

Heart rate and cardiac autonomic responses to concomitant deep breathing, hand grip exercise, and circulatory occlusion in healthy young adult men and women

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Abstract

Background: Deep breathing (DB) and handgrip (HG) exercise -with and without circulatory occlusion (OC) in muscle-, have been shown to have beneficial effects on cardiovascular function; however, the combination of these maneuvers on heart rate (HR) and cardiac sympathovagal balance have not been previously investigated. Therefore, the aim of the present study was to evaluate the effect of simultaneous DB, HG, and OC maneuvers on the sympathovagal balance in healthy women and men subjects. **Methods and results:** Electrocardiogram and ventilation were measured in 20 healthy subjects (Women: n = 10; age = 27 ± 4 years; weight = 67.1 ± 8.4 kg; and height = 1.6 ± 0.1 m. Men: n = 10; age = 27 ± 3 years; weight = 77.5 ± 10.1 kg; and height = 1.7 ± 0.1 m) at baseline and during DB, DB + HG, or DB + HG + OC protocols. Heart rate (HR) and respiratory rate were continuously recorded, and spectral analysis of heart rate variability (HRV) were calculated to indirectly estimate cardiac autonomic function. Men and women showed similar HR responses to DB, DB + HG and DB + HG + OC. Men exhibited a significant HR decrease following DB + HG + OC protocol which was accompanied by an improvement in cardiac autonomic control evidenced by spectral changes in HRV towards parasympathetic predominance (HRV High frequency: 83.95 ± 1.45 vs. 81.87 ± 1.50 n.u., DB + HG + OC vs. baseline; p < 0.05). In women, there was a marked decrease in HR after completion of both DB + HG and DB + HG + OC tests which was accompanied by a significant increase in cardiac vagal tone (HRV High frequency: 85.29 ± 1.19 vs. 77.93 ± 0.92 n.u., DB + HG vs. baseline; p < 0.05). No adverse effects or discomfort were reported by men or women during experimental procedures. Independent of sex, combination of DB, HG, and OC was tolerable and resulted in decreases in resting HR and elevations in cardiac parasympathetic tone. **Conclusions:** These data indicate that combined DB, HG and OC are effective in altering cardiac sympathovagal balance and reducing resting HR in healthy men and women. © 2021, The Author(s).

Author keywords

Cardiac autonomic control; Deep breathing; Isometric handgrip; Parasympathetic; Sympathetic