

Winning and losing performance in boxing competition: a comparative study

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Abstract:

National boxing championships represent the first step in discovering potential top performing boxers who could achieve good results at higher competition levels. The aim of this research is to compare performances of winning and losing elite male amateur boxers competing in the National Championship of Bosnia and Herzegovina. The sample consists of 48 national level boxers that competed in 24 boxing matches. Forty-six variables were established to define technical and tactical performances during boxing contests. To verify differences between winners and losing elite male amateur boxers we utilized Wilcoxon's test ($p \leq 0.05$). Results of the Wilcoxon's test displayed numerous differences within winners and losing boxers in advanced defensive techniques (i.e, ducking to the side); offensive techniques (i.e, Straight punch to head by lead hand, Straight punch to body by lead hand, Straight punch to head by total lead and rear hand, hooks punch to body by lead hand, uppercuts punch to head by rear hand, and uppercuts punch to body by rear hand); applying tactics (i.e defensive fighting technique, and Combined fighting technique); Knock-downs (i.e, knock-down by rear arm hook, total number of knock-downs by lead and rear arm hooks, and total number of knock-downs); and way of winning (win by knock-out, and win on points). Results might help trainers and boxers to develop their technical and tactical performance.

KeyWords: Combat sport; notational analysis; boxing competition; efficiency

Introduction

Amateur boxing belongs to the family of Olympic sports. Being a "noble skill" it is practiced by both men and women around the world and it enjoys great popularity. Boxing fight, as a polystructural acyclic activity, is characterized by a constant change in the structure of movement during work of variable intensity and duration of 3 rounds per three minutes with one minute of rest between them.

The success in boxing is determined by the level and structure of large number of abilities, knowledge and characteristics that can be measured and analyzed, and consequently improved by appropriate means and methods during the sports career (Kapo, 2005).

Many researches have been focused on identifying performance parameters of winning and losing competitors on the basis of recording of the events during the competitions, using sets of different technical/tactical elements performed by winners and losers, from different levels of boxing competitions (EL-Ashker, 2011; Darby, et al. 2014; Davis, et al. 2015; Davis, Wittekind, Beneke, 2013; Šiška&Brodžani, 2016). Studying amateur boxer performances, Bianco et al. (2013) found that modern amateur boxing, with fighting duration of 3x3 minutes, is much safer for the health of boxers in comparison to fighting duration of 5x2 and 4x2 minutes. Similar results were obtained by Kapo et al. (2016), by comparing the performances of amateur boxers from the National Championships of Bosnia and Herzegovina in 2007 and 2016.

The effect of 2007 National Championship of Bosnia and Herzegovina 4x2 minute matches was an increase in fight intensity through increased frequency of punches and in the same time a decrease in quality of technical/tactical elements performance with a greater possibility of injuries and less attractive boxing to watch. The International Boxing Association (AIBA, 2009) reinstated the old rules, based on rule changes regarding the duration and number of rounds, to 3x3 minutes matches, which was a good thing for boxing, because boxers were able to show their best technical/tactical qualities with greater efficiency and reduction of injuries, and hence more interesting boxing to watch, which was confirmed at the National Championship of Bosnia and Herzegovina in 2016

In such circumstances, all actions and tactical activities of a boxer require the ability to quickly solve various, often unpredictable complex motor tasks. Creating a high-quality boxer, capable of great international

results, is a complex process of many years of preparation, primarily based on the adoption of rational technique and formation of moving habits in boxers.

The boxing technique essentially represents a repertoire of special material necessary for a boxer to successfully fight within the existing rules of boxing (AIBA, 2019) and thus solve moving tasks during the fight. The technique is expressed through the skill of comprehensive application of defenses and attacks and it is directly dependent on tactics. The richer the technique, the more diverse the tactics and vice versa. The tactics influences development of technical quality level of boxers. Therefore, the technique is a weapon used by a boxer, guided by tactical assessment. The analysis of use of technical-tactical elements on the basis of which the fighting distance and use of technique and tactics are determined, were the reason of many researchers conducted to date (EL-Ashker, 2011; Davis, Benson, Waldock, and Connorton 2016; Davis, Benson, Pitty, Connorton, & Waldock 2015; Davis, Wittekind, & Beneke, 2013; Dunn, Humberstone, Iredale, Martin, & Blazevich 2017; Hristovski, Davids, Araujo, & Button, 2006; Loturco, et al., 2015; Kapo, et al., 2008; Šiška, & Brođani, 2016; Šiška, et al., 2016; Thomson, Lamb, & Ceri, 2012 and Thomson, & Lamb, 2016).

The aim of this research is to compare performances of winning and losing elite amateur boxers competing in the National Championship of Bosnia and Herzegovina.

Material & methods

Sample, Variables and Research Design

The sample of examinees in this study consists of 48 elite competitors who had a total of 24 fights at the National Championship of Bosnia and Herzegovina in 2016. There were 46 variables analyzed through this study (18 offensive techniques, 9 basic defensive techniques, 3 advanced defensive techniques, 3 Applying of tactics in boxing, Knock-downs by different punching techniques, Way of winning) to define performances elements of winning and losing boxers through the 24 boxing fights.

Data collection methods

All matches have been recorded by a SONY HANDYCAM DCR- SR75 camcorder. Three educated evaluators by means of notational analysis of 24 matches from 2016 National Championship of Bosnia and Herzegovina entered data into specially designed notational analysis protocols for winning and losing boxers.

Ethics

This paper has been ethically made in accordance to the Helsinki Declaration standards, and approval for realization of this work has been given by the Scientific Council of the Faculty of Sports and Physical Education of the University in Sarajevo on July 2nd, 2016, no. 01-2984-16.

Reliability

The results of the Cohen's Kappa reliability test between Observer 1 and Observer 2 is .929, between Observer 1 and Observer 3 is .907, and between Observer 2 and Observer 3 is .894, which represents a very good agreement between three observers in the process of analyzing boxer performance.

Data Analysis

The results are presented in frequencies and percentage values. The Wilcoxon rank test was used to determine the differences between the winning boxers and losing ones. The effect size (r) was also calculated using the formula (Cohen, 1988): $R = z / \text{square root of } N$, Where N = total number of observations.

Results

Table 1 illustrates no statistical significant differences in all of the basic defensive techniques variable at $p < 0.05$ between winners and losing elite boxers.

Table 1. Basic defensive techniques statistics

	Variable	Winners	Losing	Total	Z	r	P - value
Arm blocks against straight	Lead punch	303 40.8%	440 59.2%	743	-.426	0.02	0.670
	Rear punch	181 42.4%	246 57.6%	427	-1.009	0.05	0.313
	Total	486 41.5%	686 58.6%	1170	-.654	0.02	0.513
Arm blocks against hook	Lead punch	182 58.5%	129 41.5%	311	-.926	0.05	0.354
	Rear punch	142 59.9%	95 40.1%	237	-.808	0.05	0.419
	Total	324 59.1%	224 40.9%	548	-1.308	0.06	0.191
Arm blocks against uppercut	Lead punch	23 44.2%	29 55.8%	52	-.287	0.04	0.774
	Rear punch	22 78.6%	6 21.4%	28	-1.676	0.32	0.094
	Total	45 56.2%	35 43.8%	80	-.474	0.05	0.635

Table 2 illustrates statistical significant differences in the advanced defensive techniques variable at $p < 0.05$ between winners and losing elite boxers only in ducking to the side technique variable.

Table 2. Advanced defensive techniques statistics

Variable	Winners	Losing	Total	Z	r	P - value
Rotation	82 46.6%	94 53.4%	176	.000	0.00	1.000
Swaying back	50 42.4%	68 57.6%	118	-.534	0.05	0.593
Ducking to the side	70 73.7%	25 11.7%	95	-1.910	0.20	0.049*

*Significant difference at a level of < 0.05

The result of Wilcoxon test in offensive techniques statistics (Table 3) authorizes the existence of differences between winners and losing elite boxers ($p < .001$) in some offensive techniques variables (i.e. Straight punch to head by lead hand, Straight punch to body by lead hand, Straight punch to head by total lead and rear hand, hooks punch to body by lead hand, uppercuts punch to head by rear hand, and uppercuts punch to body by rear hand). This can affirm the way of winners and losing boxers pursue to utilize these offensive techniques throughout the contest to attain bestmatch results.

Table 3. Offensive techniques statistics

Variable	Winners	Losing	Total	Z	r	P - value			
Straight	To Head	Lead	938 55.2%	760 - 44.8%	1698	-.745	0.02	0.456	
		Rear	562 60.4%	369 39.6%	931	-1.994	0.06	0.046*	
		Total	1500 57.1%	1129 42.9%	2629	-1.095	0.02	0.273	
	To Body	Lead	164 97.0%	5 3.0%	169	-3.235	0.25	0.001*	
		Rear	64 87.7%	9 12.3%	73	-1.620	0.19	0.000	
		Total	228 94.2%	14 5.8%	242	-2.758	0.18	0.006*	
	Hooks	To Head	Lead	73 54.5%	61 45.5%	134	-1.742	0.15	0.082
			Rear	42 56.0%	33 44.0%	75	-.748	0.08	0.454
			Total	115 55.0%	94 45.0%	209	-1.324	0.09	0.186
To Body		Lead	60 80.0%	15 20.0%	75	-2.286	0.26	0.022*	
		Rear	75 62.5%	45 37.5%	120	-.372	0.03	0.710	
		Total	135 69.2%	60 30.8%	195	-1.031	0.07	0.303	
Uppercuts	To Head	Lead	465 53.8%	399 46.2%	864	-.336	0.01	0.737	
		Rear	298 61.7%	185 38.3%	483	-2.698	0.12	0.007*	
		Total	763 56.6%	584 43.4%	1347	-1.263	0.03	0.207	
	To Body	Lead	115 83.9%	22 16.1%	137	-1.851	0.16	0.064	
		Rear	108 69.7%	47 30.3%	155	-1.985	0.16	0.047*	
		Total	223 79.4%	69 23.6%	292	-2.357	0.14	0.018*	

*Significant difference at a level of < 0.05

The results showed that statistics of applying tactics (Table 4) approve significant statistical differences ($p < 0.05$) between winners and losing elite boxers in two variables (i.e. defensive fighting technique, and Combined fighting technique). These differences between the two groups 'winners and losing' might be described by the insufficient tactics especially the defensive and combined.

Table 4. Statistics of applying tactics

Variable	Winners	Losing	Total	Z	r	P - value
Offensive fighting technique	5 41.7%	7 58.3%	12	-.302	0.09	0.763
Defensive fighting technique	3 25.0%	9 75.0%	12	-2.121	0.60	0.034*
Combined fighting technique	14 60.9%	9 39.1%	23	-2.236	0.47	0.025*

*Significant difference at a level of < 0.05

The results of knock-downs statistics by different punching techniques (Table 5) showed significant statistical differences ($p < 0.05$) between winners and losing elite boxers in three variables (i.e. knock-down by rear arm hook, total number of knock-downs by lead and rear arm hooks, and total number of knock-downs). The significant differences between the winners and losing boxers might be described by the state of exhaustion, unconsciousness, pain, or confusion for the losing boxers.

Table 5. Knock-downs statistics by different punching techniques

VARIABLES	Winners	Losing	Total	Z	r	P - value
Knock-down by lead arm straight punch	0 0%	0 0%	0	.000	0.00	1.000
Knock-down by rear arm straight punch	0 0%	0 0%	0	.000	0.00	1.000
Total number of knock-downs by lead and rear arm straight punches	0 0%	0 0%	0	.000	0.00	1.000
Knock-down by lead arm hook	2 100.0%	0 0%	2	-1.414	1.00	0.157
Knock-down by rear arm hook	5 100.0%	0 0%	5	-2.236	0.99	0.025*
Total number of knock-downs by lead and rear arm hooks	7 100.0%	0 0%	7	-2.333	0.88	0.020*
Knock-down by lead uppercut	0 0%	0 0%	0	.000	0.00	1.000
Knock-down by rear uppercut	1 100.0%	0 0%	1	-1.000	0.00	0.317
Total number of knock-downs by lead and rear uppercuts	1 100.0%	0 0%	1	-1.000	0.00	0.317
Total number of knock-downs	9 100%	0 0%	13	-3.000	1.00	0.003*

*Significant difference at a level of < 0.05

The results of way of winning statistics (Table 6) showed significant statistical differences ($p < 0.05$) between winners and losing elite boxers in three variables (i.e. Win by Knock-out, and win on points).

Table 6. Way of winning statistics

VARIABLES	Winners	Losing	Total	Z	r	P - value
Win by Knock-out	8 100.0%	0	8	-2.828	0.99	0.005*
Win on points	16 100%	0 0%	16	-3.500	0.88	0.000*
Win by retirement due to injury	0 0%	0 0%	0	.000	0.00	1.000

*Significant difference at a level of < 0.05

Discussion

The defined goal of this research, which was to determine difference in performance of winners and losing amateur boxers, has been completely realized and the significant technical and tactical elements that contribute to that difference have been precisely identified. Characteristics of the way the winners fought, in relation to losing boxers, indicate that the winners successfully fought at distance, using the right straight punch which could result in knock-out, while maneuvering from a distance at the same time, which was much safer way to fight and gather points (Blower, 2007; EL-Ashker, 2011; Davis, et al., 2015; Davis, Wittekind, & Beneke, 2013).

By observing performance of the winners, it can be seen that the lead arm straight punch, which is one of the most useful punches in boxing, was applied more in relation to losing boxers. The reason for that is its short path and convenience for realization of complex tactical tasks.

Lead arm straight punch is the basic attacking punch because, if used correctly, it simply irritates the opponent and further introduces the boxer to the fight and continuous gathering of points. In addition, it reveals the level of knowledge of the opponent and his initial actions, on the basis of which the boxer can get an approximately accurate idea of the quality of the opponent.

Lead arm straight punch to the body was used by the winners in their attacks from a distance to the opponent, which is also effective in application, as a feint punch, thus creating space for the main punch to the opponent's head. A competitor who intends to perform a lead arm straight punch to the body must have good defense and good head protection.

Total number of straight punches to the body indicates the tactically good application of straight punches from distance, where space was opened for entering at medium distance and successful throwing of hooks to the head, which are the strongest punches in boxing. This statement was confirmed by the results of this research, which showed that the winners achieved five knock-downs by the rear arm hook.

The reason for such efficiency of hook punches in this competition, but also in other competitions (EL-Ashker, 2011; Davis, et al., 2015; Davis, Wittekind, & Beneke, 2013), is that they are very strong effective punches and tactically can be very well used in fighting at medium distance, as well as combined with the left straight punches. This was used by winners in the competition during attack while approaching the opponent, and somewhat in close range fighting.

Uppercut

In close range fights analyzed, the winners delivered a series of punches using lead uppercut to the body, as a feint punch to maintain the desired distance, as well as to get closer to the opponent, emphasizing the performance of front / left uppercut to the body.

The winners used the uppercut to the body during their fights at medium distance and close range, and they effectively applied direct punches from distance, medium distance, as well as in transition to close range attacks. In addition to the above, the special value of the uppercuts is that they can be performed as responsive counterattacks, but rarely used as introductory punches, and in general only in sagittal positions of the opponent's body (EL-Ashker, 2011, EL-Ashker, 2018).

Tactical forms of fighting

Tactical activities of a boxer in the ring encompass variety of tactical activities depending on fighting circumstances as well as on personality of the opponent. Fighting at all distances – long, medium and short, is carried out in a variety of conditions that have their own laws. Each distance has a time limit that determines importance and quality of defense against punches. At long distance, the boxer will easier defend against punches, at medium distance defense will be more difficult, because it takes place in a micro-interval of one second. The boxing skill of defense against punches is of crucial importance, as having extraordinary speed of reaction and movement in order to react in time to the opponent's actions (EL-Ashker, 2012).

The time limit at various distances is determined by the choice of one's own tactics and techniques, which can be developed through various training tasks, ranging from basic to complex. During a fight, a boxer may act technically and tactically for the purpose of attack, defense or counterattack. These different tactical forms of fighting are applied depending on tasks related to tactical plan, strategic goal and specific situation. The winners used a counterattack form of fighting characterized by defense with very fast counterattacks and interceptions, which resulted in dynamics and uncertain outcome, in the same time contributing to the beauty and attractiveness of the competitive activity.

In addition, the winners who used a counterattack form of fighting had a high degree of concentration, thus they were calm, they rarely attacked, and when they did, they decisively shortened the distance. In order for this tactical form to be successfully applied, it requires long-term practice, because the competitor must fully master the chosen techniques, possess high speed of reaction and movement, exceptional concentration and courage.

In their counterattacking form of fight, winners used interception for which they had to possess the sense of recognizing the opponent's movements, as well as the right moment to intercept. In order to successfully use their counterattacking form of fight, the winners had to create favorable positions, mainly by challenge, dynamics and active defense.

This form of tactical fight is used as the main tactical weapon by technically and intellectually weaker boxers, then by older boxers who have lost the speed necessary to implement offensive technique, but can skillfully use the opponent's mistakes due to their long experience and knowledge of opponents, as well as by less physically prepared and less aggressive fighters (Vargas, et al., 2015).

Application of defensive technique by losing boxers most likely indicates that they were not sufficiently physically conditioned or were not able to match their opponents at the technical and tactical level, which resulted in use of defensive tactics during the bout.

The winners were dominant in knock-downs by right hook as well as in total number of hook punches. This only confirms the conclusion that the winners successfully used direct punches at long distance, entered medium distance and used series of punches to the body while preparing the main scoring and final hook punches to the head, which resulted in knock-downs or knock-outs and ultimately victories by referees' decision. It can be seen that the largest number of victories was obtained by decision of referees, which indicates that the participants in the BiH National boxing championship were quite equal and even, which resulted in the largest number of victories by referees' decision – 15 in total, while 8 bouts ended by knock-out, which indicates good score and quality of boxers at this level of competition.

Conclusions

All actions and tactics used by a boxer require the ability to quickly solve various, often unpredictable complex motor tasks. Therefore, for each distance, the time limit determines the importance and quality of defense against a punch. While defending against punches, it is of crucial importance for a boxer to have an extraordinary speed of reaction and movement, in order to react in time to the opponent's actions. The time limit at various distances determines the choice of tactics and technique used by a boxer.

At the national championship, the straight punches were considerably used by the winners, most likely due to their advantage of fast, easy and precise delivery and use of these punches with the least possibility of injuries and energy consumption. The hook punches were also used by winners, most likely because the hook is one of the most natural ways of punching. These are punches that travel around the imaginary axis of our body and they allow greatest precision, because they are delivered from medium distance.

Uppercuts are punches with less application and significance with the winners in the analysis, most likely because they are technically the most demanding punches in boxing, requiring longer period of technical training and competitive experience. The return to 3x3 minutes rules resulted in re-use of distance and half-distance fighting by boxers, as well as use of straight punches, which reduced the dynamics while increasing the technical and tactical quality of boxing and application of combined tactics. In line with the above mentioned, in order to improve training processes and competitive performance, it is suggested to use multidisciplinary approach to research the performance of boxers of all ages and genders at all levels of competition.

Conflicts of interest

Authors declare that they have no conflicts of interest.

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