GENDER DIFFERENCES IN BAROREFLEX SENSITIVITY DURING INTERMITTENT ISOMETRIC HANDGRIP EXERCISES

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INTRODUCTION

It has been reported by many researchers that there exist gender differences in changes of blood pressure during exercise, and also in the sensitivity of the reflex of baroreceptor of the carotid sinus and aortic arch which are said to play a role in raising blood pressure during exercise (BRS: Baroreflex Sensitivity.). However, the reports about BRS have evaluated the rise in blood pressure by means of the Valsalva maneuver or pharmacological stimuli (Abdel-Rahman et al. 1994), and very few studies about gender related differences in BRS during exercise have been conducted. Bertinieri et al. (1985) reported that BRS can be evaluated by the relationship between beat by beat changes of systolic blood pressure and pulse intervals, and that this spontaneous BRS measurement makes it possible to measure BRS during exercise avoiding pharmacological stimuli or other artificially induced stimuli. Therefore, the present experiments were undertaken to examine gender related differences in spontaneous BRS during isometric handgrip exercises for two different intensities.

METHODS

Healthy university students (9 men, 12 women) performed 4 sets of 1 min isometric handgrip exercises (IHG) at 40% maximal voluntary contraction (MVC) combined with 1 min test (exercise 1), and healthy university students (8 men, 9 women) performed 2 sets of 2 min IHG at 30% MVC combined with 1 min rest between the exercises (exercise 2). Beat by beat blood pressure was measured by a Finapres (Ohmeda Co. Ltd), and pulse intervals (PI) were measured by ECG during the exercises and rests. BP and PI changes from the rest values in the last 30s of each one-minute of the experiments were averaged. We identified the sequences of three or more consecutive beats in which systolic blood pressure (SBP) was raised or lowered by at least 1 mmHg during each beat, and the pulse interval was progressively shortened or lengthened. The regression lines between the systolic values and the subsequent pulse intervals were calculated by computer. And also, their correlation coefficients were provided. The regression lines whose regression coefficients were more than 0.85 were taken as a measure of BRS. The BRS of each one-minute of the experiments were averaged.

RESULTS

During the exercise bouts in exercise 1, BRS was significantly lowered from the rest values in both sexes, but the changes were greater in men compared with women in the 3rd and 4th bouts in exercise 1 (3rd: 4.16 vs 7.05 msec/mmHg, 4th: 3.70 vs 6.94 msec/mmHg, p<0.01). However, BRS did not change from the rest values, and there was no difference between men and women (average of all: 15.71 vs 16.24 msec/mmHg, NS) in exercise 2.

There were no differences between men and women in the changes of systolic blood pressure (SBP), but diastolic blood pressure (DBP) was higher in men than women from the pre-exercise values (p<0.05) during the 3rd and 4th exercise bouts and the rest after the 3rd exercise bout in exercise 1 (exercise: 36.7 vs 26.3 mmHg, 44.7 vs 27.2 mmHg, rest: 6.6 vs 0.9 mmHg, p<0.05). SBP and DBP changed higher in men (p<0.05) during the first and the second set of exercises in exercise 2 (second half minute of the first exercise bout: 23.72 mmHg vs 12.28 mmHg, first and second half minute of the second exercise bout: 25.80, 32.06 mmHg vs 10.40,16.02 mmHg, p<0.05). We saw no gender difference in PI in exercise 1, while PI was shorter for men than for women (p<0.05) during exercise bouts in exercise 2.
**DISCUSSION**

The major findings of the present study were: (1) During IHG at 30% MVC, while the changes from the pre-exercise values in SBP and DBF were different between men and women, BRS did not change for either sex, and we found no gender difference in BRS; and (2) During IHG at 40% MVC, there was no gender difference in SBP, but DBF increased in men during the 3rd and 4th exercise bout. BRS decreased significantly during the exercise in men and women, but the changes were more noticeable in men during the 3rd and 4th exercise bout. These results suggest that BRS lowers when exercise intensity is high, and BRS lowers more in men; and that the result in BRS does not reflect on SBP.

It is generally said that sympathetic nerve activity is depressed by parasympathetic nerve activity at rest, and that once exercise starts, parasympathetic nerve activity is reduced to raise sympathetic nerve activity (Rowell 1993). Yamamoto et al. (1991) reported that during dynamic exercise at VT, parasympathetic nerve activity disappeared and sympathetic nerve activity itself started to rise. On the other hand, early studies showed that women have higher parasympathetic nerve activity and lower sympathetic nerve activity than men (Ryan et al. 1994).

These reports suggest that reduction of parasympathetic nerve activity could be faster, and that sympathetic nerve activity increases more in men when exercise intensity rises. The gender difference in BRS during IHG at 40% in the present study may be reflected by this gender related difference in the rate of parasympathetic nerve and sympathetic nerve activity.

**REFERENCES**


