

Influence of Training Loads on nocturnal Heart rate variability of healthy young students

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For those student athletes who undergo the intense training while pursuing their academic studies, it is extremely important, but difficult as well, to retain the function of parasympathetic nerves and to take a good rest and make a quick recovery.

PURPOSE

To examine the suitable indices of **Heart rate variability (HRV)** to prevent overtraining and to evaluate athlete student's daily condition. It will be also tested if recent training load or physical activities give any influence on HRV of young students.

METHODS

The Autonomic Nervous activity entering the heart was analyzed in following conditions

- 1) HRV for 5 minutes direct after awaking was measured in 6 long-distance runners at different training terms. (Subjects: Age 19.2yr, Height 163cm, Weight 51kg, HR at rest 49bpm on average, Aside from NM, their career in competitive sport is at least more than 8 years.)
- 2)-1. Nocturnal HRV was measured in 4 Lacrosse players at different training periods. (Subjects: Female student players in age 19~21yr.)
 - 2. For comparison, HRV in 10 healthy students of the same age was also measured in same way. (Subjects: 6 female & 4 male healthy students not engaged in regular physical training)
 When measuring on non-exercise days, they were asked not to drink any alcohol or do not engage in any special activities on previous day of measurements.
- 3) Nocturnal HRV of 2 male soccer players were repeatedly measured 10 times/year at different training terms. (Subjects: Age 21yr. Their career as soccer player is at least more than 10 years)

HRV analysis

Sympathetic nervous activity $HR \uparrow$ $L/H \uparrow$
Parasympathetic nervous activity $SD1 \uparrow$ $pNN50 \uparrow$ $HFnu \uparrow$
 $SD1$ = Deviation of the scatterogram plot in the "short" direction.
 $HFnu$ = $(HF/(LF+HF)) =$ Normalized Unit

Devices

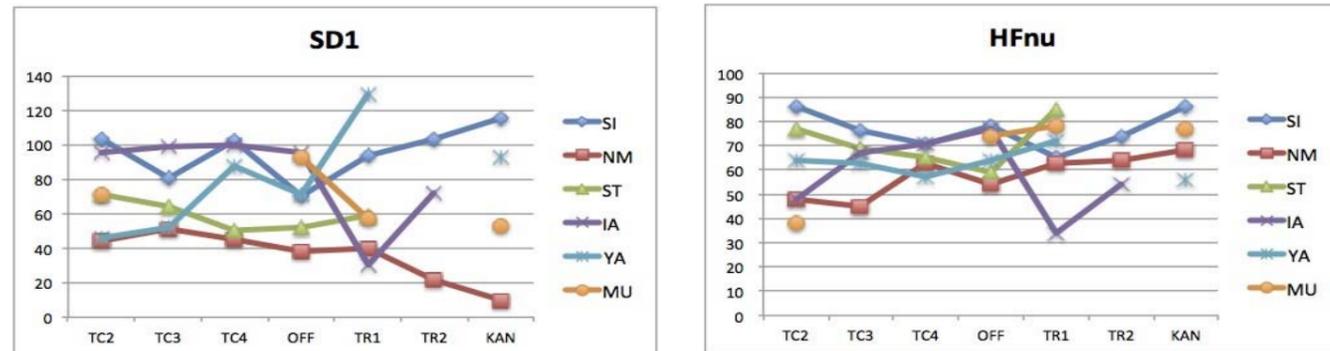
- 1), 2) Polar RS800CX 3) CamNtechHR4

Statistics

Data were analyzed by one-way ANOVA and then differences among means were analyzed using Bonferroni/Dunn. Student's t-test was used in comparison between 2

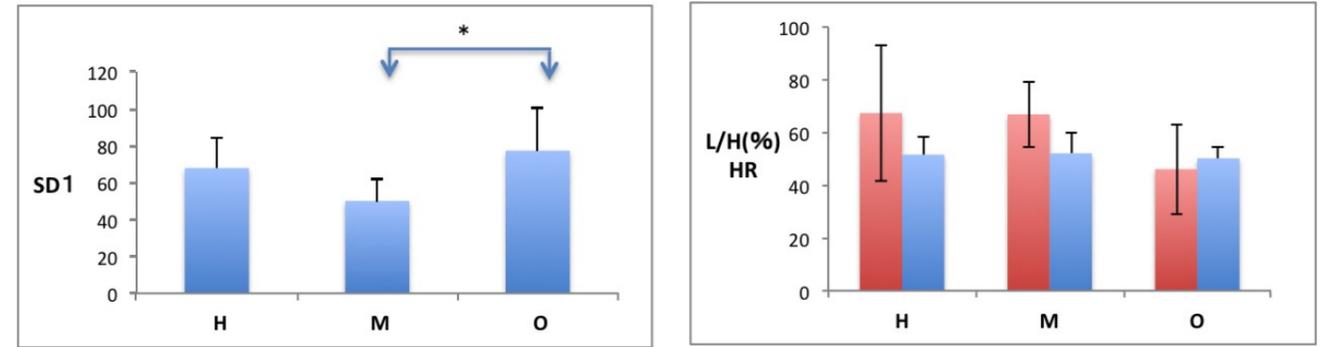
RESULTS

Fig.1 1) Changes of [SD1], [HFnu] at different training terms



Abbreviations: TC, Training camp; OFF, Rest; TR, Training on Campus; KAN, day after race.
 ★Relatively good performances were observed in Subj. SI, YA

Fig.2 2)-1 HRV indices in comparison with training load of previous day (Values are mean ±SE)



Abbreviations: H, intensive training 2 times a day; M, moderate training 1 time a day; O, No practices (*p < 0.05)

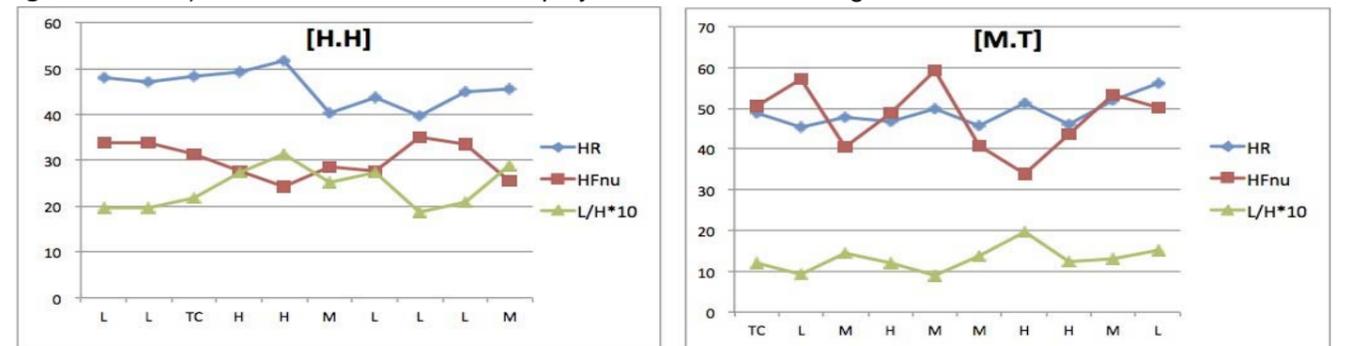
Tab.1 2)-2 Comparison of data from L.Players and H.Students

	L.players *		H.Students **		p value
	mean	SD	mean	SD	
HR(/min.)	50.2	4.0	59.6	6.2	p=0.001
SD 1	75.5	23.2	64.9	15.7	ns
pNN50(%)	29.9	5.2	21.2	6.0	p=0.003
L/H	47.6	16.6	102.9	49.9	p=0.03

*Lacrosse players(Training-off periods) ** Healthy students without a habit of physical training

★Athlete students shows lower sympathetic nervous activity at rest than non-athlete students

Fig.3 3) Nocturnal HRV of 2 Soccer players at different training terms



Abbreviations: L, Trainingload low; TC, Training camp; H, Trainingload high; M, Mental stress(examination)
 ★Individual large fluctuation / In case of long-term decreases of HFnu, attention must be paid

CONCLUSION

These results suggest that **the repeated measuring of HRV** would be an objective indicator for monitoring young athletes' condition throughout the year. But more detailed research is necessary **to prevent their physical disturbance in advance**. The significant change of physiological data preceding their subjective sense of fatigue should be proven, for instance.