Comparison of Selected Physiological Variables among Different Weight-category Indian Elite Male Boxers

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ABSTRACT

The present study is aimed to compare the selected physiological parameters among the different weight categories of boxers (light, medium and heavy). Total 36 elite boxers were studied within the age range of 20-25 years belonging to National coaching camp held at SAI NSNIS, Patiala. De Bruyn Prevost Test (1974) was used to measure the anaerobic power of the athletes. The grip dynamometer was used to record the strength of grip. The study concluded that the physical, physiological variables of the sportsmen of various weight categories need to be analysed at regular intervals and prompt counselling of the results, will enable the sportsmen to achieve higher level of sporting excellence.

KEYWORDS: Physiology Boxing, Anaerobic Power, Heart Rate Recovery, Grip strength

INTRODUCTION

Boxing is a highly individual sport. Fighters possess unique styles that create specific physical demands. Some relay on explosive strength ("power"), for others it's starting strength ("speed"), and for most a combination of the two ("speed-strength"). Generally sports are considered either to a low power activity or a high power activity. The development of power lies at the foundation of all movement, especially athletic performance. The low power activities include endurance activities like a long distance running and swimming. In such types of activities the athletes depends more on the aerobic energy system. The high power activities depend upon the anaerobic energy systems. Anaerobic energy systems are divided into the alactate and lactacid systems. Weightlifting, jumping tasks, sprint activities are the short but explosive type of activities requires the sufficient use of the ATP - CP or alactic system. Sprint such as the boxing, 100 - 400 meter running events and team sports like Hockey, Basketball commonly involves lactic system.

Anaerobic power is the power produced without the requirement for

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oxygen to be present. It relates to short-term high-energy production where the predominant fuels are produced without the necessity of oxygen. Tests for anaerobic performance aim to assess relatively short duration exercise bouts.

The return of the muscle homeostasis to its pre-exercise state following exercise is known as recovery. The capability to recover faster is critical in many team sports like Football and Hockey and in combat sports like Boxing and Judo. It has been suggested that adaptation associated with endurance training should enhance the recovery. The ability to recover following a bout of intense activity may therefore to a large extent, influence performance or even in selection of players for particular position in game/sport. Furthermore, recovery constitutes an important component of interval-style training to maximize the training effect.

The present study is aimed to compare the selected physiological parameters among the different weight categories of boxers (light, medium and heavy). Total 36 subjects were recruited from Indian male sportspersons belonging to Boxing national camps that were be held at Netaji Subhas National Institute of Sports, Patiala, during the period of study.

METHODOLOGY

All the subjects were divided in to three different weight categories according to their body weight.

Light weight = 47Kg-60Kg
Medium weight = 61Kg–75Kg
Heavy Weight = above 75Kg

Each subject have been first subjected to physical examination that will include measurements of the corporal exercise testing, in a manner described below, to asses their following physiological transients:

1. Anaerobic Power output
2. Peak power output
3. Grip Strength
4. Recovery response

Exercise test were performed on electronically operated computerized bicycle ergometer (ER 900: Erich Jaeger, Germany), using a test protocol that consisted of graded exercise test. The initial load in the test phase was fixed at 1watt/kg, and increased by 2 watt/kg after 2 min , consequent to which, the volunteers were asked to cycle briskly at a rate of 60-70 RPM. First heart rate was taken after 2 minutes, cycling at 1 watt/kg workload and 2nd heart rate was taken after 4th min cycling at 2-watt/kg workload. De Bruyn Prevost Test (1974) was used to measure the anaerobic power of the athletes. The grip dynamometer was used to record the strength of grip.

All the values of physiological and morphological variables was expressed as mean, Standard deviation, standard error of mean. ANOVA (as per the suitability) and Post Hoc were applied to compare the physiological transients in three given groups to find out the differences. All analysis were done by using standard statistical package, SPSS.

RESULTS & DISCUSSION

Table-1 : Comparison of Physical Variables of Different Weight Categories

	Light		Medium		Heavy		F value
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	
Age (Yrs)	15	22.59 (3.77)	11	23.01 (3.29)	10	22.23 (1.98)	0.155
Weight (Kg)	15	53.33 (3.96)	11	65.27 (3.41)	10	86.30 (6.38)	136.3**

**Significant at the 0.01 level (2-tailed).

The obtained F ratios for age of three groups (light, medium and heavy) is statistically non significant, as the calculated F values is less than the Table value. The obtained F ratios for body weight of three weight categories is statistically significant, as the calculated F values (136.3*) is more than the Table value ($p<0.01$). Body Mass have significant impact on elite boxers. There are significant differences in body weight between the boxers light & heavy ($P<0.01$), light & medium ($p<0.05$) and medium & heavy ($P<0.01$).

Table-2 : Comparison of Variable Anaerobic Power Among National Boxers of Different Weight Categories

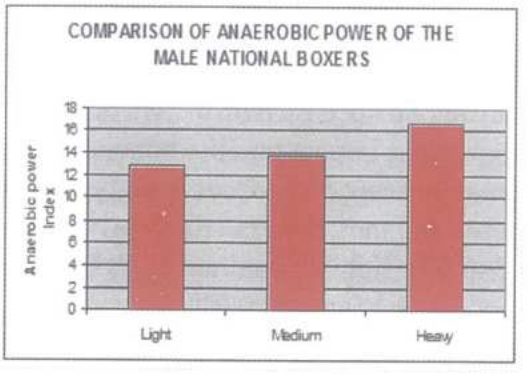
	Light		Medium		Heavy		F value
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	
Anaerobic Power	15	12.82 (1.94)	11	13.84 (3.41)	10	16.65 (3.17)	12.6*
Peak Power (rpm)	15	159 (12.40)	11	160.73 (8.63)	10	159.10 (10.15)	0.094 NS
Recovery HR	15	94.33 (15.57)	11	91.55 (12.15)	10	100.55 (91.55)	1.138
Grip St. (Rt)	15	40.13 (9.95)	11	49.5 (2.15)	10	51.8 (8.2)	7.887*
Grip St. (left)	15	33.40 (9.95)	11	44.64 (2.15)	10	46.30 (8.2)	8.072*

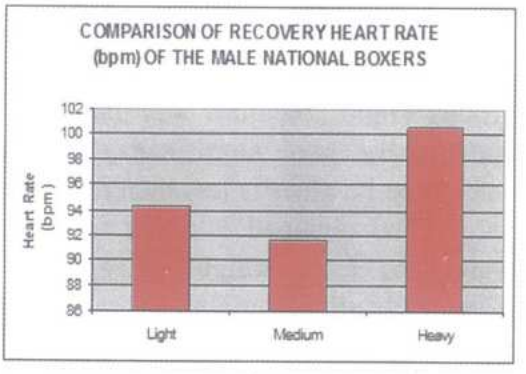
NS=Non Significant
**Significant at the 0.01 level
*Significant at the 0.05 level

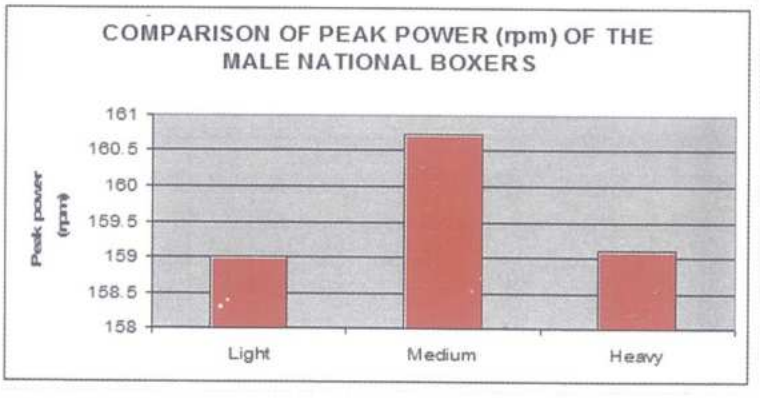
Table-3 : Post Hoc Analysis of Anaerobic Power Among National Boxers of Different Weight Categories

Anaerobic Power Index	Mean Difference (I-J)	Std. Error
Light/Medium	-1.82	1.830
Medium/Heavy	-187	2.014
Heavy/Light	-4.80**	1.88

** Significant at the 0.01 level * Significant at the 0.05 level







The obtained F ratios for anaerobic power of three weight categories is statistically significant, as the calculated F values (12.6*) is more than the Table value ($p>0.01$). There are significant differences in anaerobic power index between Light & heavy weight categories ($P<0.05$).

The obtained F ratios for peak power of three weight categories is statistically non-significant, as the calculated F value (0.094) is less than the Table value. The

obtained F ratios for maximum heart rate (bpm) of three weight categories is statistically non-significant, as the calculated F value (0.796) is less than the Table value.

The obtained F ratios for recovery heart rate (bpm) of three weight categories is statistically non-significant, as the calculated F values (1.138) is less than the Table value. The obtained F ratio for grip strength (Kg) of three weight categories is statistically significant, as the calculated F value (7.9) is more than the Table value.

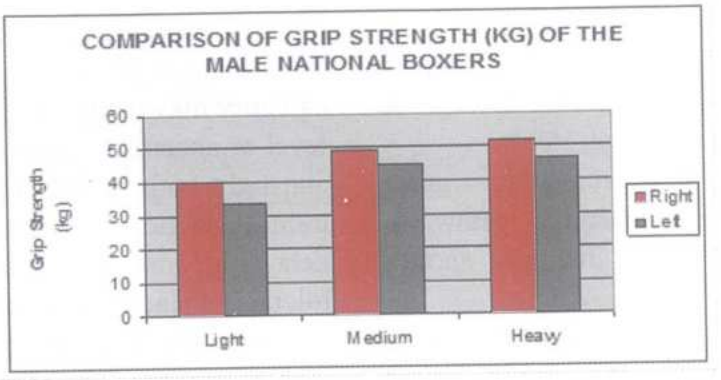


Table-4 : Post Hoc Analysis of Grip Strength of Right Hand and Left Hand Among National Boxers of Different Weight Categories

Grip Strength	Mean Difference (I-J)	Std. Error
Light/Medium	-5.41	3.91
	-2.23	4.72
Medium/Heavy	10.55	4.31
	-12.66	5.20
Heavy/Light	-15.96*	4.02
	-14.90*	4.86

** Significant at the 0.01 level

* Significant at the 0.05 level

The obtained F ratio for grip strength (Kg) of three weight categories is statistically significant, as the calculated F value (8.09) is more than the Table value. There are significant differences in grip strength between light & heavy weight categories ($P<0.05$).

In order for exercise physiologists to construct and implement specific training programs, they must have access to the fundamental information concerning the qualities that contribute to successful

athletic performance. The boxers of the present study were older and heavier when compared to boxers studied by Khanna et al, 2005.

The body composition especially in an athlete is a better guide for determining the desirable weight rather than using the standard height weight age Table of normal populations due to the presence of high proportions of muscular contents their total body composition. (Beunen & Malina, 1988; Reilly et al, 1990).

Training programs place great emphasis on the anaerobic pathways. Training this system requires shorter interval periods (Baar, K., 2006).

Heart rate increases with an increase in work intensity and shows linear relationship with work rate/(Astrand & Rodhal, 1970). Heart rate was measured during maximal exercise, as well as the during recovery to evaluate the cardiovascular fitness of athletes/ (Karvitz et al, 2003; Manna et al, 2002) In the present study, higher values of heart rate were recorded in heavy weight categories boxers. Similar observations were noted in the earlier study (Bellinger et al, 1997; Khanna et al, 2005).

As Boxing is a combat sports, many activities are forceful and explosive (e.g. punches, movements changing pace etc.) (Khanna et al, 2006). The power output during such activities is related to the strength of the muscles involved in the movements. Thus, it might also diminish the risk (Reilly et al, 1990).The higher level of anaerobic power in heavy weight category may be due to exposure to high level of anaerobic training than medium and light body weight category. By the training lactic acid system, the athlete delays the onset of fatigue by increasing tolerance to lactic acid build up.

Grip strength has significant impact on performance. The higher level of grip strength in heavy weight categories may be due their higher body mass and high level strength training. The study concluded that the physical, physiological variables of the sportsmen of various weight categories need to be analysed at regular intervals and prompt counselling of the results, will enable the sportsmen to achieve higher level of sporting excellence.

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