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LETTER TO THE EDITOR

DOES THE LEVEL OF INSTRUMENTATION AFFECT RESTING HEART RATE VARIABILITY?

Sir,

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Heart rate variability (HRV) is measured under various laboratory conditions with differing levels of instrumentation. This could conceivably alter resting autonomic nervous function. For instance, intravenous cannulation is associated with an elevation in plasma catecholamine levels for about 30 minutes (1). Instrumentation could also enhance levels of subjective stress and stress is known to alter HRV (2, 3). Therefore, in order to assess the effect of level of instrumentation on resting HRV, we evaluated separate groups of subjects who had undergone "less" and "more" instrumentation. Because age is a major determinant of HRV, we stratified the subjects into young (18–30 yrs) and old subjects (>60 yrs). Autonomic responses to stress are known to be muted in older subjects (4); the stratification would therefore allow us to ascertain if there was any interaction between age and level of instrumentation on autonomic responses.

One hundred and fifty healthy male adults were recruited from in and around medical college for on going metabolic/ autonomic studies in the Division of Nutrition. The subjects included medical students, patients from the Ophthalmology OPD undergoing investigation but without any systemic diseases, healthy volunteers from residential areas, urban slums and near by village. Subjects were divided into a less instrumented (n=87; young=52; old=35) and more instrumented group (n=63; young=46; old=17).

A retrospective analysis of the data on the 150 subjects indicated that they fell into 2 groups based on their level of instrumentation. The details of their recruitment have been presented in Table I. The "less instrumented" subjects had been recruited from non-invasive autonomic testing which included application of ECG electrodes and finger cuffs for beat-to-beat measurement of blood pressure (Portapress TNO, The Netherlands). The "more instrumented" subjects had been recruited for combined metabolic and autonomic protocols which included application of ECG electrodes, finger cuffs for beat to beat measurement of blood pressure but additionally also had an IV cannula in the hand placed in a hot air box for arterialisation of blood samples and ventilated hood over the head for indirect calorimetry. The experiments were carried out in the morning under standard conditions; fasting, with abstinence from smoking and caffeinated beverages for 12 hours. All participants gave written consent to the studies, which were approved by the Institution Ethics Review Board.

Variability in resting heart rate was measured after a mandatory 30-minute rest period following instrumentation with the

TABLE I: Distribution of subjects based on their place of recruitment and nature of instrumentation.

Sl. No.	*Place of recruitment*	*Subjects*	*Number of subjects*	*Nature of instrumentation*
1.	Students from the medical college	Healthy volunteers	23	Less instrumented
			20	More instrumented
2.	Urban slum	Healthy volunteers	21	Less instrumented
			24	More instrumented
3.	From near by villages	Healthy volunteers	31	Less instrumented
			17	More instrumented
4.	Residential area around the medical college	Healthy volunteers	8	Less instrumented
			2	More instrumented
5.	Ophthalmology (Subjects who came for general check up)	Healthy volunteers	4	Less instrumented
			Total – 150	

Less instrumented – ECG electrodes and cuffs for beat to beat measurement of blood pressure.

More instrumented – ECG electrodes, cuffs for beat to beat measurement of blood pressure, IV cannula in the hand placed in a hot air box for arterialization of blood samples and ventilated hood for indirect calorimetry.

TABLE II: Effect of instrumentation on heart rate variability measures in young and old subjects.

Variables	*More instrumentation*		*Less instrumentation*	
	Young adults (n = 46)	*Old (n = 17)*	*Young adults (n = 52)*	*Old (n = 35)*
Age	21±2	66±5	22±3	65±6
BMI	19.3±2.7	20.0±2.3	18.7±2.4	19.6±2.9
0–0.04 Hz	887.0(427.3–2306.6)	329.9(195.7–501.0)	815.7(555.1–1278.1)	279.3(142.4–465.1)
0.04–0.15 Hz (LF)	936.8(464.8–2111.7)	182.9(102.1–258.1)	879.0(580.8–1444.7)	185.9(60.6–308.0)
0.15–0.4 Hz (HF)	1013.8(527.2–2529.7)	180.0(80.7–545.1)	999.2(1917.3–4587.0)	150.3(68.5–324.6)
0–0.4 Hz	2585.2(1500.1–7672.3)	780.0(440.6–1106.6)	2964.9(1917.3–4587.0)	631.9(322.9–1131.8)
LF power nu	47.7(36.9–64.0)	57.4(33.8–73.0)	50.7(33.1–62.9)	55.2(36.5–76.6)
HF power nu	58.1(45.7–64.0)	58.4(40.2–72.5)	57.0(33.1–62.9)	52.2(32.5–71.21)
LF/HF ratio	0.81(0.54–1.4)	1.11(0.47–1.77)	0.90(0.46–1.43)	1.06(0.53–2.22)
Heart rate (bpm)	61.6(57.4–68.3)	61.5(56.0–67.9)	63.7(59.2–68.9)	59.7(53.1–65.7)

Data are median (interquartile range); bpm = beats per minute; nu = normalized for total power; LF = Low frequency; HF = High frequency; absolute power in $msec^2$.

subject lying supine. ECG (Lead II, Nihon Kohden RM-6000 Polygraph system, Japan) was recorded for 10–12 minutes and HRV was determined using the fast Fourier Transform as described earlier (5, 6, 7) and in accordance with the recommendations of the Task Force (8).

Table II indicates there were significant differences in the absolute measures of HRV across age (Two way ANOVA); normalised units of HRV were not different in young and old subjects. There was no effect of the level of instrumentation between young and old subjects and no age group × instrumentation group interaction. These data suggest that the level of instrumentation does not effect resting HRV values provided subjects have a mandatory 30-minute rest period following instrumentation. These data are important to Physiologist who work with different instruments and who may be concerned about how instrumentation of subjects affects HRV.

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