

Effect of the E₃ Fitness Grips on Running Economy

JULIE A. SZABO*, BRIAN B. PARR‡, JAROD A. HOLT*, and CHRISTOPHER M. DEWITT‡

Department of Exercise and Sports Science, University of South Carolina Aiken, South Carolina, USA

*Denotes undergraduate student author, ‡denotes professional author

ABSTRACT

Int J Exerc Sci 3(2) : 64-67, 2010. The purpose of this study was to evaluate the effect of the E₃ Fitness Grips (BioGrip, Inc., Rancho Cordova, CA) on running economy, as measured by oxygen uptake (VO₂), and heart rate (HR) during submaximal treadmill running. Eleven subjects, seven female and four male, completed a submaximal running test on a treadmill while VO₂ and HR were measured continuously. After achieving steady-state at a speed and grade that elicited a VO₂ equivalent to 70% VO_{2max}, the subjects ran for five minutes holding the E₃ Fitness Grips (G) and five minutes without the grips (NG). The tests were counterbalanced so half of the subjects held the grips first and half completed the NG condition first. The difference in VO₂ and HR between the G and NG conditions were compared to determine the effect on running economy. The mean VO₂ (33.2±4.6 vs. 33.2±4.6 ml·kg⁻¹·min⁻¹, p=0.96) and mean HR (172.0±8.9 vs. 172.8±8.9 beats·min⁻¹, p=0.38) were not significantly different between the G and NG conditions during submaximal running. These findings suggest that the E₃ Fitness Grips do not significantly alter running economy, as measured by VO₂, or HR during submaximal treadmill running.

KEY WORDS: Running performance, exercise, oxygen uptake, biomechanics

INTRODUCTION

Running economy is defined as the aerobic demand at a given submaximal running velocity and is determined by measuring oxygen consumption (VO₂) during submaximal running. Running economy is related to distance running performance, especially among individuals in which VO_{2max} values are comparable. Running economy is affected by numerous factors including: gender and age, physiological factors like body temperature, heart rate, ventilation, and muscle fiber type (1); biomechanical factors such as stride length, vertical oscillation of body, upper body motion, kinematics, and kinetics (2); and

other factors including air resistance, running surface, and shoe properties (2).

The E₃ Fitness Grips are manufactured by BioGrip, Inc., Rancho Cordova, CA. The grips function as a biomechanical hand positioning system designed to improve athletic performance. The E₃ Fitness Grips weigh 71 g each and are molded to fit in the hands comfortably. The E₃ Fitness Grips work on the basic principle of stabilizing the shoulders, back and hips through the proper positioning of the joints. This creates a stable platform for an optimum range of motion with increased muscular efficiency (3). We are not aware of any published studies that have evaluated the effect of the

E₃ Fitness Grips on muscular efficiency, running economy, or running performance. However, it is possible that any effect the E₃ Fitness Grips have on body motion or muscular efficiency could impact the energy cost of running.

The purpose of this study was to determine the effect of the E₃ Fitness Grips on running economy, as measured by VO₂, and HR during submaximal treadmill running. It was hypothesized that, by stabilizing the body and improving muscular efficiency, the E₃ Fitness Grips would improve running economy.

METHODS

Participants

Eleven college students, seven females and four males, volunteered to participate in this study. Participation in the study was limited to subjects who were regular runners (at least 3 days·week⁻¹). Prior to participating in the study each subject was informed of the testing protocol and potential risks and signed an informed consent document. This study was approved by the University of South Carolina Institutional Review Board. The descriptive data of the subjects is shown in table 1. Each subject was required to complete two testing sessions at the University of South Carolina Aiken Exercise Science Laboratory to complete a treadmill VO_{2max} test and a running economy test at 70% VO_{2max}. These tests were scheduled 3-7 days apart.

Protocol

On the first visit the subjects read and signed an informed consent statement and completed a health history questionnaire to ensure they had no cardiac or

musculoskeletal conditions that would make participation in the study unsafe. Then, height and weight were measured using a physician scale and stadiometer. The subjects then completed a treadmill VO_{2max} test. Before the test the subjects were allowed to warm-up and stretch before being fitted with a mouthpiece, nose clips, and a Polar HR monitor (Polar Electro Oy, Kempele, Finland). The treadmill VO_{2max} test began with the subjects running at 174 m·min⁻¹ and 0% grade for 2 minutes. Then, the speed remained constant while the grade was increased 1% per minute to exhaustion. Oxygen uptake was measured continually using SensorMedics Vmax 229 metabolic cart. After the test, the breath-by-breath data were averaged over one minute intervals. Heart rate was measured using a Polar heart rate monitor and recorded every minute. The highest VO₂ achieved was taken as the VO_{2max} and all subjects met at least one of the following criteria: a plateau in VO₂ (<2.0 ml·kg⁻¹·min⁻¹) with increasing grade, heart rate within 10 beats·min⁻¹ of age-predicted maximal heart rate, RER ≥1.10, and RPE ≥18 (4).

Table 1. Descriptive data of the subjects

Age (y)	21.3±2.1
Height (cm)	165.2±6.5
Weight (kg)	64.6±10.2
BMI (kg·m ⁻²)	23.9±2.9

Values expressed as mean±SD

On the second day of testing the subjects completed a submaximal running economy test. Following warm-up and stretching the subjects were fitted with a mouthpiece, nose clips, and a Polar HR monitor. The treadmill speed and grade was individually adjusted to elicit a VO₂ equivalent to 70% of the individual's VO_{2max}. Oxygen uptake and heart rate were monitored

continuously throughout the duration of the test as in the VO_{2max} test. The subjects ran for ~10 min to reach steady-state then completed five minutes holding the E₃ grips followed by five minutes without the E₃ grips. The tests were counterbalanced so that half of the subjects completed the G condition first and half completed the NG condition first. Both G and NG conditions were completed in the same trial to avoid potential intraindividual variability in running economy over separate trials. The mean HR and VO_2 during the five minutes with the E₃ grips and the five minutes without the E₃ grips were used for comparisons.

Statistical Analyses

The significance of differences between the mean HR and VO_2 during the five minutes with the E₃ grips and the five minutes without the E₃ grips were determined by paired t-tests using SPSS for Windows statistical software (SPSS, Inc., Chicago, IL). The level of significance was set at $p < 0.05$.

RESULTS

The data from the VO_{2max} and running economy tests are shown in table 2 and 3, respectively. During the running economy test the treadmill speed and grade was individually set to elicit a VO_2 equivalent to 70% VO_{2max} . Once this was reached, the treadmill speed and grade remained constant throughout the remainder of the

Table 2. VO_{2max} test data.

VO_{2max} (ml·kg ⁻¹ ·min ⁻¹)	45.7±6.4
HR _{max} (beats·min ⁻¹)	199.0±11.7
RER _{max}	1.12±0.05
RPE _{max}	18.1±0.3

Values expressed as mean±SD

test. The running speed during the G and NG portions of the submaximal test was 167.2±12.4 m·min⁻¹. This was equivalent to an intensity of 72.9±6.5 % VO_{2max} ($p=0.16$ vs. target of 70% VO_{2max}). The mean VO_2 during the G and NG portions of the test was 33.2±4.6 ml·kg⁻¹·min⁻¹, and 33.2±4.6 ml·kg⁻¹·min⁻¹, respectively ($p=0.96$). The mean HR was 172.0±8.9 beats·min⁻¹ during the G condition and 172.8±8.9 beats·min⁻¹ during the NG portion of the test ($p=0.38$).

Table 3. Running economy test data.

	With E ₃ Grips	No E ₃ Grips	p
VO_2 (ml·kg ⁻¹ ·min ⁻¹)	33.2±4.6	33.2±4.6	0.96
HR (beats·min ⁻¹)	172.0±8.9	172.8±8.9	0.38

Values expressed as mean±SD

DISCUSSION

The results of this study show that VO_2 and HR were not significantly different when holding the E₃ Fitness Grips during submaximal running. This finding suggests that the magnitude of the upper body stabilizing effect of the E₃ Fitness Grips was not sufficient to affect running economy. It should be noted that no measures of upper body motion or gait mechanics were made in this study. However, this finding is in accordance with the suggestion that the relationship between individual descriptors of gait mechanics and running economy is weak (5). It is possible that the E₃ fitness grips did modify running mechanics, but not enough to affect VO_2 . Since running economy is related to the sum of many variables (6), improvement in one variable (e.g. upper body motion) may not be sufficient to alter running economy.

The steady-state VO_2 during the G and NG conditions was measured while the subjects ran at an intensity equivalent to

approximately 70% $\text{VO}_{2\text{max}}$. It has been suggested that running economy testing in elite athletes should be conducted at a higher intensity (7), so it is possible that differences in running economy may have been seen at a higher % $\text{VO}_{2\text{max}}$. However, the subjects in this study were not elite athletes, so conducting the running economy testing at a greater % $\text{VO}_{2\text{max}}$ may not have led to a different finding.

Factors such as air resistance, running surface, and shoe properties have also been shown to influence running economy (2). However, in this study the subjects were running indoors on a treadmill wearing the same shoes for both the G and NG conditions. It is possible, though, that during over ground running the E₃ Fitness Grips may offset the negative effect of these factors on running economy.

The E₃ Fitness Grips purport to stabilize the shoulders, back and hips to increase muscular efficiency (3). It should be noted that we made no measures of joint movement or muscular efficiency in this study. Therefore, we cannot conclude that the E₃ Fitness Grips were not effective in altering the biomechanics of running only that this potential effect did not result in significant changes in submaximal VO_2 or HR when holding the grips. Future studies using the E₃ Fitness Grips should focus on the biomechanics of running and other factors that may alter running economy.

In conclusion, the E₃ Fitness Grips do not significantly alter running economy, as measured by VO_2 , or HR during submaximal treadmill running. It is unlikely that E₃ Fitness Grips would result in changes in running performance based on improved running economy.

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