ORIGINAL ARTICLE

Critical velocity determined by a non-exhaustive method in menopausal women

Vitesse critique déterminée par une méthode non-exhaustive chez les femmes ménopausées

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Summary
Purpose. — The aim of the present study was to test the reproducibility of critical velocity determined in a non-exhaustive method (CV_{NE}) and its relationship with the maximal lactate steady state (MLSS) in menopausal women.
Methods. — Nine women (aged 59.8 [4.6] years) were subjected to two efforts, of the same intensity, in each session, lasting 180 s and separated by an interval of 90 s. The blood lactate

Abbreviations: ANOVA, analysis of variance; CV_{NE}, critical velocity determined in a non-exhaustive manner; CV%, coefficient of variation; ES, effect size; HR, heart rate; ICC, intraclass correlation coefficient; [Lac], lactate concentrations; MLSS, maximal lactate steady state; RPE, rating of perceiver exertion; TE, typical error; Δ, delta.
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([Lac]) and heart rate (HR) differences (Delta; Δ) between the first and second sessions were determined. The session intensities corresponded to 4, 5 and 6 km.h^{-1}. The CV_{NE} was assumed to be the Y-intercept between the Δs and the intensities.

Results. — The CV_{NE}, determined through the [Lac] (test = 5.4 ± 0.7; retest = 5.0 ± 0.6) and HR (test = 4.8 ± 0.4; retest = 4.9 ± 0.5), was not significantly different between the conditions. However, no correlation was observed between test and retest situations for the CV_{NE} determined through the [Lac] ($r = 0.29$) or the HR ($r = -0.16$). Furthermore, CV_{NE} determined through both variables significantly underestimated and was not correlated with MLSS.

Conclusion. — Thus, it can be concluded that CV_{NE} does not have high reproducibility and cannot be used to estimate the MLSS in postmenopausal women.

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Résumé

But. — Le but de la présente étude était de tester la reproductibilité de la vitesse critique déterminée d'une manière non-exhaustive (CV_{NE}) et sa relation avec le taux maximal de lactate à l'état stable (MLSS) chez les femmes ménopausées.

Méthodes. — Neuf femmes (âgés de 59,8 [4,6] ans) ont été soumis à deux efforts, de la même intensité, dans chaque session, d'une durée de 180 s et séparés par un intervalle de 90 s. Les différences (delta, Δ) des lactate sanguin ([Lac]) et de la fréquence cardiaque (HR) entre les première et deuxième sessions ont été déterminées. Les intensités des sessions correspondent à 4, 5 et 6 km.h^{-1}. La CV_{NE} a été supposée être le Y-intercept entre le ∂S et les intensités.

Résultats. — La CV_{NE}, déterminée par la [Lac] (test = $5,4 \pm 0,7$; retest = $5,0 \pm 0,6$) et RH (test = $4,8 \pm 0,4$; retest = $4,9 \pm 0,5$), n'était pas significativement différente entre les conditions. Cependant, aucune corrélation n'a été observée entre les situations de test et retest pour la CV_{NE} déterminée par la [Lac] ($r = 0,29$) ou la RH ($r = -0,16$). En outre, CV_{NE} déterminée par deux variables était significativement sous-estimée et n'a pas été corrélée à MLSS.

Conclusion. — Ainsi, on peut conclure que CV_{NE} n'a pas une grande reproductibilité et ne peut être utilisée pour estimer le MLSS chez les femmes ménopausées.

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1. Introduction

Both the aging process and the menopause are related to important morphological changes in women, such as decreased muscle mass and bone [1]. In addition, physiological changes, such as significant reductions in cardiorespiratory fitness, increase the risk of cardiovascular disease in this population [2]. Increasing levels of physical activity seems to be a very effective tool in reducing the negative effects caused by aging [3].

The implementation of low intensity, long duration efforts has been prioritized for the maintenance and/or improvement of aerobic capacity in this population; however, this is rarely prescribed based on assessments and appropriate physiological indices [4]. The protocol recognized as the ''gold standard'' for determining aerobic capacity is the maximal lactate steady state (MLSS) [5—7], which consists of performing several constant efforts at different intensities. However, determining MLSS in individuals of advanced age is hampered predominantly by the need to determine lactate concentrations ([Lac]) and the duration of the necessary effort (i.e. 30 min).

The critical power model, originally proposed by Monod and Scherrer [8], is an alternative method for determining aerobic capacity using mathematical models. Although this model is non-invasive and easy to apply, the necessary efforts need to be performed in the severe exercise intensity domain (i.e. exhaustion between 2 and 10 min), which may carry risks when applied to individuals of advanced age [9]. Thus, Chassain et al. [10], also using mathematical models, proposed to determine critical power through non exhaustive efforts, thereby reducing the risks involved during the assessments and facilitating the determination of optimal training intensities.

In summary, the methodology proposed by Chassain et al. [10] uses the behavior of physiological variables during various double effort tests carried out at different submaximal intensities. In this protocol, critical power, determined in a non-exhaustive manner, is assumed to be the intensity at which the physiological variables present equilibrium between the two efforts (i.e. the difference between the second and first efforts is equal to zero). As submaximal loads can be used, this protocol appears to be a very reliable tool for the determination of aerobic capacity in menopausal women, facilitating the prescription and monitoring of training. Furthermore, the possibility of using heart rate (HR) for the measurements further facilitates the introduction of this methodology into the training routine.

However, to our knowledge, there are no studies, which have investigated the validity of this method in menopausal women.

Thus, the objectives of the present study were to test the reproducibility of the protocol proposed by Chassain et al. [10] and to compare critical velocity determined in a non-exhaustive manner (CV_{NE}) and MLSS in menopausal women,