Effect of Packages of Training on Functions of Haemoglobin Concentration and Mean Arterial Pressure among School Boys

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Abstract

The purpose of this study was to find out the effect of packages of training on functions of Haemoglobin concentration and Mean arterial pressure among school boys. Sample of ninety subjects drawn at random among the schoolboys of Elisa bondolfi Gregory (EBG) matriculation School Madurai. Their age ranges from fifteen to eighteen. They were divided into three equal groups namely control Group (Group – I), Run & walk group (Group – II) and interval training group (Group-III). The subjects were tested in order to find out Haemoglobin concentration, Mean Arterial pressure, Blood glucose and Blood Lactic Acid concentration in the yearly morning before the start of the training program. Group II were given Run & walk program for Ten weeks on alternate days a week for one hour to one and half hour duration. Group III were given Interval training for Ten weeks on alternate days a week for one hour to one and half hour duration. The control group did not involve any training. The data collected on the pre and posttest data on selected dependent variables were subjected to ANCOVA to find out significant. Scheefe's post hoc test was used to find out which of the paired means differed significantly. Analysis of data revealed that the haemoglobin concentration was increased due to the treatment of ten weeks of Run & Walk and Interval training. The Interval training increased in the haemoglobin concentration more than the Run & Walk group and control group. However, the Run & Walk group increased the haemoglobin concentration more than the control group.There was no significant difference in Mean Arterial pressure, blood glucose and blood lactic acid concentration level due to the influence of the ten weeks of Run & Walk and Interval training groups.

Keywords: Haemoglobin, Mean Arterial Pressure, Blood Glucose, Blood Lactic acid Packages of training, Interval training

INTRODUCTION

Sports training is a planned and controlled process in which, achieving a goal, change in complete sports motor performance, ability to act and behaviour are made through measures of content, methods and organization.

Sports training must be understood as a specialized process of all-round physical conditioning aimed at the methodical preparation of athletes.

Success in competitive sports and games can be attributed to many factors, training being one of the most important factors. Different training methods have been commonly lead to improve physical fitness and its related standards of performance of athletes or players. The training methods include, interval training, fartlek training, hollow sprint training,

Resistance training, Altitude training, Alternative pace training, Weight training, Aerobic training and Anaerobic training etcetera.

Physical training provide a means of acquiring optional fitness in systematized controlled fashion. The intensity, load and vigor of packages of physical training are indeed challenging and enjoyable to the performer. The package of training has contained all the above said qualities.

Physical training brings a lot of changes in the body that is an increase of maximum respiratory minute volume in exercise A slight increase in oxygen diffusion capacity Ten to thirty percent increase in maximum oxygen uptake. An increase in stroke volume and maximum cardiac output an increase in size of the heart. An increase in total haemoglobin and blood volume.

Effect of packages of training on physiological variables is considered as both scientific discipline and applied science as a sub discipline of physical education, it is concerned with the study of cardiovascular, cardio respiratory, neuromuscular and metabolic process and the effects of packages of training exercises on them. Its study includes the sources of energy for movement, the process of energy generation and the effects that movement has on the body system. Through the research it is proved that the packages of training programme of both maximal and sub-maximal levels brings about the changes in various systems in the human body.

Materials & Methods

To execute this investigation, the research scholar employed random sample of ninety subjects drawn at random among the schoolboys of Elisa Bondolfi Gregory (EBG) Matriculation School Madurai. Their age ranges from fifteen to eighteen. They were divided into three equal groups namely control Group (Group – I), Run & walk group (Group – II) and interval training group (Group-III). The subjects were tested in order to find out Haemoglobin concentration, Mean Arterial pressure, Blood glucose and Blood Lactic Acid concentration in the yearly morning before the start of the training program. Group II were given Run & walk program for Ten weeks on alternate days for one hour to one and half hour duration. Group III were given Interval training for Ten weeks on alternate days a week for one hour to one and half hour duration. The control group did not involve any training. The initial and final results were recorded.

Independent Variable

i. Run and Walk Program
ii. Interval Training

Dependent Variable

i. Haemoglobin concentration
ii. Mean arterial pressure
iii. Blood glucose
iv. Blood lactic acid concentration

Criterion measure

Haemoglobin content from the blood sample in mg% was determined by the procedure prescribed by *Sahil's (1985)*.

The mean arterial pressure was measured by ascultatory method using sphygmomanometer and stethoscope. The blood pressure for all subjects was taken

in the morning after ten to twelve minutes of rest in a comfortable position. Mean Arterial Pressure was calculated by using the formula

Mean Arterial Pressure = Diastolic pressure + 1/3 pulse pressure

Where, *Pulse pressure = (systolic pressure – diastolic pressure)*

Blood Glucose in mg/dl was estimated as per *Astar and King (1980).* For the estimation of lactic acid in blood the procedure prescribed by Barker and Summerson (1980) was followed.

Training programme

The following schedule of training was given for the Run & Walk and Interval training group.

Run and walk program

1.	50 steps run, 50 steps walk (i) 5 sets the first day. (ii) Every two weeks the number of sets was increased by one until 10 sets were completed. (iii) Used the same set procedure for each new series of run-walk.
2.	50 steps run, 40 steps walk
3.	50 steps run, 30 steps walk
4.	50 steps run, 20 steps walk
5.	50 steps run, 10 steps walk
6.	75 steps run, 10 steps walk
7.	100 steps run, 10 steps walk
8.	125 steps run, 10 steps walk
9.	150 steps run, 10 steps walk
10.	175 steps run, 10 steps walk
11.	200 steps run, 10 steps walk
12.	Individual Program

Interval training program

WEEK : 1ST, 2ND , 3rd

Day : I, II , III

Program	Repetition	Recovery
80 Meters	4 - 6	Walk 5 minutes
100 Meters	3 - 4	Walk 5-8 minutes
150 Meters	2 - 3	Walk 10 minutes
200 Meters	2 - 3	Walk 10 minutes
300 Meters	1	--

WEEK : 4th, 5th, 6th

Day : I, II , III

Program	Repetition	Recovery
100 Meters	4 - 6	Walk 5 minutes
150 Meters	3 - 4	Walk 5-8 minutes
200 Meters	2 - 3	Walk 10 minutes
300 Meters	2 - 3	Walk 10-15 minutes
400 Meters	1	--

WEEK : 7th, 8th, 9th & 10th

Day : I, II , III

Program	Repetition	Recovery
100 Meters	4 - 6	5 min Walk
150 Meters	3 - 4	5-8 min Walk
200 Meters	2 - 3	10 min Walk
300 Meters	2 - 3	10-15 min Walk
400 Meters	1	--

Statistical technique

Analysis of covariance was used to find out the significance difference among the treatment groups.

Scheffe's post-hoc test was used to find out the paired mean significant difference between the groups

Results

TABLE – I (A): Computation of Analysis of Covariance of Haemoglobin Concentration Scores of Control, Run & Walk and Interval Training Groups (Scores in gm/ 100ml)

	Control Group	Run & Walk Group	Interval training Group	Source of variance	Sum of Squares	df	Means Squares	F-ratio
Pre-test means	13.01	13.12	12.70	B	2.76	2	1.38	
				W	21.68	87	0.25	5.52*
Post-test means	12.96	13.32	13.54	B	5.04	2	2.52	
				W	10.65	87	0.12	21.00*
Adjusted Post-test means	12.93	13.24	13.65	B	7.33	2	3.67	
				W	10.47	86	0.12	30.12*

B - Between Group Means, W - Within Group Means NS - Not Significant, * - Significant, Df - Degrees of freedom Table Value for 0.05 Level = 3.11)

The result of the study showed that experimental groups had significantly improved in Haemoglobin concentration due to Run & Walk and interval training when compared with the mean difference of the control group.

TABLE – I (B): Ordered Adjusted Haemoglobin Concentration Means and Differences between the Means of Control, Run & Walk, Interval Training Groups (Scores in gm/100ml)

Control Group (N=30)	Run & Walk Group(N=30)	Interval training Group (N=30)	Mean Difference	Scheffe's Test CI Value
12.93	13.24		0.41*	
		13.65	0.72*	0.25
12.93	13.24	13.65	0.31*	

CI – Confidence Interval Value *-Significant at 0.05 Level

TABLE – II: Computation of analysis of covariance of mean arterial pressure score of control, run & walk and interval training groups. (Scores in Milimeters of Mercury)

	Control Group	Run & Walk Group	Interval training Group	Source of variance	Sum of Squares	df	Means Squares	F-ratio
Pre-test means	**95.25**	**95.92**	**96.29**	**B**	**16.46**	**2**	**8.23**	**0.35 NS**
				W	**2072.02**	**87**	**23.82**	
Post-test means	**94.81**	**95.26**	**94.60**	**B**	**6.79**	**2**	**3.40**	**0.31 NS**
				W	**939.96**	**87**	**10.80**	
Adjusted Post-test means				**B**	**9.10**	**2**	**4.55**	**0.66 NS**
				W	**594.24**	**86**	**6.91**	

The result of the study showed that experimental groups had no significant effect on mean arterial pressure due to Run & Walk and interval

training when compared with the mean difference of the control group.

TABLE-III: Computation of analysis of covariance of blood glucose, Score of control, run & walk and interval training groups. (Scores in per mg/100ml)

	Control Group	Run & Walk Group	Interval training Group	Source of variance	Sum of Squares	df	Means Squares	F-ratio
Pre-test means	92.62	93.25	93.92	B	25.36	2	12.68	1.00 NS
				W	1098.75	87	12.63	
Post-test means	91.46	92.38	93.37	B	54.36	2	27.18	1.62 NS
				W	1462.76	87	16.81	
Adjusted Post-test means				B	27.81	2	13.91	2.69 NS
				W	445.10	86	5.18	

The result of the study showed that experimental groups had no significant effect on Blood glucose levels due to Run & Walk and internal training when compared with the mean difference of the control group.

TABLE – IV: **Computation of analysis of covariance of blood lactic acid score of control, run & walk and interval training group** (Scores in Mmoles)

	ControlGroup	Run & Walk Group	Interval training Group	Source of variance	Sum of Squares	df	Means Squares	F-ratio
Pre-test means	10.07	10.50	10.37	B	2.96	2	1.48	0.55 NS
				W	234.33	87	2.69	
Post-test means	10.23	10.57	10.40	B	1.67	2	0.84	0.34 NS
				W	217.93	87	2.50	
Adjusted Post-test means				B	0.11	2	0.06	0.04 NS
				W	146.63	86	1.71	

The result of the study showed that experimental groups had no significant effects on Blood Lactic acid due to Run & Walk and interval training when compared with the mean difference of the control group.

Discussion

Experimental groups had significantly improved in haemoglobin concentration due to Run & Walk and Interval training when compared with the mean difference of the control group

Ten weeks of Run & Walk and Interval training may have caused a small increase in the production of red blood cells. Therefore, total haemoglobin increases slightly with such training. The concentration of haemoglobin at rest is known to decline slightly with training because of the increase in plasma volume that is somewhat larger than the increase in red cells, expansion of plasma volume in trained persons further reduces haemoglobin concentration during exercise.

Haemoglobin is obviously vital to exercise because it transports oxygen from the lungs to the working muscles. Since red blood cells do not ordinarily leave the vascular space during exercise, it is not surprising that total haemoglobin does not change with exercise. Haemoglobin concentration during

exercise reflects the extent of any Haemo-concentration or haemodilution, haemoglobin concentration will rise with haemo-concentration and fall with haemodilution.

Run & Walk and Interval training showed increased blood volume and total Haemoglobin content. Most of the increase in blood volume reflects an increase in the amount of plasma rather than an actual rise in the red blood cell volume. Therefore haemoglobin concentration slightly increased after this training. Due to this training Interval training group increased in the haemoglobin concentration more than the Run & walk training group and control group. However the Run & Walk group increased the Haemoglobin more than the control group.

Experimental groups revealed no significant effect on mean arterial blood pressure due to Run & Walk and Interval training when compared with the mean difference of the control group.

During Run & Walk and Interval training, the dilation of blood vessels in the working muscles reduces the arterial resistance to blood flow more than the vasoconstriction in non-working tissues, increases the resistance. Therefore, the net effect of changes in blood vessels, size, during exercise is to decrease the blood pressure simultaneously however, cardiac output causes a greater systolic pressure, which more than counteracts the tendency toward reduced pressure caused by vaso dilation in the working muscles, since only a slight fall in blood pressure.

It was found that haemo-dynamic changes in older normotensive and hypertensive men and women who exercised for 45 min between 50-70% VO_2max and followed their cardio vascular changes from 1-3 hours post exercise. Mean blood pressure and cardiac output were significantly decreased, whereas measured haemodynamic changes in older normotensive and hypertensive men and women who exercised for 45 min between 50-70% VO_2max and followed their cardio vascular changes from 1-3 hours post exercise. Mean blood pressure and cardiac output were significantly decreased, whereas peripheral vascular resistant increased. Stroke volume was decreased, a change attributed to a reduction in preload caused by a possible decrease in plasma volume.

Run & Walk and Interval training programme involves moderate to streneous workloads. The typical response is an elevation of systolic pressure on average 8mm of Hg for each increase in workload of 2000 foot-pounds per minutes. Diastolic pressure follows the course of systolic, but to a lesser degree. Thus the mean arterial pressure raises approximately 3mmHg pounds for each 2000 foot-pounds per minute increase in workload. The Mean Arterial Pressure is usually calculated at one third of the way between diastolic and systolic pressure because of the shape of the arterial pressure wave form, and therefore control group and training groups did not have any significant improvement after 10 weeks of Run & Walk and Interval training on Mean Arterial Pressure.

Experimental groups had no significant effect on Blood glucose levels due to Run & Walk and Internal training when compared with the mean difference of the control group.

Run & Walk and Internal training increases blood flow in subjects and

improve the microcirculation. There was increased peripheral blood flow, which brings greater amount of glucose to the site of utilization. Such increased utilization of glucose may bring about desirable decrease in blood sugar. The Run & Walk training leads to hyperglycemia, excess of sugar in blood due to glucogenolysis. But Interval training leads to lypocemia. The practice of taking glucose during exercise is aimed more at preventing hypoglycemia than giving energy for the exercise.

Due to the Run & Walk and Internal training the rate of total Carbohydrates oxidation was also similar during the first 2 Hrs of exercise in both trials. However, CHO oxidation began declining during the third hour of the placebo trial, at a time when muscle glycogen was low and blood Glucose concentration was declining. Blood glucose concentration and the rate of CHO oxidation eventually fell to 2.5 mmol/ltr and less 1.4g/min respectively at the time of fatigue. Thus the lowering of blood glucose during the later stages of prolonged strenuous exercise appeared to play a major role in the development of muscular fatigue. The only time that carbohydrates should possibly be avoided is in the 30-60 min immediately before competition or training. For some individuals has timing of feeding may produce a rapid fall in blood glucose levels in the first 20min or 80 of exercise and so impair performance.

It was found that during prolonged heavy exercise, the water balance may be disturbed and the stores of available energy, particularly glycogen, may be critically too. Therefore, the individuals' ability to transport oxygen from the air to the working muscles may not always be the limiting factor. It has been found that the subjective feeling of glucose in the fasting subject and for a depletion of the glycogen depots in the working muscles. An increase in heart rate with reduction in stroke volume as work proceeds is often observed during prolonged exercise, particularly in a hot environment. If dehydration and the fall in blood sugar are prevented by proper supply of fluid and sugar, performance capacity is better maintained during prolonged exercise, therefore control group and training groups did not have any significant improvement after 10 weeks of Run & Walk and Interval training on Blood Glucose.

Experimental groups had no significant effects on Blood Lactic acid due to Run & Walk and Interval training when compared with the mean difference of the control group.

Run & Walk and Interval training prolonged for hours the work output during maximal effects decreases gradually. After the rest, a workload that normally could be tolerated for 6 minutes had to be terminated after about 4 minute due to exhaustion. The peak lactate level in the blood correspondingly decreased.

It is believed that the limiting factor must be sought at the cellular level in the exercising skeletal muscles, and could be anything from a change in the properties of the membranes of muscle fibers, and distributed ATP-ADP 'machine' etc to a depletion of the oxygen stores or a reduced capacity to neutralize the metabolites produced.

Subjects in Run & Walk and interval training can work for hours with an oxygen uptake around 70 to 80 percent of their maximum with little or no

increase in blood lactate concentration. From physiological side it is important to determine those speeds and to train in Interval methods and forms with identical or varying speed intensities which will lead to a steady state Lactate or almost equal Balance between ATP breakdown and its regeneration with low to medium blood lactate concentration and less PH decrease. This means that active pause between the runs will help accelerate the elimination of lactic acid by high oxygen transportation. By working at 30-50% VO_2 max, the Lactate values can be eliminated 2-3 times faster.

It was found that due to 10 weeks of Run & Walk and Interval training at sub maximal intensity elicits a lower blood lactate response in children than in adults and an age-related increase towards adult values during development. In 12 to 18 Years old boys suggest that glycogenolysis and consequent ability to produce lactate is limited in children and adolescence compared with adults, therefore control group and training groups did not have any significant improvement after 10 weeks of Run & Walk and Interval training on Blood Lactic Acid Concentration.

Conclusions

Within the limitations of the present study, the following conclusions were drawn.

The haemoglobin concentration was increased due to the treatment of ten weeks of Run & Walk and Interval training. The Interval training increased in the haemoglobin concentration more than the Run & Walk group and control group.

However, the Run & Walk group increased the haemoglobin concentration more than the control group.

There was no significant difference in Mean Arterial pressure, blood glucose and blood lactic acid concentration level due to the influence of the ten weeks of Run & Walk and Interval training groups.

References

Astar and King 1980. *Practical Clinical Biochemistry***.** London: The White Friars Press, 1980

Astrand, Per-Olf and Rodahl, Kaare 1970. *Text Book of work Physiology*, Saint Louis: Mcgraw Hill Company.

Barker, I.B and Summerson 1980. Estimation of Lactic acid", as cited by Harold Varely, *Practical Clinical Biochemistry*, London: The White Friars Press.

Berger, Richard A. 1982. *Applied Exercise Physiology*, Philadelphia Lea and Febiger

Fox, E. L. 1984. *Sports Physiology*, Philadelphia" Saunder's College Publishers.

Guyton, A. C. 1974. *Text book of Medical Physiology***,** Philadelphia W. B. Saunders Company.

Singh, H. 1984. *Sports Training General theory and methods***,** Netaji Subhas National Institute of Sports, Patiala.

Hellerstain, H.K. 1973. *Principles of exercise prescription in exercise testing and exercise training in coronary Heart disease,* New York: Academic Press.

Khanna, G. L. and Jeyaprakash, C.S 1990. *Exercise Physiology and Medicine,* Hisar: Lucky Enterprises.

Lamb, D. R 1984. *Physiology of Exercise Responses and Adaptations*, New York: Macmillan Publishing Company.

Ribeiro, L.F., Malachias, P.C., Junior, P.B., Baldissera, V. 2004. Lactate and glucose minimum speeds and running performance, *Journal of Science and Medicine in Sport.* Mar; **7(1):** 123-7.

Shaver, L. G, 1981. *Essentials Of Exercise Physiology*, Delhi: Surjeet Publication.

Weltman, A. 1991. The lactate threshold as a critical training intensity, abstract of research paper 34: 210

William, D, M. 1991. *Essentials of exercise Physiology,* Williams & Wilkins USA,

Willmore, Jack H. and David L. Costill, Training for Sports activity, The Physiological basis of the conditioning process**,** 3rd ed., Champaign: Human Kinetics Publisher, 1988.