



THE EFFECT OF LACTATE BUILDUP AS AN ENERGY SUBSTRATE DURING A SHORT-DURATION, HIGH-INTENSITY RUN OF 400-m AND A MEDIUM RUN OF 800-m ON UTA KINESIOLOGY STUDENTS

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Introduction

Lactic acid is a metabolic byproduct of the anaerobic glycolysis energy system present in blood and muscle. Some research indicates that lactic acid is a marker of fatigue during short duration exercise due to its dissociation into lactate and the H⁺ ion, whose accumulation in tissues and blood can lead to a subsequent decrement in muscle and plasma pH causing an inhibition of coupling mechanisms and enzymatic processes necessary for maintenance of muscular force production. Other studies have not implicated lactate to be the sole contributor of fatigue, as different types of exercise produce multifaceted fatigue factors, depending on muscle fiber type composition, intensity and duration of exercise and degree of fitness of the individual. A higher lactate production has been previously associated with better performances at the onset and during short duration, high-intensity exercise or competition, and its ability to possibly offset effects of fatigue.

Purpose

The purpose of this study was to evaluate the effect of lactate build up in UTA Kinesiology students of different fitness levels and compare lactate blood level with time to completion of the 400-m and 800-m run on a running track and asses if a higher blood lactate level was associated with a better performance in these events.

Methods

SUBJECTS

- 8 students attending the University of Texas at Arlington Kinesiology department volunteered as subjects for this study
- 5 males and 3 females
- Each subject participated in at least the minimum amount of weekly recommended exercise, was not a smoker and/or binge drinker according to the inclusion questionnaire and were free of any musculoskeletal and/or health ailments and were cleared to participate in this study according to the PAR-Q they filled out.

Table 1: Demographics

	Age (yrs)	Height (cm)	Weight (kg)
Mean	23.8	173.65	72.45
SD	± 2.1	± 8.69	± 14.35

INSTRUMENTATION

- Accusport Lactate Analyzer, Model-1488767 (Boehringer Mannheim, Germany)
- Single use lancets
- Blood lactate applicator (Hirschmann Laborgerate, Eberstadt, Germany)
- Polar watch heart rate monitor and chest strap (Polar Electro, USA)
- ACCUSPLIT stopwatch, Model-Pro Survivor 601X 3V (Livermore, CA)
- Sphygmomanometer and stethoscope (American Diagnostic Corporation, Hauppauge, NY)

Methods (cont'd)

PROCEDURE

- Upon arrival subjects filled out a general health and activity questionnaire and were asked not to consume any food or caffeine 2 hours previous to workout
- Subjects ran 400-m on day 1 and 800-m on day 3, and were instructed not to participate in any physical activity on or between those days
- A resting blood lactate level, heart rate and blood pressure value were obtained before each run
- Blood lactate level, heart rate, blood pressure, were obtained as well immediately at completion of each run, and 5 minutes post-run during recovery time.
- Rate of Perceived Exertion (RPE, Borg Scale 0-16) was obtained immediately at completion of each run

Statistics

▪ **NULL HYPOTHESIS:** There is no significant difference in blood lactate buildup and time to completion in either the 400-m or 800-m run.

- Independent variable
 - 400-m blood lactate
 - 800-m blood lactate

- Dependent Variable
 - Time to completion of run
 - Heart Rate
 - Blood pressure
 - Rate of perceived exertion (RPE)

- A correlation measures statistical analysis was used
- The P-value was set to .05
- The data was analyzed using the SPSS 17.0 software

Results

- There was a high, inverse correlation in blood lactate buildup in 400-m (mean 13.9 mmol ± 2.4 mmol) and 800-m (13.7 ± 2.7 mmol) and time to completion of each event (mean 97.23 ± 17.55 sec, r=-.814, P=.014, P< 0.05) and (mean 230.11 ± 44.20 sec, r=-.860, P=.006, P< 0.01), respectively.
- In terms of lactate buildup and its relationship with HR (163 ± 21 bpm [400-m]; 168 ± 16 bpm [800-m]), BP (161/66 ± 14/16 SBP/DBP [400-m]; 169/61 ± 13/19 SBP/DBP [800-m]), and max RPE (15 ± 1 [400-m]; 15 ± 1 [800-m]), no significant differences were observed.

Results (cont'd)

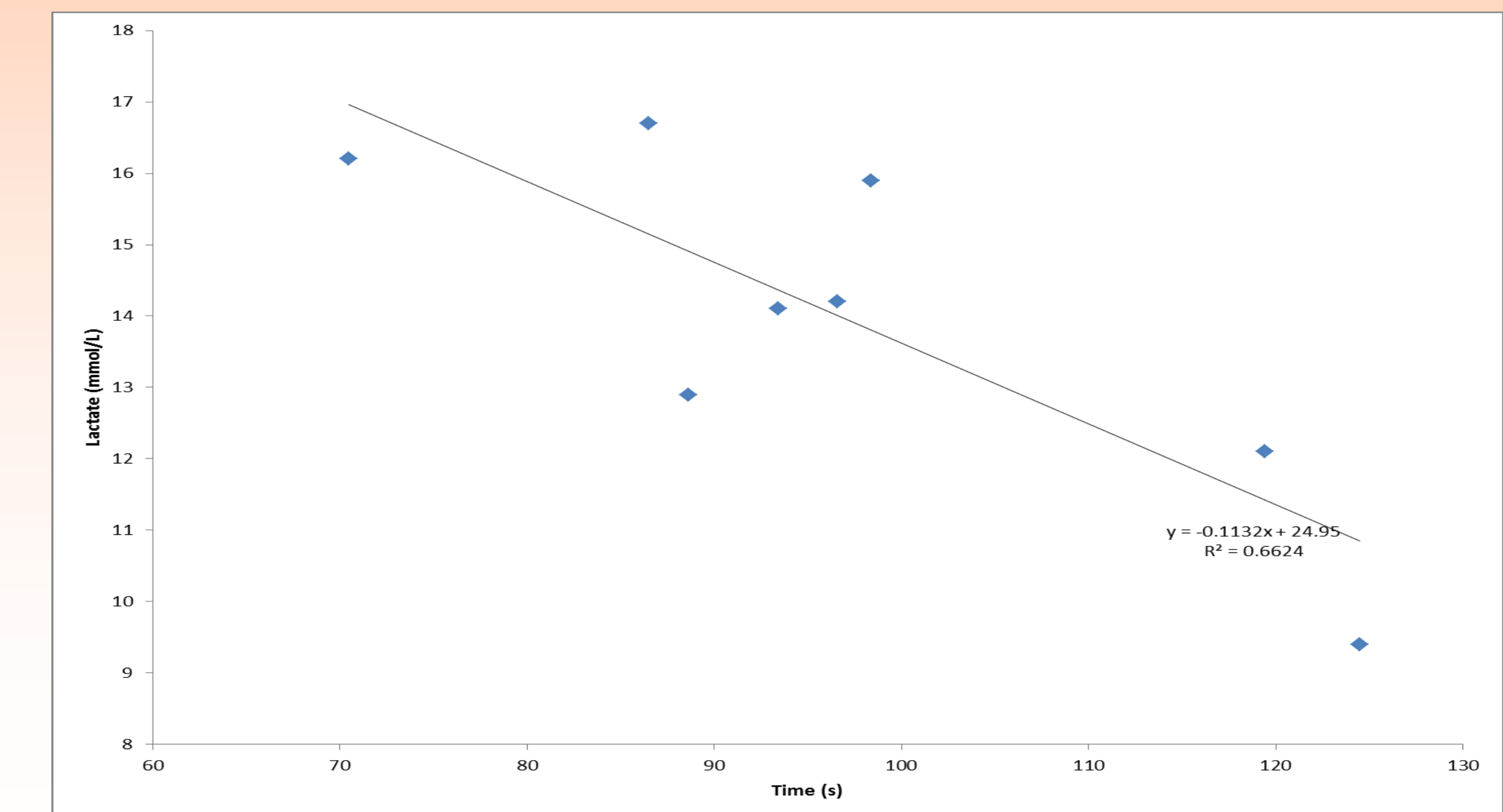


Figure 1: Relationship of time (s) and blood lactate (mmol/L) in a 400-m run

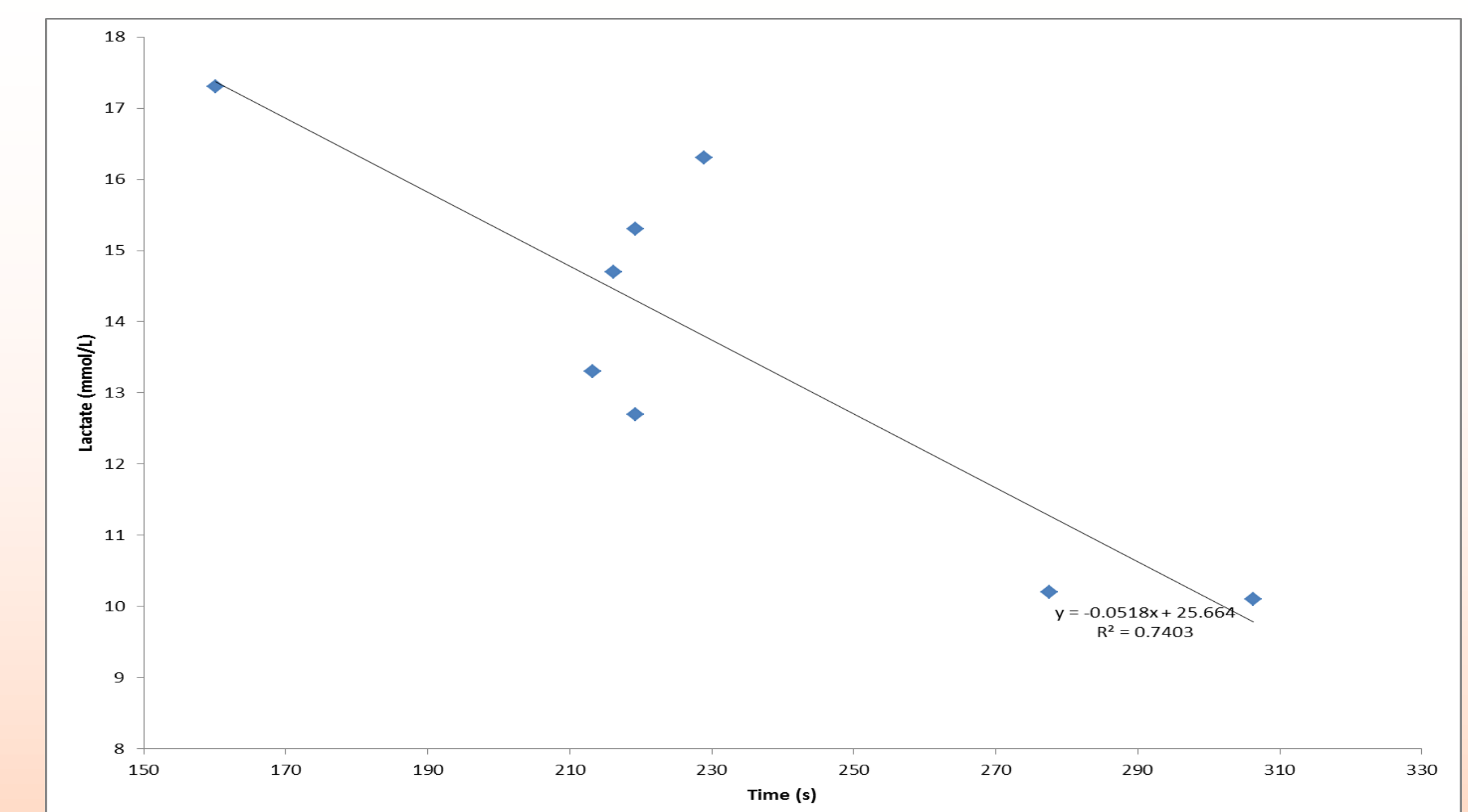


Figure 2: Relationship of time (s) and blood lactate (mmol/L) in a 800-m run

Conclusions

These results indicate that a higher blood lactate build up is associated with a better performance during short duration, high intensity performance and some of the associated lactic acid fatigue factors seem to be offset as impairments in performance, although, subsequent performance might be affected, a factor to be assessed in the future.