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LETTER TO THE EDITOR

IS RESTING HEART RATE VARIABILITY FOLLOWING 12 HOURS OF ABSTINENCE FROM SMOKING SIMILAR TO THAT OF NON SMOKERS ?

Sir,

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Cigarette smoking results in an acute increase in blood pressure, heart rate and systemic vascular resistance as well as a release of catecholamines (1, 2). These changes can conceivably affect resting heart rate variability (HRV) by altering adrenomedullary, baroreceptor and cardiac vagal activity (3, 4). It has been conventional that smokers abstain from smoking for at least 12 hours prior to conventional autonomic testing. However, there is little data to indicate that this applies to HRV testing as well. This study aimed to determine whether a 12 hour abstinence from smoking in smokers results in comparable resting heart rate variability measures as those seen in non-smokers.

Four groups of subjects were studied; Smokers [n = 55; young (18–30 yrs) = 29, old (60–80 yrs) = 26] and non-smokers [n = 95; young (18–30 yrs) = 69, old (60–80 yrs) = 26]. The study of young and old subjects provided us with a wider range of smoking consumption data and allowed us to determine if any putative effect of a 12 hour abstinence from smoking on heart rate variability was related to the extent of smoking in non smokers (by adjusting for smoking in an analysis of co variance). In addition, the 2 × 2 factorial design allowed us to ascertain age × smoking interactions, if any, on resting heart rate variability.

Subjects who had a history of asthma, diabetes, hypertension, any cardiovascular disease, weight loss over the preceding 3 months or who were on chronic medication were excluded. Cigarette consumption in smokers ranged from 6 months to 50 years, with an average consumption of 7 ± 7 (mean ± SD) cigarettes per day.

The experiments were carried out in the morning with the subjects fasted and with abstinence from smoking and caffeinated beverages for 12 hours. Written informed consent was obtained from all the subjects for the protocol, which was 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 subject lying supine. EGG (Lead II, Nihon Kohden RM-6000 Polygraph system, Japan) was recorded for 10–12 minutes and HRV was determined using the Fast Fourier Transform (5, 6, 7) in accordance with task force recommendations (8).

Table I indicates that while there were significant differences in resting HRV in the

TABLE I: Effect of smoking status on heart rate variability measures in young adults and old subjects.

Variables	*Smokers*		*Non smokers*		*Age effect 'P' value*	*Smoking effect 'P' value*	*Age x smoking 'P' value*
	Young adults (N=29)	*Old (N=26)*	*Young adults (N=69)*	*Old (N=26)*			
Age (years)	21 (20–23)	63 (61–70)	21 (19–23)	64 (60–70)			
Pack-years of cigarette smoking	1.10 (0.45–1.9)	12 (6–36.5)	NA	NA			
BMI (kg/m^2)	17.8 (16.7–21.6)	19.5 (18.1–22.8)	18.3 (17.1–21.3)	18.4 (17.2–20.3)	0.12	0.53	0.29
0.04–0.15 Hz	1000.8 (580.5–1719.3)	186.8 (88.8–298.7)	856.2 (562.5–1624.5)	179.1 (60.6–262.2)	0.00	0.72	0.06
0.15–0.4 Hz	1196.8 (502.5–2705.1)	153.4 (74.7–507.6)	891.52 (560.5–1870.5)	165.6 (68.1–262.5)	0.00	0.77	0.52
0–0.4 Hz	2906.1 (1879.9–5950.7)	697.6 (362.0–1086.7)	2529.0 (1669.2–4592.1)	686.2 (315.5–1136.3)	0.00	0.85	0.24
LF power nu	50.4 (34.4–73.3)	56.6 (37.1–75.5)	49.8 (34.6–62.4)	55.1 (34.8–77.3)	0.09	0.38	0.88
HF power nu	56.1 (37.9–69.8)	53.7 (41.0–68.8)	57.4 (46.1–70.3)	51.5 (31.8–71.2)	0.32	0.44	0.47
LF/HF ratio	0.89 (0.49–1.89)	1.06 (0.53–1.78)	0.84 (0.48–1.39)	1.07 (0.51–2.30)	0.14	0.45	0.38
Heart rate (bpm)	61.2 (56.8–71.6)	60.8 (54.4–68.5)	63.1 (59.0–67.8)	59.9 (53.5–64.4)	0.12	0.92	0.50

Values are median (interquartile range); $P<0.05$ is considered as significant; bpm, beats per minute; absolute power is in ms^2; nu, normalized for total power; NA, Not Applicable; Pack years, the number of packs of cigarettes smoked per day multiplied by the number of years the person has smoked.

low and high frequency range between young and old subjects in absolute terms, these differences disappeared when the HRV was normalized for total power. There was no difference in resting HRV between smokers who had abstained from cigarettes for 12 hours and non smokers, both before and after adjusting for smoking history (pack years).

In conclusion, our data indicate that resting HRV following cessation of smoking for 12 hours in young and old smokers is comparable to that of non smokers.

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REFERENCES

1. Hayano J, Yamada M, Sakakibara Y, et al. Short and long term effects of cigarette smoking on heart rate variability. *Am J Cardiol* 1990; 65: 84–88.
2. Narkiewicz K, van de Borne PJH, Hausberg M, et al. Cigarette Smoking Increases Sympathetic Outflow in Humans. *Circulation* 1998; 98: 528–534.
3. Grassi G, Seravalle G, Calhoun DA, et al. Mechanisms responsible for sympathetic activation by cigarette smoking in humans. *Circulation* 1994; 90: 248–253.
4. Niedermaier ON, Smith ML, Beightol LA, Zukowska-Grojec Z, Goldstein DS, Eckberg DL. Influence of cigarette smoking on human autonomic function. *Circulation* 1993; 88: 562–571.
5. Sucharita S, Bharathi AV, Kurpad AV, Vaz M. A comparative study of tests of cardiac parasympathetic nervous activity in healthy human subjects. *Physiol Meas* 2002; 23: 347–354.
6. Srinivasan K, Sucharita S, Vaz M. Effect of standing on short-term heart rate variability across age. *Clin Physiol & Func Im* 2002; 22: 404–408.
7. Vaz M, Bharathi AV, Sucharita S, Nazareth D. Heart rate variability and baroreflex sensitivity are reduced in chronically undernourished, but otherwise healthy, human subjects. *Clin Sci* 2003; 104: 295–302.
8. Task Force of the European society of cardiology and the North American society of pacing and electrophysiology. Heart rate variability, standards of measurement, physiological interpretation and clinical use. *Circulation* 1996; 93: 1043–1065.