



Effects Intensive Combined Training on Performance Level Based on Multifaced Performance Analysis of Elite Athlete Preparing for Muay Thai Championship

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Abstract

It is a multifaced performance analysis for the professional athlete preparing for the Muay Thai Championship and a study level of the performance impact of intensive combined training. Material Method; One (1) professional Muay Thai athlete who was 35 years old and 175 cm high and weighted 85 kg participated in the study. In our study, from versatile performance analysis, Anthropometric (Subcutaneous Fat, Environmental measurements), Posture Analysis (Anterior-Lateral), Biomotor Tests (Strength (1RM), Aerobic Endurance (3000 m), Anaerobic Endurance FTP (3 min Load 1 min rest 3 Set), flexibility and physiological evaluations (Heartbeat Counts, Lactate) tests were performed. Based on the multiple data obtained from tests, exercises were applied to the determined zones for 4 weeks (3 training sessions 5 days a week, morning-afternoon-evening – 2 days a week). At the end of the four weeks, PRE-POST test values were compared this study. Our study resulted positive changes in body subcutaneous fat ratio (I test = 8.17% II test = 7.90) from anthropometric tests, posture analysis in circumference measurements, Strength (1RM), Endurance, Flexibility, FTP and physiological I test and II test have been determined. Consecutive results based on the data we have obtained, believe that the intensive combined training applied to the performance analysis positively affects the performance of the Muay Thai athlete and the training periodization applied will bring about a perspective to those who will work in this field.

Keywords: Muay thai, performance, combine training.

INTRODUCTION

Muay thai one of the Far Eastern combat sports is a sports branch that attracts worldwide attention at homeland is Thailand. Branch is Thai boxing is known as the art of 8 limbs and athletes can punch, knee, elbow, kick and hold their opponents. A Muay Thai match lasts about 5 or 3 rounds of 3 minutes often it can be manipulated depending on the skills of the athletes. As with most martial arts, competitors are matched by weight (Turner, 2009). Muay Thai also has a content that requires complex skills and tactical excellence to be successful opponents (Crisafulli et al., 2009). Movements that require complex skills and tactical excellence for success have dynamic and high-intensity interval effects. Performance in these sports includes unpredictable strong actions and these affect the outcome of the competition (Matsushigue et al., 2009; Del Vecchio et al., 2011). It is seen that physical characteristics, physiological (aerobic and anaerobic energy systems, cardiovascular and metabolic competence), biomotor features (strength, ability, mobility, flexibility) technical and tactical

features come to the fore in Muay Thai sport. The duration of the rounds is 3 minutes, and the rest time is 1 minute. It is seen that while it brings the high level of anaerobic power and capacity feature to the forefront due to its being, it affects the success as a complementary to the features. Results obtained from Muay Thai time structure analysis determined that 60% of the duration of a round was attacked and approximately 40% was defensive (Cappai et al., 2012). Performance is the physical, physiological, biomotor (strength, speed, endurance, mobility, flexibility, coordination), psycho-mental, technical, and tactical products of the athlete. It is known that many internal and external factors that affect performance are effective (Kılınc, 2003). It is important that the performance outputs coincide with the characteristic (physical, physiological, biomotor, psycho-mental, technical tactical) of the branch it has done. For example, Aerobic capacity (MaxVO₂) stands out from the physiological characteristics in determining the performance status of a distance runner while the Anaerobic Power values (Peakpower / Average Power) of a Muay Thai athlete stand out. It has been reported that studies on Muay Thai generally focus on strength and condition, sports physiology, sports psychology, and biomechanics (Mohamad et al., 2017).

In addition, it is seen that the participants' lung capacity, estimated maximum oxygen uptake (MaxVO₂), Wingate anaerobic capacity, isokinetic Peak Power (strength), hand grip strength, back and leg strength, explosive power, agility, static balance, and flexibility were examined in multifaceted related tests (Abidin et al., 2018). It is necessary to know the versatile performance outputs of the athlete, which is prerequisite for training periods. As in any sport where S&C (Strength & Condition) training will be applied, Strength and Conditioning (S&C) trainers must first undergo a performance analysis to determine the biomechanical and physiological requirements of the sport. This after determination, sportmanship and the trainer have to set goals together (Turner, 2009). Therefore, knowing every parameter that can affect the performance of the athlete together with the basic measurements and tests to be made will constitute an important place in formation the training periodization to be applied. The purposes of this study were to examine the effects of intense combined training applied based on the versatile performance analysis of the elite athlete preparing for the Muay Thai championship on the performance level.

MATERIAL AND METOT

Participant

One professional Muay Thai athlete voluntary participated in the study. Participant was 35 years old, 174 cm height, 85.2 kg body weight (Pretest) and athletic age was 25 years. Sports background includes National (2004 63,5 kg Turkey Champion), International (2007 ISCA European Championship 2nd, 2009 ISCA Grand Prix Champion 2.71 Kg) Professional matches 2013-2021 (13 professional 5 losses 8 wins).

Anthropometric measurement

Skinfold calipers and tape measure were used for anthropometric measurements in the study. Subcutaneous fat measurements (Biceps Triceps Pectoral Sub-Scapula Suprailiac Abdomen and Quadriceps Calf (mmhg) regions were taken. Lange Formula% Fat% = $(Bic + Trs + Pec + Scpl + Siliac + Quad) \times 0.097 + 3.64$ was used to determine the body fat percentage (Lang and Brozek, 1961). Anthropometric circumference measurements using standard tape measure

(Full shoulder, right-left shoulder, arm weakness/stiffened leg loose /stiffened, chest normal, chest full inspiration, chest full expiration) measurements were taken in (cm) regions.

Posture analyze

Performed in the APPA Posture Analysis program. The program photographs taken with a high-resolution Canon digital camera according to the Anterior Lateral posture position used in postural transferred to the designated area were within the APPA Posture analysis program. Postural Anterior (anterior) 15 areas that can be evaluated angular limb according to the posture (Head, Shoulder, Right Elbow, Left Elbow, Right Hand Wrist, Left Hand Wrist, Right Chest, Left Chest, Abdomen, Hip, Right Knee, Left Knee, Right Ankle Left Ankle, Ground (Malleol-Shoulder inverted angle). 3 reference points were used in calculated the interior angle of each region. Such as, evaluation of the elbow region, lateral deltoid point (1 marker) of cubital region external and innermost curve point (2 marker) and on lateral processes of styloid reference (3 marker) these are marked. Longitudinal reference points distance humerus was drawn three point. Subsequent calculation distance twopoint centre references and inter angular were calculated.

Inside angle formula “ $((180-(\text{two external angle total}) \text{ use. Tablo/Picture 4/1, 1. Region } [(180-(7+6,1)] = 166, 9 \text{ as degree were calculated.}$

Strength and mechanical tests

All Bench Press, Military Press, Upper Row, Lat Pull, abdominal crunch, Hyperextension, Leg Extension, Leg Curl, Squat as 1RM with Cable Cros tool – right-left handers, crochet, uppercut, front kick, and knee punches (1RM) recorded. Calisthenic strength; horizontal bar, push-ups, shuttle, dips movement maximum repetitions recorded. Superman Plank posture constant position (sn) expected record. Flexion, sit-lie down taken to (cm) in tool.

Anaerobic tests

Test protocol proper in the competition conditioning the 3 duration maximal load-1 duration (3 load-3 duration) was performed (Tacx Flux Powermeter). All loads and duration average power, mean heart beat number (Garmin Edge 820) and initial finish Lactate (LacEdge) was values obtained.

Aerobic test

Then, 15 min warmup runner pist was tested 3000 m distance. Performance time, mean Heart Beat Point and Maximal Heart Beat Point (Polar H10) were recorded. All testes before 2 hours their were request not nutrition substance. Athlete when felt that he was good and ready as warm-up, the tests were starded. As a warm-up protocol, the tests were initiated after 15 minutes (110-120 HBP) of light tempo jogging / pedaling, then after the joint mobility and flexibility study, again 5 minutes of short running / pedaling (110-120 HBP) adaptation. Maximum loading was all requested in tests.

The data obtained from the tests were digitized and the increase and decreased values were determined mathematically.

Statistical Analysis

Data were analyzed using the SPSS program. The qualitative versatile performance variables were obtained Pre-Post means value.

RESULTS

Comparative results obtained from versatile performance data are explained into tables. The characteristic features of the muay thai athletes participating in the study are given in table 1.

Table 1. Physical information of the elit muay thai athlete participating in the study

PARAMETER	PreTest 03.03.2021	PostTest 06.04.2021
Age (yr)	35	
Heigh (cm)	174	174
Body mass (kg)	85,2	80,1
Sport participant (year)	25	

Table 2. Anthropometric subcutaneous fat pre and post measure results

PARAMETER	PreTest 03.03.2021	PostTest 06.04.2021
Biceps (mmhg)	5,5	3,5
Triceps (mmhg)	5,5	5,5
Pectoral (mmhg)	6,4	7
Sub Scapula (mmhg)	12	11,5
Suprailiac (mmhg)	9	9
Abdomen (mmhg)	22	14
Quadriceps (mmhg)	8,4	7,5
Calf (mmhg)	3	3
Fat% % (Lange)	8,2	7,9

Proportional change in muscle groups was obtained from anthropometric subcutaneous fat pre-post measurements (Tablo 2). Significant muscle strength variability and hypertrophic results were obtained in the biceps, pectoral and abdominal and quadriceps muscle groups of the athlete.

Table 3. Anthropometric circumference pre and post measure results

PARAMETRE	PreTest 03.03.2021	PostTest 06.04.2021
Shoulder (cm)	118	118,5
Side-right shoulder (cm)	40	41
Side-left shoulder (cm)	40	40
Biceps extension (cm)	32	31
Biceps contraction (Elbow 90 Degrees) (cm)	37	37
Humarus extension (cm)	29	29
Humarus contraction (Elbow 90 Degrees) (cm)	32	32
Chest (cm)	94	94
Chest inspiration (cm)	96	94
Chest expiration (cm)	92	89

Abdomen chest (cm)	94	89
Thigh (cm)	94,5	97
Quadriceps extension (cm)	61	61
Quadriceps contraction (cm)	61,5	61,5
Calf extension (cm)	39	39
Calf contraction (cm)	39	39

Results obtained from anthropometric circumference pre-post measurements showed that right shoulder and thigh hypertrophy increase and lean muscle mass changes in other regions were significantly different (Tablo 3).

Tablo/Picture 4/1. Anterior posture analysis

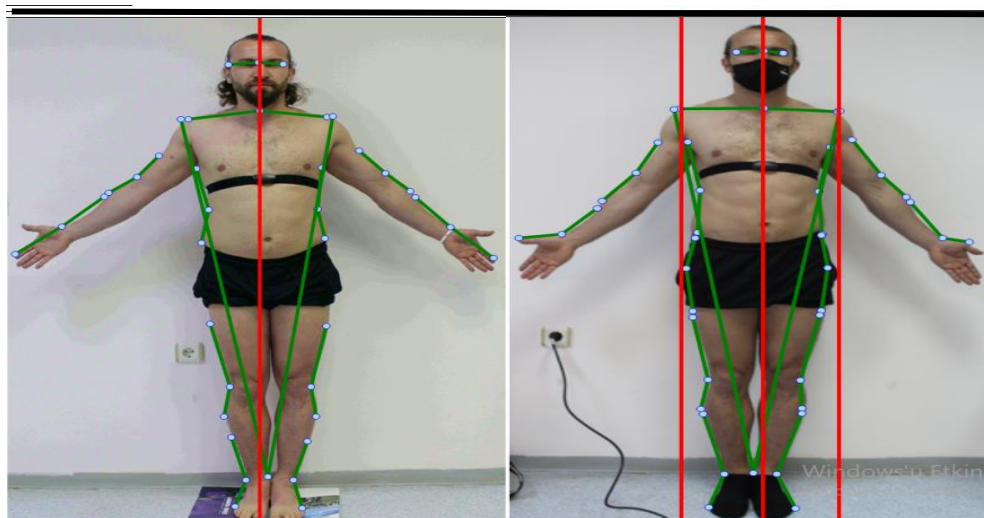


Table 5. Biomotoric pre and post test result

ROW	PARAMETER	PreTest 03.03.2021	PostTest 06.04.2021
1	Bench press (1RM/kg)	110	120
2	Upper row (1RM/kg)	100	100
3	Lat pull (1RM/kg)	95	105
4	Military Press (1RM/kg)	80	100
5	Abdominal Machine (1RM/kg)	60	60
6	Hyperextension (1RM/kg)	55	60
7	Right hander (1RM/kg)	55	55
8	Left hander (1RM/kg)	55	55
9	Right hander (1RM/kg)	35	45
10	Left hander (1RM/kg)	35	45
11	Right crochet (1RM/kg)	45	50
12	Left crochet (1RM/kg)	45	50
14	Squat (1RM/kg)	130	120
15	Leg extension (1RM/kg)	80	85
16	Leg curl (1RM/kg)	45	50
20	Front kick (1RM/kg)	81	80
21	Knee punch (1RM/kg)	70	70
22	Barfix (pieces)	10	12
23	Push-up (pieces)	55	80
24	Shuttle (pieces)	120	130

25	Dips (pieces)	30	35
26	Superman plank (sn)	142 sn	180 sn
27	Flexibility (cm)	25	30

Biomotor performance resulted an increase in muscle strength of the biomotor strength tests bench press, lat pull, military press, right hander, left-right crochet, leg extension, leg curl, additionally the increased were obtained the number and time of functional calisthenics (Table 5).

Table 6. Aerobic endurance pre and post test result

PARAMETER	PreTest 03.03.2021	PostTest 06.04.2021
3000 m (dk.sn)	12,40	12
3000 m Max Heart Beat Point beat/min	192	190
3000 m Mean Heart Beat Point beat/min	153	155
Estimate FTP Watt (Tab Runner Value)	350	375

A significant reduction in maximal heart rate has been demonstrated for 3000 m at the same time significant increases were seen in threshold working power and aerobic power (Table 6).

Table 7. Anaerobic power results

PARAMETER	PreTest 03.03.2021	PostTest 06.04.2021	Lactate
Static Heart Beat Point (Morning)	54	53	
Pre Warm up 15 min (HBP)	120	104	0,8 mmol/L
1. Load 3 min last (HBP)	164	169	
1. Load 3 min finish (Watt)	220	233	
1. Static 1 min (HBP)	157	151	
1. Static 1 min (Watt)	80	60	
2. Load 3 min (HBP)	171	172	
2. Load 3min (Watt)	200	218	
2. Static 1 min HBP	160	153	
2. Static 1 min Watt	80	75	
3. Load 3 min HBP	176	178	11mmol/L
3. Load 3 min Watt	200	297	
3. Static 1 min HBP	157	153	
3. Static 1 min Watt	80	71	1 min last 14.1 mmol/L
Peak Power Watt	995	1100	3 dk. sonu 14.7/ mmol/L
Maximal HBP	176	178	
Estimate FTP Watt	351	362	
Estimate FTP Watt/Kg	4,12	4,46	
Estimate Max VO2 (ml/kg/min:)	48,8	50,4	

Significant reductions in maximal heart rate variability were exhibited in anaerobic explosive power. Heart rate and power were optimal at the end of the 3 period. Maximal oxygen consumption was optimal for muscle energy return watt increases (Table 7).

Table 8. Periodization training determinate to use intensity (Pretest HBP AS Zones)

ZONE	LOW (HBP)	HIGH (HBP)
Z1	98	114
Z2	116	132
Z3	134	150
Z4	151	160
Z5	160,2	167,3
Z6	169,1	172,7
Z7	174,44	178

In the power and strength regions related to heartbeat, the athlete showed more effort increases in zone 5 the most. In zone 1, there was an accumulation in aerobic capacity energy production. Its optimal performance is in zone 3 and zone 4 (Tablo 8).

<https://www.saris.com/post/blog-training-with-power-principles-no-go-zones>

Table 9. 4 of weeks (1 month) the training periodization

WEEK	1. WEEK							
DAY	1	2	3	4	5	6	7	
DATA	18.04.2021	19.04.2021	20.04.2021	21.04.2021	22.04.2021	23.04.2021	24.04.2021	
Weekly Intensity	65							
Day Intensity	65	65	75	65	75	65	75	
ZONE	Z1	Z2	Z3	Z1	Z3	Z2	Z3	
Morning	6000	07:00	07:00	Interval	07:00	Interval	07:00	07:00
		116-132	116-132	161-160	116-132	Bmp 161-	116-132	116-132
		3000x2	3000x2	bmp	3000x2	160	3000x2	3000x2
		5 min break	5 min	07:00	5 min	07:00	5 min	5 min
		test	break test	10 min wrp	break	10 min wrp	break test	break
				1000 m	test	1000 m		test
				120-130		120-130		
				200 m x 15		200 m x 15		
				T		T		
				TAD 30 sc		TAD 30 sc		
			2 set		2 set			
			SAD 5-10 min		SAD 5-10 min			
POWER	MAX	4S/8T/TAD	4S/8T/TAD		4S/8T/TAD		4S/8T/TAD	4S/8T/TAD
		30 S	30 S		30 S		30 S	30 S
		SAD 5	SAD 5		SAD 5		SAD 5	SAD 5
	MIN	MIN		MIN		MIN	MIN	
	1:1	1:1		1:1		1:1	1:1	
Bench Press	110	61	72		61		72	83
Upper Row	100	55	65		55		65	75
Lat Pull	95	52	62		52		62	71
Military Press	80	44	52		44		52	60
Abdominal Mac	60	33	39		33		39	45
Hyperext	55	30	36		30		36	41
Squat	130	72	85		72		85	98

Leg Ext	80	44	52	44	52	60	
Leg Curl	45	25	29	25	29	34	
Barfics	10	6	7	6	7	8	
Push up	55	30	36	30	36	41	
Shuttle	120	66	78	66	78	90	
Dips	30	17	20	17	20	23	
Superman plank	142	78	92	78	92	107	
	66-116 bpm	116-132 bpm	161-160 bpm	66-116 bpm	161-160 bpm	116-132 bpm	134-160 bpm
Evening	1. Sec	1. Sec	1. Sec	1. Sec	1. Sec	1. Sec	1. Sec
	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)
	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min
	2. Sec	2. Sec	2. Sec	2. Sec	2. Sec	2. Sec	2. Sec
	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)
	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min
	3. Sec	3. Sec	3. Sec	3. Sec	3. Sec	3. Sec	3. Sec
	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)	4 Round (5 min/ 30)
	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min	SAD 5 min

DISCUSSION

Versatile performance analysis of the athlete and create a training period based on it is a scientific methodological approach should be known and followed that is important in terms of specific athletic and condition performance development. It is necessary to plan and program performance variables to gradually maximize performance and examine every aspect of the athlete. Based on this requirement, our study and the studies of the authors who have done research in this field are shared below.

Studies, according to the Lange formula the percentage of body fat from the athlete was PreTest 8.2% while the PosTest value was 7.9%. According to body segments, weight and body fat were calculated as the PreTest period ($85.2 \text{ kg} \times 0.08 = 6.8 \text{ kg}$) as the PostTest ($80.1 \times 0.079 = 6.323 \text{ kg}$). Similar study conducted by Durkalec et al 2016 on combat athletes. They determined the fat mass as 13.0 kg and the percentage of fat as 15.5%. Tota et al in 2019, their study on combat sports determined body fat (79.8 kg) as 13.1% in the pre-test and 10.8% in the post-test (77.1 kg).

Multiple methods are used in posture analysis. These tests; Grid Method, Posture Test (Kılınc et al., 2009), Newyork State Posture (McRoberts et al., 2013), 3D (Steffen et al., 2010), PC software and Posture Analysis in Computer Environment (Ferreira et al., 2010, Alexander et al., 2015, Steffen et al., 2010) Radiographic Testing (Takeshima et al., 2002) is generally a method used by researchers. The evaluation made with the APPA Posture Analyzed software program using the photographs we used in our study is observed to be compatible with methods used in the literature.

Study, the changes in joint angular regions and general changes in the structure of the body segments were comparatively evaluated with the APPA Posture Analysis performed on the electronic photography in the Anterior posture analysis. Santos & Da Veiga (2012) analyzed Muay Thai athletes with a software program over photography and the most frequent changes were: trunk rotation, shoulder medial rotation, left scapular waist, kyphosis, hip flexion,

pelvic anteversion, valgus knee, valgus ankle, knee hyperextension. They identified head prominence, winged scapula, raised left shoulder (Domaradzki et al., 2021) examined the postures on the KickBoxers from combat sports with photometric method and stated that there are significant angular differences compared to other athletes, especially in the thoracolumbar and lumbosacral regions. It is stated that, with the work done by both us and the researchers, the formation has been formed with the characteristic features of the branch. We depend on the analysis of 15 regions, the additional exercises required in the training program were systematically designed according to both the angular values and the visual appearance level of the weak areas In Table 3/ Picture 1. It was shown that both the sports scientist and the athlete himself (Pre and PostTest) saw the developments in a comparative way and contributed to focusing on their training motivationally.

Crisafulli et al (2009) stated in their studies that Muay Thainin was a physically demanding activity with great participation of both aerobic metabolism and anaerobic glycolysis. Therefore, it is a necessity to determine aerobic and anaerobic capacities in Muay Thai athletes. In a similar study by Ivo Cappai et al., The MaxVO₂ level was 54.3 ± 1.4 ml · min · kg. The mean maximum HR was 187.2 ± 0.5 bpm and the HR level in AT was 168.4 ± 1.3 bpm. Crisafulli et al 2009, in their study on Muay Thaicer, MaxVO₂ 48.52 ml / kg / min, Max VO₂ AT 30.8 ml / kg / min (HRAT137.5 beats / min) and maximal heartbeat rate to 182.9 beats / min. In a similar study conducted by Tota et al in 2019, the pre-test was 55.1 ml / kg / min and the post-test was 59.7 ml / kg / min. In a similar study conducted by Durkalec et al. 2016 on combat athletes, MaxVO₂ was determined to be 57.9 ml / kg / min.

It has been reported that aerobic training forms an important part of training plans (with the basic structure aspect) (Kumyaito, and Tamee, 2016), In our study, 3000 meters PreTest Max Heart Rate 192 beats / min average beats per minute 153 beats / min in aerobic tests, PosTest Max Heartbeat Rate 190 beats / min average beats / min was 155 beats / min Anaerobic (simulated 3 min / 3 Round) 1 round 164 beats / min in Pretest 2nd Round 171 beats / min, 3rd Round 176 beats / min Post test was determined as 1 round 169 beat / min. Round 2 was 172 beats / min, Round 3 was 178 beats / min.

In a study conducted by Tota et al on the determination of anaerobic power and capacity on combat athletes in 2019, the average power values were 860.3 watts in the pre-test, 886.3 watts in the post-test, and the maximum power values were 1014.9 watts in the post-test 1082.3 watts in similar MaxVO₂ 57,9 ml/kg/dk.

It has been reported that aerobic training forms an important part of training plans (with the basic structure aspect) (Kumyaito & Tamee, 2016), In our study, 3000 meters PreTest Max Heart Rate 192 beats / min average beats per minute 153 beats / min in aerobic tests, PosTest Max Heartbeat Rate 190 beats / min average beats / min was 155 beats / min Anaerobic (simulated 3 min / 3 Round) 1 round 164 beats / min in Pretest 2nd Round 171 beats / min, 3rd Round 176 beats / min Post test was determined as 1 round 169 beat / min. Round 2 was 172 beats / min, Round 3 was 178 beats / min.

Ouergui et al. 2013, in their study on kick boxers, determined the Heartbeat point as 141 beats / min in the 1st round, 166 beats / min after the 2nd round, and 182 beats / min at the end of 3 rounds. In a similar study by Ivo Cappai et al., The maximum HR was 187.2 ± 0.5 HBP and

the HR level at AT was 168.4 ± 1.3 bpm. Ouergui et al 2014 determined the Heartbeat Counts as 1 round 141 beats / min, Round 2 163 beats / min, Round 3 180 beats / min in their study on the kick box. In a similar study conducted by Durkalec et al. 2016 on combat athletes, the number of heartbeats was maximally 183 beats / min, and the anaerobic threshold pulse was 162 beats / min. and Tota et al, in their study in 2019, determined the pre-test 182 beats / min and the posttest 182 beats / min.

In our study, they determined the lactate value (Anaerobic) as 08 mmol / L at the beginning of the test and 11.1 mmol / L at the end of the 3rd round. Ivo Cappai et al determined that blood lactate reached the highest value of 6.02 mmol / L in the first round and 12.55 ± 1.1 mmol in the fourth round during the matches and the average BLa level during the matches was 9.72 ± 0.6 mmol / L. Based on these findings, they emphasized that anaerobic systems gained importance in Muay Thai. They stated that energy systems such as Teakwondo, Karate etc. are also concentrated in similar sports (Beneke et al., 2004; Degoutte et al., 2003; Francescato et al., 1995). Ouergui et al 2014 lactate values in their study on the kick box, 1 round 8.63 mmol / L Round 2 11.72 mmol / L, Round 3 14.93 mmol / L, end of third round 13.24 after 3 minutes mmol / L, 11.99 mmol / L after 5 minutes and 8.94 mmol / L after 10 minutes. Durkalec et al determined the Lactate value as 1.8 mmol / L / 3.6 mmol / L in a similar study they conducted on 2016 combat athletes.

Periodization includes programmed specifications in training frequency, intensity and volume, and planned rest days (Kraemer and Fleck., 2007). Turner (2009) in his study, it is given an example where the number of sets and the number of repetitions is generally low, along with the paralelism of the conditioning equipment (Squat, Bent over Row, Lat Pull) we used in the training program we used. In our study, due to the high number of repetitions in accordance with the general structure of the Muaytan, the number of sets and repetitions were kept high, and the loading severity rates were changed only in the zone regions. When the fitness studies for Muay Thai in THAI work are examined, it is seen that the training periods are made according to the principle of variability of loading time and intensities (variations in the number of heartbeats). In the study conducted by Bounty et al. In 2011, it was seen that interval training was put on a certain day of the week during which they do mixed training periods rather than a fixed program. In a similar study conducted by Hakim et al. 2018, they mentioned the effectiveness of high intensity interval training in performance improvement. In our study, Interval training was carried out according to Zone regions 2 days a week, and its effectiveness in performance improvement is in parallel with the results we obtained.

CONCLUSION

Based on the data we have obtained it has been observed that multi-directional performance analysis of professional athletes and multiple and intense training (according to zone regions) positively affect their performance development. In addition, versatile performance analyzes can be important in terms of creating a database for tracking periodic performance changes of the athlete. We think that the versatile performance analysis and periodization we have applied in our study can provide a perspective for those who will work in this field.

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