Factors affecting differences in mechanical power output between American football and Triathlon athletes

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Purpose: Triathlon athletes (TRI) need the endurance capacity of low power output, while power sports such as American football (AFB) need instantaneous high power output. Mechanical power output (MPO, Watt) is defined as load (N) multiplied by speed (m/sec or rpm). However, it is not clear whether MPO in athletics is dependent on load or speed. We determined MPO during maximal cycling in TRI, AFB and untrained subjects (CON), then analyzed factors affecting MPO, contribution of load, speed, and physical characteristics to MPO.

Methods: Sixteen college-age TRI, fifteen AFB and nineteen CON participated in this study. An electrical controlled cycle ergometer (Power MAX VII, CONBI, Japan) was used to determine the maximal power output (P-max). Subjects performed maximal cycling at three loads related to body mass (2, 4, 6 or 3, 5, 7 kilopond, kp) for 10 sec including a 2-min rest period, and the peak cycling speed (PCS, rpm) and peak power output (PPO, PCS x load, Watt) were measured at each load. P-max was estimated using the load-speed equation, then load (P-load) and speed (P-speed) at P-max were calculated using the load-power and load-speed equation (P-max=P-load x P-speed).

Results and Discussion: The estimated P-max or P-load was significantly (p<0.001) greater in AFB and TRI than in CON, whereas these parameters were similar between AFB and TRI. The P-speed and P-max/lean body mass (LBM) were similar between AFB, TRI and CON. A significant (p<0.05) relationship of P-max with P-load or LBM was observed in each group. Correlation coefficient (R²) of the relationship between P-max and P-speed was greater in AFB than in CON, while there was no significant relationship of P-max with P-speed in TRI. These findings suggest that P-load or LBM was related to P-max in each group, while the contribution of P-speed to P-max was greater in AFB than in TRI or CON.

Key Words: peak power, maximal cycling, load, speed

Effect of the deconditioning after resistance exercise training on muscle metaboreflex

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Purpose: Although several authors reported effects of inactivity on a metaboreflex muscle sympathetic nerve activity (MSNA), those results were equivocal, i.e. it was increased, unchanged or decreased. The aim of this study was to test if the metaboreflex MSNA was altered by deconditioning (DCN) after resistance training.

Methods: Seven volunteers, all were good health and gave their informed consents before the study. They trained with a unilateral non-dominant arm handgrip exercise, which consisted of thirty 10-s static contractions with maximal effort, 10 s apart, five days per week, for four weeks and four weeks DCN period was followed. The metaboreflex response was determined with rhythmic handgripping under forearm ischemia with maximal effort followed by two-min post-exercise arterial occlusion (PEAO), and was measured before, after training and after 4-week DCN. MSNA was recorded using a microneurography and was expressed as the total activity (bursts x burst area). Handgrip force was measured simultaneously. The time (training and DCN) and arms effects were tested with two-way ANOVA and Wilcoxon test was applied for post hoc examination.

Results & discussion: Maximal handgrip force (MHF) in the trained arm (TA) increased post-training by 6% but not in the control arm (CA). After DCN, MHF did not change in TA and decreased by 7% in CA compared to the post-training. A total work during exercise was not different among the tests in both arms. Although the time effect on the metaboreflex was not found, there was the interaction between the time and exercise (p=0.007). By post hoc test, the MSNA during PEAO decreased after DCN in TA (p=0.028) than the post-training period, and no difference in the pre-training was found. In CA the metaboreflex response was lower than pre- (p=0.018) and post-training period (p=0.028). In conclusion, the results demonstrated that the short-term resistance training was not associated with the significant change in muscle metaboreflex, although deconditioning after resistance training weaken the metaboreflex response.

Key words: static handgrip exercise, detraining