

Improving heart rate variability (HRV) by non-pharmacological techniques

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Sir,

We read with interest the excellent article of Sztajzel J [1]. It is an important and carefully reviewed article which illustrates the various techniques for measurement of heart rate variability (HRV) and its clinical applications. We would like to suggest that there are also a number of non-pharmacological techniques for improvement of HRV, such as thought field therapy [2], aerobic training [3], biofeedback [4], yoga [5], abdominal breathing [6], qigong breathing [7], and meditation. These techniques are believed to stabilise the autonomic nervous system by modulating the parasympathetic nervous system and in turn improve HRV. As reduced HRV is associated with increased risk of cardiac and overall mortality and the occurrence of life-threatening arrhythmias, long term studies are needed to determine the impact of these techniques on HRV and whether this is of therapeutic value in patients with reduced HRV.

References

- 1 Sztajzel J. Heart rate variability: a noninvasive electrocardiographic method to measure the autonomic nervous system. *Swiss Med Wkly* 2004;134: 514-22.
- 2 Callahan RJ. The impact of Thought Field Therapy on heart rate variability. *J Clin Psychol* 2001; 57:1153-70.
- 3 Buchheit M, Simon C, Viola AU, et al. Heart rate variability in sportive elderly: relationship with daily physical activity. *Med Sci Sports Exerc* 2004; 36:601-5.
- 4 Cowan M, Kogan H, Burr R, Hendershot S, et al. Power spectral analysis of heart rate variability after biofeedback training. *J Electrocardiol* 1990; 23:85-94.
- 5 Bernardi L, Sleight P, Bandinelli G, Cencetti S, et al. Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: comparative study. *Br Med J* 2001;323:1446-9.
- 6 Srinivasa J, Ramesh Bhat M, Prabha Adhikari MR. Respiratory sinus arrhythmia (RSA): Noninvasive measure of parasympathetic cardiac control in newly diagnosed hypertensives and the influence of abdominal breathing. *Kharkiv Karazin's National University Bulletin (Medicine)* 2002;545: 80-5.
- 7 Lee MS, Huh HJ, Kim BG, et al. Effects of Qi-training on heart rate variability. *Am J Chin Med* 2002;30:463-70.

Authors' reply

I thank the editor for giving me the opportunity of replying to the interesting letter of Jayachandra and Pinto.

It is well established that HRV can be used as a tool to explore the effects of various non-pharmacological interventions on autonomic function, and the favourable effect that these interventions may exert in patients with abnormal HRV values. Well studied non-pharmacological procedures with various effects on HRV comprise invasive cardiac interventions such as coronary artery percutaneous interventions [1] and coronary artery bypass grafting [2], cardiac transplantation [3] and radiofrequency ablation procedures [4].

In their letter Jayachandra and Pinto mention different non-pharmacological techniques based mainly on non-invasive interventions and their effects on HRV parameters. These interventions include psychotherapeutic (Thought Field Therapy), respiratory (yoga) and physical (aerobic and biofeedback training) techniques.

To measure HRV for the effectiveness of a given psychotherapeutic technique is certainly very attractive. However, the patient groups treated are highly heterogeneous, due to the wide variety of existing psychological problems and the potential concomitant use of psychotropic drugs. Thus, particular care must be taken when analysing HRV data in this context. Furthermore, it is important to bear in mind that HRV reflects the influence of the autonomic nervous system (ANS) on the sinus node of the heart. This being so, measurement of HRV in a patient suffering from depression is not the same in a patient with an underlying heart disease and one with a normal heart.

Respiratory exercises (yoga) and physical training may induce changes in the ANS, probably by increasing the parasympathetic component and thereby favourably influencing cardiovascular status. However, in the setting of physical training observations from different studies have shown variable behaviour of HRV parameters [5-7]. For example, in one study [5] higher time, but lower frequency domain values were observed in a group of athletes when compared with untrained control subjects. A markedly lower HF component, a marker of vagal modulation, was noted which was a somewhat unexpected finding in highly trained endurance athletes. In another study [6] higher SDNN values were found in highly trained male cyclists as compared with healthy male untrained controls. However, there were no significant differences between the study groups for temporal parameters such as RMSSD and pNN50, reflecting vagal activity, as well as for the LF and HF spectral bands. Another study [7] failed to demonstrate significant differ-

ences in HRV parameters, either time or frequency domain analysis, in a study comparing cyclists, weight lifters and controls.

Thus, improvement of HRV by specific interventions should result in better regulation of the autonomic imbalance by reducing sympathetic and increasing parasympathetic activity. Although an increase in vagal activity is considered beneficial in terms of cardioprotection, it is still not established by how much vagal activity must increase to provide adequate protection. As Jayachandra and Pinto state, controlled studies are needed to measure the impact of these particular interventions on HRV indices.

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References

- 1 Manfrini O, Margagni G, Pizzi C, Fontana F, Bugiardini R. Changes in autonomic nervous system activity: spontaneous versus balloon-induced myocardial ischemia. *Eur Heart J* 2004;25:1502-8.
- 2 Kuo C-D, Chen G-Y, Lai S-T, Wang Y-Y, Shih C-C, Wang J-H. Sequential changes in heart rate variability after coronary artery bypass grafting. *Am J Cardiol* 1999;83:776-9.
- 3 Sands KEF, Appel ML, Lilly LS, Schoen FJ, Mudge GH, Coehn RJ. Power spectrum analysis of heart rate variability failure in human cardiac transplant recipients. *Circulation* 1989;79:76-82.
- 4 Kocovic DZ, Harada T, Shea JB, Soroff D, Friedman PL. Alteration of heart rate and of heart rate variability after radiofrequency catheter ablation of supraventricular tachycardia. *Circulation* 1993;88: 1671-81.
- 5 Sacknoff DM, Gleim GW, Stachenfeld N, Coplan NL. Effect of athletic training on heart rate variability. *Am Heart J* 1994;127:1275-8.
- 6 Pluim BM, Swenne CA, Zwinderman AH, Maan AC, van der Laarse A, Doornbos J, et al. Correlation of heart rate variability with cardiac functional and metabolic variables in cyclists with training induced left ventricular hypertrophy. *Heart* 1999; 81:612-7.
- 7 Lazoglu AH, Glace B, Gleim GW, Coplan NL. Exercise and heart rate variability. *Am Heart J* 1996;131:825-7.

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