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# Human's Sensitive Reactions during Different Geomagnetic Activity: An Experimental Study in Natural and Simulated Conditions

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**Abstract :** This study considers the possible effects of geomagnetic activity (GMA) on humans situated on Earth by performing experiments concerning specific sensitive reactions in humans in both: natural conditions during different GMA and by the simulation of different GMA in the lab. The measurements of autonomic nervous system (ANS) responses to different GMA via measuring the heart rate variability (HRV) indices and stress index (SI) and their comparison with the K-index of GMA have been presented and discussed. The results of experiments indicate an intensification of the sympathetic part of the ANS as a stress reaction of the human organism when it is exposed to high level of GMA as natural as well as in simulated conditions. Aim: We tested the hypothesis whether the GMF when disturbed can have effects on human ANS causing specific sensitive stress-reactions depending on the initial type of ANS. Methods: The study focuses on the effects of different GMA on ANS by comparing of HRV indices and stress index (SI) of n= 78, 18-24 years old healthy male volunteers. Experiments were performed as natural conditions on days of low (K= 1-3) and high (K= 5-7) GMA as well as in the lab by the simulation of different GMA using the device of geomagnetic storm (GMS) compensation and simulation. Results: In comparison with days of low GMA (K=1-3) the initial values of HRV shifted towards the intensification of the sympathetic part (SP) of the ANS during days of GMSs (K=5-7) with statistical significance p-values: HR (heart rate, p= 0.001), SDNN (Standard deviation of all Normal to Normal intervals, p= 0.0001), RMSSD (The square root of the arithmetical mean of the sum of the squares of differences between adjacent NN intervals, p= 0.0001). In comparison with conditions during GMSs compensation mode (K= 0, B= 0-5nT), the ANS balance was observed to shift during exposure to simulated GMSs with intensities in the range of natural GMSs (K= 7, B= 200nT). However, the initial values of the ANS resulted in different dynamics in its variation depending of GMA level. In the case of initial balanced regulation type (HR > 80) significant intensification of SP was observed with p-values: HR (p= 0.0001), SDNN (p= 0.047), RMSSD (p= 0.28), LF/HF (p=0.03), SI (p= 0.02); while in the case of initial parasympathetic regulation type (HR < 80), an insignificant shift to the intensification of the parasympathetic part (PP) was observed. Conclusions: The results indicate an intensification of SP as a stress reaction of the human organism when it is exposed to high level of GMA in both natural and simulated conditions.

**Keywords :** autonomic nervous system, device of magneto compensation/simulation, geomagnetic storms, heart rate variability
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