

Effects of the Order of Combined Resistance and High Intensity Interval Training on  
Muscle Hypertrophy and Metabolism

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Abstract

**Introduction:** Concurrent training is combination of two different training modes. In this study, we conducted an experiment by combining resistance (RE) and high intensity interval training (HIIT). Until now, the order of execution for optimizing both exercise effects has not been studied. The purpose of this study was to investigate the difference of the order of concurrent training for molecular signals in skeletal muscle.

**Methods:** 7 weeks of age male ICR mice were divided into 3 groups: Control (Con), HIIT before resistance (HIIT-RE), HIIT after resistance (RE-HIIT). These training were conducted for 3-week (3 times / week).

**RE-protocol:** The gastrocnemius muscle was isometrically exercised (3-s stimulation 10 contractions, with a 7-s interval between contractions, for 5 sets with 3-min inter-set intervals). The voltage (30 V) and stimulation frequency (100 Hz) were adjusted to produce maximal isometric tension.

**HIIT-protocol :** Mice were performed a 20-s swimming exercise for 10 sets or until the mouse reached exhaustion, with a weight (equivalent to 10% of their body weight) attached to their tails. After each sets, mice were landed from water, and a 10-s rest period was allowed.

**Results:** We analyzed the change in signal molecules. The phosphorylation levels of mTOR signaling increased significantly in concurrent training groups. The change in gene expression related to metabolism were also increased in concurrent training groups.

**Conclusions:** In conducting concurrent training on the same day, resistance training before HIIT training is effective for both strength and glycolysis enhancement.

**Keywords:** Concurrent training, mTOR signaling, Glycolysis