

**COMPARISON OF RESTING BLOOD LACTATE CONCENTRATION WITH
DIFFERENT RECOVERY PATTERNS AFTER 600 METERS UPHILL AND DOWNHILL
SPRINT RUN**Sujay Bisht, PhD*¹ and Ramesh Chand Yadav, PhD²¹Lakshmbai National Institute of Physical Education, North East Regional Centre Guwahati, Assam, India.²National Institute of Technology, Kurukshetra, Haryana, India.***Corresponding Author: Sujay Bisht**

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ABSTRACT

[Purpose] This study was undertaken to compare resting blood lactate concentration with different static recovery patterns after 600 meters uphill and downhill sprint run. [Subjects and Methods] Five undergraduate male students were regularly engaged in conditioning program and different physical activity were selected as a subjects, blood sample were collected from each subject at four different stages: at rest and after static different recovery patterns i.e. 1 minute, 10 minutes, 20 minutes and 30 minutes. [Results] The blood lactate concentration found significant differences when compared resting to the different static recovery patterns. [Conclusion] Blood lactate accumulation has suddenly improve during high intensity work and it has slowly reduced as well as recovery pattern will be improve. Higher lactate accumulation (Thresh hold) in blood was reached ($11.58 \text{ mmol}\cdot\text{l}^{-1}$) at 10 minute recovery pattern.

KEYWORDS: Blood lactate concentration, Static recovery patterns.**INTRODUCTION**

An accumulation of lactate occurs when one is not able to meet the energy demand of exercise by aerobic metabolism. Lactic acid produced in skeletal muscle during exercise diffuses into the blood. Blood lactate concentration represents the difference between release of lactate into blood from contracting skeletal muscle and the removal (uptake) of lactate by various tissues, including the liver.^[1]

Blood lactate concentration may give valuable information not only about changes in glycolysis, but also about the anaerobic work capacity in humans. Previous studies demonstrated that peak blood lactate, which was determined after 1 min of supramaximal exercise on a treadmill or 400-m sprinting, correlated with the running time of a 400-m sprint in untrained male and female subjects.^[2-4]

Studies of changes in blood lactate and lactate dehydrogenase, depending on maximal exercise intensity have been implemented, and such studies are frequently conducted in order to review exercise and training effects on athletes. Following a high -load exercise, creatinekinase, CK, a blood fatigue substance, was found to remarkably increase. CK catalyses the Lohmann reaction which combines phosphocreatine, with adenosine triphosphate, and then recompounds it with

adenosine triphosphate. In addition, CK is reported to act as a blood marker of polymyositis, skin reaction, skeletal muscle disease, and it increases after high-load muscle resistance exercise, in particular, following eccentric contraction.^[5] Another measure which has been used as an index of endurance performance is the anaerobic threshold (AT). When workload is incremented gradually during exercise, there is a stage at which activation of anaerobic metabolism is followed by release of lactate from the muscle into the blood.^[6] The onset of this process is termed the AT, and may be expressed as a percentage of $\text{V}02 \text{ max}$, or as a work rate, at which it occurs. The AT has been defined as the level of work or $\text{V}02$ just below that at which metabolic acidosis occurs.^[7] The AT may be determined by means of serial venous lactate measures and/or respiratory gas exchange during exercise.^[7,8]

However, these results were obtained after exhaustive running exercise on a treadmill with a grade of 8.6% (uphill running) or on the en-tout-cas 400m track at a 0% gradient (level running). In other words, it is possible to assume that there may be some differences in peak blood lactate after supramaximal exhaustive exercise for short periods between uphill and downhill running.^[9]

The purpose of the study were 1) compare the resting blood lactate with different recovery patterns 2) to

examine the peak blood lactate (AT) after uphill and downhill 600 meters sprint run.

SUBJECTS AND METHODS

Five male undergraduate students of the Lakshmbai National Institute of Physical Education, North East Regional Centre, Guwahati, Assam volunteered to participate in the study. The anthropometric characteristics of the subjects were as follows: age 21 ± 2.12 years; height 172 ± 6.82 cm; mass 64 ± 8.09 kg. Ethical approval was obtained for the study and the entire participant completed informed consent. The entire participant regularly engaged in conditioning program and different physical activity. A hill of 300 meters from starting line which is 20 to 25 degree approximately incline from base (starting line) and participants were covered to run 600 meters total of uphill and return to downhill sprint run. In which 5 times run of incline (cover 300 meters) and 5 times decline (cover 300 meters). The total distance of incline and decline sprint run was covered 600 meters. Blood sample were taken before the warm-up and just after the completion of 600 meters sprint run followed by 1 minute, 10 minute, 20 minute and 30 minute of recovery patterns. The blood sample collected from the right index finger tip of each participated and analyzed by using a portable lactate analyzer Blood Lactate Scout + (plus). All safety and hygienic procedure were strictly followed during and

after the collection of blood. The subjects were weighed to nearest 0.1 kg wearing only shorts. Body weight and height were taken by weighing machine and stadiometer respectively. Post exercise heart rate was measured by carotid pulse palpation technique. Body fat % and other anthropometric measurement was determined for each subject. The fat % was measured by using maltron bio-scan 916 body analyzer. Bio scan uses scientific patented method of measuring Electrical Impedance. A total of four electrodes are used, 2 electrodes are applied to the hand and two to the foot. A low-level battery operated electric current is passed through the body and the Impedance (Z) measurement is the frequency dependent opposition of a conductor or flow of an alternating electric current and is a makeup of two vectors Resistance (R) and Reactance (Xc) measured at a particular frequency and described mathematically Impedance.

The following analyses were performed using SPSS 15.0 Statistics software was provided by DST, BHU, Varanasi, India. Mean and standard deviation were calculated for each variable. An analysis of variance with repeated measure ANOVA was used to find out the significant difference. The post hoc LSD test was used for comparison of the means, and significance was accepted at values of $p < 0.05$.

RESULTS

Table 1: Descriptive statistic of blood lactate accumulation ($\text{mmol}\cdot\text{l}^{-1}$) at different static recovery patterns (n=5). (Mean \pm SD).

	Resting blood lactate	Recovery periods			
		1 minute	10 minute	20 minute	30 minute
Recovery patterns	1.38 ± 0.77	3.04 ± 0.97	11.58 ± 1.59	7.64 ± 1.97	4.22 ± 1.00

Table 2: Independent Table ANOVA (Repeated Measure).

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Lactic Acid	330.93	4	82.73	70.78*	0.00
Error(Lactic Acid)	18.71	16	1.16		

Table 3: Post Hoc analysis of blood lactic acid concentration for resting period and during recovery periods.

(I) Lactate Acid	(J) Lactate Acid	Mean Difference (I-J)	Std. Error	Sig.(a)
1	2	-1.66(*)	0.40	0.01
	3	-10.20(*)	0.58	0.00
	4	-6.26(*)	1.01	0.00
	5	-2.84(*)	0.42	0.00
2	3	-8.54(*)	0.77	0.00
	4	-4.60(*)	0.97	0.00
	5	-1.18	0.60	0.12
3	4	3.94(*)	0.71	0.00
	5	7.36(*)	0.30	0.00
4	5	3.42(*)	0.67	0.00

Means and standard deviations of collected blood lactate (Table 1). In this study a significant differences were shown in compare resting blood lactate accumulation to different static recovery patterns ($p < 0.05$) (Table 2).

When compared to means of resting blood lactate to 1 minute, 10 minutes, 20 minutes and 30 minutes were shown insignificant ($p < 0.05$) (Table 3).

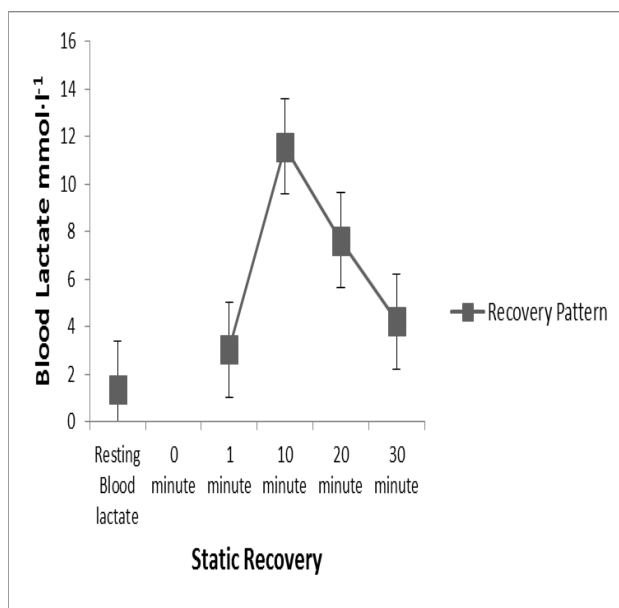


Figure 1: Graphical representation of the means of blood lactate concentration at rest and different recovery patterns.

DISCUSSION

Aim of the present study was to examine the resting blood lactate concentration to the different recovery patterns after 600 meters sprint run of trained undergraduate students, significant difference were found at the resting blood lactate concentration and during different recovery patterns. Blood lactate accumulation sharply improve in compare to resting blood lactate after submaximal run. A significant correlation between peak blood ammonia and work/LBM after supramaximal treadmill running with a grade of 5 or 3 for 60-70 sec.^[10]

It has been shown that short term high intensity exercise produces high level of arterial lactated with values of up to 25 mmol·l⁻¹ being reported in highly motivated individuals.^[11,12,13] Accumulation of blood lactate concentration during exercise has a strong relationship with the intensity of exercise load, and has a deep influence on muscle fatigue.^[14] The difference could be related to the muscle fibre recruitment pattern and also to the effect of eccentric and/or concentric muscle contraction during supramaximal downhill and uphill running. However, it is necessary to confirm this possibility.^[15]

During high intensity sports training to recognize in what condition the body consume and produced adequate energy, exercise increase the concentration of blood lactate. It has observed that the lactate concentration found significantly incremental after uphill and downhill sprint run and decreased as well as recovery period increases. Blood lactate has been reach to the lactate threshold value up to the 11.58 mmol·l⁻¹ during 10 minutes recovery blood sample after cease of work as shown in the figure 1.

It was concluded that the found significantly greater blood lactate accumulations after 600 meters uphill and downhill sprint run during 1 minute, 10 minutes, 20 minute and 30 minutes in compare to rest. The peak blood lactate (Lactate Threshold) level appeared after uphill and downhill sprint run. These results suggest that different recovery patterns may be due to large involvement of muscles, broken down ATP-PC and improve the H⁺ concentration in the blood. The peak lactate (LT) accumulation obtained during recovery period after uphill and downhill sprint run for about 10 minute may be used as an index of anaerobic work capacity of trained undergraduate students.

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