Heart Rate Response to Constant, Relative Submaximal Work Load in Middle-Aged Women

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Abstract

The present study aimed at clarifying the effects of aging on responses of heart rate (HR) during adaptation and recovery periods to the standard exercise. Twenty active middle-aged women (50 ± 4.4 years) participated as subjects. The data were compared with those of 9 active young women (22 ± 3.5 years). The standard exercise consisted of pedaling at 50 rpm on a cycle ergometer for 6 min followed by 5 min-recovery. Two submaximal exercise tests were performed and the loads were set at 70% and 90% of maximal HR (HRmax). Heart rate was measured continuously every 10 sec through the test. From these HR recordings, HR curve of 80% HRmax was interpolated and the dynamics were calculated in the following indices: heart rate increase during exercise phase (ΔHRε), time constant of HR curve during exercise phase (τε), increasing speed of HR at τε (Acceleration Index: AI), heart rate decrease during recovery phase (ΔHRe), time constant of HR curve during recovery phase (τr), decreasing speed of HR at τr (Deceleration Index: DI).

As a result, τε was significantly longer in the middle-aged group than in the young one (74.45 ± 16.64 sec vs 50.44 ± 12.60 sec, p < 0.001), but AI was significantly smaller in the former than in the latter (0.45 ± 0.13 beats·min⁻¹·sec⁻¹ vs 0.70 ± 0.21 beats·min⁻¹·sec⁻¹, p < 0.001). There was no significant difference in ΔHRε between the groups (50.53 ± 8.51 beats·min⁻¹ vs 52.36 ± 6.45 beats·min⁻¹). Difference in τε was not significant (65.45 ± 13.76 sec vs 56.27 ± 12.31 sec), while DI was significantly smaller in the middle-aged group (0.56 ± 0.11 beats·min⁻¹·sec⁻¹ vs 0.78 ± 0.17 beats·min⁻¹·sec⁻¹, p < 0.001). Absolute value of ΔHRe was smaller in the middle-aged group (−56.65 ± 7.90 beats·min⁻¹ vs −67.22 ± 8.64 beats·min⁻¹, p < 0.01). These results showed that HR adaptation and recovery to an exercise load in the middle-aged women were delayed by approximately 36~48% and 16~28% respectively compared to those in the young women. It is concluded that these delayed HR responses should be well considered in exercise prescription to person over middle-aged and aged persons.

Key words: heart rate response, submaximal exercise, middle-aged women

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