

スポーツ科学研究, 11, 35-68, 2014 年

**Effects of circadian rhythm and acute endurance exercise on insulin sensitivity**Karina Ando<sup>1</sup>, Hyeon-Ki Kim<sup>1</sup>, Masayuki Konishi<sup>2</sup>,  
Mio Nishimaki<sup>1</sup>, Hiroki Tabata<sup>1</sup>, Mi Xiang<sup>1</sup>, Shizuo Sakamoto<sup>2</sup><sup>1</sup> Graduate School of Sport Sciences, Waseda University<sup>2</sup> Faculty of Sport Sciences, Waseda University

Exercise therapy is effective for the treatment of diabetes. Endurance exercise has beneficial effects on insulin sensitivity via PPAR $\gamma$  and C/EBP $\alpha$ . PPAR $\gamma$  and C/EBP $\alpha$  are essential transcription factor for the differentiation of fat cells and insulin sensitivity. Biological response to exercise is different in the morning and evening because of the fact that material related to the metabolism is under the involvement of clock genes. Although PPAR $\gamma$  and C/EBP $\alpha$  are affected by clock-genes, effects of exercise performed in different timing on PPAR $\gamma$  and C/EBP $\alpha$  are not clear. Considering more effective exercise therapy against diabetes, especially insulin sensitivity, it is important to investigate the impact of exercise timing on PPAR $\gamma$  and C/EBP $\alpha$ . The purpose of this study

was to examine whether the timing of exercise influences PPAR $\gamma$  and C/EBP $\alpha$ , insulin sensitivity on the next day morning in humans. Nine healthy young men participated in three trials in a randomized cross-over design: (1) morning exercise (0900-1000) (2) evening exercise (1800-1900) (3) control trials. At exercise trials, participants walked for 60 minutes at 60% of maximal oxygen uptake on a treadmill. We used oral glucose tolerance test before and after exercise or control day to assess insulin sensitivity. Subjects' average maximum oxygen uptakes per body weight before trials were not significantly different between in the morning and evening. The additional data is now under analysis.