



# **THE VERIFICATION OF REGENERATIVE EFFECTS OF THE HHP ANDULLATION THERAPY SYSTEM**

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## THE VERIFICATION OF REGENERATIVE EFFECTS OF THE HHP ANDULLATION THERAPY BED

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The objective of the study was to verify the acceleration of regenerative processes after a repetitive maximum sports performance. The performance parameter was the time achieved. Other parameters assessing the organism's fatigue level were biochemical parameters (see design of study), the heart rate during and after the exertion and its variability, while the subjective perception of fatigue was assessed using the Borg Scale of Perceived Exertion.

14 probands, who were randomly subdivided into two blinded groups, participated in the survey. The design of the study is presented in Table 1.

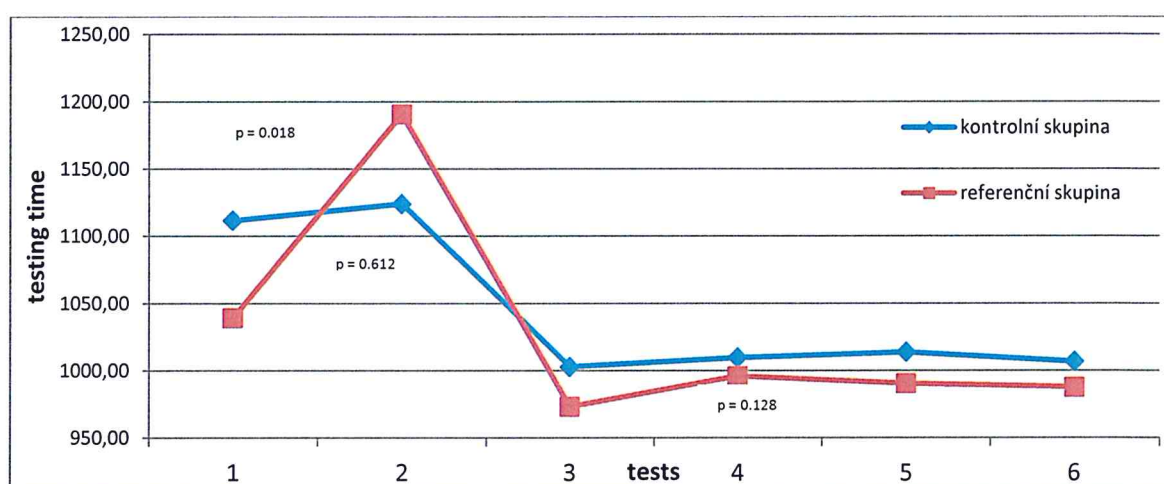
	ráno	dopoledne	odpoledne	večer
PO (V)	●●●○	●●●○ X (13)	●●●○ X (13)	X (2)
PO (E)	●●●○	●●●○	●●●○	
ÚT (V)	●●○	●●●○ X (13)	●●●○ X (13)	X (2)
ÚT (E)	●●○	●●●○	●●●○	
ST (V)	●●○	●●●○ X (13)	●●●○ X (13)	X (2)
ST (E)	●●○	●●●○	●●●○	
ČT (V)	●●●○	X (5) ●		
ČT (E)	●●●○	●		

Note: PO – Monday; ÚT – Tuesday; ST – Wednesday; ČT – Thursday; V – reference group (blinded); E – control group (blinded); X (13) programme 13 of the andullation bed; X (2) programme 2 of the andullation bed; X (5) programme 5 of the andullation bed;

●	Heart rate variability test
○	Blood sampling: urea, ALT, CK
○	Blood samplings: AST, GL, Creatinine, Bilirubin, GMT
●	Treadmill exercise stress test to exhaustion (performance = time achieved in the accelerated test)
○	Blood sampling: LA, BE (5 <sup>th</sup> min)
○	Blood sampling: LA, BE (12 <sup>th</sup> min)
○	Blood sampling: LA, BE (20 <sup>th</sup> min)

## Research results

The results presented in the chart (Chart 1) analyzing the average performance of both groups during the whole testing imply that the group of athletes using the bed showed a statistically significant increase in the performance ( $p = 0.018$ ) in the afternoon of the first day (2), while there was no performance increase in the control group ( $p = 0.612$ ). On the second day of testing, there was again an afternoon improvement in the performance of the group using the bed, but this improvement was not statistically significant ( $p = 0.128$ ). No statistically significant differences were manifested in the comparison between both groups, which, however, could be caused by the different initial performance of both tested groups.

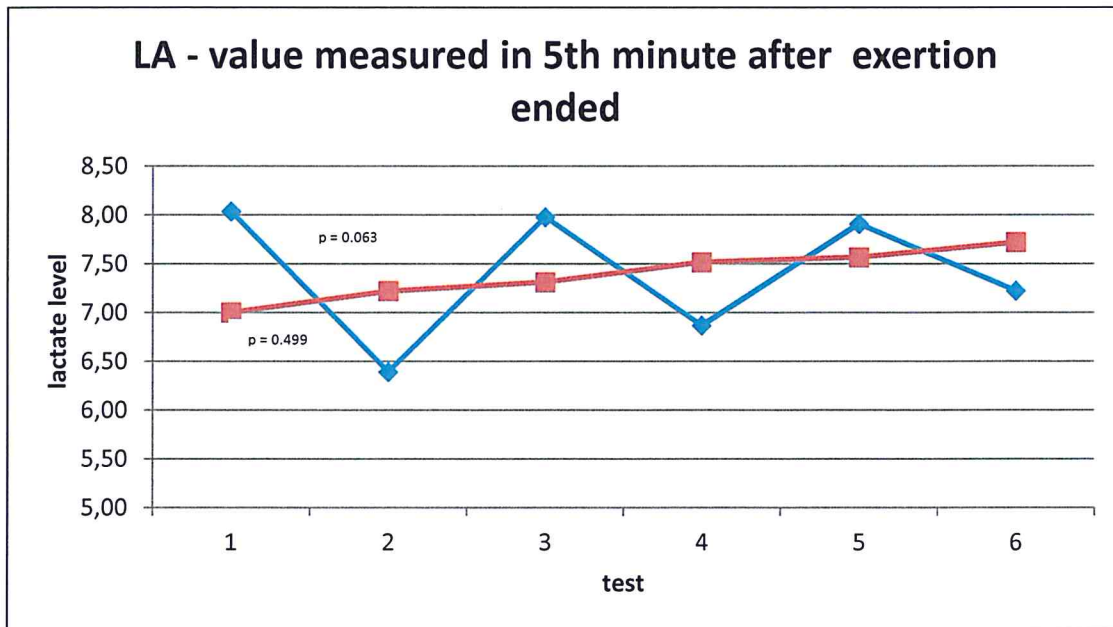


Kontrolní skupina: control group

Referenční skupina: reference group

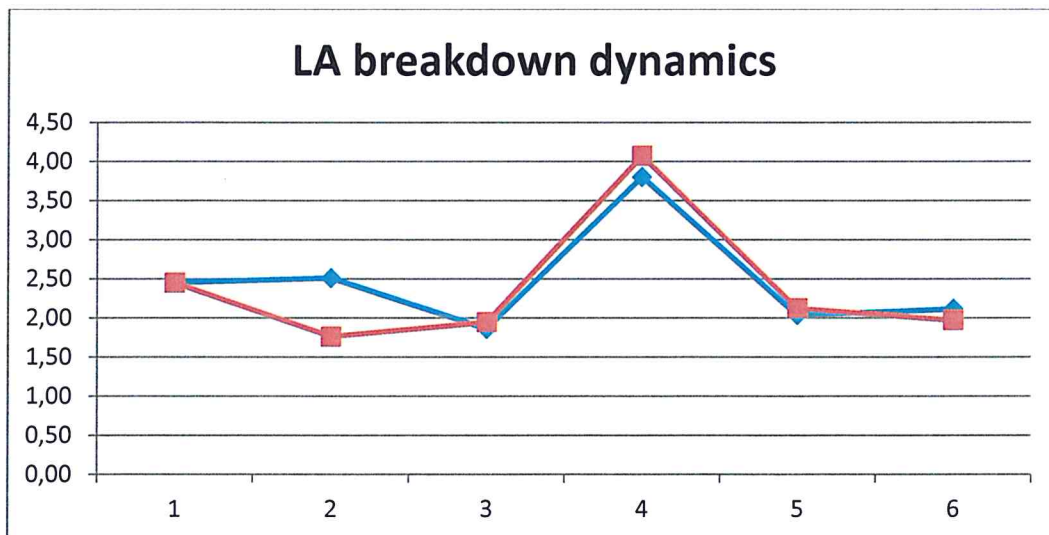
Note. The chart displays average values for both groups, the data were statistically processed using the Wilcoxon Test.

The blood lactate concentration analysis produced some interesting findings. Whereas the values reached (from samplings in 5<sup>th</sup>, 12<sup>th</sup> and 20<sup>th</sup> minute) in the group using the bed were stable during the tests, the control group showed signs of fluctuations occurring always after the afternoon test. There was a drop in the maximum blood lactate concentrations reached in the control group by 20.5% in the afternoon of the first day, but the statistical significance at a level of 0.05 could not be manifested ( $p = 0.063$ ). No such changes occurred on the following days any more. Statistically significant differences from the comparison of both groups were not manifested either, which, however, could have been caused by different initial values as was the case of the performance of both tested groups.

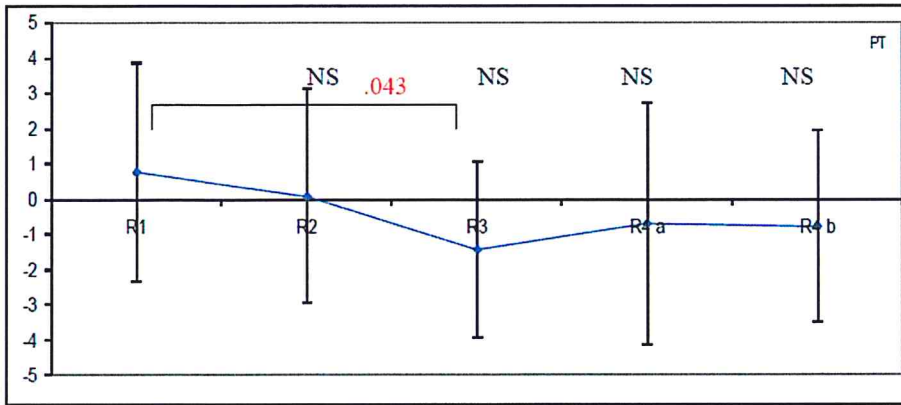


Note. The chart displays average values for both groups, the data were statistically processed using the Wilcoxon Test.

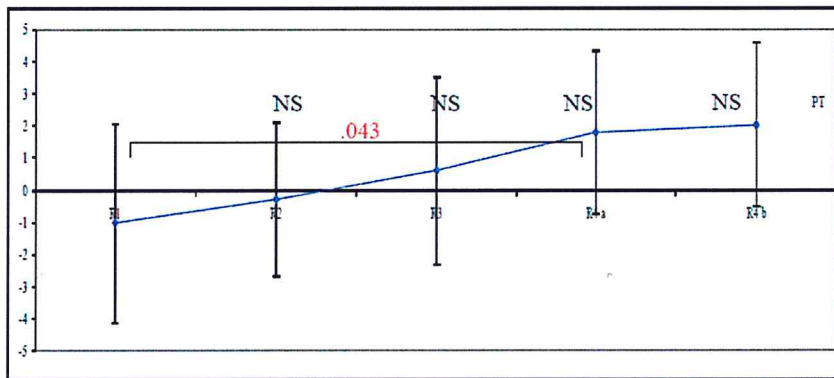
Similar results were also found for BE where the breakdown dynamics remained very similar in both groups (Chart 3).



Differences were also identified in the assessment of the total spectral performance, which got worse ( $p = 0.043$ ) in the control group (Chart 4), but, on the contrary, improved ( $p = 0.043$ ) in the reference group (Chart 5).



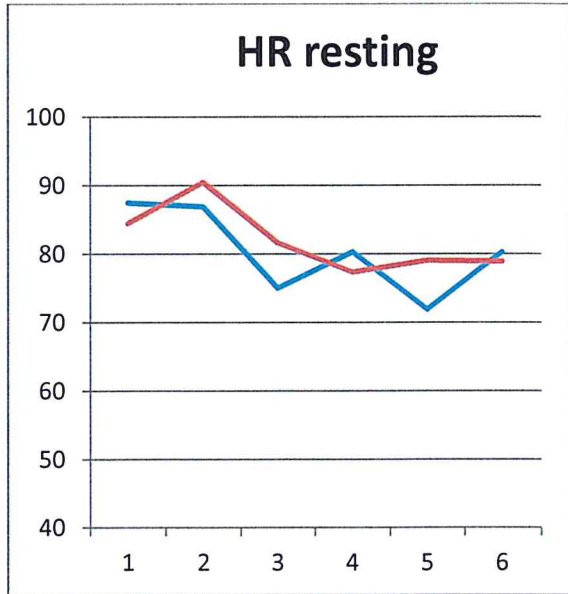
R1 – vstupní měření, R2 – druhý den; R3 – třetí den; R4 a – R4 b: porovnání posledních dvou vyšetření čtvrtý den  
Wilcoxon test



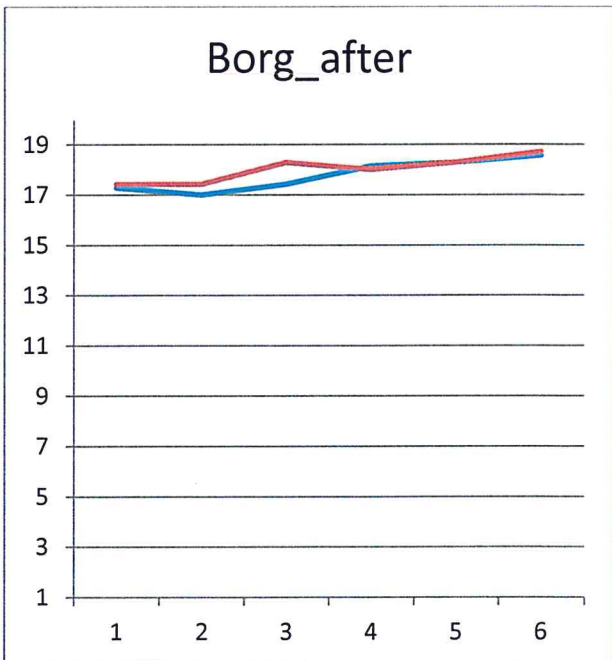
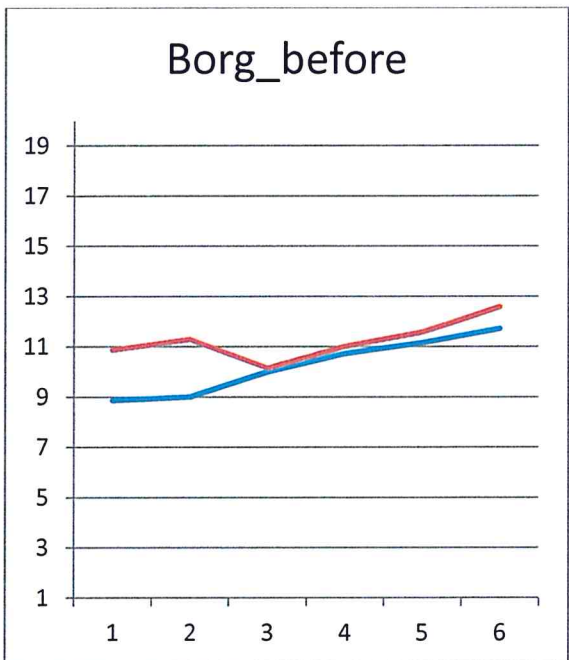
R1 – vstupní měření, R2 – druhý den; R3 – třetí den; R4 a – R4 b: porovnání posledních dvou vyšetření čtvrtý den  
Wilcoxon test

Note: R1 – initial measurement; R2 – second day; R3 – third day; R4 a – R4 b: comparison of the last two examinations on the fourth day, Wilcoxon Test

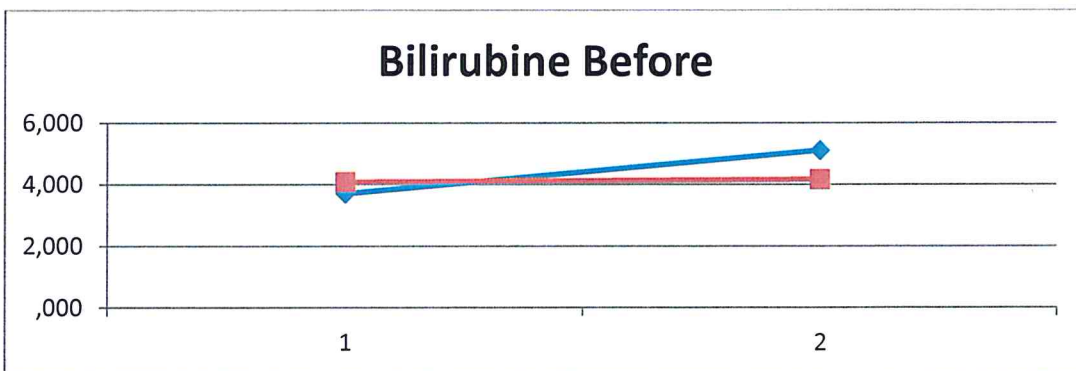
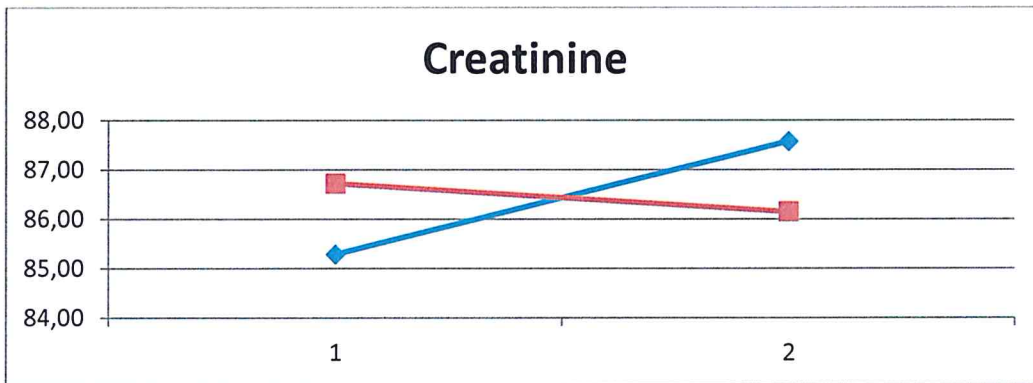
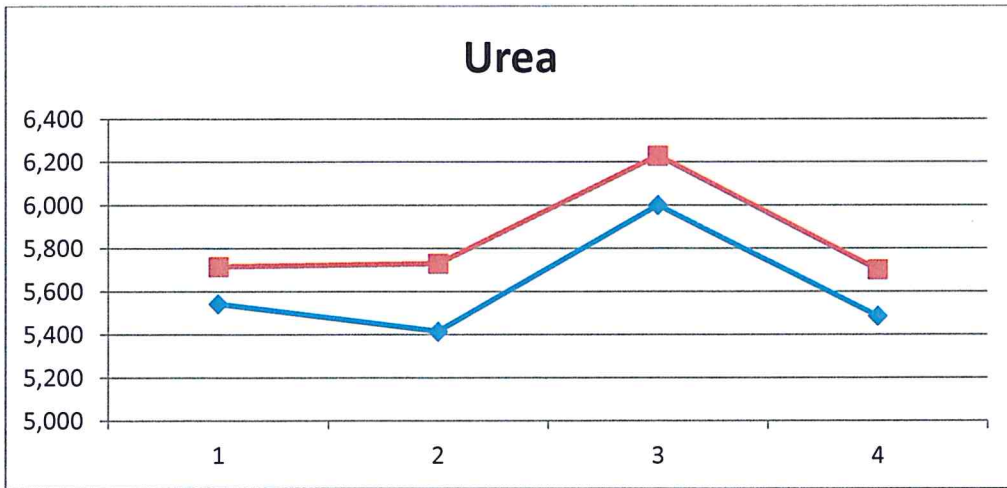
Analyzing the relevant change in the heart rate (resting HR before the test, relaxing after exercise – 60s), no inter or intra individual changes were manifested in either group.

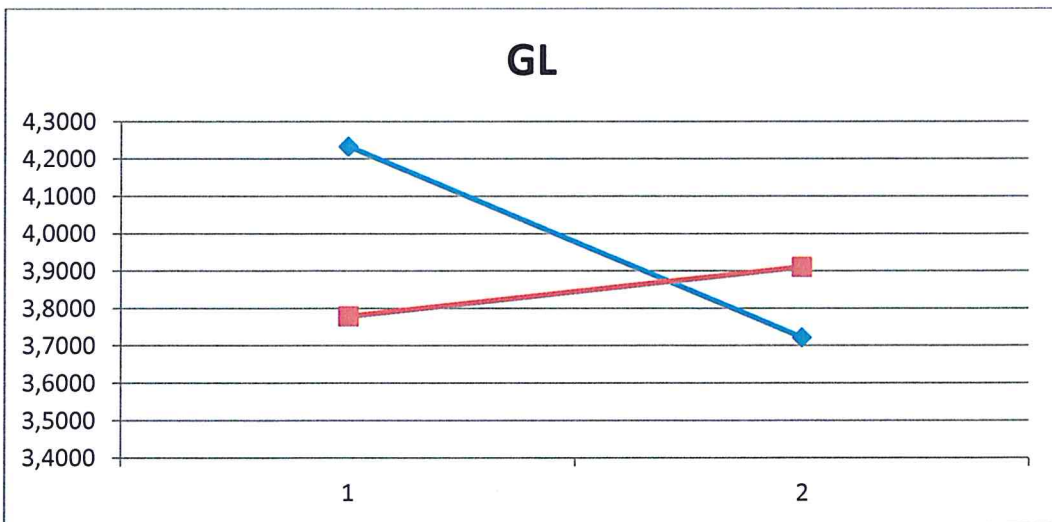
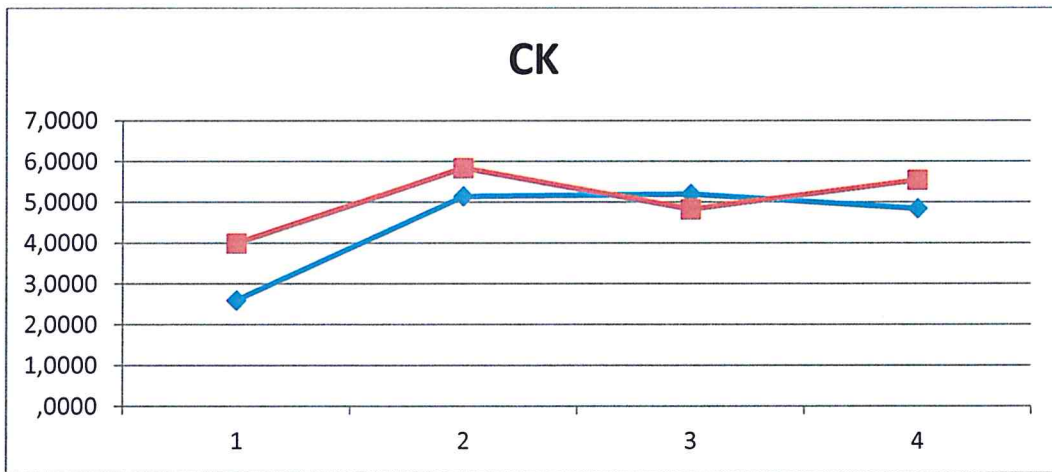
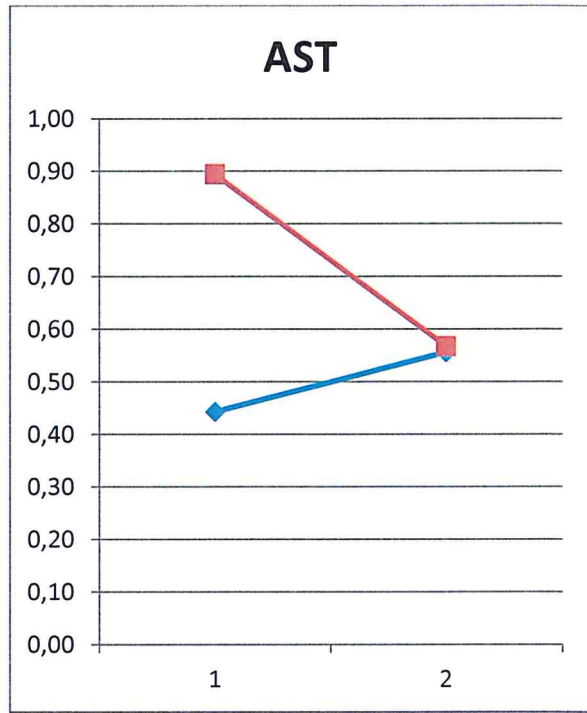
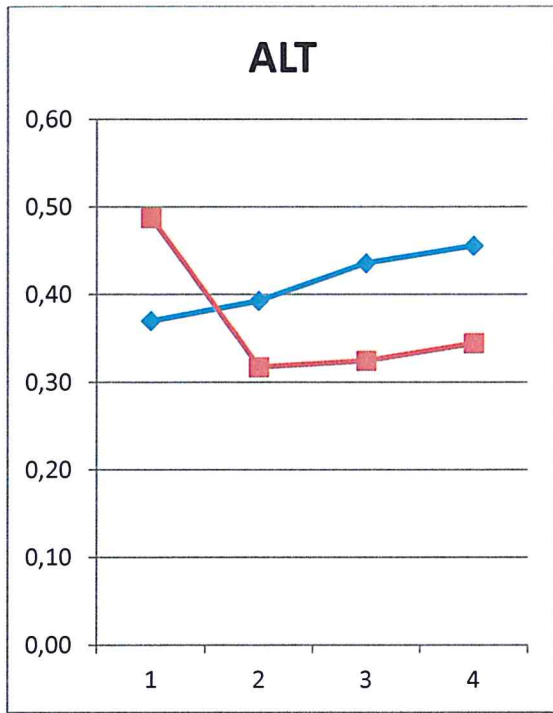


Analyzing the relevant change in the subjective perception of fatigue using the Borg Scale of Perceived Exertion (before and after performance), no inter or intra individual changes were manifested in either group.



Analyzing the other biochemical parameters, no more inter or intra individual changes were manifested.







Conclusions: Several pieces of interesting information were found during the survey.

- The performance of the group of athletes using the bed showed a statistically significant improvement ( $p = 0.018$ ) on the first day in the afternoon (2), while there was no improvement in the performance of the control group ( $p = 0.612$ ). On the second day of testing, there was again an afternoon improvement in the performance of the group using the bed, but this improvement was not statistically significant ( $p = 0.128$ ).
- Whereas the blood lactate concentrations reached (in samplings in 5<sup>th</sup>, 12<sup>th</sup> and 20<sup>th</sup> minute) in the group using the bed were stable during the whole testing, the control group showed signs of fluctuations occurring always after the afternoon test. The statistical significance at a level of 0.05, however, could not be manifested ( $p = 0.063$ ).
- Differences were also found in the assessment of the total spectral performance, which got worse ( $p = 0.043$ ) in the control group (Chart 4), but, on the contrary, improved ( $p = 0.043$ ) in the reference group (Chart 5).

In these respects, it may be said that the andullation therapy bed affected the performances and the current condition of the probands who used it. No changes were manifested in the other analyzed parameters.