

TRAINING LOAD AND TRAINING EFFECTIVENESS IN THE PREPARATORY PHASE BY THE CASE OF KICKBOXING FIGHTERS OF UKS GLADIATOR CLUB

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ABSTRACT

The aim of the paper is to analyze the effectiveness of training of fighters of UKS Gladiator Club in the preparatory phase and to analyze training loads used during that time. Participants included a group of 12 fighters of UKS Gladiator Club who have achieved high sports results – this group includes medalists of Polish Championships and of the Cup of Europe. Tests were carried out three times in the preparatory phase. Physical fitness parameters have been evaluated by means of selected tests of EUROFIT testing battery. Summing up, it should be noted that an important cognitive element of the research carried out is an observation of improvement of the level of physical fitness in case of the majority of investigated features, which was the intended effect of training in the preparatory phase. The adopted training load has caused an average increase of investigated parameters, which proves training effectiveness.

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INTRODUCTION

Kickboxing was created and popularized in the United States. Its roots are found in Far Eastern martial arts. Eastern martial arts reached the United States through soldiers carrying out military service in various countries. Together with soldiers came numerous immigrants who opened schools of close combat arts and the golden period of Far Eastern marital arts started because of popularity of exoticism. As a result of ongoing commercialization, sports competition in those disciplines combined with obtaining sports results started as well. In 1960s Mike Anderson, an instructor of karate, adopted techniques of classic box and combined them with karate and tae kwon do kicks for the first time. This has resulted in new sports discipline called American Karate or Full Contact Karate¹.

In 1968 first full contact karate tournament was organized (however, at the time participants did not yet wear body protection against too strong kicks), which resulted in a great number of injuries (almost all contestants were injured) and led to introduction of pads which have been used to this day. In 1970 in Florida a fight between contestants Lewis and Baines was labelled as full contact karate, but this time with the use of pads. This fight received incredible media coverage. Since this fight the name kickboxing started to be used. In 1974 first World Championship in Kickboxing were organized.

At present kickboxing is a combination of boxing punching techniques with kicking techniques borrowed from Eastern marital arts². Various forms of sports competitions are used:

1. Musical forms which is a type of competition in which contestants perform a staged fight with one or several opponents to music.

¹ K. Wieczorek, *Podstawy Kick-boxingu. Historia, technika, metodyka treningu* [The basis of kick-boxing. History, technique and methodology of training], Siemiatycze 2008.

² L. Ufel, *Świat Kickboxingu* [The world of kickboxing], Wydawnictwa Sport i Turystyka, Warszawa 1991.

2. Semi-contact is a fighting discipline in which fighters fight with a goal of scoring the greatest number of points by using correct, precise, light and well-controlled punching and kicking techniques. This is a technical discipline which emphasizes the speed and accuracy of techniques equally, and scoring is based on the rule of controlled actions. The fight is halted directly after a successful action and points are awarded.
3. Light contact is a continuous fight. It is very important for the punching and kicking techniques to be light. Fighting too hard can be a reason for disqualification.
4. Full contact is a match in which punches and kicks can be made with full power and strength. Fights can be held only in rings with strictly defined parameters. Forbidden techniques include attacking with the knee, kicking the opponent below the hip line as well as attacking with the elbow, the forearm, the knife-hand, striking backhanded, spinning backfist. Contestants fight with naked torsos and head protection, mouth-guard, gloves for full contact sport, groin protection, shin guard and foot protection, hand wraps are compulsory too.
5. Low kick is a fighting form during which punching and kicking techniques can be used with full power and strength; thighs can be attacked as well. Prohibited techniques include attacking with the knee, attacking with the elbow, the forearm, the knife-hand, striking backhanded, punching from above. Contestants fight with naked torsos and wear shorts. Obligatory protection include head protection, mouth-guard, gloves for full contact sport, groin protection, shin guard and foot protection, hand wraps are compulsory too.
6. K 1 is a form of fighting in which punching and kicking techniques have to be performed with full strength and power and which allows attacking thighs and attacking with the knee. Prohibited techniques include elbow techniques, attacking with the forearm and the knife-hand. Depending on tournament, it is prohibited to attack the head with the knee (then it is allowed to attack the torso repeatedly with the knee) or to perform repeated attacks with the knee (then it is allowed to attack the head with the knee). Contestants fight with naked torsos, they wear shorts. Obligatory protection include head protection, mouth-guard, gloves for full contact sport 10 Oz, groin protection, shin guard and foot protection, hand wraps are compulsory too.
7. Muay Thai is fighting in which punching and kicking techniques have to be performed with full strength and power and which it is allowed

to attack thighs, to attack with the knee, the elbow and the forearm. Prohibited techniques include attacking the groin and the back part of the body. It is also allowed to attack knee joints. Clinching is allowed as well. Contestants fight with naked torsos and wear shorts. Obligatory protection include head protection, mouth-guard, gloves for full contact sport 10 Oz or 12 Oz, groin protection, shin guard and foot protection, hand wraps are compulsory too.

8. Full Contact Karate is fighting which is used by karate organizations and which is an intermediary element between the rules of K 1 and low kick. In this fighting punching and kicking techniques have to be performed with full strength and power, it is allowed to attack thighs. Single attack to the torso with the knee is allowed as well. Prohibited techniques include attacking with the elbow, the forearm, the knife-hand, kicking the head with the knee. Duration of a fight is 3 rounds, 2 minutes each. Contestants fight with naked torsos and wear long trousers. Obligatory protection includes full contact helmet, mouth-guard, gloves for full contact 10 Oz, groin protection, shin protection, hand wraps are compulsory too.

Training load and competition burden in kickboxing characterize effort made by a contestant. The magnitude of this effort exerts a direct influence on the energetic and psychological sphere organism and can positively or negatively influence the effectiveness of training process. The relations between used loads and their effects in organism are subject of the analysis which confirm the effectiveness of training process.

Load applied during physical (training) exercises and in the course of a sports fighting (starting operation) can be divided into:

- external one – it is identified with physical effort which is made during training,
- internal one – this is individual reaction of the body to effort, which is expressed by the level and character of physiological and biochemical changes, as well as the level of psychological engagement.

External load is the product of volume, namely the work that was made, and intensity, namely the value of developed power. Whereas the volume of training work causes long-term functional changes and exerts influence on the length of maintaining shape, intensity decides about the speed at which it is obtained. In order to obtain better and better results, it is necessary to increase training load³.

³ *Obciążenia treningowe, dokumentowanie i opracowywanie danych* [Training load, documenting and compiling data], H. Sozański, D. Śledziwski (eds.), Wydawnictwo COS, Warszawa 1995.

TAB. 1. CLASSIFICATION OF LOAD ACCORDING TO APPLIED MEANS TAKES THREE AREAS OF INFLUENCE INTO ACCOUNT:

Area	Means	Symbol	Effect
1	Means having comprehensive nature.	W	They shape contestants' general fitness. They do not influence the development of special fitness.
2	Targeted means.	U	They develop leading features. They get fitness ready for specialist need.
3	Means having special nature.	S	They develop movement and performance characteristics for starting needs.

There are three types of training means (table 1) and five scopes of intensity in which heart rate before and directly after effort (HR) and duration of effort are used as criteria (table 2).

TAB. 2. CLASSIFICATION OF LOAD IN THE ENERGY AREA IS RELATED TO PERFORMING EXERCISES AND SPECIFIC INTENSITY.

Scope	Type of effort	Intensity	Heart rate	Duration of effort
I	Anaerobic effort (supporting effort).	Very low or low.	From 130 to 140.	A few or several hours.
II	Aerobic effort (developing effort).	Moderate or high.	From 160 to 180.	From 300 s to 3 and more hours of continuous work.
III	Aerobic and anaerobic effort (mixed effort).	High or submaximal.	Above 180.	Up to 300 s.
IV	Anaerobic, lactic acid effort.	Submaximal or close to maximal.	Above 190.	From 20 s to 120 s.
V	Anaerobic, non-lactic acid effort.	Close to maximal and maximal.	From 130 to 180.	Up to 20 s.

VI scope is also found in literature, which is defined as one that strengthens anabolic changes in muscles (strength training).

An analysis of load is based on presenting energetic costs incurred as a result of effort, thanks to transforming data about partial and summary time of performed work. As a result of the fact that training load is a reaction of the organism to the used means, presenting energetic costs seems to be closest to real structure of load.

Fundamental start burden in amateur kickboxing lasts 8 minutes, but it has to be divided into three periods of continuous, 2 minute long work, namely rounds separated by two periods of incomplete rest lasting 1 minute, namely breaks between subsequent rounds. When analyzing the work of contestants in energy areas it can be concluded that in kickboxing we deal mainly with work in the fourth and fifth scope (round) as well as the third scope (the whole fight). Situation changes a bit during professional fights where rounds last 3 minutes and where contestants work mainly in the third scope. In case of such efforts, lasting up to 20 minutes, energy needs of the organism are satisfied by blood glucose and liver and muscle glycogen⁴.

A classic training cycle of a kickboxing contestant involves a complex of organizational activities, studies and training tasks which aim to develop fitness and then stabilize and use it, as well as necessary regeneration. A 12-month training of kickboxing fighters can be divided into macrocycles, mesocycles and microcycles⁵.

Long cycles (macrocycles) – they most often last twelve or six months, which are related to the specificity of rivalry in this discipline; they are divided into three phases: the preparatory phase (developing form), the participation phase (stabilization and application of form), the transitional phase (partial and controlled reduction of form); in order to optimize form both volume and intensity have to change incrementally in accordance with the rule of gradual increase of training load. Many trainers resign from the transitional phase because of a tight schedule of participation in competitions⁶ (tab.3).

⁴ A. Ronikier, *Fizjologia sportu* [The physiology of sport], Biblioteka Trenera, COS, Warszawa 2001.

⁵ T. Ulatowski, *Teoria Sportu. Trening* [The theory of sport. Training], Resortowe Centrum Metodyczno-Szkoleniowe Kultury Fizycznej i Sportu, vols I & II. Warszawa 1992.

⁶ T. Ambroży, D. Mucha, D. Ambroży, A. Ostrowski, J. Omorczyk, *Logistyka działań w procesie treningu zawodników ju-jitsu* [Logistics of actions in the course of ju-jitsu fighters' training], „Logistyka”, 2014, no 6, p. 13964-13974.

Training periodization in kickboxing involves two main start periods in which the most important competitions are held in April/May, this is the time when such competitions as Polish Championship, the Cup of Poland, the World Cup, the Cup of Europe are organized, and in September, when World Championship and European Championship are organized.

TAB. 3. AN OUTLINE OF A MACROCYCLE⁷

	Pre-start phase	Main competition		Pre-start phase	Main competition	
Preparatory phase 1	Start phase I		Start phase II	Start phase II		Transitional phase

The preparatory phase in kickboxing lasts approximately four months and is divided into two shorter phases: general participation phase and special participation phase. The main aim of the general preparation sub-phase is to improve the level of motor skills by using general development training. However, developing techniques should not be neglected. In general preparation we should focus mainly on developing strength and endurance. Special preparation in the preparatory phase is a process in which transition to the participation phase takes place. The volume of effort is still high, motor skills are still developed, but by means of specialist actions, namely actions that are typical of kickboxing and while still doing general development exercises, which volume should equal 30% of the volume of the training. The main skills that are developed in this sub-phase include speed and speed endurance. At the end of this phase first contestants should in low ranking competitions of the season, which are to facilitate entering the start phase. Achievements of the preparatory phase, namely optimal general and special form, constitute a basis for preparation of the contestant to obtain maximal sports results.

⁷ *Roczny Plan Szkolenia Zawodników Light-contact* [An annual training plan of contestants], T. Skrzypek (ed.). 2000.

THE AIM OF THE PAPER

The aim of the paper is to analyze the effectiveness of training of UKS Gladiator Club Fighters' in the preparatory phase and to analyze training loads used during that time.

MATERIAL AND METHODOLOGY**PARTICIPANTS**

Participants included a group of 12 fighters of UKS Gladiator Club (the average age: $13,2 \pm 2,2$) who have achieved high sports results – this group includes medalists of Polish Championship and the Cup of Europe. Table 4 presents a description of the test group.

TAB. 4. A DESCRIPTION OF THE TEST GROUP

Parameter	Mean	Standard deviation
Age [in years]	13,17	2,21
Height [cm]	160,42	14,91
Weight [kg]	51,13	15,95

TOOLS

Physical fitness parameters have been measured by means of selected test of EUROFIT testing battery:

- agility test – 4 x 10 meter run measured in seconds,
- explosive strength test – a standing long jump measured in centimeters,
- sit and reach flexibility test – measured in centimeters,
- static strength test – bent-arm hang test measured in seconds,
- cardiorespiratory strength test – a shuttle run, the so-called beep test, measured in meters⁸.

Training loads have been measured on the basis of trainer's training documentation.

THE TEST PROCEDURE

The performed tests were of longitudinal character – they were conducted in the start period, which lasted from 02.11.2015 to 22.02.2016. During

⁸ Eurofit, *Europejski test sprawności fizycznej* [The European test of physical fitness], Translation from English: H. Grabowski & J. Szopa. AWF, Kraków 1989.

this time 3 measurements were made: 1) *pretest* – at the beginning of the preparatory period (03.11.2015), 2) *second* measurement – in the middle of the preparatory period (05.01.2015) and 3) *posttest* – at the end of the preparatory period (23.02.2016).

STATISTICAL ANALYSIS

Because of a small number of the test group, a decision has been made to use Friedman test (Friedman, 1940), which is a non-parametric counterpart of analysis of variance ANOVA for dependent variables. When differences between the measured parameters have been found, Dunn-Bonferroni (Dunn, 1964) test was used as *post hoc* test.

Statistical calculations have been made by using a statistical software by Statsoft Poland, namely Statistica 10. The alpha level for $p \leq 0,05$ was set as statistically significant in all comparisons. All descriptive data have been presented in mean \pm SD format.

TEST RESULTS

TRAINING LOAD

When analyzing training documentation, it has been found that trainings took place three times a week, each lasting from an hour to an hour and a half. There were 66 training sessions in total, which correspond to 3960 minutes of training. Whereas comprehensive training lasted 1583 minutes, 1346,4 minutes were devoted to specific means, which constitutes 40% and 34% of all training time respectively. The least time was spent on targeted training means – only 26% of all training time, which is 1029,6 minutes (table 5).

TABLE 5. A DISTRIBUTION OF TRAINING MEANS OF THE PREPARATORY MESOCYCLE

Means	Time distribution (min)	Percentage distribution (%)
Targeted (U)	1029,6	26%
Special (S)	1346,4	34%
Comprehensive (W)	1584	40%
SUM	3960	100%

PHYSICAL FITNESS

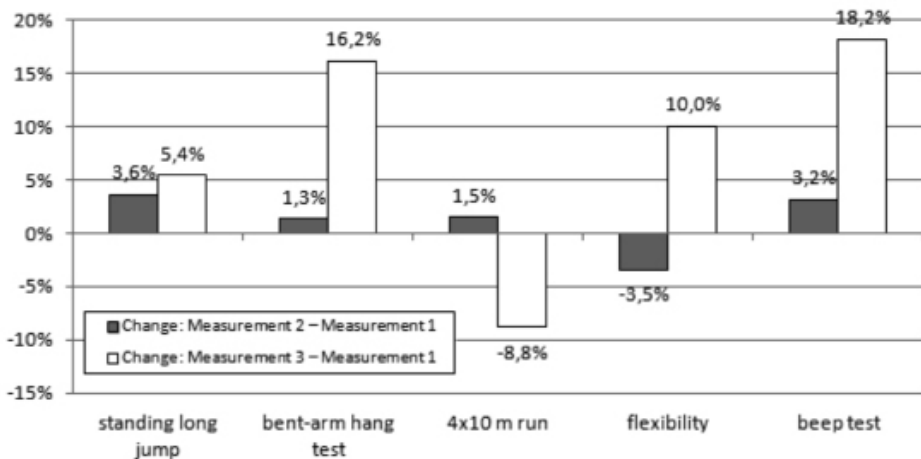
Descriptive statistics of performed fitness test has been presented in table 6.

TAB. 6. AVERAGE VALUES OF SELECTED FITNESS TESTS

Variable	Measurement 1 Pre-test	Measurement 2	Measurement 3 Post-test
Standing long jump [cm]	172,67 ± 32,37	178,83 ± 28,52	182,00 ± 30,19
Bent-arm hang test [s]	19,47 ± 17,29	19,73 ± 18,06	22,62 ± 19,17
Run 4x10 [s]	11,94 ± 1,14	12,12 ± 1,22	10,88 ± 3,54
Flexibility [cm]	10,83 ± 4,95	10,46 ± 5,55	11,92 ± 5,53
Beep test [m]	835,00 ± 266,99	861,67 ± 264,57	986,67 ± 245,44

While table 7 presents the results of statistical analysis using Friedman test, figure 1 presents percentage change of fitness test results in the course of preparatory phase. These results serve only supportive role in the interpretation of observed differences.

FIGURE 1. PERCENTAGE CHANGE OF VALUES OF ADOPTED FITNESS TESTS



In case of results of *standing long jump* test, statistically significant differences between performed measurements have been found ($\chi^2(2, N = 12) = 12.311; p = .002$). In comparison to the first measurement, statistically significant ($p < .05$) improvement of results obtained in the second (by 3,6%) and third (o 5,4%) measurement have been observed.

When analyzing the results of *arm-bent hang* test, statistically significant differences between the performed measurements ($\chi^2(2, N = 12) = 10.167; p = .006$) have been found as well. The results of *posthoc* test indicated statistically significant ($p < .05$) differences between the first and third measurement in which arm-bent hang longer on average by 16,2% has been observed.

In case of *4x10 run* statistically significant differences between performed measurements ($\chi^2(2, N = 12) = 6.426; p = .040$) have been observed. The results of Dunn-Bonferroni test⁹ have indicated statistically significant ($p < .05$) shorter duration time of this fitness test in the third measurement in comparison to earlier measurements – first and second ones. After the preparatory phase ended, the duration of 4x10 run shortened on average by 8,8% in comparison to the first measurement.

In case of *beep test* statistically significant differences between measurements ($\chi^2(2, N = 12) = 14,851; p = .001$) have been observed as well. *Post-hoc* analysis has indicated significant ($p < .05$) improvement of distance run between *pretest* and *posttest* (on average by 18,2%).

No statistically significant differences between measurements in *flexibility* test ($p > .05$) have been found.

⁹ O.J. Dunn, *Multiple comparisons using rank sums*, "Technometrics", 1964, 6, p. 241–252.

TAB. 7. THE RESULTS OF FRIEDMAN TEST¹⁰

Variable	Average rank			c ²	p
	Measurement 1 Pre-test	Measurement 2	Measurement 3 Post-test		
Standing long jump	1,21	2,29	2,50	12,311	.002
Arm-bent hang test	1,58	1,67	2,75	10,167	.006
4x10 run	2,21	2,38	1,42	6,426	.040
Flexibility	2,00	1,88	2,13	.439	.803
Beep test	1,29	1,88	2,83	14,851	.001

DISCUSSION AND SUMMARY

The basic aim of training in the preparatory phase was to increase the level of general fitness, which constitutes a basis for specialist training, as well as to improve already known and learn new elements of fighting techniques. Technical training, which constitutes 30–50% of all training means used in this phase is necessary since ceasing exercises of this type results in reducing the accuracy of movement and response time¹¹.

The performed tests indicate a growth of investigated characteristics of physical fitness in the majority of contestants. The highest progress can be observed in the explosive strength test, the static strength test and cardiorespiratory strength test. As the results of test show, these are the most important features, which are necessary to achieve success in kickboxing¹².

¹⁰ M. Friedman, *A comparison of alternative tests of significance for the problem of m rankings*, "The Annals of Mathematical Statistics", 1940, 11 (1), p. 86–92.

¹¹ Z. Czajkowski, *Poradnik trenera* [A guidebook for trainers], RCMSKFiS, Warszawa 1994.

¹² A. Kwiatkowski, *Analiza wybranych składników przygotowania motorycznego zawodniczek uprawiających kickboxing na różnym poziomie mistrzostwa sportowego* [An analysis of selected elements of motor preparation of female contestants training kickboxing at various level of sports mastery], B.A. paper, Rzeszów University 2012.

The smallest effects of training in the preparatory phase have been observed in flexibility and agility tests.

The distribution of training means in the investigated period is close to that of taekwondo contestants. Taekwondo contestants preparing for World Championship used the following training means in the preparatory phase: W-41%, U-16%, S-43%. This ration is close to the ration of investigated kickboxers, however taekwondo fighter devoted more time to specialist training¹³. Other studies have also analyzed the structure of training loads in taekwondo, e.g. in Orient Kłobuck Club. They devoted 52%, 15% and 33% of all training time to comprehensive, targeted and specialist training respectively¹⁴.

Summing up, it should be noted that an important cognitive element of the research carried out is observation of improvement of the level of physical fitness in case of the majority of investigated features, which was the intended effect of training in the preparatory phase. When planning the next preparatory phase, one has to pay greater attention to the development of such skills as flexibility and agility.

The adopted training load has caused an average increase of investigated parameters, which proves training effectiveness. The final pictures of the effectiveness of training carried out in the preparatory phase will be reflected by sports results obtained in the most important contests this year, namely Polish Championship in May and World Championship in September.

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