Effect of respiratory warm-up on anaerobic power

Mustafa Özdal, PhD1*, Özgür Bostancı, PhD2, Önder Dağlıoğlu, PhD1, Seydi Ahmet Ağaoğlu, PhD2, Menderes Kabadayı, PhD2

1) Department of Physical Education and Sports, School of Physical Education and Sport, Gaziantep University: BESYO, 27350, Gaziantep, Turkey
2) Department of Physical Education and Sports, Faculty of Sport Science, Ondokuz Mayis University, Turkey

Abstract. [Purpose] The aim of the present study was to examine the effects of respiratory muscle warm-up on anaerobic power. [Subjects and Methods] Thirty male field hockey players (age, 20.5 ± 2.0 years) each participated in a control (CAN) trial and an experimental (EAN) trial. The EAN trial involved respiratory muscle warm-up, while the CAN trial did not. Anaerobic power was measured using the Wingate protocol. Paired sample t-tests were used to compare the EAN and CAN trials. [Results] There were significant increases in peak power and relative peak power, and decreases in the time to peak after the EAN trial by 8.9%, 9.6%, and 28.8% respectively. [Conclusion] Respiratory muscle warm-up may positively affect anaerobic power due to faster attainment of peak power.

Key words: Anaerobic power, Warm-up, Respiratory

INTRODUCTION

The general warm-up has a potentially positive effect on short-term performance1). This may be because of reduction in joint stiffness2), increased neurotransmission3), and differences in the relationship between power and acceleration4). In addition, disruption of stable links between actin and myosin after warm-up may decrease muscle stiffness and affect short-term performance5). In-depth investigation of the effects of a general warm-up on respiratory muscle activity has recently been performed, and the therapeutic and beneficial effects were noted by the researchers6). Accordingly, we hypothesized that respiratory muscle warm-up may positively affect anaerobic power, and investigated this hypothesis in the present study.

SUBJECTS AND METHODS

This was a randomized crossover study. The subjects visited the laboratory three times. During the first visit, they were familiarized with the maximal inspiratory pressure (MIP), Wingate anaerobic tests, and respiratory warm-up. During their second and third visits, a Wingate anaerobic power test with general warm-up as the control trial (CAN) and a Wingate anaerobic power test with general and respiratory warm-up as the experimental trial (EAN), were randomly performed. The trials were applied at the same time each day (between 16:00 and 20:00 h). Exercise and high-intensity physical activity were not allowed before the trials. A total of 30 field hockey players (age, 20.5 ± 2.0 years; height, 179.3 ± 6.9 cm; weight, 73.7 ± 12.7 kg) voluntarily participated in the present study. Informed consent was obtained from all participants in the study. Approval was obtained from Ondokuz Mayis University Clinical Research Ethical Committee (OMÜ KAEK 2014/635). For the general warm-up, low-intensity aerobic running for 10 min and dynamic stretching for 5 min were performed by the subjects. For respiratory warm-up, an inspiratory muscle training device (POWER® Breathe Classic, IMT Technologies Ltd., Birmingham, UK) was used. Two sets of 30 inspirations were performed at an intensity of 40% of MIP with a 2-min rest be-
Results

Significant changes in peak power (\(C_{AN}=767.0 \pm 162.9\) W, \(E_{AN}=835.1 \pm 175.1\) W, percent difference=8.9%), relative peak power (\(C_{AN}=10.4 \pm 1.4\) W/kg, \(E_{AN}=11.4 \pm 2.0\) W/kg, percent difference=9.6%), and time to peak (\(C_{AN}=3.9 \pm 1.7\) s, \(E_{AN}=2.8 \pm 1.4\) s, percent difference=−28.8%) were observed between the \(C_{AN}\) and \(E_{AN}\) trials.

Discussion

Previous studies showed that general warm-up may positively affect anaerobic power and performance\(^1\)\(^–\)\(^5\). However, respiratory warm-up may affect short-term performance in a different way. In particular, when considered as part of an anaerobic energy system, respiratory warm-up may not have an impact at a physiologic level. An increase may occur with rising core temperature induced by respiratory warm-up. Previous research examined the effects of respiratory warm-up on 100-m swimming performance in 15 subjects. After respiratory warm-up, faster performance was observed with statistical significance\(^10\). Volianitis et al., investigated respiratory warm-up and rowing performance in seven male and seven female rowers, and found higher power output during a rowing test after respiratory warm-up\(^7\). Cheng et al. studied intermittent sprint performance, and showed that respiratory warm-up resulted in higher power output values than a general warm-up\(^11\).

In conclusion, anaerobic power (peak power) significantly improved after respiratory warm-up, and peaked faster. Respiratory warm-up may positively affect anaerobic power. This effect may be the result of an increase in core temperature\(^12\).

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