

# Assessment of autonomic nervous system using analysis of heart rate variability in young smokers and non-smokers

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The effect of nicotine is complex and most of the research of the heart rate variability is done with tobacco in participants trying to cease smoking. Such studies are limited with desensitization of nicotinic receptors, emergence of abstinence symptoms, and the overall modified activation of the autonomic nervous system. The aim of this study is to show the effect of nicotine on young smokers and nonsmokers using descriptive and spectral analytical methods of the heart rate variability.

The research was conducted on 50 participants (m=23, f=27), average age of  $21.8 \pm 1.49$  years, who were divided into nonsmokers (n=26, m=11, f=15) and smokers (n=24, m=12, f=12). Smokers were smoking  $14.8 \pm 6$  cigarettes on average for  $4.77 \pm 2.19$  years. A baseline ECG lasting 100s was recorded, followed by chewing a gum containing 4 mg of nicotine, after which an ECG lasting 100 s was re-recorded. The ECG analysis was followed by the analysis of the heart rate variability using time domain and frequency domain methods. In order to show the effects of nicotine more precisely, the resulting changes ( $\Delta n$ ) were calculated as the difference between the final and initial values of variables, after which the changes ( $\Delta n = T2-T1$ ) were statistically compared between smokers and nonsmokers.

After the application of nicotine, a significant difference was observed in the changes of the average length of the RR intervals ( $p=0.01$ ) and the heart rate ( $p<0.01$ ) between smokers and nonsmokers. Within the spectral analysis, a significant difference was observed in the changes of the absolute value of the spectrum of low frequencies (LF,  $p<0.05$ ), the standardized values of high and low frequency spectra (LF (n.u.), HF (n.u.),  $p<0.05$ ) and the LF and HF ratio (LF/HF,  $p<0.05$ ).

The heart rate variability analysis proved to be a valuable indirect method for analyzing the autonomic nervous system. The obtained results confirm that the effect of nicotine significantly affects nonsmokers, reducing their heart rate variability and the parasympathetic tone, while increasing the heart rate and the sympathetic tone.

Keywords: heart rate variability, autonomic nervous system, nicotine, spectral analysis, ECG  
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