Energy Expenditure of Healthy Young Men in a Postural Corrective Training (TCP®)

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ABSTRACT


The study determined the energy expenditure (EE) in the form of caloric expenditure and the metabolic equivalent (MET) in the Postural Corrective Training (TCP®) session. Nineteen subjects (25.53 ± 4.89 yrs) performed the 45-min video lesson exercise session that consisted of upper and lower limb movements based on the planes and axes. During the evaluation, oxygen consumption (VO₂) in mL·kg⁻¹·min⁻¹ was measured to determine the subjects' MET and through indirect calorimetry the caloric expenditure in kcal, using the equivalents of O₂ and VCO₂ (VCO₂ / VO₂) was determined. The findings indicate that the exercise session mean was 5.0 ± 1.32 METs, the EE was 296.55 kcal. The Postural Corrective Training session is a moderate activity (from 3 to 6 METs) that can be applied to individuals who are between 5 and 10 METs.

Key Words: Energy Expenditure, METs, TCP®, Video Lesson
INTRODUCTION

Energy expenditure (EE) is composed of the thermal effect of the physical activity (TEPA), the thermal effect of the food (TEF) and the resting metabolic rate (RMR) (7). Among the components of EE, RMR corresponds to 60 to 75%, TEF corresponds to around 10%, and TEPA is the most variable of these components. It is about 15 to 30% of EE (3). TEPA is defined as any body movement produced by the skeletal muscles that increases the EE; whereas, physical exercise is a planned, structured, and systematized component with an intermediate or final goal of increasing or maintaining physical fitness (2,9).

Any physical activity can be evaluated by the metabolic consumption of the body during its execution, being known as Metabolic Equivalent of the Task (MET), which is the oxygen consumption of approximately 3.5 mL·kg⁻¹·min⁻¹ or 1 kcal·kg⁻¹·h⁻¹, under basal conditions corresponding to 1 MET. Thus, EE is expressed as a multiple of the MET, that is, the quotient between the EE of the activity and the RMR (1,5).

Postural Corrective Training (TCP®) presents itself as a new method of training posture and human movement. This method was developed by adding scientific knowledge of the area of sports training, biomechanics, organization, control and regulation of posture, functionality, and expression. The benefits include greater postural awareness through the motor sensory activation in the control of skeletal musculature strongly integrated to the central nervous system and influenced by constant stimulation of gravity (4). However, there are no data available on EE in this modality. Thus, the purpose the present study was to evaluate the EE of healthy young men in a 45-min TCP® session.

METHODS

Subjects and Experimental Design
Nineteen (19) healthy men with a mean age of 25.4 ± 5 yrs, body weight of 71.62 ± 8.83 kg, and a height of 176.37 ± 6.43 cm without previous contact with the research method, TCP®, were the subjects in this study. After signing a Free, Prior and Informed Consent (FPIC), the subjects were introduced to the TCP® method. At the scheduled date, anthropometric data and anamnesis of the individuals were collected for subsequent analysis. The following week a TCP® familiarization session was performed, and in the following week the individual visit of each subject was scheduled for a TCP® session with a gas analyzer following the standard video lesson of the method. The research project was approved by the Ethics and Research Committee of the Federal University of São Carlos with the opinion no. 2,011,326, CAAE: 66308917.5.0000.5504.

Evaluation of Ventilatory Equivalent
The evaluation of ventilatory equivalent was determined in the acute exercise session for subsequent statistical calculation of the caloric expenditure of the TCP method. A VO2000 Aerosport® gas analyzer (Medical Graphics Corporation, USA), with a medium flow pneumotachograph was used to do this. Data collection by Ergo PC Elite software was continuously performed during the 45-min video lesson. The EE was calculated by the software by monitoring the subject’s heart rate using the rcx5 polar.
**TCP® Lesson Video**

The session of the TCP® method (4) was accompanied by the video lesson with duration of 45 min to guarantee the same pattern of movement and intensity, the execution of the combined upper and lower limbs performed in the planes and axes guarantees better joint mobility, non-injury, economy of movement, and increased energy expenditure.

**Statistical Analysis**

The data were analyzed using Microsoft Excel® software, IBM® SPSS® (Statistical Package for the Social Sciences), version 22.0. According to normality, the Kolmogorov-Smirnov or Shapiro-Wilk Test was adopted, and the Student’s $t$-test for a Sample was used for comparison of the parametric values, and the K-S Test for a Sample was used for the non-parametric ones. A $P$-value ≤0.05 was considered statistically significant.

**RESULTS**

The mean oxygen consumption of the subjects was 17.53 mL·kg$^{-1}$·min$^{-1}$ ± 2.45 with an average metabolic demand of 5 ± 1.32 METs for the training session, which was divided into three moments: (a) 4.0 ± 0.43 METs in the initial phase; (b) 5.3 ± 0.42 METs in the plateau phase; and (c) 3.98 ± 0.64 METs in the final phase of the session. The average energy expenditure during the session was 296.55 kcal ± 59.03 at a mean of 3.76 ± 0.99 kcal·kg$^{-1}$ relative to gross energy (GE) per pound of weight during the 45 min session.

**DISCUSSION**

The TCP® session in the present study with healthy young men resulted in an activity of approximately 5 METs, which was expected due to the variability of movements that were easy to perform and at low level of difficulty. According to the compendium of physical activities (1,5), activities of 5 METs include playing double tennis, aerobic dance of low impact, cycling or operating drill or crusher if we consider the same mass with the same time of execution for these activities, we will have respectively: 71.6 kg × 5 METs (45/60) = 268.5 kcal or 5 kcal·min$^{-1}$.

The TCP® session with an EE of approximately 5 METs means that the subjects’ had an energy expenditure of 296.55 kcal. However, it should be noted that the average body mass of the subjects in the present study was 71.6 kg. Since TCP® is an exercise modality that can have its EE quantified in METs, using the formula we can infer that the subjects’ EE is directly proportional to their body mass.

In this context, the main objective of TCP® is non-injury, using as practice the training through repetitive movements and conditioning factors that help in the improvement of body posture (4). With this mind, a person who begins to train using this method will have a high caloric expenditure because of gross movements and low coordination. But with practice, the EE economy becomes evident, which is the efficient result of coordinating capacities, and after the initial phase will allow the person to participate in other modules of the method that require greater complexity of both movement and muscle requirement and, consequently, the person’s EE.
Several studies have shown that EE of 1000 kcal·wk⁻¹ (4200 kJ wk⁻¹) induced by exercise or physical activity is associated with a significant 20 to 30% reduction in the risk of all-cause mortality (6,12). In the present study, there would be an anticipated decrease of 24% of subjects’ cardiovascular deaths due to exercise with more than 2000 kcal·wk⁻¹ (8.4 MJ) (11). In this sense, knowledge of the TCP® session’s EE of 296.55 kcal at a frequency of 3 times·wk⁻¹ ≈ 876.33 kcal and a monthly EE of 3505.32 kcal, which would allow for an even greater risk reduction in all-cause mortality.

If the combination of exercise components was varied by more intense electronic music, greater variability and speed of body movements, more vigor on larger muscle groups, compatibility of choreographies and sequencing (4), the energy cost would also increase during each exercise session. With EE as one of the objectives in the TCP® sessions, the increase in caloric expenditure during the training session requires additional research in order to quantify the influence on the subject’s GE. Also, we could have opted for evaluating a sedentary population of subjects so that we could have determined their EE for comparative purposes.

**Conclusion**

The findings in the present study indicate that the TCP® session has an approximate demand of 5 METs, which is considered a moderate activity (from 3 to 6 METs) that generated in 45 min an EE that ≈ 297 kcal. This makes the application of the method interesting for using to reduce the risk of all-cause mortality.

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