Letter to the Editor

A 100 km Run Does Not Induce Persistent Predominance of Sympathetic Activity During 24-Hour Recovery in Amateur Male Athletes

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High intensity exercise can lead to a marked shift in the autonomic balance towards sympathetic predominance lasting for many hours after exercise cessation.[1,2] Previous studies analyzing this effect included professional athletes. The aim of this study was to verify the effect of a long-lasting run on the autonomic nervous system (ANS) activity in amateur athletes (taking physical activity according to their own regimen and without comprehensive monitoring). The research protocol was approved by the Independent Review Board of Gdansk Medical University. Written informed consent was obtained from all participants.

The study included 17 healthy amateur, volunteer, male athletes (aged 42 ± 15 years), taking part in a 100 km run on a flat route. The participants practiced long distance running recreationally, which distinguished them from professional athletes. However, all athletes used a similar training regimen: training sessions were not regular (especially during summer, where running training was replaced with swimming or cycling), included 50-90 km per session, and were performed 5-6 times per week. There was no special preparation for competitions or any comprehensive monitoring of training sessions.

All examined athletes ran the 100 km distance in an average time of 614 ± 45 minutes (range 567-692 minutes). The assessment of ANS activity (10-minute recording of systolic arterial pressure and heart period) was performed twice: the day before and the next day after the event in the same order, between 8 a.m. and 2 p.m.[3,4] No statistically significant difference were observed between the two recordings (Table 1).

To the best of our knowledge, our study is the first to analyze the effect of a 100 km run on ANS parameters in amateur athletes. It should be emphasized that this kind of exertion is less popular in contrast to the widely practiced marathon run. The marathon can lead to a persistent shift in the ANS towards sympathetic predominance,[2,5] which can persist even up to 48 hours in amateur athletes,[6] while a 100 km run did not induce persistent changes. One possible reason behind the differences between a 100 km run and a marathon run is the type of exercise associated with these two disciplines. Marathon running, although considerably shorter, represents

Table 1. Mean HP, BRS and HRV parameters on the day before the competition (Recording 1) and the day after (Recording 2). Data are expressed as mean ± standard deviation.

	Recording 1	Recording 2	p
Mean HP (ms)	1284 ± 197	1229 ± 201	0,7
BRS (ms/mmHg)	14.6 ± 11.6	14.9 ± 10.5	0,9
SDNN (ms)	53 ± 20	56 ± 25	0,8
RMSSD (ms)	43 ± 23	46 ± 31	0,6
pNN50 (%)	21 ± 22	25 ± 23	0,6
LFnu (NU)	66 ± 19	69 ± 17	0,6
HFnu (NU)	34 ± 19	31 ± 17	0,9
LF/HF	3.1 ± 2.6	3.2 ± 2.0	0,4

HP – heart period; BRS – baroreflex sensitivity, ms/mmHg. Heart rate variability (HRV) parameters: SDNN – standard deviation of the average R-R intervals of the sinus rhythm; rMSSD – square root of the mean squared difference of successive R-R intervals; pNN50 – proportion of successive R-R intervals that differ by more than 50 ms; LFnu – relative spectral power in low-frequency range (0.04-0.15 Hz); HFnu – relative spectral power in high-frequency range (0.15-0.4 Hz); NU – normalized units.

markedly more intense exercise, with one kilometer usually covered every 4.5-5.5 minutes on average. Such speeds are associated with higher body load—a possible explanation of why the signs of adrenergic ANS activation persist after completing such exercise. In contrast, a 100 km run is associated with lower intensity, ranging between 5.5 and approximately 7 minutes per 1 km. Running instructors agree that such exercise can be performed for extremely long periods of time, even in the case of individuals lacking special preparation, such as the participants of this study. From the sport point of view, the body is not exploited too extensively during running with such intensity, as was confirmed by the results of our study.

It is important to note that this study involved amateur athletes. Such athletes differ from professional sportsmen in terms of their lower level of technical skill as well as the organization and intensity of training.[7] Moreover, professional sportsmen are usually monitored comprehensively during training and competition. In contrast, amateur sportsmen are not subjected to such monitoring. Consequently, our findings suggesting the lack of clinically unfavorable signs of persistent adrenergic activation are particularly valuable, because they confirm the safety of this type of exercise for amateur athletes. One limitation is that only men were included in the study, as there was a lack of female volunteers.

In conclusion, a 100 km run performed by amateur male athletes does not appear to lead to a persistent unfavorable shift in the autonomic balance towards sympathetic predominance. This study requires further analysis to estimate whether individuals involved in amateur sports that set personal goals requiring overcoming a higher load, such as participating in a long-distance running competition, should rather choose exercise of longer duration and lower intensity, as it involves a lesser degree of exploitation of the body.

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