Effect of Varied Combinations of Anaerobic and Aerobic Training on VO2 Max of Kabaddi Players

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Abstract

Kabaddi is a fast-paced sport that demands a combination of physiological endurance and strategic skills. The efficiency of different training regimens can play a crucial role in enhancing athletes physiological attributes. The recent studies clearly showed that kabaddi is high intensity intermittent game. The present study was focused effect of varied combinations of anaerobic and aerobic training on VO_2 max of kabaddi players. To achieve the purpose of the study, 45 intercollegiate male (21±2 years) kabaddi players were randomly selected and they were divided into three groups consisting of fifteen each (N = 15). Experimental group-1 underwent combination of high anaerobic and low aerobic training (HANLAT) and experimental group-2 underwent combination of low anaerobic and high aerobic training (LANHAT), training programme for 3 days per week of 12 weeks. Third group acted as control group was not exposed to any treatment. Test was administered before and after the training programme on VO_2 max. Statistical results of the study revealed significant improvement on VO_2 max has increased significantly for the combination of high anaerobic and low aerobic training group (HANLATG) and combination of low anaerobic and high aerobic training group (LANHATG) as compared to the control group (CG). However the result of the present study also reveals that the increases in VO_2 max were significantly more for the combination of low anaerobic and high aerobic training group (LANHATG) than the combination of high anaerobic and low aerobic training group (HANLATG) to improve VO_2 max of kabaddi players.

Keywords: Anaerobic, aerobic, VO2 max, kabaddi,

Introduction

Sports within side gift global have to turn out to be extraordinarily competitive. Kabaddi is essentially an outside group recreation, performed within side the tropical nations of Asia. Kabaddi is famous to all of us as the sport of exciting the masses, the recognition the easy and simple nature of play has attracted humans to the core. The recreation no longer wants any excessive-value gadget or a technically complex tool to apply in its conduct. Though it is essentially an outside recreation performed on clay courts, in recent times the sport is being performed on an artificial surface, with gamers gambling with shoes, the sport took a specific measurement in itself and attained super success. High intensity interval training can serve as an effective alternative to traditional endurance-based training, inducing similar or even superior physiological adaptations in healthy individuals. Interval training leads to many physiological changes, including increased cardiovascular efficiency, the ability to deliver oxygen to the working muscles, and increased tolerance to the build-up of lactic acid. These changes result in improved performance, greater speed, and endurance. Interval training on VO_2 max, lactate threshold and economy, it's important to recognize that interval training can also have a strong influence on the development of VO_2 max.

High-Intensity Interval Training (HIIT) is a training method that involves alternating brief bursts of intensive activity with periods of moderate intensity or rest. The high-intensity intervals often drive athletes to near-maximum effort, followed by periods of partial recuperation before the following hard session. During high-intensity intervals, you want to hit a high percentage of your maximal heart rate (usually 80- 95%). Sprinting, quick cycling, and vigorous jumping jacks are some examples of such exercises. The duration of high-intensity intervals varies depending on the program, but they commonly last from 15 seconds to several minutes. Rest periods provide partial recuperation and can be passive (total rest) or active (low-intensity exercises such as walking or running). Rest periods might be as long as or shorter than labor intervals. The number of high-intensity labor periods repeated in a single session varies, although it normally ranges from 4 to 8.HIIT has grown in popularity because of its ability to

improve cardiovascular fitness, burn calories, and increase workout efficiency. However, it's crucial to realize that HIIT is a hard exercise strategy and may not be appropriate for everyone **[Coates et al. (2023); Weston et al. (2014)].**

Interval training has long been recognized as a fundamental component of sports conditioning, leveraging structured alternations between intense exercise and periods of active recovery to enhance athletes' physical capacities **[Buchheit and Laursen, 2013]**. Its application in various sports, from endurance disciplines to team sports, underscores its versatility and effectiveness in improving performance metrics such as aerobic capacity, speed, and agility [**Helgerud et al., 2007; Impellizzeri et al., 2006].** In the realm of team sports, where the ability to sustain high intensity efforts amidst intermittent play is crucial, interval training offers a targeted approach to developing the specific fitness attributes demanded by these activities **[Bishop et al., 2011].**

The gold standard for determining fitness level is considered to be direct measurement of VO_2 max. **[Peric and Nikolovski, 2017].** Before establishing a training program for athletes, trainers must first understand the athlete's endurance profile. **[Nilsson and Cardinale, 2018].** High intensity interval training is regarded as the best kind of exercise for athletes to improve their cardiovascular and metabolic health. **[Buchheit & Laursen, 2013].** The researcher came to the conclusion that an exercise program was required to raise the player's VO_2 max based on the findings of the tests and measurements that were done. Researchers also interviewed the head coach; So far, the only exercises that are often done are techniques and games. Exercise that leads to physical exercise, especially endurance training is still lacking, to increase VO_2 max, players need to be given an appropriate and appropriate training program so that the preparations are carried out well. One of the training programs that the researchers implemented was high intensity interval training and Fartlek to get the players in good physical condition.

Variable continuous training is a hybrid of slow and quick continuous training approaches. This strategy can help you increase both your aerobic and anaerobic activity. This strategy is ideal for all players since it targets both minor and major muscles. This

workout should last 30 minutes to an hour, with intensity levels range from 60% to 80%. You can run for 10–15 km without stopping. The maximal oxygen absorption or maximum volume of oxygen that may be used in one minute during maximal or intense activity will referred to as VO_2 max. It will measure in milliliters of oxygen utilized per kilograms of body weight per minute (ml/kg/min). The maximum oxygen uptake, or VO_2 max, will one characteristic that can indicate an athlete's ability to conduct continuous activity and will connected to aerobic endurance. A high VO_2 max may reflect an athlete's ability to perform well in aerobic endurance tests. **[Costill and Wilmore, 1994**]. The factors affecting VO_2 were often divided into supply and demand factors. Supply was the transport of oxygen from the lungs to the mitochondria (including lung diffusion, stroke volume, blood volume, and capillary density of the skeletal muscle) while demand will the rate at which the mitochondria can reduce oxygen in the process of oxidative phosphorylation. **[Bassett and Howley, 2000].**

Methods

Selection of subjects

To achieve the purpose of the study, forty five (N = 45) Kabaddi players studying degree course in faculty of engineering of Manakula Vinayagar Institute of Technology, Pondicherry, (India). Their age ranged from 18 to 23 years. They were divided into three groups consisting of fifteen each (N = 15). There were two experimental groups and one control group. The experimental groups under gone their respective training for 3 days per week for a period of 12 weeks and no treatment for control group.

Selection of variables and criterion measures

After reviewing available scientific studies and within the limitation of availability the following VO2 max was selected for this study.

Training programme

The selected subjects divided into three groups consist of 15 each. Experimental group-1 underwent high anaerobic and low aerobic [Combination-1 HANLAT (high frequency anaerobic training (2days) and low frequency aerobic training (1day))] and experimental group-2 underwent low anaerobic and high aerobic training [Combination-2

LANHAT (low frequency anaerobic training (1day) high frequency aerobic training (2days))] for 3 days per week of 12 weeks. Third group acted as control group was not exposed to any treatment.

Statistical techniques

The data were collected from the subjects before and after the training were analysed by ANCOVA. Whenever 'F' shows significant difference among group post hoc test (Bonferroni) was adopted to find the significant between the groups. The collected data were analysed by using SPSS software for window at 0.05 level of confidence.

Results of Study

TABLE – 1

ANACOVA FOR BEFORE TRAINING AND AFTER TRAINING ON VO_2 MAX OF EXPERIMENTAL AND CONTROL GROUPS

VARIABLES	HANLA	LANHA	CG	SOV	SS	df	MS	F- ratio
Pre test Mean	32.70	32.40	32.61	B	1.075	2	0.538	0.09
SD	2.27	2.41	2.28	W	228.67	42	5.44	
Post test Mean	39.94	44.40	32.97	B	995.10	2	497.55	117.03*
SD	1.68	2.41	2.02	W	178.55	42	4.25	
Adjusted Post Test Mean	39.95	44.38	32.99	B	985.66	2	492.83	114.74*
				W	176.09	41	4.29	

The adjusted post test mean values on VO_2 max of HANLATG, LANHATG and CG were 39.95, 44.38 and 32.99 respectively. The obtained 'F' ratio of 114.74 for adjusted post test scores was greater than the table value of 3.22 for df 2 and 41 required for significance at 0.05 level of confidence on VO_2 max. The results of the study indicated that there was significant difference between the adjusted post test means of HANLATG, LANHATG and CG on VO_2 max.

TABLE – 2

SCHEFFE'S POST HOC TEST FOR THE ADJUSTED POST-TEST PAIRED MEANS DIFFERENCE ON VO_2 MAX

	Adjusted Post-Test Means			Mean difference	Confidence Interval
	HANLA	**LANHA**	**CG**		
SPEED	39.95	44.38		4.43*	1.91
	39.95		32.99	6.96*	1.91
		44.38	32.99	11.39*	1.91

***Significant at 0.05 level of Confidence.**

The table -2 shows that the adjusted post test paired mean difference between HANLATG and LANHATG, HANLATG and control group and LANHATG and control group are 4.43, 6.39 and 11.39 for VO_2 max respectively. They were greater than the confidence interval value of 1.91 at 0.05 levels which indicate that the twelve weeks of combination of high anaerobic and low aerobic training group (HANLATG) and combination of low anaerobic and high aerobic training group (LANHATG) have significantly increased VO_2 max as compared to the control group (CG). The result also reveals that the increase in VO_2 max were significantly improved for combination of low anaerobic and high aerobic training group (LANHATG) as compared with combination of high anaerobic and low aerobic training group (HANLATG).

Discussion on Finding

The result of present study was that VO_2 max has increased significantly combination of high anaerobic and low aerobic training group (HANLATG) and combination of low anaerobic and high aerobic training group (LANHATG) as compared to the control group (CG). However the result of the present study also reveals that the increase in speed and agility were significantly more for the combination of high anaerobic and low aerobic training group (HANLATG) than the combination of low anaerobic and high aerobic training group (LANHATG) of kabaddi players. Substantial and beneficial gains in VO_2 max has been reported in most of the studies conducted

previously. The results of the present study are also in line with the results observed from the previous studies.

Maximal oxygen uptake (VO_2 max) is the body's maximal aerobic power and is defined as the highest oxygen uptake the individual can attain during physical work breathing air at sea level. Oxygen uptake is the difference in oxygen content between the air inspired and the air expired. Obviously more oxygen will be required in severe exercise and so oxygen uptake will increase. However, a point is eventually reached where the body can take up no more oxygen. At this point the value is referred to as the maximal oxygen uptake. The fuelling system for combustion in aerobic exercise varies according to its duration and intensity. In prolonged aerobic exercise the preferred fuel is free fatty acids, where as in higher intensity exercise involving aerobic and aerobic pathways or exclusively anaerobic, the preferred fuel is glycogen.

Moderate–intensity aerobic exercise training is well tolerated and may provide modest improvement in aerobic capacity. Progressive aerobic training can increase the maximal aerobic power of very elderly women. A 15% increase in VO_2 max may present many elderly women from crossing functionally important thresholds **(Malbut et al, 2002)**. High or low intensity resistance exercise or training may improve aerobic capacity in older adults **(Kevin et al, 2002)**. Long-term aerobic exercise training is helpful and can improve the VO_2 max. The practice of tackwondo may increase in aerobic power and aerobic capacity **(Melhim, 2001)**.

Aerobic capacity was maintained in runners, despite the combined reduction in training volume and intensity. However, it appears that resistance training duration is important for the maintenance of 5 km running performance **(Mc Conell et al, 1993)**. Aerobic and strength training is an effective intervention to improve VO_2 peak **(Haykowsky et al, 2009)**. High-intensity type of training improves both aerobic and anaerobic fitness. Anaerobic activities should be considered in sports **(Council, 2003)**. **Don melrose et al, (2010)** study shows the concept of simultaneous, high-intensity, aerobic and strength training is viable and that this approach to training many perhaps

become a conditioning option for athletes and non-athletes. Studies on the long term physiological effect of supramaximal intermittent exercise have demonstrated an improvement in VO_2 max or running economy **(Billat, 2001)**.

Higher intensity of exercise is more effective for improving VO_2 than lower intensity of exercise in healthy young adults **(Gormly et al, 2008)**. High-aerobic intensity endurance interval training is significantly more effective than performing the same total work at either lactate threshold or at 70% HR max in improving VO_2 max. The changes in VO_2 max correspond with changes in stroke volume, indicating a close link between the different intensity training **(Helgerud et al, 2007)**. Swimmers lower level aerobic metabolic rate might be associated with a longer capacity to sustain that exercise intensity **(Fernandes et al, 2003)**. This investigated demonstrated that 6 wk of moderate-intensity endurance training did not affect anaerobic capacity but that 6 wk of high-intensity intermittent training (20 s exercise, 10 s rest; intensity 170%˙VO_2 max) may improve both anaerobic capacity and VO_2 max simultaneously (**Tabata et al, 1996)**.

Conclusions

The analysis of data revealed significant improvement on VO_2 max have increased significantly for the combination of high anaerobic and low aerobic training group (HANLATG) and combination of low anaerobic and high aerobic training group (LANHATG) as compared to the control group (CG). However the result of the present study also reveals that the increase in VO_2 max was significantly more for the combination of low anaerobic and high aerobic training group (LANHATG) than the combination of high anaerobic and low aerobic training group (HANLATG) of kabaddi players.

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