Blood Lactate Levels after All-out Exercise Depend on Body Fat Percentage in Korean College Students

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Dear Editor-in-Chief

The blood lactate level has been used as an indicator of the ability to perform endurance exercise in clinical practice (1). Moreover, during high intensity exercise, lactate production is higher than its removal from the body. Therefore, the lactate threshold (LT) level is an excellent indicator for predicting endurance capacity (1). Individuals with a high LT level have delayed onset of muscle fatigue and are able to exercise for a long duration and at high intensity (2). Additionally, those with a high fitness level have a high LT level (3).

A high fitness level is strongly associated with body composition, such as body fat percentage and muscle mass (4-5). However, whether blood lactate levels after all-out exercise depend on body fat percentage is unclear. Therefore, the purpose of the present study was to examine whether blood lactate levels at rest and after all-out exercise depend on body fat percentage in Korean college students.

The present study included 26 male and 18 female college students from a Y-gu fitness center in Seoul, Republic of Korea. In male and female participants, the mean (± standard deviation) ages were 21.35±2.42 and 20.72±1.23 yr; mean heights were 173.21 ±3.93 and 161.87±5.01 cm;

mean weights were 68.20±6.06 and 56.13±7.16 kg; mean body mass index were 22.72±1.75 and 21.44±2.66 kg/m²; mean body fat percentages were 14.12±3.89 and 24.88±6.52%; and mean lactate levels at rest were 1.07±0.28 and 1.07±0.43 mmol/L, respectively. The participants did not exercise regularly and had no health problems. All participants submitted a written consent form.

Body fat percentage was measure using an eight-polar electrode impedance instrument (InBody-720; Biospace, Seoul, Republic of Korea). Lactate levels were measured using a blood lactate test meter (Lactate Pro™ LT-1710; Arkray Inc., Japan) at rest, immediately after all-out exercise, and 2, 4, and 6 min after all-out exercise. All-out exercise was performed using a treadmill (M901; Motus, Seoul, Republic of Korea) according to the Bruce protocol (6).

The criteria presented by Lobman et al. were used to divide the participants into healthy and unhealthy groups, according to body fat percentage (7). The healthy group included male participants with a body fat percentage <15% and female participants with a body fat percentage <28%. The unhealthy group included male participants with a body fat percentage ≥15% and

female participants with a body fat percentage ≥28%. If the number of participants in a group is under 30, the data are unlikely to approximate a normal distribution and may not be reliable according to the central limit theorem (8). To overcome this, we used a non-parametric testing method. A Mann Whitney *U*-test was used, and statistical significance was set at *P*<0.05. Statistical analysis was performed using SPSS for Window (version 18.0; Chicago, IL, USA).

Blood lactate levels at rest and after all-out exercise in the healthy and unhealthy groups are presented in Table 1. No significant differences were noted in the lactate levels at rest between the two groups (male, *P*=0.330; female, *P*=0.849). How-

ever, the lactate levels were significantly different between the two groups immediately after (male, *P*= 0.004; female, *P*=0.019), 2 min after (male, *P*=0.001; female, *P*=0.035), 4 min after (male, *P*=0.032; female, *P*=0.002), and 6 min after (male, *P*=0.036) all-out exercise. These findings indicate that although lactate levels at rest are similar between healthy and unhealthy individuals, its recovery after all-out exercise differs. Unhealthy individuals who had a high body fat percentage showed a slower recovery of lactate levels compare to that in healthy individuals. Therefore, blood lactate levels after all-out exercise depend on body fat percentage.

Table 1: Blood lactate levels at rest and after all-out exercise in the healthy and unhealthy groups

Sex	Lactate level	Healthy group (n = 15)	Unhealthy group (n = 11)	*z*	*P*
Male	At rest	1.03 ± 0.18	1.14 ± 0.38	-0.987	0.330
	Immediately after all-out exercise	6.46 ± 1.58	8.13 ± 0.95	-2.777	0.004**
	2 min after exercise	5.87 ± 1.56	8.21 ± 1.72	-3.088	0.001**
	4 min after exercise	5.90 ± 1.82	7.58 ± 1.61	-2.155	0.032*
	6 min after exercise	5.44 ± 1.94	6.85 ± 0.92	-2.102	0.036*
Female	Lactate level	Healthy group (n = 13)	Unhealthy group (n = 5)	*z*	*P*
	At rest	1.03 ± 0.44	1.16 ± 0.46	-0.197	0.849
	Immediately after all-out exercise	6.64 ± 1.57	8.34 ± 0.55	-2.316	0.019*
	2 min after exercise	6.00 ± 1.40	7.39 ± 0.48	-2.119	0.035*
	4 min after exercise	5.53 ± 1.25	7.27 ± 0.53	-2.909	0.002**
	6 min after exercise	5.55 ± 1.46	7.12 ± 1.23	-1.824	0.075

Data are presented as mean ± standard deviation (Unit: mmol/L)
P<0.05; **P*<0.01 as determined using the Mann Whitney *U*-test

Acknowledgement

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