

## **Effect of Sub Maximal Exercise on Blood Lactate on Different Age Groups of Women**

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### **Abstract**

The present study attempts to study the variations in blood lactate levels among three different age groups after a sub-maximal exercise. The present study was undertaken to find out the effect of sub-maximal exercise on Blood lactate in three specified age groups.

The objectives of the was to find out whether sub-maximal exercise brings about any changes in Blood lactate concentration among the different age group of subjects. The aim of the study is to evaluate the effect of sub-maximal exercise on Blood lactate in three specified age groups. Twenty women were selected into each group. The sixty subjects of this study were categorised into three age groups viz., 18 - 22, 28 - 32, 38 - 42. The age group from 18-22 were the women students of Government Arts College, Chennai. The other groups were the working women living in and around Chennai. All subjects were selected after a detailed examination by a qualified doctor and were actively participating in the sports and games and involved in fitness aspects. The results indicates that there was significant difference among all the three groups.

**KEYWORDS:** sub-maximal exercise Blood lactate

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### **INTRODUCTION**

Due to the high degree of automatization, modern man is experiencing a high degree of inactivity which is becoming an increasingly significant factor in the appearance of a great number of illness. In these current living conditions where technological development has directed man's activities from physical to intellectual labour, modern man is increasingly susceptible to a sedentary lifestyle. This brings about a decrease in physical activity, and thus leads to the endangerment of the health and normal functioning of organs and systems of organs (Hollman, 1992; Hollman & Hettinger, 2000; Weineck, 2000). Physical inactivity and a sedentary lifestyle have a very negative effect on almost all of the systems of the human body, and especially on cardiovascular functions (Fentem, 1992).

During exercise, the point of transition from aerobic to anaerobic metabolism, which is known as anaerobic threshold (AT) Wasserman, 1994), has been used as an index to assess aerobic fitness (Wasserman, 1994), to establish an appropriate level of exercise training intensity (Casaburi et al., 1995), and to preoperatively evaluate a patient undergoing major surgery.

Blood lactate accumulation during exercise and the heart rate response and the recovery pattern following exercise are vital indicators of exercise intensity and fitness adaptations of individuals. Though studies investigating exercise intensity and

lactate formation have been widely studied, very few studies have attempted to study the same in relation to different age groups.

The present study attempts to study the variations in blood lactate levels among three different age groups after a sub-maximal exercise.

### **STATEMENT OF THE PROBLEM**

The present study was undertaken to find out the effect of sub-maximal exercise on Blood lactate in three specified age groups.

The present study was undertaken with the following objectives: to find out whether sub-maximal exercise brings about any changes in Blood lactate concentration among the different age group of subjects. The data collected from the three groups before and after the exercise were statistically examined for significant difference in means by using analysis of co-variance wherever the F-ratio was found to be significant the Least Significant Difference (LSD) post-hoc test was used to determine which of the paired mean differed significantly. In all cases the level of significance was set at 0.05 level.

### **HYPOTHESES**

In the present study, the investigator makes an attempt to observe the changes in Blood lactate following similar intensity of exercise (sub-maximal) for all the different age groups of women. Therefore the present study was undertaken with the following hypotheses:

There would not be any significant differences among the three groups in Blood lactate formation after sub-maximal exercise.

### **Statistical Techniques Used**

The data collected from the three age groups before and after the exercise were statistically examined or significant difference by using analysis of co-variance. Whenever the F-ratio was found significant LSD post-hoc test was used to determine which of the paired mean differed significantly. In all cases the criteria for statistical significance was set at 0.05 level of confidence ( $p < 0.05$ ).

### **METHODOLOGY**

The aim of the study is to evaluate the effect of sub-maximal exercise on Blood lactate in three specified age groups. Twenty women were selected into each group. The sixty subjects of this study were categorised into three age groups viz., 18 - 22, 28 - 32, 38 - 42..

The age group from 18-22 were the women students of Government Arts College, Chennai. The other groups were the working women living in and around Chennai. All subjects were selected after a detailed examination by a qualified doctor and were actively participating in the sports and games and involved in fitness aspects. No attempt was made to equate their day today life and the exercise pattern with regard to the concerned study.

## **SELECTION OF VARIABLES**

The purpose of the study was to investigate how the same exercise pattern affects the different age groups. The parameter to measure fatigue level is to measure the lactic acid produced. That is why lactic acid is selected as a variable for this study. Blood lactate accumulation during exercise following exercise is vital indicators of exercise intensity and fitness adaptation of individuals.

## **SELECTION OF EXERCISE**

The 12 minute run test and the single stage treadmill walking test were selected for this study. Hopper (1968) based on the work of Balke (1987)

Four minutes treadmill run at the grade of 5% was selected for this study. Single stage sub-maximal walking test was another sub-maximal exercise for the present study which was developed by Edbling *et al.* (1997).

## **Administration of the Tests and Collection Of Data**

As the present study investigates the effects of sub-maximal exercise at various age groups. The parameters that indicates the level of exercise intensity was studied.

Parameters like accumulation of lactic acid after 15 seconds, 30 seconds and 45 seconds among the three age groups of 15 to 18, 28 to 32, and 38-42 years were studied. To serve these purpose sixty subjects were selected in random among the three age groups. All the subjects were selected after a detailed examination by a qualified doctor and were actively participating in sports and games.

Prior to the testing procedure subjects underwent a detailed physical check up and 5 ml of blood samples were collected in a heparinised test tube for the measurement of resting blood lactate and after collecting the blood samples the subjects were asked to go for twelve minutes continuous run and soon after the completion of the run 5 ml of blood samples were collected by a qualified technician within 3 to 5 minutes and kept it in the laboratory.

In the same way the blood lactate measurements were taken for the age group of 28 to 32 years and 38 to 42 years of age after the twelve minutes run test.

After three days the subjects of 18 to 22 years of age were asked to report for the four minutes treadmill run. Before the commencement of the test the subjects were examined by a qualified doctor and 5 ml of blood samples were taken for the measurements of resting blood lactate and after collecting the blood samples, the subjects were asked to perform the four minutes treadmill run and after the completion of the exercise 5 ml of blood samples were collected for the measurements of the recovery heart rate.

After three days in the same way the other groups like the age group of 28 to 32 and 38 to 42 underwent the four minutes treadmill run and collected the data. The blood samples collected were given to the laboratory for the lactic acid estimation.

## Experimental design

The experimental design used for this study was similar to a random group design involving three different age groups who were randomly drawn into three age groups of twenty each. This study consisted of three different age groups and all the three age groups underwent the 12 minutes continuous run and four minutes treadmill run for the collection of data. All the subjects were tested at prior to and after the experimentation on recovery blood lactate.

## Statistical Technique Used

The data collected from the three groups before and after the exercise were statistically examined for significant difference in means by using analysis of co-variance wherever the F-ratio was found to be significant the Least Significant Difference (LSD) post-hoc test was used to determine which of the paired mean differed significantly. In all cases the level of significance was set at 0.05 level.

**Table I**

**ANALYSIS OF CO-VARIANCE DONE ON BLOOD LACTATE MEASUREMENTS AFTER 12 MINUTES RUN IN RELATION TO RESTING BLOOD LACTATE AMONG VARIOUS AGE GROUPS**

Source of Variance	Type III Sum of Squares	Df	Mean Sum of Squares	F-Ratio	Sig.
Corrected Model	25973.69	3	8657.90	158.23*	0.000 P≤0.001
Intercept	4595.22	1	4595.22	83.98	0.000 P≤0.001
Age group	22166.17	2	11083.09	202.56	0.000 P≤0.001
Resting Blood Lactate	10.10	1	10.10	0.19	0.669
Error	3064.12	56	54.72	-	-
Total	294053.70	60	-	-	-

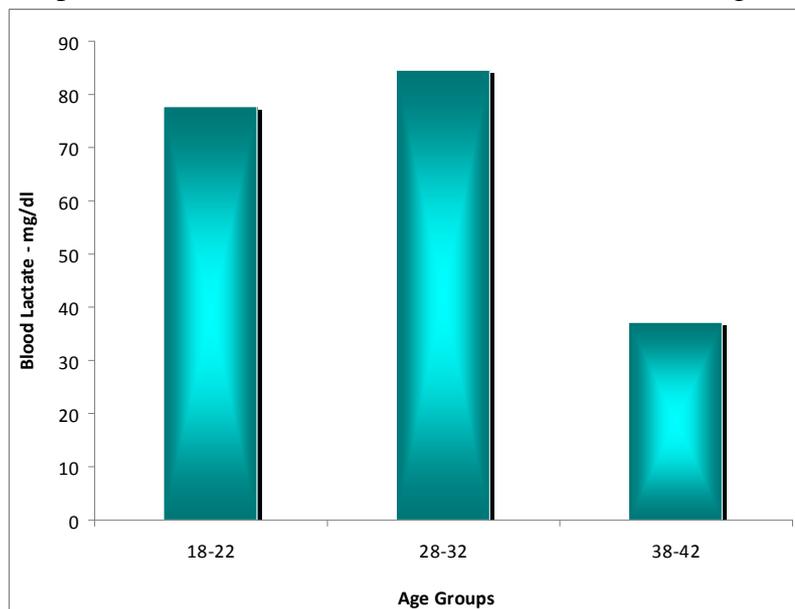
The **Table I** contains all the relevant factors related to analysis of co-variance done among the three age groups on blood lactate measurements after 12 minutes run. The post test values of BLM12R was considered, while resting blood lactate was taken as the covariate. The P- value of 0.001 and F-ratio of 158.23 associated with corrected model indicates that, there is significant difference between the means of adjusted post training means of BLM 12R among the different age groups as the tabulated F(3, 60) has been 2.76. Besides the P-value obtained has also been much less than 0.05, the level of significance set for this study.

Since the F-ratio was found to be significant, the LSD post-hoc test was done to find out whether there existed significant differences among the adjusted post training means on BLM 12R 1W and the details are presented in Table

**Table II**  
**LSD POST-HOC ANALYSIS DONE ON BLOOD LACTATE LEVEL AFTER TWELVE MINUTES RUN IN RELATION RESTING BLOOD LACTATE AMONG THE SELECTED AGE GROUPS**

Mean Scores of Different Age Groups			Mean Difference	Std. Error	Sig. (a)
18-22	28-32	38-42			
77.84	84.53		6.69*	2.35	0.006
77.84		37.04	40.80*	2.46	0.000 P≤0.001
	84.53	37.04	47.49*	2.54	0.000 P≤0.001

Table II related to post-hoc tests among the different age groups do indicates significant mean differences between the age group 18 to 22 years and 28 to 32 years of age, between the age group 18 to 22 years and 38 to 42 years and also between 28 to 32 years and 38 to 42 years of age as the mean differences and the P-values of all the said comparisons were (MD = 6.69 and P = 0.006) (MD = 40.80 and P≤0.001) and (MD = 47.49 and P ≤ 0.001) respectively, since all the P-values in all the above comparisons were much less than 0.05, the level of significance set for this study.



**FIGURE 1: MEANS ON BLOOD LACTATE MEASUREMENTS AFTER 12 MINUTES RUN IN RELATION TO RESTING BLOOD LACTATE AMONG THE SELECTED AGE GROUPS**

**DISCUSSION OF FINDINGS**

The findings indicate significant mean differences in blood lactate among the different exercise patterns and among different age group women.

This indicates significant difference in exercise stage at which threshold occurs, do always strengthen the hypothesis that significant difference do occur in recovery heart rate.

Thus the framed null hypotheses that there would not be any significant differences among the three age groups of women in blood lactate formation after sub-maximal exercise after sub-maximal exercise was rejected.

Blood lactate threshold do vary based on the mode of exercise or in other words, as different mode of exercise elicit a different blood lactate concentration at a given heart rate.

The result of the present study indicates that there is significant difference in blood lactate measurements among the three specified age groups at 15 seconds, 30 seconds and 45 seconds after the four minutes treadmill run even at the age difference of 10 years.

The result of the study is similar to the result obtained by **Rodriguez-Alonso et al. (2003)** and **Ghosh et al. (1990)** and **Benhlel et al. (2006)**.

Findings of Hurley *et al.* (1984) provide evidence that the adaptations to training that result in an increase in VO<sub>2</sub> max are to some degree, independent of those responsible for the lower blood lactate levels during sub-maximal exercises. The study of **Karlsson et al.** provides evidence that, lower the lactate concentration during sub-maximal exercise in the trained state is secondary to a lower lactate concentration in the exercising muscles.

## CONCLUSIONS

The results indicates that there was significant differences among all the three women groups in all the variables. As **Stephan Arthur and Arthur Baltimore** stated in their longitudinal test (1979) the result of this study also showed significant differences in 10years may not influence the lactic acid concentration and recovery heart rate in sub-maximal exercises selected for this study.

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