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©Journal of Sports Science and Medicine (2006) 05 , 194 - 201

Research article

Sprint-Interval Training Induces Heat Shock Protein 72 in Rat Skeletal Muscles

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ABSTRACT

Previous studies have demonstrated that endurance exercise training increases the level of heat shock proteins (HSPs) in skeletal muscles. However, little attention has been drawn to the effects of high intensity-short duration exercise, or sprint- interval training (SIT) on HSP72 level in rat skeletal muscles. This study performed to test the hypothesis that the SIT would induce the HSP72 in fast and slow skeletal muscles of rats. Young male Wistar rats (8 weeks old) were randomly assigned to a control (CON) or a SIT group (n = 8/group). Animals in the SIT group were trained (1 min/sprint, 6~10 sets/day and 5~6 days/week) on a treadmill for 9 weeks. After the training period, HSP72 levels in the plantaris (fast) and soleus (slow) muscles were analyzed by Western blotting method. Enzyme activities (hexokinase, phosphofructokinase and citrate synthase) and histochemical properties (muscle fiber type compositions and cross sectional area) in both muscles were also determined. The SIT resulted in significantly ($p < 0.05$) higher levels of HSP72 in both the plantaris and soleus muscles compared to the CON group, with the plantaris producing a greater HSP72 increase than the soleus (plantaris; $550 \pm 116\%$, soleus; $26 \pm 8\%$, $p < 0.05$). Further, there were bioenergetic improvements, fast-to-slow shift of muscle fiber composition and hypertrophy in the type IIA fiber only in the plantaris muscle. These findings indicate that the SIT program increases HSP72 level of the rat hindlimb muscles, and the SIT-induced accumulation of HSP72 differs between fast and slow muscles.

Key words: Hindlimb, treadmill running, enzyme activity, fiber type shift, hypertrophy

Key Points

- There is no study about the effects of high intensity but short duration exercise, or sprint-interval training (SIT) on heat shock protein 72 (HSP72) level in skeletal muscles.
- The SIT program (≤ 10 min-day) accumulated HSP72 in rat skeletal muscles.
- The SIT-induced accumulation of HSP72 in the plantaris (fast) muscle was drastic compared to the soleus (slow) muscle and accompanied with the improvements of enzyme activities, fast-to-slow shift within fast muscle fiber type and muscle hypertrophy.

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