Science & Sports (2015) 30, 283—289

Disponible en ligne sur ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com

ORIGINAL ARTICLE

Blood lactate removal after a rowing all-out test depends on the active protocol proposed

L'élimination du lactate dans le sang après une épreuve d'aviron complète dépend du protocole actif proposé

C. Cristi-Montero[a,*], F. Rodriguez-Rodriguez[a], J. Mendoza-Muñoz[b], F. Baronti-Correa[b], S. Leiva-Olivares[b], M. Rojas-Hube[b], G. Bresciani[c]

[a] *Laboratorio de Motricidad Humana, Escuela de Educación Física, Pontificia Universidad Católica de Valparaíso, AV. El Bosque 1290, Viña del Mar, Chile*
[b] *Carrera de Pedagogía en Educación Física, Universidad de Viña del Mar, Valparaiso, Agua Santa 7055, sector Rodelillo, Viña del Mar, Chile*
[c] *Facultad de Ciencias de la Salud, Universidad Autónoma de Chile, Avenida Alemania 01090, Temuco, Chile*

Received 1st August 2014; accepted 22 December 2014
Available online 5 May 2015

KEYWORDS
Active recovery;
Passive recovery;
Rowing;
Running;
Lactate removal

Summary
Aims. — In sports competition recovery is considered fundamental, especially in those modalities that require competing repeatedly within one contest. One of the main concerns regarding the short recovery period during repeated-based competitions is the accumulation of blood lactate, which may impair muscle function on a metabolic basis. Therefore, the aim of this study was to compare the lactate concentration ([Lac]) removal rate with different recovery active protocols after an all-out rowing test.
Materials and methods. — The participants were chosen at random from the Naval School and subjected to four removal protocols (rowing, cycling, running and complete rest). Blood lactate samples were taken at rest and subsequent to the all-out test (0, 5, 10, 15, 20, 25 and 30 min).
Results and conclusion. — At minute 20, the running protocol presented similar blood [Lac] values as resting sample, whereas rowing reached it on 25, and cycling on 30 min. Additionally, a passive 30 min rest after the last blood sampling indicated that all protocols were able to reduce

* Corresponding author.
E-mail address: carlos.cristi.montero@gmail.com (C. Cristi-Montero).

http://dx.doi.org/10.1016/j.scispo.2014.12.003

the blood [Lac] to rest values, including the resting group. In this sense, this study indicates that different active protocols induce a faster blood [Lac] removal after high-intensity rowing. Finally, treadmill running may be a feasible tool to boost blood [Lac] removal after rowing trials within the same competition.

MOTS CLÉS
Récupération active ;
Récupération passive ;
Aviron ;
Course à pied ;
Élimination du lactate

Résumé
Objectifs. — Lors de compétitions sportives, la récupération est considérée comme fondamentale, notamment lorsque les modalités de concours requièrent des compétitions à plusieurs reprises dans une même épreuve. L'une des principales préoccupations concernant la courte période de récupération lors des compétitions à caractère répétitif est l'accumulation de lactate dans le sang, ce qui peut altérer la fonction musculaire sur le plan métabolique. Par conséquent, l'objectif de cette étude était de comparer la concentration du taux d'élimination de lactate [Lac] avec différents protocoles de récupération actifs après une épreuve d'aviron complète.
Participants et méthodes. — Les participants ont été choisis au hasard au sein de l'École Navale et soumis à quatre protocoles d'élimination (aviron, cyclisme, course à pied et repos complet). Des échantillons de lactate dans le sang ont été prélevé au repos et à la suite de l'épreuve complète (0, 5, 10, 15, 20, 25 et 30 min).
Résultats et conclusion. — Le protocole de course à pied a détecté des valeurs de sang [Lac] similaires à l'échantillon prélevé au repos à la 20^{e} minute tandis que pour l'aviron, c'était à la 25^{e} minute, et le vélo à la 30^{e} minute. En outre, un repos passif de 30 minutes après la dernière prise de sang a indiqué que tous les protocoles sont parvenus à réduire le sang [Lac] aux mêmes valeurs que celles au repos, y compris pour le groupe de repos. Dans ce sens, cette étude indique que les différents protocoles actifs induisent une élimination plus rapide du sang [Lac] après avoir ramé à haute intensité. Enfin, le tapis de course pourrait être un outil applicable afin de stimuler l'élimination du sang [Lac] après les épreuves d'aviron dans la même compétition.

1. Introduction

Rowing is a highly intensive sport, which combines mechanical, biomechanical and physiological principles. During competition, its aerobic component can reach values close to 70%, which generates elevated energy costs [1,2]. This increases the blood lactate concentration ([Lac]) comparing to other sports, such as athletics [3], skiing [4], cycling [5], and swimming [6]. In fact, blood [Lac] concentration up to 20 mmol.L^{-1} has been registered in rowers [2]. In this sense, blood [Lac] removal has been described as an important performance indicator in rowers [7].

Scientific evidence shows that increases in blood [Lac] may inhibit enzymes responsible for the ATP re-synthesis and muscle contractibility, leading to a negative effect on performance sports, which involve a series of classifications on a single day [8,9]. High blood [Lac] prior to a competition may also lead to alterations in hydrogen potential stabilisation systems, decreasing the affinity between hemoglobin and oxygen [9]. This reduces the hydrogen capture of and the calcium reabsorption into the sarcoplasmic reticulum [10—12], leading to a decrease in muscle power [9—11].

Thus, recovery during a competition plays a key role in order to maintain performance level in the next trials [13]. This is especially applied after a maximal effort with a short recovery period between each trial [14], as in the case of rowing. Therefore, means to identify optimal recovery processes between trials in order to increase general performance are of interest in high intense sports [9,15]. In this regard, a moderate intensity active method is more effective on removing blood [Lac] when compared to resting alone [16]. This is due to the increases in the blood flow, which in turn accelerates the [Lac] removal rate [9,12,17]. Nevertheless, to date just a few studies have investigated the active blood [Lac] removal rates after maximal effort in rowers [18].

Therefore, the objective of the present study was to compare the blood [Lac] removal capacity of different active protocols after a maximal test in young semi-professional rowers.

2. Methods

2.1. Experimental design

The week prior to the study, the participants visited the Exercise Physiology laboratory on two occasions. Firstly, measurements were taken of body weight (kg) and body fat percentage measured by bio-impedance using digital scales calibrated to a precision of 0.1 kg (model TBF-300A, Tanita®, Japan), height (cm) (model 216, Seca®, Germany), and heart rate after 10 minutes' rest (Polar Team, Polar Electro®, Finland). On the second visit, the participants' VO_2max was measured with a gas analyser using a stage incremental