Respiratory Sinus Arrhythmia and Breathing Control Technic in Young Adults: A Pilot Study

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ABSTRACT

BACKGROUND: Lower breathing frequencies are associated to larger respiratory sinus arrhythmia (RSA) and, consequently to higher heart rate variability (HRV). RSA is a cyclic fluctuation of heart rate (HR) during the respiratory cycle, with increase of HR during inhalation and decrease during exhalation. The slower the breathing frequency the higher the oscillation, resulting in higher values in the Low Frequency (LF) range (0.04-0.15 Hz); resulting in a resonant effect[1]. Sedentarism is associated with lower RSA[2]. **OBJECTIVE:** The purpose of this study was to verify if lower breathing frequencies were significantly associated with augmented RSA. **METHODS:** 10 irregularly or active young adults (18.6 ± .69 years old; 4 women; height- 168 ± 7.51 cm; weight- 62.8 ± 11.11 kg; IMC- 22.17 ± 3.06). Physical activity was evaluated with IPAQ short version[3]; and, HRV was obtained with Polar V800 heart rate monitor[4], in supine position, during 10min, in each of two conditions: i) baseline (B)- normal breath; ii) controlled breath (C)- diaphragmatic breathing at slow pace. Informed consent was obtained. HRV parameters were obtained with gHRV, v.1.6[5]. **RESULTS:** Participants took 2-3mn to achieve resonant effect at .13 ± .03 Hz, significantly augmenting LF from B to C (1107.25 ± 951.76 msec^2 and 2564.78 ± 2162.47 msec^2, respectively) (Z = -2.703, p < .01, r = .85, rrb = .80). In C, breathing frequency was inversely associated with heart rate standard deviation (*rho* (10) = -.927, p < .0001), heart rate variability index (*rho* (10) = -.685, p < .05), SD2 Poincaré plot (*rho* (10) = -.685, p < .05), and ApEnt (*rho* (10) = -.827, p < .01); and, heart rate was inversely associated with LF (*rho* (10) = -.815, p < .01), mean RR interval (*rho* (10) = -1.0, p < .0001), standard deviation RR interval (*rho* (10) = -.806, p < .01), pNN50 (*rho* (10) = -.952, p < .0001), rMSSD (*rho* (10) = -.648, p < .05), SD1 Poincaré plot (*rho* (10) = -.648, p < .05), SD2 Poincaré plot (*rho* (10) = -.673, p < .05), and FracDim (*rho* (10) = -.853, p < .01). **CONCLUSIONS:** Results confirm the hypothesis that slow diaphragmatic breathing may enhance RSA and HRV in irregularly or less active young adults. Slow diaphragmatic breathing may be a non-invasive, non-expensive, easy to use nonpharmacological method for help stabilizing autonomic function in less active young adults.

Keywords: *breathing frequency, respiratory sinus arrhythmia, heart rate variability, sedentarism, young adults*

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