Comprehensive technical analysis of *K1 Kickboxing* fights based on match observation

Wojciech Wąsacz [1]*, Marta Niewczas [2], Tadeusz Ambroży [1], Łukasz Rydzik [1]

[1] Institute of Sports Sciences, Faculty of Physical Education and Sport, University of Physical Education, 31-571 Kraków, Poland
[2] Institute of Physical Culture Studies, College of Medical Sciences, University of Rzeszów,35-958 Rzeszów, Poland
*Correspondence: wojciech.wasacz@doctoral.awf.krakow.pl; Tel.: +48 732-777-358

Introduction: Observation and specialized analysis of confrontations in combat sports form the basis for introducing corrections in training programs and modifying the individual technical-tactical profiles of athletes engaged in such activities. These actions comprehensively assess the course of sports activities, ultimately inspiring and determining the direction of training in sports clubs. The objective of this study was to analyze and evaluate the level of offensive structure in sports combat, specifically in Kickboxing under the K1 format, with a global perspective on simulated sparring sessions, within selected thematic comparisons.

Methods: The research material consisted of multimedia recordings of 10 simulated K1 sparring sessions, involving 20 high-performance athletes in this discipline (age: 24.5±4.6 years; height: 179.1±4.6 cm; body weight: 81.7±9.9 kg; BMI: 25.5±3.7; training experience: 6.9±1.3 years). To assess the offensive structure of the combat, a retrospective analysis of the recorded empirical data was conducted, quantifying the executed attacks. Subsequently, specialized indicators of technical-tactical preparation (PTT) were calculated, considering the global perspective of sparring, within thematic comparisons (overall; punches vs kicks; attacks on the right vs left limbs; types of techniques; direction of attack).

Results: During the analysis, a significantly higher technical-tactical efficiency was observed for hand strikes, left-hand techniques, and the direction of strikes to the opponent's head for activity (p<0.001), effectiveness (p<0.001), and efficiency (p=0.008–0.408) of the attack. Isolating kicking techniques revealed a significant advantage in efficiency for selected attacks targeting the lower parts of the opponent's body, such as the torso and legs (p=<0.001-0.043). The most effective and frequently used techniques were the left straight punch (Aa $\bar{x}$=36.8; Sa $\bar{x}$=23.9), while in the context of kicks, the right low kick (Aa $\bar{x}$=14.9; Sa $\bar{x}$=5.6) showed prominence. The highest attack efficiency was noted for the right middle kick (Ea $\bar{x}$=54.18). Several selected comparative sets (inter-limb symmetry, type of attack, direction of attack) for technical-tactical efficiency were characterized by significant statistical differences (p= <0.001-0.048).

Conclusions: Kickboxing is an asymmetrical combat sport, necessitating the implementation of targeted training for specific body segments of the athlete and compensatory actions in injury prevention. The research results enable a detailed diagnosis and interpretation of the technical-tactical profile, along with the key manifestation of offensive competencies in Kickboxing, particularly in the K1 format. This contributes to optimizing the quality of coaching control.

Keywords: combat sports, offensive fight analysis, technical-tactical indicators, Kickboxing K1.

Table 1. Quantitative summary of applied attacks, in the global and segmental context for K1 fights

Variable	Effective	Non-effective	Total
GLOBAL SUMMARY OFFENSIVE ACTIONS			
Offensive actions (n=20)	952	1404	2356
SEGMENTAL SUMMARY OFFENSIVE ACTIONS			
Segmental summary with division into punches and kicks			
Punches, (n=20)	630	840	1470
Kicks (n=20)	322	564	886
Symmetry summary with division into left and right limbs			
Left hand strikes (n=20)	478	618	1096
Right hand strikes (n=20)	152	222	374
Left leg kicks (n=20)	130	260	390
Right leg kicks (n=20)	192	304	496
Segmental summary with division into punch techniques			
Left straight punch (n=20)	338	398	736
Right straight punch (n=20)	74	98	172
Left hook (n=20)	126	186	312
Right hook (n=18)	54	102	156
Left uppercut (n=8)	14	32	46
Right uppercut (hak) (n=6)	12	10	22
Left Spinning Backfist (n=2)	0	2	2
Right Spinning Backfist (n=6)	12	12	24
Segmental summary with division into targets of punch techniques			
Left straight high (n=20) vs Left straight middle (n=12)	300 vs 38	366 vs 32	666 vs 70
Right straight high (n=20) vs Right straight middle (n=12)	62 vs 12	86 vs 12	148 vs 24
Left hook high (n=20) vs Left hook middle (n=14)	112 vs 14	158 vs 28	270 vs 42
Right hook high (n=18) vs Right hook middle (n=6)	50 vs 4	98 vs 4	148 vs 8
Segmental summary with division into kick techniques			
Left low roundhouse kick (n=16)	56	62	118
Right low roundhouse kick (n=18)	112	186	298
Left middle roundhouse kick (n=20)	34	74	108
Right middle roundhouse kick (n=20)	40	42	82
Left high roundhouse kick (n=12)	4	34	38
Right high roundhouse kick (n=10)	6	30	36
Left spinning kick (n=2)	0	2	2
Right spinning kick (n=16)	14	30	44
Left front kick (n=16)	30	72	102
Right front kick (n=16)	10	12	22
Left knee strike (n=10)	6	16	22
Right knee strike (n=6)	10	4	14
Segmental summary with division into targets of kick techniques			
Right spinning hook kick high (n=12) vs Right spinning hook kick middle(n=15)	3 vs 11	17 vs 13	20 vs 24
Left front kick high (n=13) vs Left front kick middle (n=16)	2 vs 28	34 vs 38	36 vs 66
Right front kick high (n=8) vs Right front kick middle (n=14)	0 vs 10	8 vs 4	8 vs 14
Left knee strike high (n=4) vs Left knee strike middle (n=8)	1 vs 5	5 vs 11	6 vs 16
Right knee strike high (n=2) vs Right knee strike middle (n=6)	2 vs 8	1 vs 3	3 vs 11

Table 2. Summary mean of Attack Activity, Effectiveness and Efficiency Indicators, in the global and segmental context for K1 fights

Variable	$\bar{x}$	sd	min	max	CV%	
GLOBAL SUMMARY TECHNICAL AND TACTICAL INDICATORS						
Attack Activity	117.8	30.4	80	196	25.8	
Attack Effectiveness	47,6	14,9	32	82	31,3	
Attack Efficiency	40,6	8,2	29,1	60,2	20,3	

Variable	Attack Activity		Attack Effectiveness		Attack Efficiency	
	$\bar{x}$±sd	p value	$\bar{x}$±sd	p value	$\bar{x}$±sd	p value
SEGMENTAL SUMMARY TECHNICAL AND TACTICAL INDICATORS						
Segmental summary with division into punches and kicks						
Punches	73.5±22.9	<0.001	31,5±13,7	<0.001	42.1±9.2	0.386
Kick	44.3±15.2		16,1±6.7		38.7±15.1	
Symmetry summary with division into left and right limbs						
Left hand strikes	54.8±16	<0.001	23.9±11.5	<0,001	42.7±11.9	0.348
Right hand strikes	18.7±9.2		7.6±4.1		39.5±7.2	
Segmental summary with division into punch techniques						
Left straight punch	36.8±11.2	<0.001	16.9±6.6	<0.001	47.2±16.1	0.218
Right straight punch	8.6±5.1		3.7±2.8		37.4±22.9	
Left hook	15.6±11.4	0.002	6.3±5.9	0,014	35.9±18.2	0.221
Right hook	7.8±5.1		2.7±2.3		25.5±18.4	
Segmental summary with division into targets of punch techniques						
Left straight high vs Left straight middle	33.3±8.4 vs 3.5±3.6	<0.001	15±6.9 vs 1.9±2.1	<0.001	45.8±18.5 vs 31.7±27.4	0.093
Right straight high vs Right straight middle	7.4±4.2 vs 1.2±1.2	<0.001	3.1±2.4 vs 0.6±0.8	<0.001	36.2±23.5 vs 28.3±37.5	0.408
Left hook high vs Left hook middle	13.5±9.2 vs 2.1±2.4	<0.001	5.6±5.2 vs 0.7±1	<0,001	37.2±21.1 vs 17.6±22.6	**0.008**
Right hook high vs Right hook middle	7.4±4.5 vs 0.4±0.7	<0.001	2.5±2.1 vs 0.2±0.4	<0,001	25.4±18.8 vs 15±32.9	0.158
Segmental summary with division into kick techniques						
Left low roundhouse kick	5.9±5.2	0.014	2.8±2.9	0,018	35.5±19.9	0.940
Right low roundhouse kick	14.9±8.8		5.6±3.35		38.1±25.9	
Left spinning kick	0.1±0.3	<0.001	0±0	0,002	0.0±0.0	<0.001
Right spinning kick	2.2±1.7		0.7±0.7		30.8±32	
Left front kick	5.1±6.9	0.003	1.5±2.9	0,347	16.4±18.6	0.070
Right front kick	1.1±0.7		0.5±0.5		35±40.1	
Segmental summary with division into targets of kick techniques						
Left front kick high vs Left front kick middle	1.8±2.5 vs 3.3±4.6	0.012	0.1±0.3 vs 1.5±2.7	0,005	1.2±3.6 vs 27.2±33.3	**0.005**
Right knee strike high vs Right knee strike middle	0.2±0.5 vs 0.6±0.9	0.043	0.1±0.3 vs 0.4±0.7	0,068	7.5±24.5 vs 24.2±41	0.080

Figure 1. *Left straight punch* – the most effective and frequently used techniques

Figure 2. *Right low roundhouse kick* – the most effective and frequently used techniques kicks

Figure 3. *Right middle roundhouse kick* – the highest attack efficiency