



ORIGINAL ARTICLE

Effects of continuous and intermittent endurance exercise in autonomic balance, rating perceived exertion and blood lactate levels in healthy subjects



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KEYWORDS

Autonomic balance;
Blood lactate;
Rating of perceived exertion;
Intermittent exercise

Abstract

Purpose: The aim of this study was to determinate the changes in the Autonomic Balance, Rating Perceived Exertion (RPE) and blood lactate after continuous versus intermittent exercise protocols.

Methods: Seven active and healthy male (33 ± 5.1 years) participated in the study. Each subject performed two exercise protocols: (i) a continuous exercise at 110% of the lactate threshold (CONT). The CONT protocol consisted in continuous running, and the distance covered was the same in meters as it was in the intermittent session, and (ii) an intermittent exercise at 100% of the Peak Treadmill Velocity (INTT). The protocol consisted of 30 min of 15 s running, interspersed with 15 s of passive rest. Autonomic balance was assessed through the LF/HF ratio, before beginning the exercises, immediately finishing the exercises and 24 h post-exercise; RPE was evaluated every 5 min in each exercise protocol; and blood lactate was measured immediately after both protocols. Alpha level was set at $P \leq .05$.

Results: Autonomic balance did not show significant differences between protocols ($P = .60$). RPE during INTT exercise was significantly higher than CONT exercise ($P = .01$). Blood lactate levels after exercise did not show significant differences ($P = .68$). Heart rate variability parameters in the time domain (mean RR and pNN50) show no statistical differences between both protocols pre and 24 h post exercise ($P = .24$ and $P = .61$, respectively).

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PALABRAS CLAVE

Balance autonómico;
Lactato en sangre;
Percepción subjetiva
del esfuerzo;
Ejercicio
intermitente

Conclusions: The data suggest that intermittent exercise is perceived more intense than continuous, although both protocols showed similar internal loads in autonomic balance and blood lactate levels.

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Efectos del ejercicio de resistencia continuo e intermitente sobre el balance autonómico, la escala de esfuerzo percibido y los niveles de lactato en sangre en sujetos sanos

Resumen

Objetivo: La finalidad de este estudio fue determinar los cambios en el balance autónomo, la percepción subjetiva del esfuerzo (PSE), y el lactato sanguíneo después de un protocolo de ejercicio aeróbico continuo y uno intermitente.

Métodos: En el estudio participaron 7 varones activos y sanos ($33 \pm 5,1$ años). Cada sujeto realizó 2 protocolos de ejercicios: a) un ejercicio continuo al 110% del umbral del lactato (CONT); el protocolo CONT consistió en una carrera continua, siendo la distancia cubierta en metros igual a la distancia de la sesión intermitente, y b) un ejercicio intermitente al 100% de la velocidad pico en cinta (INTT). El protocolo consistió en 30 min de carrera de 15 segundos, intercalados con 15 segundos de descanso pasivo. El balance autónomo se evaluó mediante el ratio LF/HF antes de comenzar los ejercicios, inmediatamente después de finalizar los mismos, y a las 24 h de su finalización; la RPE se evaluó cada 5 min en cada protocolo de ejercicios, y el lactato en sangre se midió inmediatamente tras ambos protocolos. El nivel alfa se estableció en $p \leq 0,05$.

Resultados: El balance autónomo no reflejó diferencias significativas entre ambos protocolos ($p=0,60$). La RPE durante el ejercicio INTT fue considerablemente superior al ejercicio CONT ($p=0,01$). Los niveles de lactato en sangre no reflejaron diferencias significativas ($p=0,68$). Los parámetros de variabilidad de la frecuencia cardiaca en el dominio del tiempo (RR medio y pNN50) no reflejaron diferencias estadísticas entre ambos protocolos, con mediciones previas y a las 24 h del ejercicio ($p=0,24$ y $p=0,61$, respectivamente).

Conclusiones: Los datos sugieren que el ejercicio intermitente se percibe más intenso que el continuo, aunque ambos protocolos reflejaron cargas internas similares en cuanto a balance autónomo y niveles de lactato en sangre.

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Introduction

Recovery after exercise, that is, return of body homeostasis after training is important to obtain training adaptations and its control may provide useful data for the individualization of training loads.¹ Rating of perceived exertion (RPE) allows to monitor training intensity,² being an accessible tool for training control. From a metabolic view, blood lactate (production vs removal) can be used to evaluate glycolytic activity and to assist with determining training exercise intensity.³ Heart Rate Variability (HRV) analysis is a non-invasive measurement of cardiac control of the autonomous nervous system,^{4,5} and can be used as a monitoring tool to control training loads.¹ Frequency and time domain are the most used assessment for HRV analysis in different physiological conditions.^{5,6} LF/HF ratio can be used as a measure of autonomic balance.^{1,5,7} It has been reported that HRV indexes are modified by

exercise training at different intensities,⁸ been continuous endurance training of low and moderate intensities the most studied type of exercise related to HRV.^{9,10}

Although low to moderate exercise intensity (close to LT intensity) has been proposed systematically to modulate vagal activity,^{9,10} to obtain complete adaptation in the cardiovascular system and vagal activity should be performed a combination of moderate and high intensity aerobic exercise.^{11,12} Recent studies have shown that intermittent exercise may have an important role in achieving these goals,¹³⁻¹⁵ however, these adaptations are both, primarily peripherally or acute effects and little is known about HRV, RPE, and lactate responses to intermittent exercise. The aim of this study is to analyze the response of autonomic balance, RPE and blood lactate levels in continuous exercise at 110% of lactate threshold (LT), and intermittent exercise at 100% of Peak treadmill velocity (PTV) in healthy subjects.

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