time from a long distance, and also an increase in the speed of young athletes actions.

The tempo of young boxers' and fencers' bouts affects the effectiveness of theirs defensive actions. When conducting bouts at optimal tempo, the effectiveness of defensive actions is significantly higher than conducting bouts at high tempo.

In order to increase the effectiveness of attacking and defensive actions during the main part of the training session it is reasonable for young fighters the following:

1. To master the ability periodically to increase the excitation of their nervous system by using a complex of motor exercises.
2. Effectively to conduct training and competitive fights at optimal tempo, skilfully applying pauses to restore their young organism.

Conflict of interests

Authors confirm that there is no conflict of interest.

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