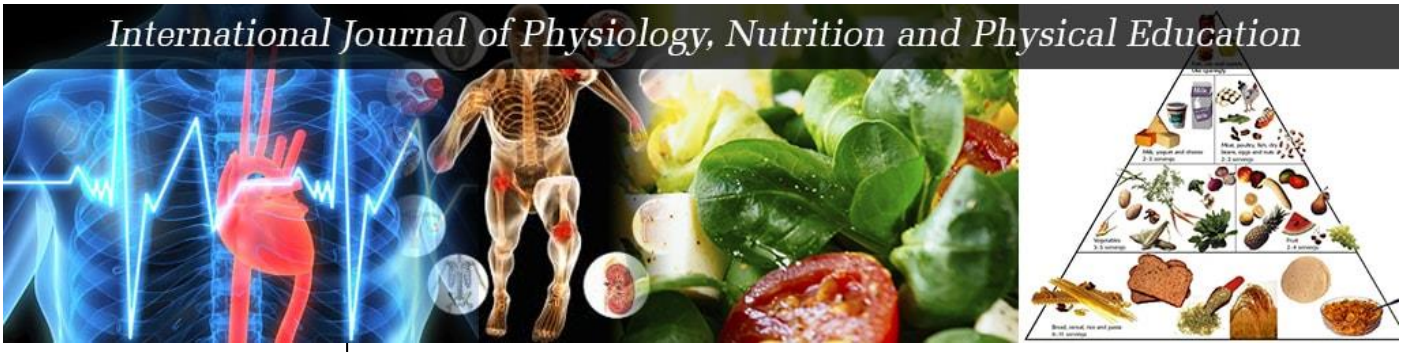

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Blood lactate and rate of recovery as determining factor in performance of tribal athletes

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Abstract
The purpose of the present study was to evaluate the influence of blood lactate and lactate clearance in recovery after immediate exercise on performance of tribal athlete. Seventeen (N=17) middle distance tribal athletes were selected purposively as subject for this study who belonged from Dooars of Jalpaiguri district. Their age ranged from 18 to 21 years. Performance level was measured through time in 1500mt. run. Blood lactate levels of athletes were recorded at resting condition and immediate after finish of 1500mt. run in three phases during recovery priod i.e. after 3min., 6min. and 9min. respectively utilizing finger prick blood analysis via Accutrend Plus blood lactate analyzer. Recovery rate after exercise was recorded in two phases. To mark the association of performance with lactic acid concentration in blood (resting) and recovery rate of lactic acid during recovery period after exercise, Pearson's Product Moment correlation of coefficient was employed. No significant results were obtained in relation to blood lactate in resting condition and recovery rate after exercise with performance of middle-distance tribal athlete. Although a positive relationship existed in both phases of recovery rate of lactic acid and performance of middle-distance athletes.

Keywords: Blood lactate, rate of recovery, performance, tribal athletes

Introduction
By nature, human beings are competitive and ambitious for the excellence. Not only every individual but also every nation wants to exhibit their supremacy by challenging the other man or nations. Such type of challenging stimulates, inspires and motivates the entire nation to exhibit their performance in the present competitive sports world. People of a certain race or genetic background seem to perform better at certain sports than others. It is evolution that is likely responsible for genetics role in athletic performance. Tribal seeks a platform around the world on the basis of their evolutionary success in sports. Mainly their customs, physical and physiological responses, psychological traits differentiate them from others. Genetics play a indispensable role in their outstanding sports performance. Genetic variations provide them a separate and self-recognition in global scale. The physiological and bio- chemical aspects are the major factor for their incomparable physical fitness. Science gets interest on them to find out their inherent qualities.

Lactic acid is a bio-chemical product which presence in our body. Many people commonly, but wrongly, view lactic acid as a waste product that causes fatigue and muscle soreness. However, while lactic acid production often accompanies fatigue, it does not directly cause tired muscles, nor is it responsible for the muscle soreness you may feel a day or two after your workout. In fact, rather than being a waste product, lactic acid is an important energy source for your body both during and after your workout.

Lactic acid is a by-product of glycolysis and forms when your body breaks down glucose for energy when oxygen is low. Participation in regular anaerobic exercise will help your body tolerate and eliminate lactic acid more efficiently. When you exercise, your body uses oxygen to break down glucose for energy. During intense exercise, there may not be enough oxygen available to complete the process, so a substance called lactate is made. Your body can convert this lactate to energy without using oxygen. But this lactate or lactic acid can build up in your bloodstream faster than you can burn it off. Lactic acid plays a major role in performing any exercise, that may be aerobic or anaerobic. On such basis lactic acid relevant factors may

determine the performance level of aerobic and anaerobic events as it involves in supplying the energy sources.

During and after your workout, your muscles and heart can metabolize lactate for energy. Your liver clears lactate from the bloodstream by converting it into glucose, or blood sugar. The liver can also convert lactate into amino acids, the building blocks of proteins. Some lactate is lost in your sweat as well. All of these processes contribute to the rapid clearance of lactate from your bloodstream after exercise.

Methodology

The objective of the study was to identify the relationship of blood lactate in resting and recovery rate of lactic acid with performance of tribal athletes. The subject for the present study was confined to male athletes from different tribal communities living in Dooars of Jalpiguri district. Only middle-distance runners (800mt. and 1500mt.) were drawn as subjects assuring their minimum district level participation for two times. Seventeen (N=17) subjects were selected purposively as representative of whole population of tribal athlete for this study and the age of the subjects were ranged from 18 to 21 years.

Criterion Measures: The following variables were selected to fulfill the objective of the present study and the tests were conducted to measure the parameters were:

Variables	Measuring Tools	Unit of Measurement
Lactic Acid in Blood (Resting)	Accutrend Plus	mmol/L
	Cobas – Roche (Made in Germany)	
Recovery Rate of Lactic Acid	Accutrend Plus	In%
(Accumulated in blood after exercise)	(Calculated by Percent Recovery Method)	
Performance level over 1500mt. Run	Stop-Watch(Casio- 1/100)	min.

Testing Protocol: To assess lactate level in plasma portion of whole blood in resting condition, portable lactate analyzer (Accutrend Plus) was used. To determine the rate of recovery of lactic acid after exercise, subject was asked to perform 1500mt. run. Immediate after finish of 1500mt. run lactic acid concentration was measured for three phases i.e. after 3min., 6min. and 9min. respectively. To obtain recovery rate of lactic acid, scores were converted through percent recovery method for each phases. Times in 1500mt. run were recorded as performance level of athletes.

Statistical Procedure: In order to analyse the collected data and to investigate the existence of significant relationship correlation of co-efficient was employed and to analyse the hypothesis level of significance was set at 0.05. Prior evaluating, the relevant data were converted into standard score as measuring units were not in uniform in nature. Mean, standard deviation and standard error were calculated as descriptive statistics to interpret the assessment of each variable.

Findings of the Study

The results of the present investigation reflects in the following tables and the interpretation of such results are as follows:

Table 1: Subject Characteristics Regarding Lactic Acid in Blood (Resting) and Performance Level Over 1500mt. Run and Ratio of Association Between Them

Name of the Variables	Mean	Standard Deviation	Standard Error	Highest Score	Lowest Score	'r' Ratio
Lactic Acid in Blood (Resting) mmol/L	2.68	0.82	0.2	3.9	1.5	-0.19NS
Performance(Minute)	5.1	0.28	0.067	5.65	4.62	

Significant at r 0.05(15) = 0.482

NS – Not Significant

It can be observed in table no.1 that the descriptive analysis as mean and standard deviation of lactic acid in blood in resting condition were 2.68 $\pm$0.82 and SEM was 0.2. The value of mean and standard deviation of performance level over 1500mt. run were 5.1 $\pm$0.28 and SEM was 0.067. It also reflects that there was a negative insignificant relationship of lactic acid in blood (Resting) with performance of tribal athletes as calculated value (r = 0.19) was lesser than tabulated value (r(15) = 0.482) at 0.05 level of significance. Here we need to clarify a crucial fact of this study for the appropriate interpretation of the result because there lies a conflict. Actually an inverse relation always exists between performance and time in running event. So, we can conclude that as 1500mt. run has a inverse relation with performance, the revealing correlation which indicated negatively insignificant was actually existed as a positive insignificant relationship between lactic acid in blood in resting and performance and a slight correlation existed between them.

The strength of Correlation of Co-efficient

Table 2. The structure of strength of relationship is shown in the following table

Range	Strength of association
0 (zero value)	Zero relation or absolutely no relationship
From 0.01 to $\pm$ 0.20	Slight or almost negligible relationship
From $\pm$ 0.21 to $\pm$ 0.40	Low correlation or small relationship
From $\pm$ 0.41 to $\pm$ 0.70	Moderate correlation
From $\pm$ 0.71 to $\pm$ 0.90	High correlation or marked relationship
From $\pm$ 0.91 to $\pm$ 0.99	Very high correlation or quite dependable relationship
$\pm$ 1	Perfect correlation

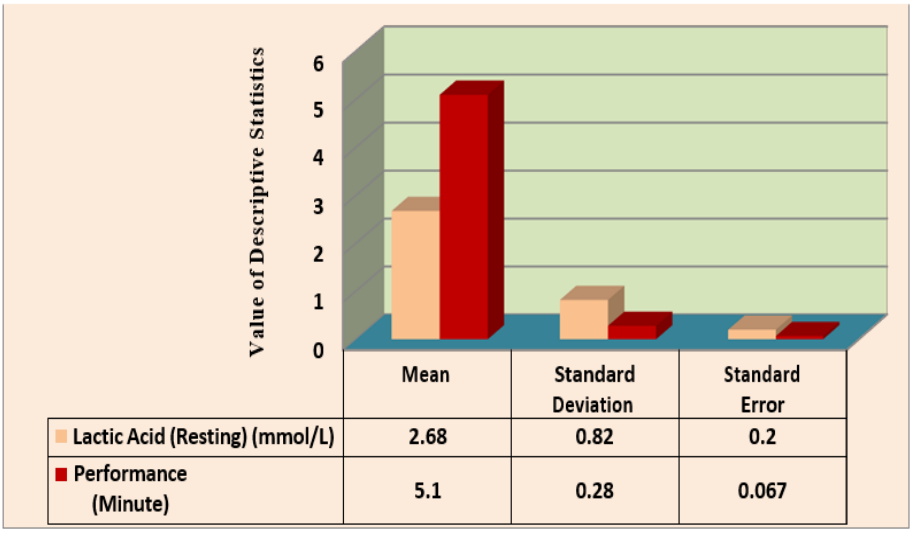

Fig 1: Graphical Presentation of Descriptive Analysis of Lactic Acid in Blood (Resting) and Performance Level Over 1500mt. Run

Table 3: Subject Characteristics Regarding Recovery Rate of Lactic Acid in 1st Phase and Performance Level Over 1500mt. Run and Ratio of Association Between Them

Name of the Variables	Mean	Standard Deviation	Standard Error	Highest Score	Lowest Score	'r' Ratio
Recovery Rate of Lactic Acid in 1st Phase (%)	-0.62	21.29	5.17	36.84	-43.37	-0.304NS
Performance (Minute)	5.1	0.28	0.067	5.65	4.62	

Significant at r0.05 (15) = 0.482
NS – Not Significant

Table no.3 depicts the value of mean and standard deviation of recovery rate of lactic acid in 1st phase were -0.62 ±21.29 and SEM was 5.17 as characteristics of tribal athletes. In performance level over 1500mt. run, mean and standard deviation of subjects were 5.1 ±0.28 with SEM 0.067. The above table also indicates that there was a negative insignificant relationship of recovery rate of lactic acid in 1st phase with performance of tribal athletes as calculated value (r = 0.304) was lesser than tabulated value (r(15) = 0.482) at 0.05 level of significance. But on the basis of the inverse relationship of 1500mt. run with performance, the nature of relationship was transformed into reverse. So a conclusion can be drawn that recovery rate of lactic acid in 1st phase and performance were positively associated with each other and the relationship was categorically low.

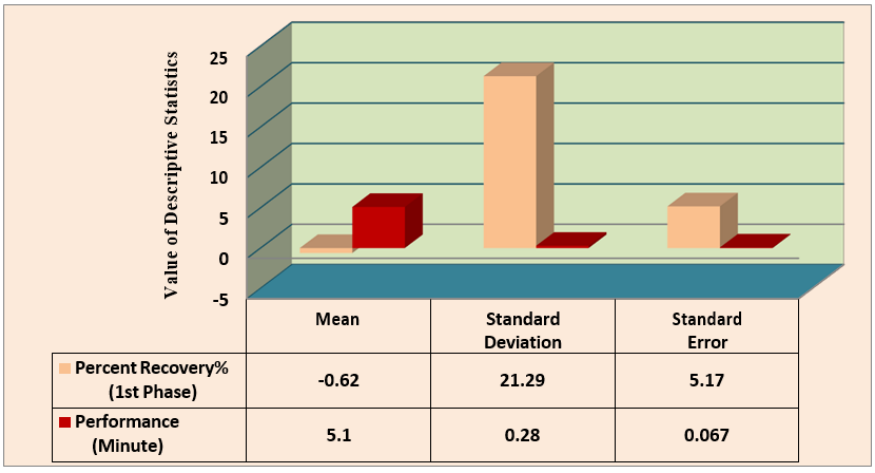

Fig 2: Graphical Presentation of Descriptive Analysis of Recovery Rate of Lactic Acid in 1st Phase and Performance Level Over 1500mt. Run

Table 4: Subject Characteristics Regarding Recovery Rate of Lactic Acid in 2nd Phase and Performance Level Over 1500mt. Run and Ratio of Association Between Them

Name of the Variables	Mean	Standard Deviation	Standard Error	Highest Score	Lowest Score	'r' Ratio
Recovery Rate of Lactic Acid in 2nd Phase (%)	23.89	12.05	2.92	44.74	3.18	-0.368NS
Performance(Minute)	5.1	0.28	0.067	5.65	4.62	

Significant at r0.05 (15) = 0.482
NS – Not Significant

According to the table no.-4, the descriptive statistics such as mean and standard deviation of the measured variables i.e. recovery rate of lactic acid in 2nd phase and performance level over 1500mt.run were 23.89 ±12.05 with SEM = 2.92

and 5.1 ±0.28 with SEM = 0.067 respectively. The above table also display an existence of insignificant relationship between recovery rate of lactic acid in 2nd phase and performance level over 1500mt. run of tribal athletes as calculated value (r= 0.368) was lesser than tabulated value (r = 0.482) at 0.05 level of significance with 15 degree of freedom, although a low negative relationship was found there. But the real fact is, a low positive relationship was truly existed among them as 1500mt. run has an inverse relation with performance.

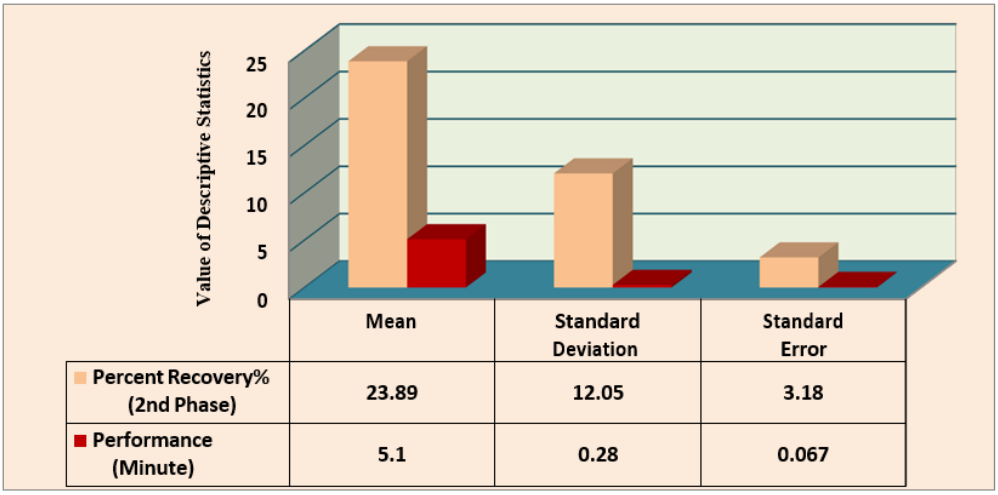

Fig 3: Graphical Presentation of Descriptive Analysis of Recovery Rate of Lactic Acid in 2nd Phase and Performance Level Over 1500mt. Run

Discussion of Findings

The findings on the basis of the results revealed that no significant association were found in relation to blood lactate in resting and recovery rate of lactic acid with performance of tribal athletes.

Lactic Acid in Blood (Resting)

The result of present investigation indicated an insignificant relationship between lactic acid in blood in resting condition and performance of middle-distance athlete, but there had an indication of slight positive association which allows to draw a conclusion that there may be no beneficial effect of blood lactate in resting on performance of such athletes. In contrast, A cross sectional study done by Silva *et al*. (2007) [6] and found in his study that the enhancement in blood lactate concentration observed after the specific soccer training program which included aerobic and anaerobic nature of exercise and it may be explained by an increase in the lactate/H+ transport capacity of human skeletal muscle. Plowman and Smith (2007) [3] suggested that Both resting and exercise values depend on the balance between lactic acid production (appearance) and removal (disappearance, or clearance). The reason of such findings probably could be that tribal respondents who belong from Dooars of Jalpaiguri district have a different environmental impact and also have distinct difference from other community in relation to their living style, nutritional aspect and hereditical variability.

Recovery Rate of Lactic Acid

Lactic acid is much more important as energy source for body both during exercise and post exercise (recovery). The accumulation of lactic acid in blood due to perform any exercise and rate of removal of the accumulated lactic acid from blood have been taken into account to enhance sports performance. In different study, the findings regarding the concentration of lactic acid in blood in post exercise period are not in same manner as the researcher considered different nature of activity for their study. The muscle lactate level was still high at 3 min into recovery, and the blood lactate concentration peaked after 6 min after the Yo-Yo intermittent recovery test (Krustrup *et al*., 2006) [5]. Krustrup *et al*. (2006) [5] confirmed based on his findings that in response to continuous exercise the clearance of both muscle and blood lactate are slow processes, with the rate of lactate removal from the blood being slower than the rate of muscle lactate decrease. This could be the reason that in current study, the investigator found the mean assessment value -0.62% ±21.29 of recovery rate of lactic acid in 1st Phase (that indicates the recovery status on 6min. in respect of 3min.). The researcher observed during the data analysis that whatever the assessment values of lactic acid in blood on 3min. after the completion of 1500mt. run, were lower in most of the cases than the value of lactic acid in blood measured on 6min. after exercise. As result showed the concentration of lactic acid in blood was higher on 6min. rather than on 3min. after exercise. On basis of these evidences, the investigator noted that muscle still releases lactic acid to blood on that period and in cases of most of respondents, recovery was much slower than the secretion of lactic acid by muscle into blood. Rashidi *et al*. (2013) [4] also considered the same fact from his findings that immediately after activity and 5 minutes after initial sate recovery, the amount of blood lactic acid increased in all groups because of secretion of the lactic acid produced by muscle into blood. Actually the rate of release of lactic acid from muscle to blood mostly depends on intensity of activity and duration also.

In next phase, that is on 9min. the density of blood lactic acid gradually decreased and recovery started (Mean value of Recovery rate of lactic acid in 2nd Phase was 23.89% ±12.05). The findings of the current study revealed that no significant result was found in both 1st and 2nd phase recovery, although a positive relationship obtained in both phases of recovery rate of lactic acid with performance of middle-distance athletes. Comparatively in 2nd phase the deviation was low to be significant. The research was limited to the low number of participants used in the study. The inclusion of a greater number of athletes would have increased the variability and may be found a significant result in response to 2nd phase recovery.

Here, respondents were categorically middle-distance athlete and 1500mt. run considered to assess their performance level. As 1500mt. run comes under middle distance running event

which is combination of anaerobic and aerobic both in nature, then production and removal of lactic acid in blood definitely influenced by intensity and duration both. Anaerobic glycolysis system in active muscle is responsible for produce energy resulting in lactic acid production in response to intensive exercise (Rashidi *et al*., 2013) [4]. During high-intensity exercise lactic acid plays another role, large amounts of lactate and H+ can be produced in skeletal muscle, and the resulting accumulation of lactate and lowering of pH in the muscle can impair the ability of the muscle to maintain force (Silva *et al*., 2007) [6]. In relation to aerobic exercise, lactic acid accumulation in skeletal muscle can be cleared with the presence of oxygen by accelerating the oxygenation of lactate to pyruvate which is used as fuel during the Kreb's cycle or utilized by the liver to create glucose via gluconeogenesis (Mohamad et. al, 2012) [7]. A cross-sectional study showed that speed endurance-trained athletes have a higher capacity to transport lactate than untrained and less trained subjects (Pilegaard *et al*., 1994) [2]. The enhance of lactate/H+ transport capacity of human skeletal muscle may increase the release rates of lactate and H+ after a training program (Silva *et al*., 2007) [6].

Conclusions

On the basis of the results and discussion following conclusions can be drawn -:

1. It was evident from the result of the study that no significant relationship existed between lactic acid in blood in resting condition and performance of middle distance athlete.
2. The present study observed that no significant relationship was existed in relation to recovery rate of lactic acid and performance although a positive relationship existed in both phases of recovery rate of lactic acid and performance of middle distance athletes.

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