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BRIEF NOTE

Beetroot juice supplementation does not modify the 3-km running performance in untrained women

La supplémentation en jus de betterave ne modifie pas les performances de course de 3 km chez les femmes non entraînées

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Received 4 August 2017; accepted 31 January 2018

KEYWORDS

Inorganic nitrate;
Nitric oxide;
Ergogenic aids

Summary

Introduction. – The aim of the study was to analyze the acute effect of beetroot juice supplementation in untrained women 30 minutes before a 3-km running performance.

Summary of facts and results. – Eight untrained woman (30.1 ± 5.7 years old) performed two 3-km running performances on an official track, supplemented with beetroot juice (S) (500 mL, 8.4 mmol/NO_3^-) ingested 30 minutes before performance and without supplementation (C), in a randomized order. Pre- and post-running, glycemic index ($\text{Glyc}_{\text{post}}$ and Glyc_{pre}) was analyzed and the blood lactate concentration was measured to determine the lactate peak (La_{peak}). The maximal rating of perceived exertion (RPE_{max}), maximal heart rate (HR_{max}) and time performance were monitored at each trial. The RPE_{max} was significantly high for the condition S in relation to C (19.3 ± 1.2 vs 18.3 ± 1.7 , $P=0.039$) whereas, $\text{Glyc}_{\text{post}}$ was statistically higher in condition C compared to that in condition S (89.4 ± 17.4 vs $80.6 \pm 17.4 \text{ mg}\cdot\text{dL}^{-1}$, $P=0.036$). In addition, the supplementation showed altered test pacing strategy. No statistical differences were found for 3-km running performance; HR_{max} , La_{peak} and Glyc_{pre} .

Conclusion. – The analysis concluded that untrained women supplemented with 500 mL of beetroot juice 30 minutes before a 3-km running performance presented a modified RPE and $\text{Glyc}_{\text{post}}$, with no significant differences in HR_{max} , La_{peak} and Glyc_{pre} .

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MOTS CLÉS

Nitrate inorganique ;
Oxyde nitrique ;
Ressources
ergogéniques

Résumé L'objectif de cette étude est d'évaluer l'effet aigu de la supplémentation en jus de betterave ingérée 30 minutes avant une performance de course à pied sur 3 km chez des femmes non entraînées. Y ont participé huit femmes non entraînées ($30,1 \pm 5,7$ ans), ayant réalisé deux performances sur 3 km de course sur une piste officielle d'athlétisme, avec une supplémentation en jus de betterave (S) (500 mL, $8,4 \text{ mmol/NO}_3^-$) ingérée 30 minutes avant la performance et sans supplémentation (C), au hasard. Leur glycémie a été analysée avant ($\text{Glyc}_{\text{pré}}$) et après ($\text{Glyc}_{\text{post}}$) le test et des échantillons ont été prélevés pour la précision du pic lactique (Lac_{pic}). La PE_{max} , la FC et le temps de performance ont été enregistrés à chaque tour de piste. La PE_{max} a présenté des valeurs plus grandes pour la condition (S) par rapport à (C) ($19,3 \pm 1,2$ vs $18,3 \pm 1,7$, $p=0,039$) et la $\text{Glyc}_{\text{post}}$ a été statistiquement plus grande dans la condition (C) en comparaison avec (S) ($89,4 \pm 17,4$ vs $80,6 \pm 17,4 \text{ mg}\cdot\text{dL}^{-1}$, $p=0,036$). En plus, la supplémentation a modifié la stratégie de rythme de l'épreuve. Des différences statistiques n'ont pas été retrouvées au niveau du temps de la performance sur 3 km, de la FC_{max} , du Lac_{pic} et de la $\text{Glyc}_{\text{pré}}$. L'ingestion de 500 mL de jus de betterave 30 minutes avant la performance de course sur 3 km ne change pas le temps de l'épreuve, la FC, les concentrations de Lac_{pic} et la $\text{Glyc}_{\text{pré}}$ chez des jeunes femmes non entraînées, ne modifiant que les réponses de la PE et de la $\text{Glyc}_{\text{post}}$.

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1. Introduction

The effect of beetroot juice (BRJ) has been extensively studied in sports mainly owing to its high concentration of inorganic nitrate (NO_3^-), a natural precursor of nitric oxide (NO) [1,2]. Nitric oxide is a reactive gaseous signaling molecule that regulates a broad range of physiological processes, including blood flow and vasodilation, muscle contraction, mitochondrial respiration and immune function [1,3,4]. Studies have indicated that BRJ supplementation containing $\approx 4\text{--}19.5 \text{ mmol/NO}_3^-$ ingested in intervals ranging of 30 minutes to 15 days prior to testing, can improve time to exhaustion and time-trial performances during sub-maximal exercise and short-duration (< 30 min) exercise tests, particularly in untrained and moderately trained individuals [1–4]. However, although widely studied in modalities such as cycling and rowing, the effect of BRJ is yet to be clarified in runners [2]. Therefore, the purpose of the current study was to analyze the acute effect of BRJ supplementation in untrained women 30 minutes prior to a 3-km running performance. We hypothesized that BRJ supplementation modifies the running performance and other associated variables.

2. Methods

2.1. Participants

Eight untrained and healthy women (30.1 ± 5.7 years old, $64.9 \pm 15.2 \text{ kg}$, $166.4 \pm 4.5 \text{ cm}$) without experience in race events or participants of any training systematized in this modality took place in this study. Written informed consent was obtained from all participants and the study was approved by the local Ethics Committee (# 1.407.724/2016). Participants were advised to attend the well-hydrated test local and the last meal done at least two hours prior to the start of the tests and instructed not to use any type of mouthwash on the day of testing because of their potential

inhibitory effect on the conversion of nitrate-nitrite. They were also instructed to abstain from caffeinated or alcoholic beverages and strenuous physical exercise within 24 hours prior to testing and to consume the same diet and to maintain the same physical exercise regimen 48 hours prior to testing.

2.2. Experimental overview

In a crossover study, participants underwent two 3-km running performances in official tracks (400 m) and in random sequences, separated by a 1-week washout period. In one test run, the participants consumed 500 mL (8.4 mmol/NO_3^-) of BRJ 30 minutes before the running performance (S) and in the other test run, participants consumed just water, serving as the control (C). Both the dosage offered and the interval between supplementation and the test were chosen based on previous studies demonstrating positive effects of inorganic nitrate supplementation [1]. Participants were requested to run as fast as possible and time was recorded in the first 200 m and then every 400 m until the end of the race. The overall mean velocity (MV) for each trial was calculated by dividing the total distance covered by the trial duration. Additionally, partial MVs were calculated in three phases: start phase (first 200 m), middle phase (200–2600 m) and end phase (last 400 m).

Earlobe capillary blood samples ($25 \mu\text{L}$) were collected into a capillary tube at the start and end of the tests (time zero of recovery) and at the third and fifth minutes of passive recovery, while participants were sitting in a comfortable chair. From these samples, [LA] was subsequently determined by electroenzymatic methods using an automated analyzer (YSI 2300 STAT Yellow Springs; Ohio, USA). Peak [LA] (LA_{peak}) was defined for each participant as the highest post-exercise [LA] value.

Blood samples were collected of the index finger ($0.6 \mu\text{L}$) at the start and end of the tests for the determined glycemic pre (Glyc_{pre}) and glycemic post ($\text{Glyc}_{\text{post}}$). Rating of

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