IMPACT OF LYDIARD TRAINING WITH TAPERING ON SELECTED PHYSIOLOGICAL VARIABLES AMONG MALE RACE WALKERS

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Abstract- **The purpose of the study was to find out the impact of Lydiard training with tapering on selected physiological variables namely breath holding time, resting heart rate, vital capacity, forced vital capacity, slow vital capacity, and maximum voluntary ventilation among male race walkers. To achieve the purpose of the study twenty male race walkers have been randomly selected from various colleges in the state of Tamil Nadu, India. The age of subjects were ranged from 18 to 25 years. The subjects had past experience of at least three years in race walking and only who those represented their respective college teams were taken as subjects. A series of physiological tests was carried out on each participant. These included breath holding time assessed by digital stop watch, Resting heart rate assessed by digital heart rate monitor, vital capacity, forced vital capacity, slow vital capacity and maximum voluntary ventilation assessed by spirometer. The subjects were randomly assigned into two groups of ten each, such as experimental and control groups. The experimental group participated in the Lydiard training with tapering for 5 days a week, one session per day and for 12 weeks each session lasted 90 minutes. The control group maintained their daily routine activities and no special training was given. The subjects of the two groups were tested on selected variables prior and immediately after the training period. The collected data were analyzed statistically through analysis of covariance (ANCOVA) to find out the significance difference, if any between the groups. The 0.05 level of confidence was fixed to test the level of significance difference, if any between groups. The results of the study showed that there was significant level differences exist between Lydiard training with tapering group and control group. And also Lydiard training with tapering group showed significant improvement on level of breath holding time, resting heart rate, vital capacity, forced vital capacity, slow vital capacity, and maximum voluntary ventilation compared to control group.**

Key words: **Lydiard training, tapering, vital capacity, maximum voluntary ventilation,**

Introduction

Race walking is a long-distance athletic event. Although it is a foot race, it is different from running where one foot must appear to be in contact with the ground at all times. Arthur Leslie Lydiard was a New Zealand runner and athletics coach. He has been lauded as one of the outstanding athletics coaches of all time and is credited with popularizing the sport of running and making it commonplace across the sporting world. His training methods are based on a strong endurance base and periodisation. Lydiard et al. (1999) opine that the Lydiard training system is based on a balanced combination of aerobic and anaerobic running. Aerobic running means running within once capacity to use oxygen. Everyone, according to his or her physical condition, is able to use a limited amount of oxygen each minute. With the right kind of exercise, one can raise once limit. The maximum limit is called the "Steady State", the level at which one working to the limit of once ability to breathe in, transport, and use the oxygen. The marathon-conditioning phase of Lydiard's system is known as base training, as it creates the foundation for all subsequent training. Lydiard's emphasis on an endurance base for his athletes, combined with introduction of periodisation in the training of distance runners, were the decisive elements in the world-beating success of the athletes he coached or influenced. Periodisation comprises emphasizing different aspects of training in successive phases as an athlete approaches an intended target race. After the base training phase,

Lydiard advocated four weeks of strength work. This included hill running and springing, followed by a maximum of four weeks of anaerobic training (Lydiard found through physiological testing that four weeks was the maximum amount of anaerobic development needed—any more caused negative effects such a decrease in aerobic enzymes and increased mental stress, often referred to as burnout, due to lowered blood pH). Then followed a co-ordination phase of six weeks in which anaerobic work and volume taper off and the athlete races each week, learning from each race to fine-tune himself or herself for the target race. For Lydiard's greatest athletes the target race was invariably an Olympic final. The primary objective of tapering is to decrease the training stress to allow for the body to recover and eliminate fatigue. When the training impulse is decreased, fatigue decreases more rapidly than fitness, and increased performance results from the increasing difference between the two factors. Thus, in a well-designed taper, the body becomes rested (with all the associated benefits) and the athlete's fitness level is well maintained. In fact, improvements in performance during taper are significantly correlated with decreases in the negative influences of training (fatigue), but are not correlated with the positive influences of training (fitness) (Mukika et al. 1996). The taper is a progressive nonlinear reduction of the training load during a variable period of time, in an attempt to reduce the physiological and psychological stress of daily training and optimize sports performance. A progressive, nonlinear reduction of the training load during a variables amount of time that is intended to reduce the physiological and psychological stress of daily training and optimize sport performance (Mujika and Padilla 2000). The final preparation for competition is both an art and a science, requiring an understanding of the physiological changes that are occurring and the skills to manage the psychological and emotional state of an athlete as they near the culmination of a hard year of training. Tapering phase are often associate with performance-enhancing psychological changes such as reduced perception of effort, reduced global mood disturbance, reduced perception of fatigue, and increased vigour (Hooper et al. 1999). A segment of time when the amount of training load are reduced before a competition in an attempt to peak performance at a target time (Thomas and Busso, 2005).

The Pollster is a race walker, official, coach, administrator, selector, observer attempted to study about the physiological effects of the race walkers. Lydiard and tapering training can help to improve performance in athlete. Little research had done on race walking.

Statement of the problem

The purpose of the study was to find out the impact of Lydiard training with tapering on selected physiological variables namely breath holding time, resting heart rate, vital capacity, forced vital capacity, slow vital capacity, and maximum voluntary ventilation among male race walkers.

Methods

To achieve the purpose of the study twenty male race walkers have been randomly selected from various colleges in the state of Tamil Nadu, India. The age of subjects were ranged from 18 to 25 years. The subjects had past experience of at least three years in race walking and only who those represented their respective college teams were taken as subjects. A series of physiological tests was carried out on each participant. These included breath holding time assessed by digital stop watch, Resting heart rate assessed by digital heart rate monitor, vital capacity, forced vital capacity, slow vital capacity and maximum voluntary ventilation assessed by spirometer. The subjects were randomly assigned into two groups of ten each, such as experimental and control groups. The experimental group participated in the Lydiard training with tapering for 5 days a week, one session per day and for 12 weeks each session lasted 90 minutes. The control group

maintained their daily routine activities and no special training was given. The subjects of the two groups were tested on selected variables prior and immediately after the training period. The collected data were analyzed statistically through analysis of covariance (ANCOVA) to find out the significance difference, if any between the groups. The 0.05 level of confidence was fixed to test the level of significance difference, if any between groups.

TABLE-I
Criterion measures

S.No	Criterion measure	Test items	Unit of measurement
1	Breath holding time	Digital stop watch	Seconds
2	Resting heart rate	Digital heart rate monitor	Beats / min
3	Vital capacity	Spirometer	In liters
4	Forced vital capacity	Spirometer	In liters
5	Slow vital capacity	Spirometer	In liters
6	Maximum voluntary ventilation	Spirometer	In liters

Training flow chat

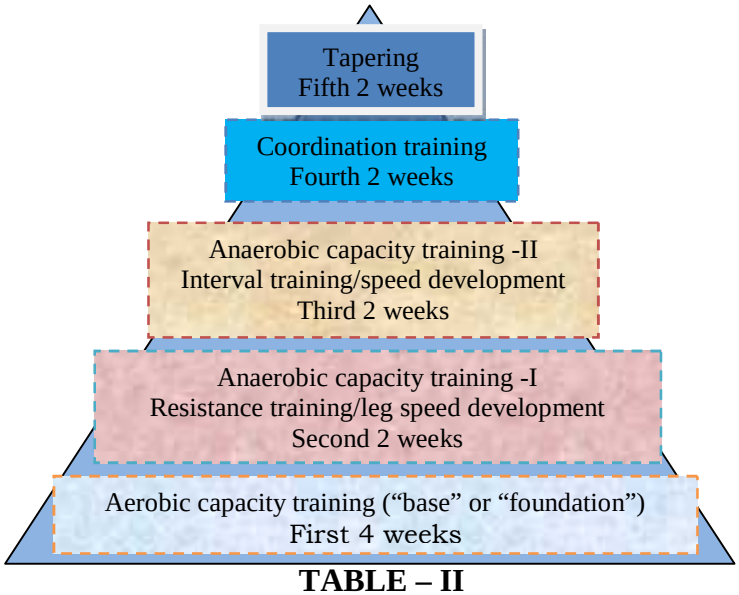

TABLE – II
Descriptive analysis of selected physiological variables among control and experimental groups

S.No	Variables	Group	Pre-Test Mean	SD (±)	Post –Test Mean	SD (±)	Adjusted Mean
1	Breath holding time	CG	44.70	1.94	46.70	2.62	46.64
		LTG	44.20	2.14	49.80	1.47	49.85
2	Resting heart rate	CG	69.90	1.66	67.80	1.75	67.80
		LTG	69.80	1.54	65.80	0.78	65.79
3	Vital capacity	CG	2.78	0.08	2.86	0.20	2.86
		LTG	2.80	0.07	3.31	0.24	3.30
4	Forced vital capacity	CG	3.71	0.14	3.82	0.56	3.83
		LTG	3.78	0.08	4.33	0.06	4.32
5	Slow vital capacity	CG	2.82	0.17	3.10	0.42	3.11
		LTG	2.90	0.16	3.61	0.21	3.60
6	Maximum voluntary ventilation	CG	110.60	3.50	119.35	11.6	119.51
		LTG	111.00	3.36	128.60	5.69	128.43

LTG= Lydiard training with tapering group CG= Control group

The tables-II the pre, post-test means, standard deviations and adjusted means on selected physiological variables of male race walkers were numerical presented. The analysis of covariance on selected variables of Lydiard's training with tapering and control group is presented in table – III

TABLE – III
Computation of analysis of covariance on selected physiological variables among male race walkers

S.No	variables	Test	Sum of variance	Sum of squares	df	Mean square	F ratio
1	Breath holding time	Pre-test	Between groups	1.25	1	1.25	0.29
			Within groups	75.70	18	4.20	
		Post-test	Between groups	48.05	1	48.05	10.58*
			Within groups	81.700	18	4.539	
		Adjusted means	Between sets	50.65	1	50.65	11.02*
			Within sets	78.10	17	4.59	
2	Resting heart rate	Pre-test	Between groups	0.05	1	0.05	0.01
			Within groups	46.50	18	2.58	
		Post-test	Between groups	20.00	1	20.00	10.84*
			Within groups	33.20	18	1.84	
		Adjusted means	Between sets	20.13	1	20.13	10.39*
			Within sets	32.92	17	1.93	
3	Vital capacity	Pre-test	Between groups	0.001	1	0.001	0.20
			Within groups	0.11	18	0.006	
		Post-test	Between groups	0.99	1	0.99	19.65*
			Within groups	0.91	18	0.05	
		Adjusted means	Between sets	0.96	1	0.96	18.15*
			Within sets	0.89	17	0.05	
4	Forced vital capacity	Pre-test	Between groups	0.02	1	0.02	1.42
			Within groups	0.26	18	0.01	
		Post-test	Between groups	1.316	1	1.316	8.19*
			Within groups	2.88	18	0.16	
		Adjusted means	Between sets	1.10	1	1.10	6.57*
			Within sets	2.84	17	0.16	
5	Slow vital capacity	Pre-test	Between groups	0.02	1	0.02	1.00
			Within groups	.519	18	.029	
		Post-test	Between groups	1.26	1	1.26	11.27*
			Within groups	2.01	18	0.11	
		Adjusted means	Between sets	1.14	1	1.14	9.66*
			Within sets	2.00	17	0.11	
6	Maximum voluntary ventilation	Pre-test	Between groups	0.80	1	0.80	0.06
			Within groups	212.40	18	11.80	
		Post-test	Between groups	427.35	1	427.35	5.08*
			Within groups	1514.14	18	84.11	
		Adjusted means	Between sets	396.64	1	396.64	4.89*
			Within sets	1376.84	17	80.99	

*Significant at 0.05level of confidences

(Table value for df 1 and 18 was 4. 45, Table value for df 1 and 17 was 4.41)

The obtained F-ratio of 11.02 for adjusted mean was greater than the table value 4.41 for the degree of freedom 1 and 17 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant level difference among control and experimental groups on Breath holding time. The above table also indicates that pre test of control and experimental groups did not differ significantly and post test of control and experimental groups have significant difference on Breath holding time levels.

The obtained F-ratio of 10.39 for adjusted mean was greater than the table value 4.41 for the degree of freedom 1 and 17 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant level difference among control and experimental groups on resting heart rate. The above table also indicates that pre test of control and experimental groups did not differ significantly and post test of control and experimental groups have significant difference on resting heart rate levels.

The obtained F-ratio of 18.15 for adjusted mean was greater than the table value 4.41 for the degree of freedom 1 and 17 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant level difference among control and experimental groups on vital capacity. The above table also indicates that pre test of control and experimental groups did not differ significantly and post test of control and experimental groups have significant difference on vital capacity levels.

The obtained F-ratio of 6.57 for adjusted mean was greater than the table value 4.41 for the degree of freedom 1 and 17 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference level among control and experimental groups on forced vital capacity. The above table also indicates that pre test of control and experimental groups did not differ significantly and post test of control and experimental groups have significant difference on forced vital capacity levels.

The obtained F-ratio of 9.66 for adjusted mean was greater than the table value 4.41 for the degree of freedom 1 and 17 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference level among control and experimental groups on slow vital capacity. The above table also indicates that pre test of control and experimental groups did not differ significantly and post test of control and experimental groups have significant difference on slow vital capacity levels.

The obtained F-ratio of 4.89 for adjusted mean was greater than the table value 4.41 for the degree of freedom 1 and 17 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant level difference among control and experimental groups on maximum voluntary ventilation. The above table also indicates that pre test of control and experimental groups did not differ significantly and post test of control and experimental groups have significant difference on maximum voluntary ventilation levels.

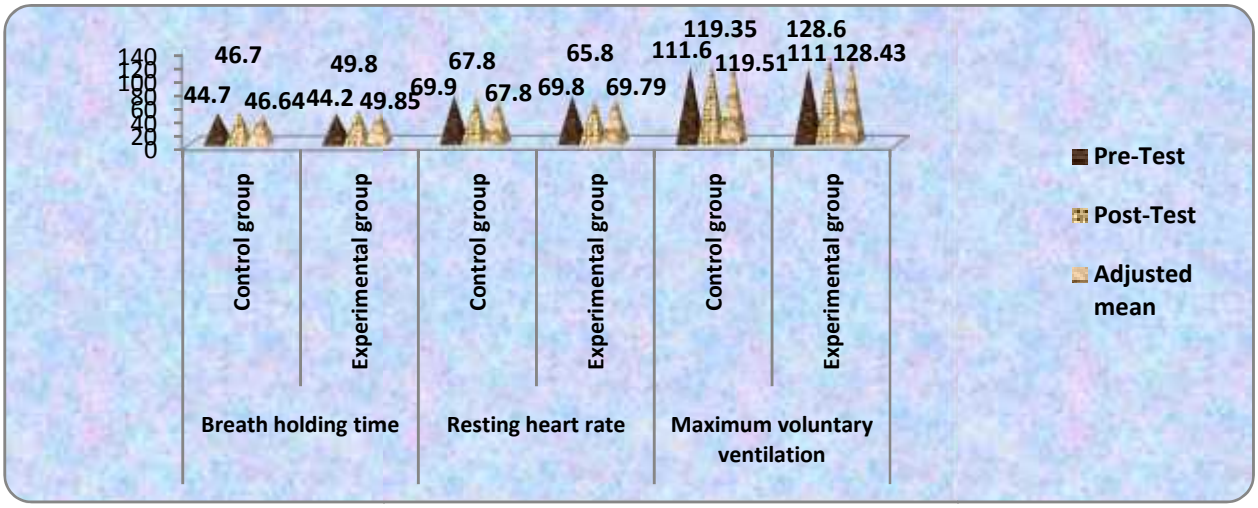

Figure-I The pre, post and adjusted mean values of breath holding time, resting heart rate and maximum voluntary ventilation of both control and experimental groups are graphically represented in the figure-I

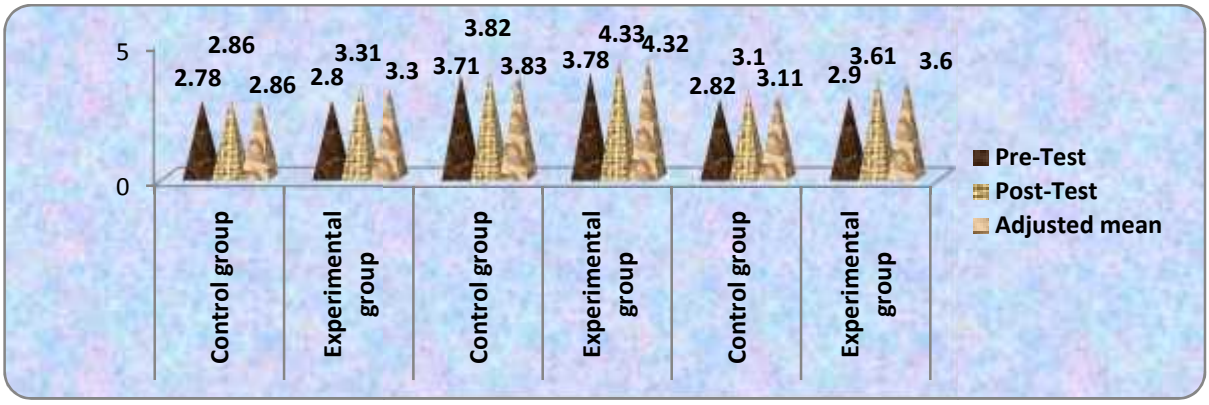

Figure-II The pre, post and adjusted mean values of vital capacity, forced vital capacity and slow vital capacity of both control and experimental groups are graphically represented in the figure-II

Discussion of findings

The results of the study indicate that the experimental group which underwent Lydiard's training with tapering had showed significant level improvement in the selected variables namely breath holding time, resting heart rate, vital capacity, forced vital capacity, slow vital capacity, maximum voluntary ventilation, when compared to the control group. The control group did not show significant improvement in any of the selected variables. The past studies on selected physiological variables also reveals similar result Margaritis and Colleagues (2003) recently observed 3 percent gains in both VO_2 max and simulated decathlon performance during a 14-day taper in long –distance triathletes. Banister et al (1999) Well-trained triathletes can increase VO_2 max by 9.1 percent and criterion laboratory running (1.2-6.3/) and cycling (1.5-7.9/) performance after 2 weeks of taper. Jeukendrup and colleagues (1992) described a decrease from 54 to 51 beats/min in the sleeping heart rates of their group of cyclists after 2 weeks taper. Hooper et al (1999) found that changes in plasma norepinephrine concentration, heart rate after maximal effort swimming time with tapering. Houmard et al (1994) opined that 7 days of tapered running improved distance running performance and

running economy. A taper regimen of equivalent duration cycle training maintained performance in distance runners.

Conclusions

From the analysis of data, the following conclusions were drawn.

1. The experimental group race walkers showed significant improvement in all the selected physiological variables namely breath holding time, resting heart rate, vital capacity, forced vital capacity, slow vital capacity, and maximum voluntary ventilation.
2. The control group race walkers did not show significant improvement in any of selected variables.

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