

Sleep Related Recovery in Athletes: The Role of Heart Rate Variability Parameters

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INTRODUCTION

Sleep is vital for athletes' musculoskeletal recovery, skills learning and emotional balance. Insufficient sleep is related to performance deterioration. Heart rate variability (HRV) analysis upon waking up is widely used as a recovery measure in athletes. We aimed at evaluating sleep HRV parameters as a measure of recovery in athletes.

METHODS

Observational study of sleep HRV in athletes who monitored their sleep by means of a mobile application (SleepRate) and a heart rate sensor (Polar H7) was performed.

- 58 professional athletes (AT)
- 57 age-matched control individuals from the general population (GP).

460 nights were analyzed. Sleep analysis was performed using an HRV-based validated algorithm.



The HRV parameters evaluated were:

- RMSSDavg: the average root-mean square differences of successive RR intervals (RMSSD) over the whole night.
- RMSSDlast5: the RMSSD for the last 5 minutes of the recording.

The variability and differences between these two parameters were further studied in 386 recordings of 9 athletes who recorded more than 20 nights each.

RESULTS

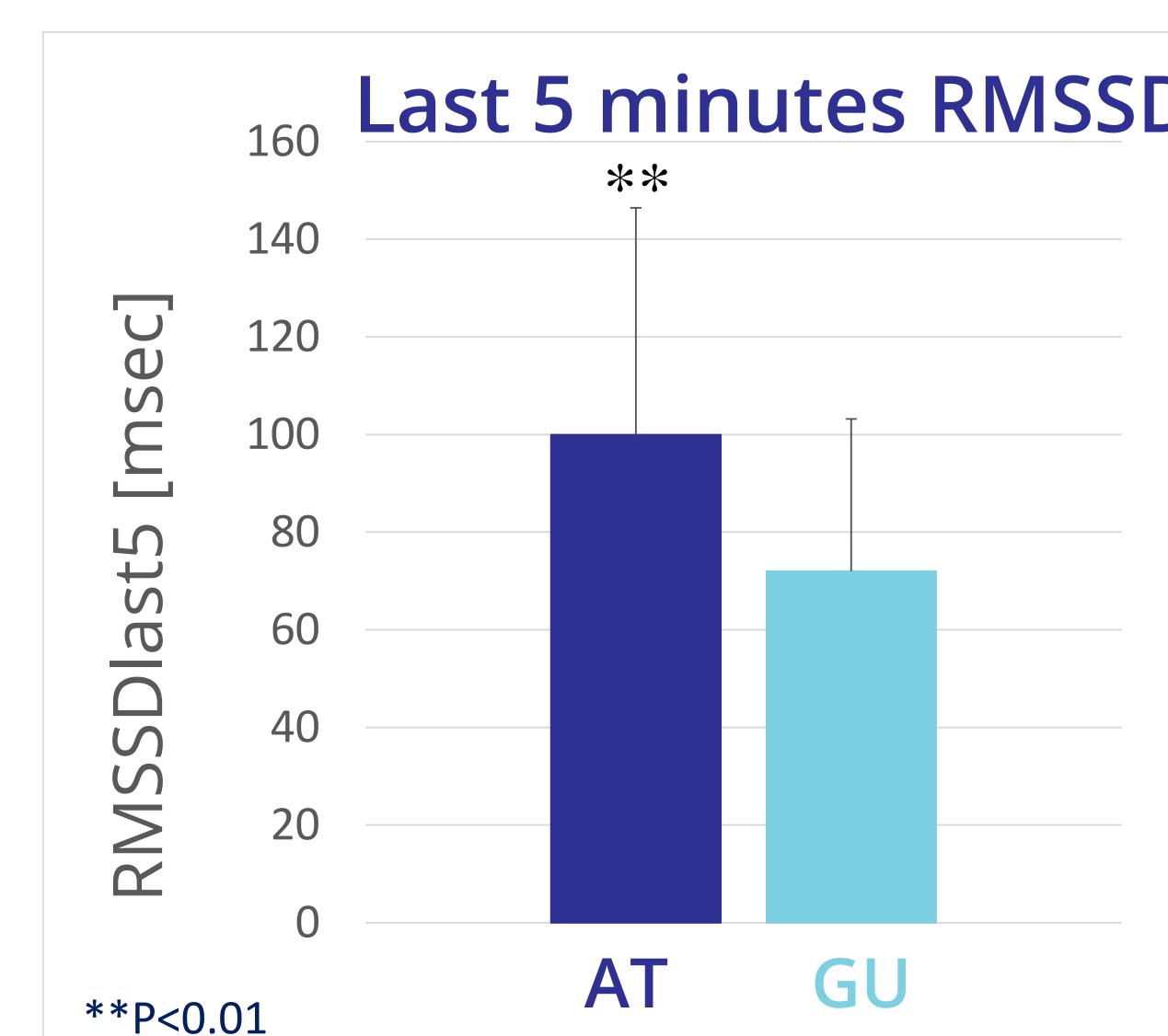
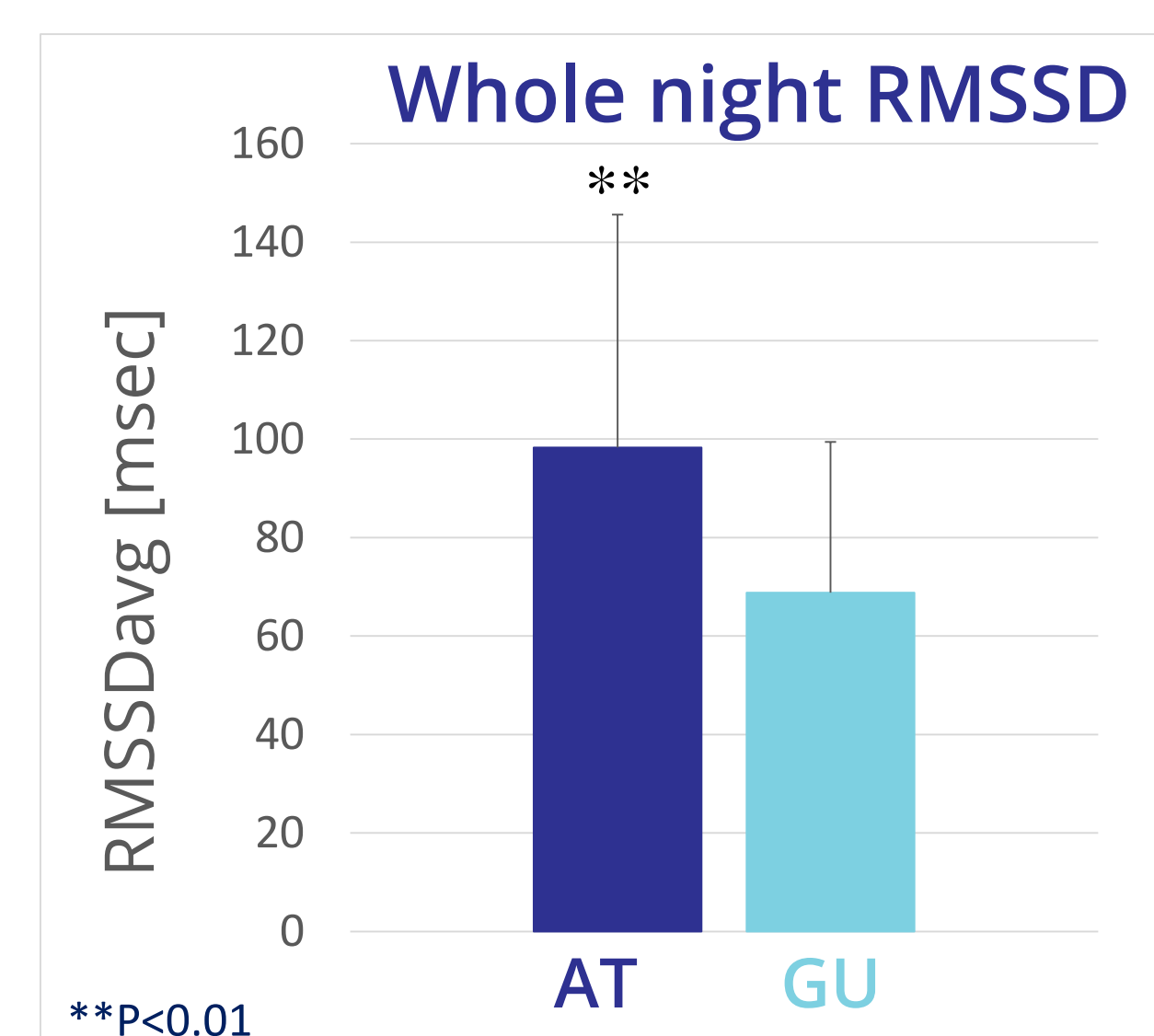
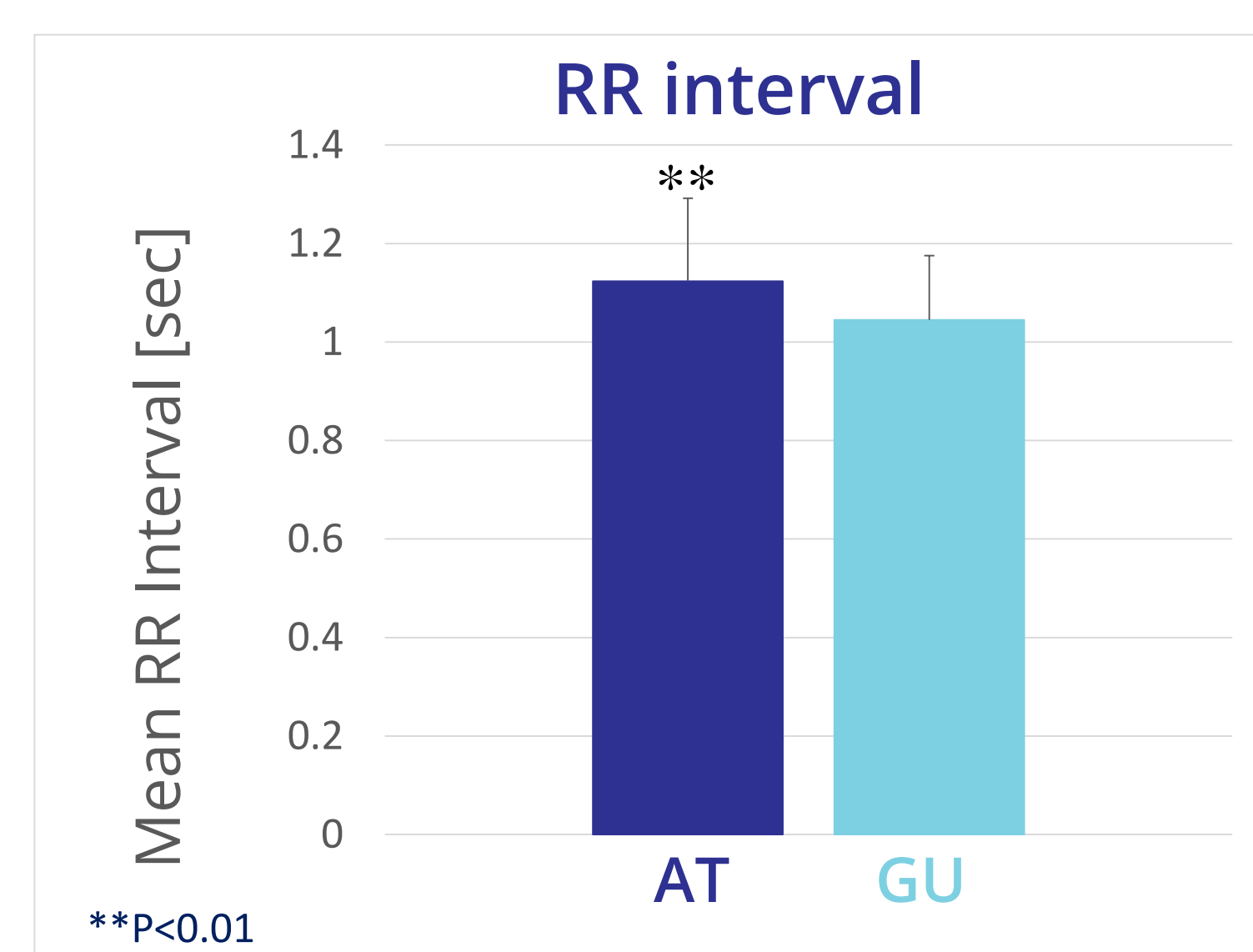
The sleep of athletes compared with the controls shows:

- Longer time in bed
- Longer total sleep time
- No other difference in sleep parameters

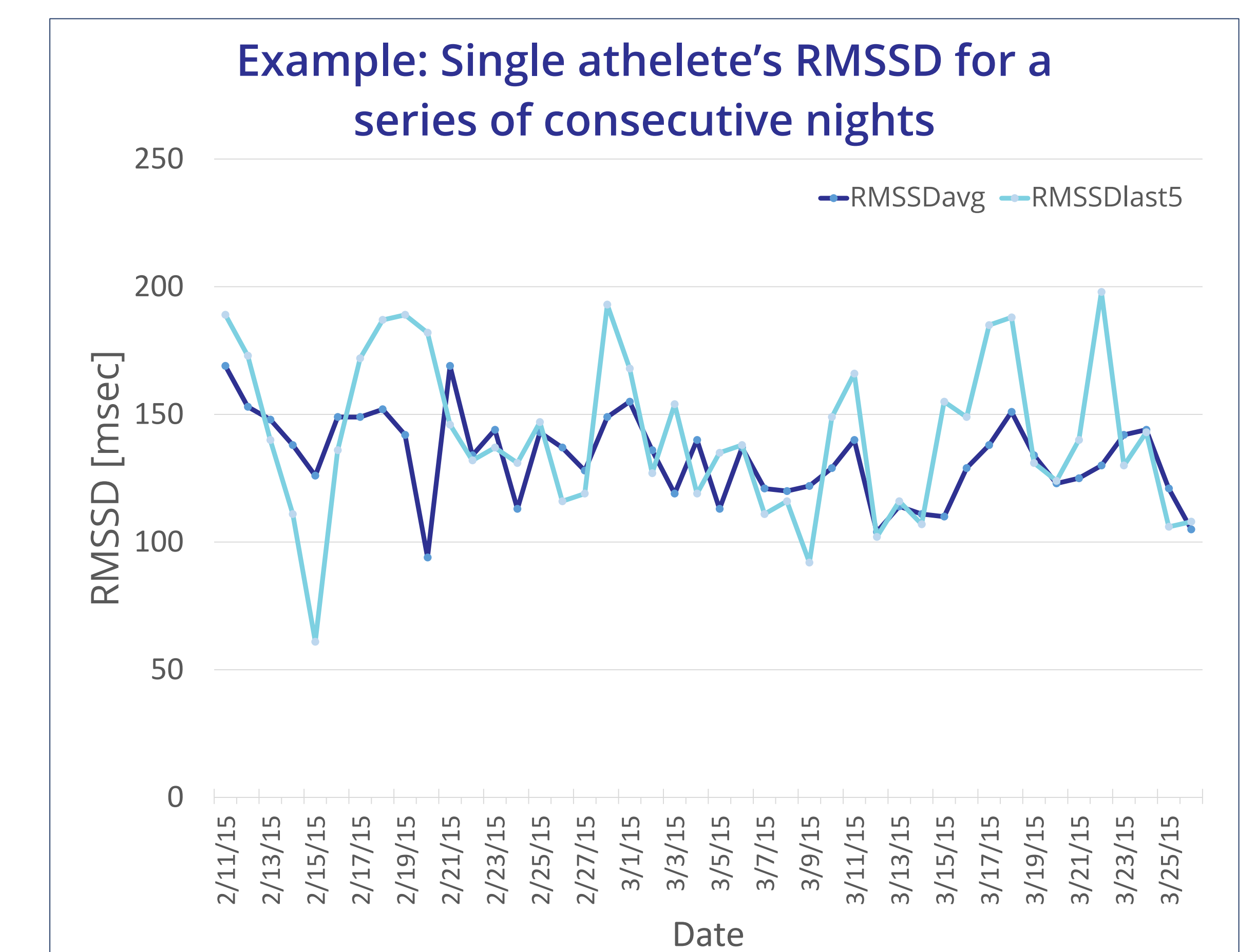
Sleep Data	AT	GU	P-Value
Total time in bed [min]	487.8 ± 50.5	451.3 ± 52.7	P < 0.001
Total sleep time [min]	417.0 ± 44.7	383.4 ± 47.4	P < 0.001
Sleep latency [min]	18.4 ± 8.1	19.6 ± 7.6	NS
WASO [min]	52.4 ± 18.8	48.3 ± 15.5	NS
Sleep efficiency [%]	85.7 ± 4.1	85.1 ± 3.7	NS

Heart rate parameters in athletes show:

- Higher mean RR interval (Lower mean heart rate)
- Higher values of HRV parameters:
 - RMSSDavg
 - RMSSDlast5



In addition, RMSSDavg displayed significantly lower variability compared to RMSSDlast5, with lower standard deviations within subjects. The absolute difference between RMSSDavg and RMSSDlast5 was greater than 30% of RMSSDavg in 20% of the nights.



CONCLUSION

- Total sleep time was longer in athletes, most probably due to their high awareness of the importance of sleep for recovery and performance.
- Athletes had higher RMSSD parameters, reflecting a higher parasympathetic activity, related to an increased fitness status.
- The high variability in RMSSDlast5 is due to the effect of wakefulness at the end of the night.
- Thus, we suggest to consider the RMSSDavg as the preferred measure of recovery across multiple nights.

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