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## BRIEF NOTE

# Biomechanical and physiological effects of two-week sprint interval training in collegiate swimmers

*Effets biomécanique et physiologique de deux semaines d'entraînement par intervalle à haute intensité chez des nageurs universitaires*

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## KEYWORDS

Swimming;  
Kinematics;  
Aerobic capacity;  
Wingate test

## Summary

**Introduction.** – Interval training with high-intensity loads is recommended for skeletal muscle adaptation in competitive athletes. According to the results of some studies, training intensity, not volume, has greater impact on swimming performance. The aim of present study was to evaluate the effect of 2-week high-intensity, low-volume swimming training with individual passive recovery on both aerobic and anaerobic performance in collegiate swimmers.

**Summary of facts and results.** – Seven collegiate male swimmers participated in six swimming training sessions within two weeks. Each workout contained repeated high-intensity task. Before and after the training period kinematic variables were assessed in 25-m maximal swim test and 8 × 25-m swim test with 5-second rest. Aerobic and anaerobic capacities were determined in the laboratory tests, blood markers were also specified. Six training sessions improved swimming velocity in maximal 25-m swim test, as well as power outputs in Wingate test. However, no significant improvement was observed in the kinematic variables of eight 25-m repetitions. Aerobic capacities of the swimmers did not change essentially.

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## MOTS CLÉS

Natation ;  
Cinématique ;  
Capacité aérobie ;  
« Test Wingate »

**Conclusion.** – Two weeks of sprint interval training improved power abilities and speed in short distance swimming test. However, the short recovery intervals in training protocol may not positively affect the aerobic capacity.

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## Résumé

**Introduction.** – L'entraînement par intervalles à haute intensité est recommandé aux sportifs afin de favoriser les adaptations musculaires. Dans la littérature scientifique, il est indiqué que, c'est l'intensité de l'entraînement, et non le volume, qui a plus d'influence sur la performance en natation. L'objectif de cette étude était d'évaluer l'influence de deux semaines d'entraînement à haute intensité et à faible volume sur les performances aérobies et anaérobies chez des nageurs universitaires.

**Synthèse des faits et résultats.** – Sept nageurs universitaires de sexe masculin ont participé à six sessions d'entraînement pendant deux semaines. Chaque entraînement contenait une répétition d'exercice répété à haute intensité. Avant et après l'entraînement, une analyse cinématiques des paramètres de nage était réalisée lors d'un test de 25 m à vitesse maximale et lors d'un test de 8 × 25 m avec cinq secondes de récupération. Les capacités aérobies et anaérobies étaient déterminées en laboratoire. Six sessions d'entraînement ont amélioré la vitesse de la nage au 25 m ainsi que la puissance maximale dans le test Wingate. Aucune amélioration significative des paramètres de nage n'a pas été observée lors du test de 8 × 25 m.

**Conclusion.** – L'entraînement haute intensité par intervalles pendant deux semaines permet d'améliorer la puissance et la vitesse sur les courtes distances. Cependant, les durées de récupération courtes dans l'entraînement par intervalles, n'ont pas affecté positivement la capacité aérobie des sportifs.

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## 1. Introduction

Both high-volume training and high-intensity training are important components of an athlete's training program. There are suggestions for overdistance training at speeds lower than lactate threshold as well as low volume at high-intensity workloads. Mujika et al. [1] have shown that the improvement in swimming performance is correlated with the mean intensity of the training season, but not with training volume or frequency [1]. Moreover, short-term period of high-intensity training is known to induce various muscle metabolic adaptations, accelerating aerobic and anaerobic pathways, to meet the demand for ATP resynthesis [2]. Therefore, sprint interval training (SIT) is commonly used in sport practice.

The aim of present study was to evaluate the effect of 2-week swimming SIT with individual passive recovery on both aerobic and anaerobic performance in collegiate swimmers.

## 2. Methods

### 2.1. Subjects

Seven collegiate male swimmers (age  $21.5 \pm 0.5$  yr, body height  $186.7 \pm 4.1$  cm, body weight  $77.5 \pm 3.6$  kg) volunteered to participate in the experiment. At the time of the study their experience of swimming training was at least 6 years. The mean volume of training session was 3000 m. The subjects were asked to refrain from any physical activity or alcohol consumption for at least 24 hrs prior to testing.

The study was approved by the Ethics Committee at Medical University of Gdansk. All subjects gave their informed consent before beginning the study.

### 2.2. Procedures

#### 2.2.1. Laboratory tests

Four days before the initiation of the training procedure, as well as four days after the last training bout, aerobic and anaerobic capacities were determined on separate days. The tests were performed on a mechanically braked cycle ergometer (884E Sprint Bike, Monark, Vansbro, Sweden). Aerobic and anaerobic capacity tests were determined according to the procedures described previously [3].

#### 2.2.2. Repetitive swimming test

The test was conducted in 25-meter indoor swimming pool with water temperature of 28 °C. The warm up consisted of mixed swimming drills: 300m front crawl, 200m as 50m pull/swim, 100backstroke and 2 × 25 front crawl with increasing speed. The test consisted of 8 × 25m front crawl repetitions with maximum effort. The athletes started swimming after push off from the wall. The rest period between repetitions was set to 5 seconds [4].

#### 2.2.3. Maximal swimming test (25 m)

Maximal swimming test was conducted twice, each time a day prior to repetitive swimming test. The athletes had to swim 25 meters with maximal velocity after pushing off the

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