



Sleep habits, quality and chronotypes of Paralympic athletes in the preparation for Tokyo 2020 Games

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Sleep is a vital pillar of an athlete's health



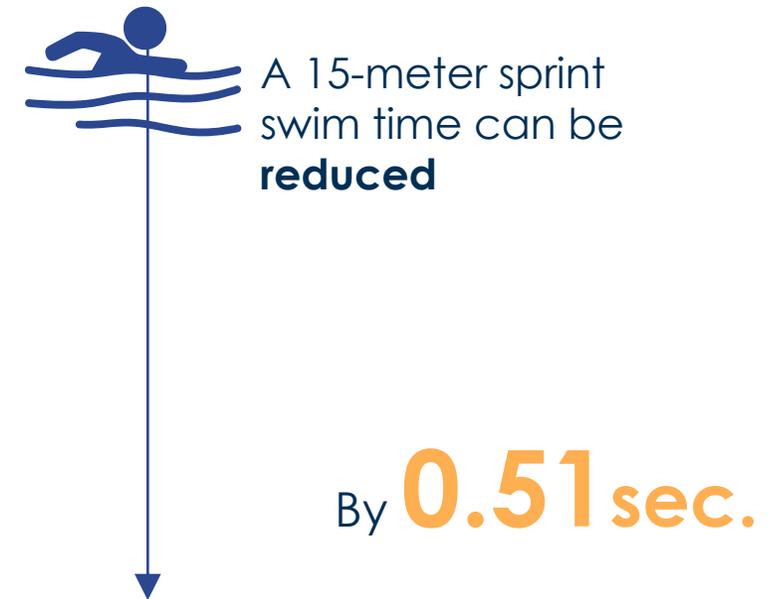
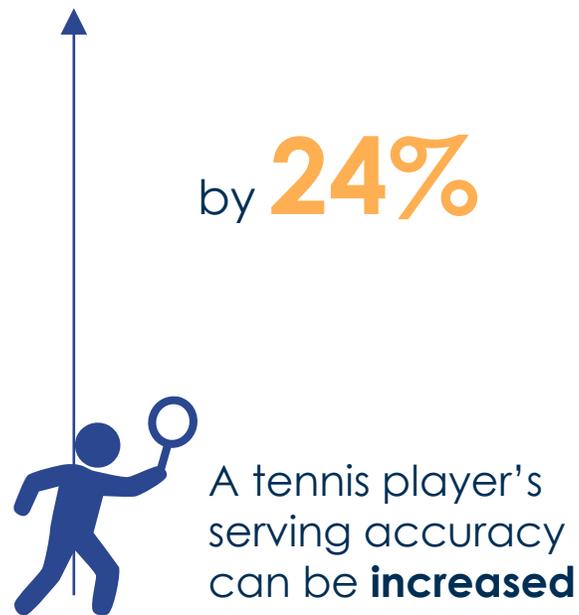
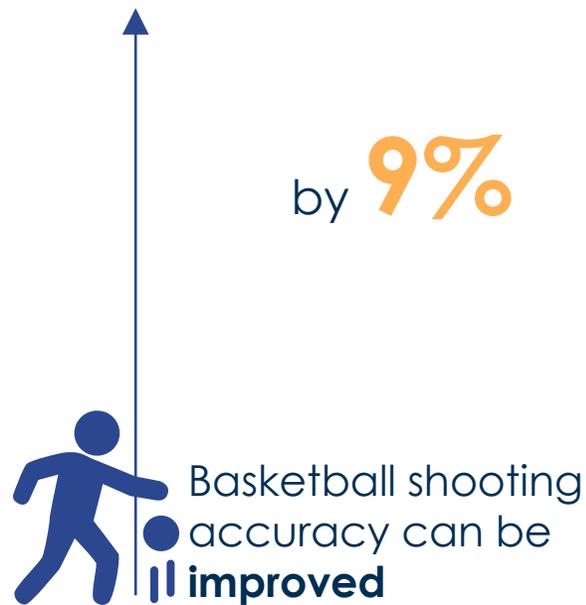


Sleep in Athletes

- Both athletes and coaches rate sleep as critical to optimal performance, yet only a few studies have investigated the sleep quality and quantity of the athletic cohort
- Some authors suggest athletes should sleep between 9 and 10 h, whilst others recommend that 7–9 h is enough for healthy adults
- Recent evidence suggests that athletes sleep far less than either of these recommendations [Sargent C, Halson S, Roach GD. Sleep or swim? Early-morning training severely restricts the amount of sleep obtained by elite swimmers. *Eur J Sport Sci.* 2014;14:S310–5.]
- Although sport scientists and researchers are aware of the negative effects of sleep loss on athletic performance, such knowledge needs to be supplemented with sufficient understanding of sleep's role in recovery, and possible sleep hygiene strategies to overcome these issues

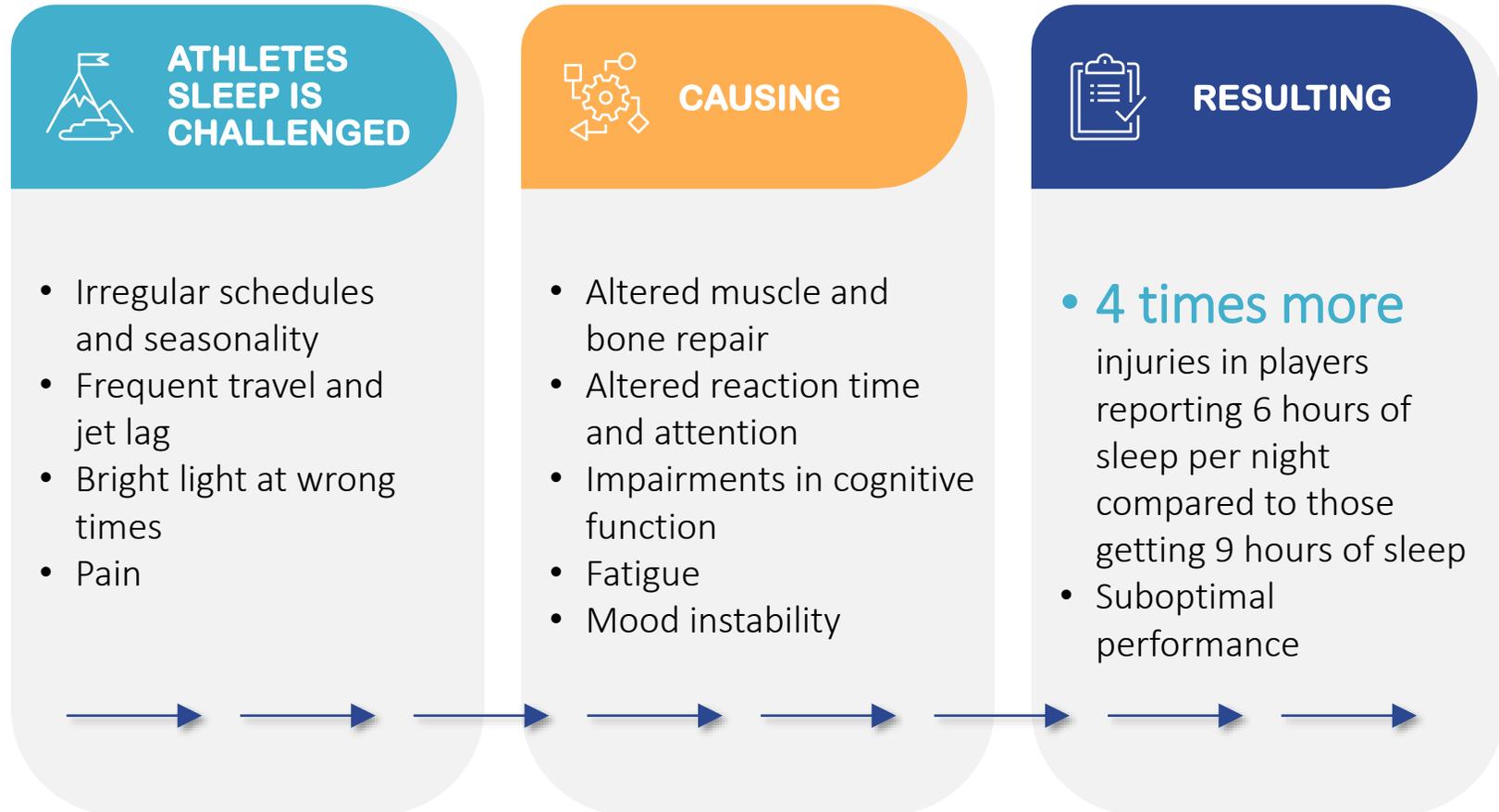
Sleep is a differentiator in performance

When optimal sleep opportunity is provided



Mah, C.D., Mah, K.E., & Dement, W.C. 2008. Extended sleep and the effects on mood and athletic performance in collegiate swimmers. *Sleep*
Mah CD, Mah, K.E., Dement, W.C. 2009 Athletic performance improvements and sleep extension in collegiate tennis players. *Sleep*
Mah, C.D., et al. 2011. The effects of sleep extension on the athletic performance of collegiate basketball players. *Sleep*

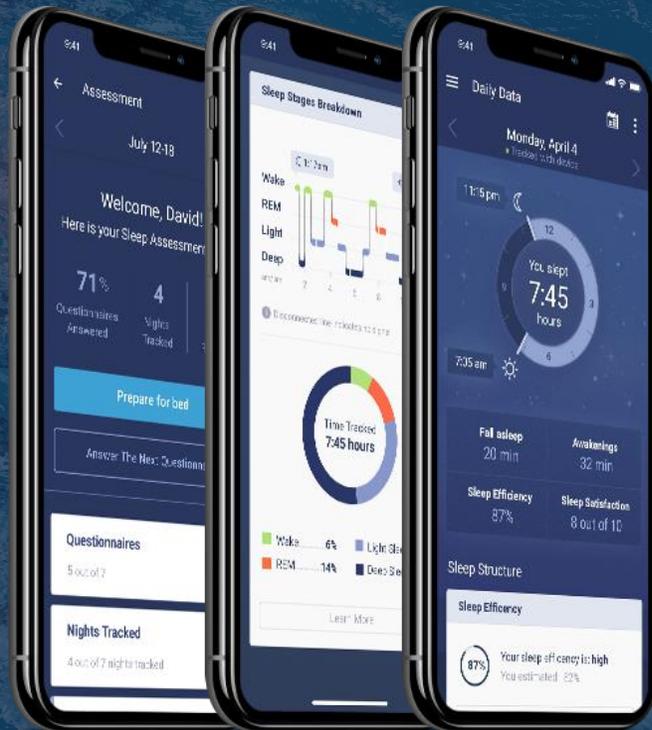
Better sleep reduces the risk of injuries



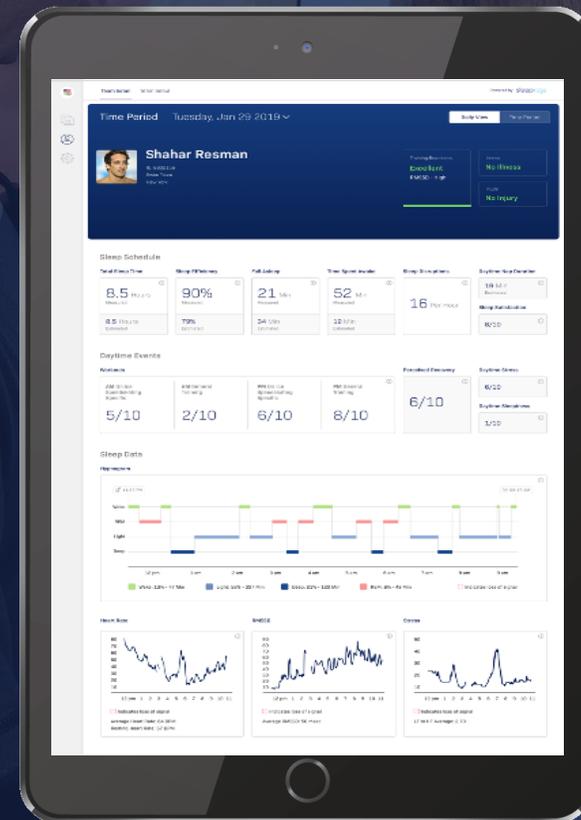
Milewski M et al. Chronic Lack of Sleep is Associated with Increased Sports Injuries in Adolescent Athletes. J Pediatr Orthop. 34(2):129-133, 2014.

Introducing SleepRate for Performance

ATHLETES



COACHES





Research Goal

to evaluate the quality of sleep, sleepiness and chronotype of Israeli Paralympic athletes, as a pre-intervention step, selecting athletes for applying SleepRate monitoring (sensor and App)



Monitoring sleeping with Sleeprate:

- Provides insight into athletes' sleep, including intra-personal variations



To allow

- Adjusting training load to improve performance
- Meeting sleep needs to prevent injury
- Improving overall daytime function and wellbeing



Methods

- ❑ On-line survey (Qualtrics, USA)
- ❑ Sleep quality was evaluated using the **Pittsburgh Sleep Quality Index (PSQI)**
- ❑ The **Epworth Sleepiness Scale** was used to evaluate sleepiness during the day (ESS)
- ❑ **Chronotype** was assessed by the **Morningness-Eveningness questionnaire** by Horne and Östberg (MEQ)
- ❑ The study was approved by the ethical committee of TLV University

Silva, A.F., Queiroz, S.S., Winckler, C., Vital, R.G., Sousa, R.A., Fagundes, V., Tufik, S., & Mello, M.T. (2012). Sleep quality evaluation, chronotype, sleepiness and anxiety of Paralympic Brazilian athletes: Beijing 2008 Paralympic Games. *British journal of sports medicine*, 46 2, 150-4 .



Methods

Sleep quality - the Pittsburgh Sleep Quality Index

- ❑ Consists of 21 items that evaluate sleep quality and disturbances (last month report)
- ❑ Includes 7 components: sleep subjective quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping pills and daytime dysfunction.
- ❑ Cut-off point
 - ≥5 poor quality
 - <4 is good sleeping quality



Methods

The Epworth Sleepiness Scale - sleepiness during the day

- Athletes determine **the chance of falling sleep** in active and passive situations:
Sitting and reading; watching TV; sitting in a public place; sitting on a train, car or bus, lying down for an afternoon nap; sitting and talking to someone; sitting quietly after lunch; abstaining from alcohol use; and driving while stuck in traffic for a few minutes
- Scoring likelihood from 0 (no chance) to 3 (high chance)
- The reference values are:
Epworth Sleepiness Scale (SE) *normal*, from 0 to 6
SE *limit*, from 7 to 9
SE *slight*, from 10 to 14
SE *moderate*, from 15 to 20
SE *high (severe)*, above 20



Methods

- ❑ Chronotype – MEQ questionnaire
- ❑ 19 questions, each with a number of points
- ❑ Scores can range from 16-86

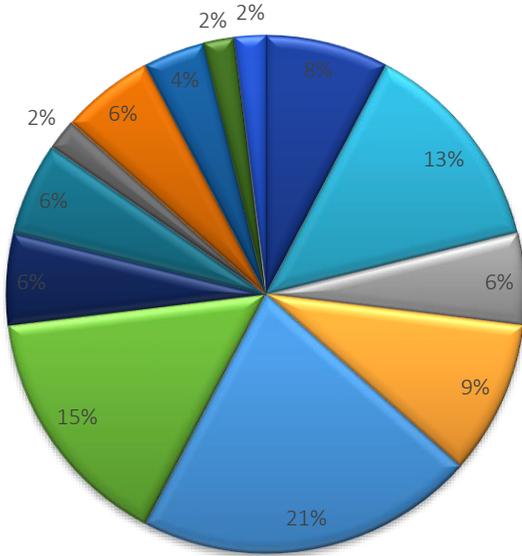
Scores of 41 and below indicate "evening" types
Scores of 59 and above indicate "morning" types
Scores between 42-58 indicate "intermediate" types

Result

Demographic

- ✓ 52 Para-athletes (32 men and 20 women)
- ✓ Average age of 31.2 ±11.9 years
- ✓ All prepare to major competitions in 13 para-sports

Paralympic Sports



- Para Table Tennis
- Wheelchair Basketball
- Hand Cycling
- Badminton
- Para Swimming
- GoallBall
- Boccia
- Shooting
- Kayaks
- Wheelchair rugby
- Para Rowing
- Wheelchair Tennis
- Power lifting



A person in a wheelchair is playing badminton in an indoor sports hall. The person is wearing a blue shirt and black shorts, and is holding a badminton racket with both hands, looking up at the shuttlecock. The background shows a basketball hoop and a net.

Result

Descriptive statistics

- ❑ 63.4% of the athletes reported sleep duration of **less than 7 hours**
- ❑ 26.9% slept **less than 6 hours** per night during the last month
- ❑ 30.7% were classified as **morning type** while the majority were classified as **Intermediate type (61.5%)**
- ❑ 32.6% of the athletes reported **moderate to severe excessive daytime sleepiness** and were referred to relevant professional personnel.
- ❑ **14 athletes** presented **moderate to poor sleep quality** and were selected for the future intervention with SleepRate (PSQI ≥ 6)

A person in a wheelchair is playing badminton in an indoor sports hall. The person is wearing a blue shirt and black shorts, and is holding a badminton racket with both hands, looking up at the racket. The background shows a basketball hoop and a net.

Result

Subgroup comparison (one way ANOVA)

Athletes with **poor sleep quality** showed

- ❑ **Significantly lower sleep efficiency** ($p=0.028$, $F=5.11$, partial $\eta^2=0.093$)
- ❑ **Greater daytime dysfunction** ($p<0.001$, $F=14.1$, partial $\eta^2=0.221$)
- ❑ **Greater sleep latency** ($p<0.001$, $F=15.08$, partial $\eta^2=0.232$), than athletes with good sleep quality
- ❑ No significant differences in quality of sleep between the sleepiness and non-sleepiness groups ($P=.324$, $F=.994$, partial $\eta^2=0.19$)
- ❑ No significant differences in quality of sleep for athletes with different chronotypes



Example:

Level	Age	Male	Female	Sport Type	Years practicing this sport	Chronotype	PAQI Score	ESS Score	Reasons
Silver	20		1	Para Swimming	8	Intermediate	8	11	
Gold	51	1		Shooting	30	Intermediate	6	8	
Gold	41	1		Para Badminton	10	morning	7	6	Pain
Silver	19		1	Goal Ball	7	morning	6	12	Noise
Silver	33	1		Rowing	4	Intermediate	7	14	
Reserve	35	1		Hand Bike	2	morning	6	16	Baby
Silver	20		1	Para Swimming	8	Intermediate	6	12	
Bronze	39	1		Wheelchair basketball	20	Intermediate	8	7	Pain
Silver	52		1	Power lifting	6	Intermediate	7	11	
National	37		1	Wheelchair Rugby	3	Intermediate	14	9	Thoughts

Conclusion

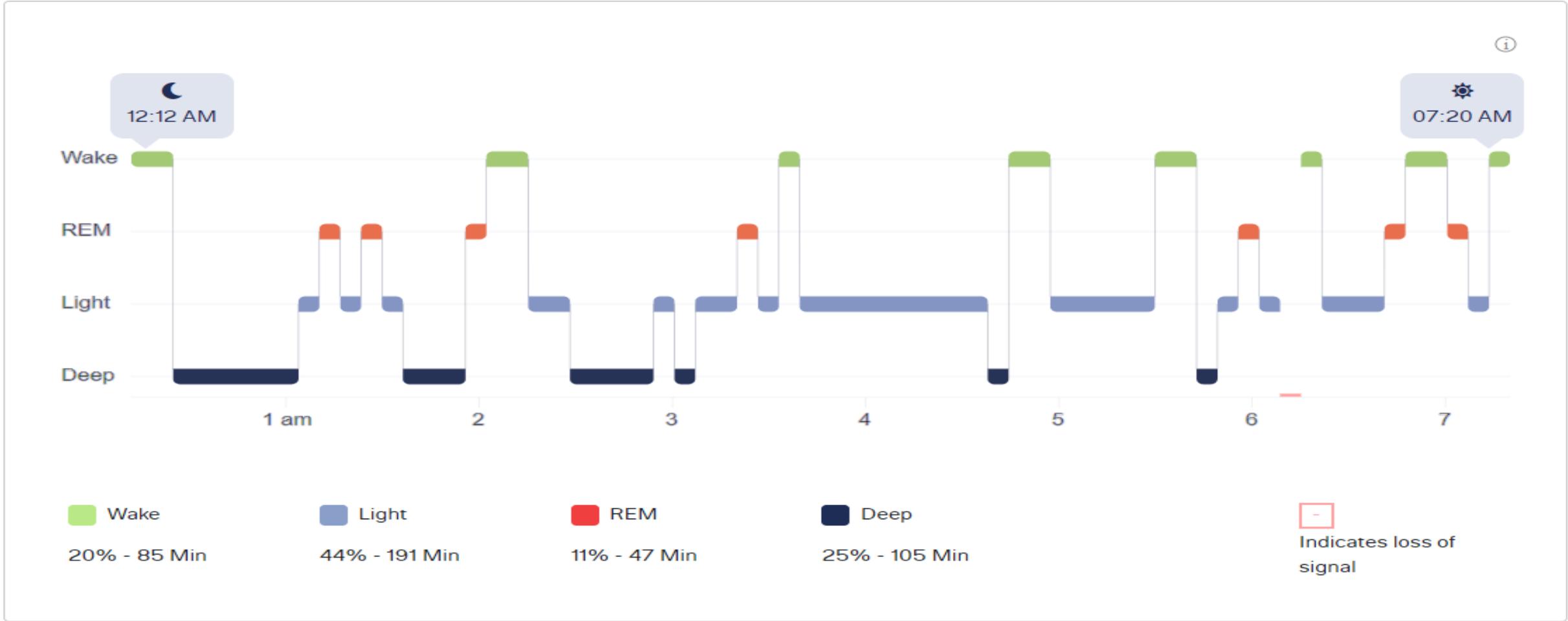
Personalized sleep strategies are essential, and could have an impact on optimizing performance, preventing injuries & improving overall wellbeing

Current situation

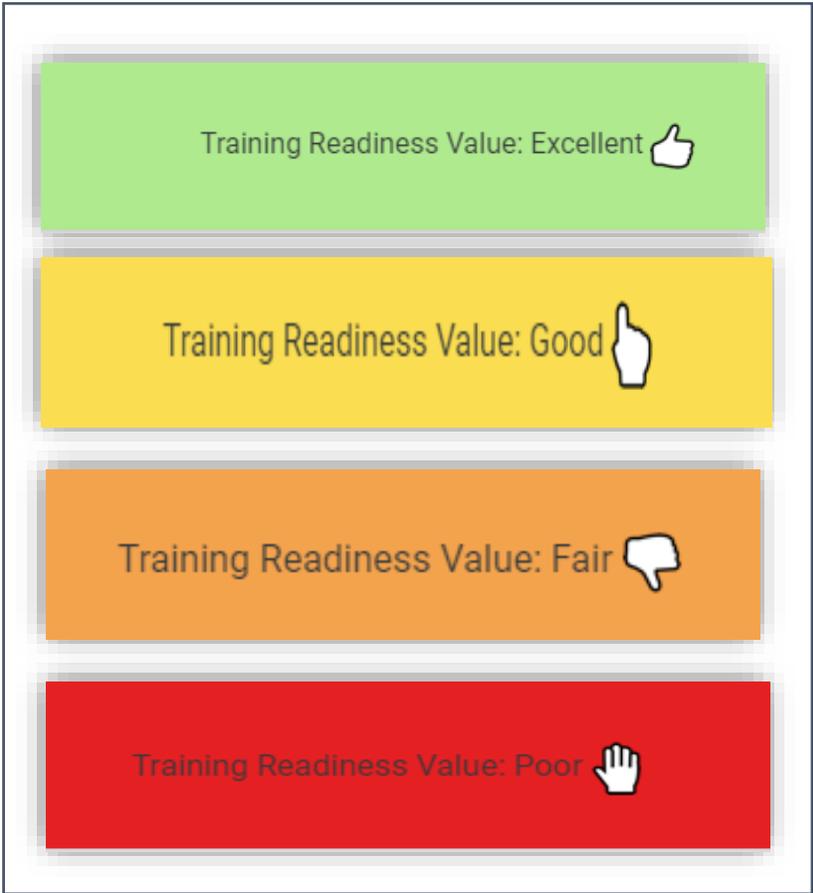
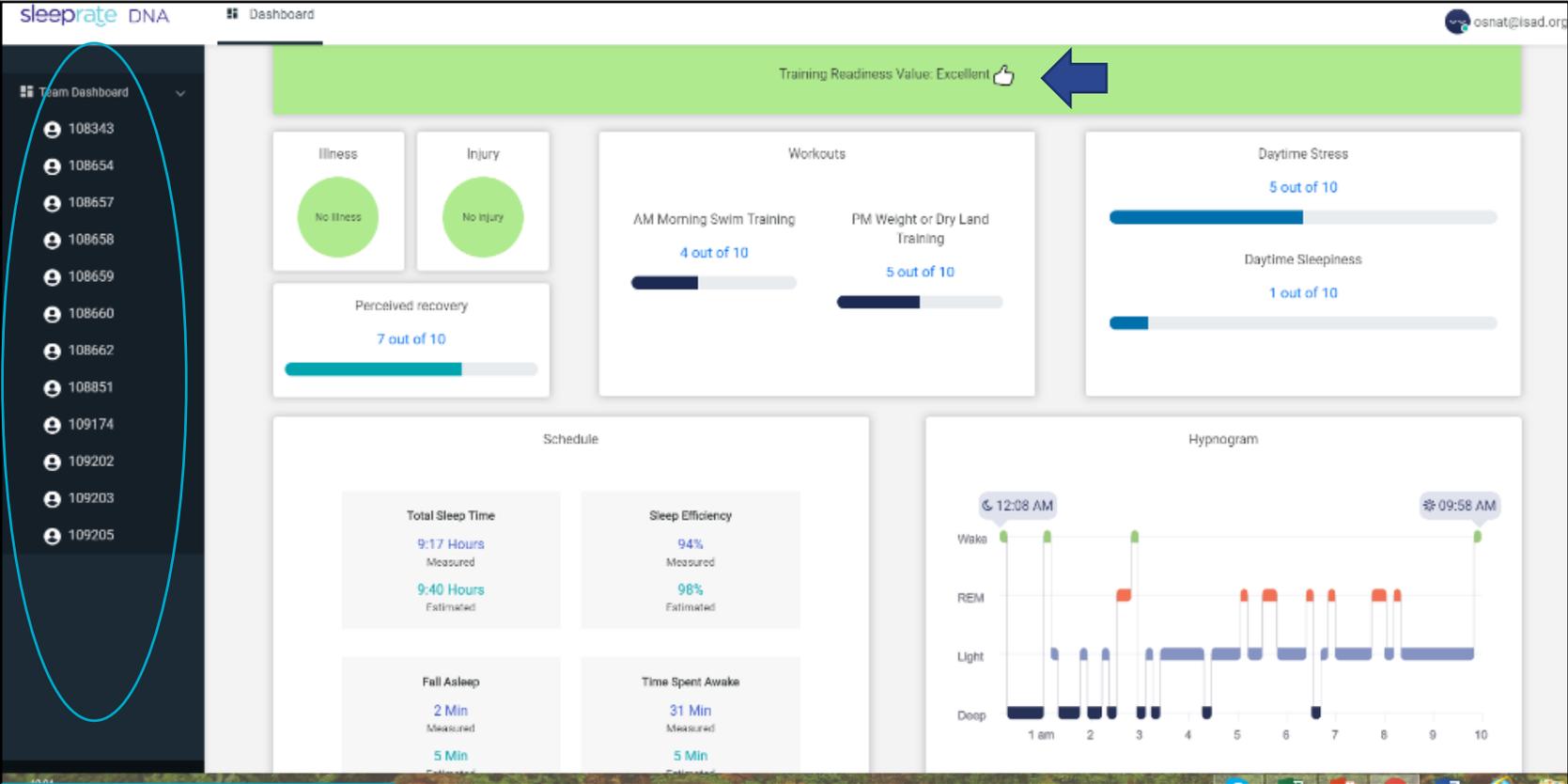
- ❑ Following the study, each athlete received a report with his/her results, and **personalized recommendation** in order to improve the quality of sleep
- ❑ The 14 athletes that presented moderate to poor sleep quality in the survey, were selected for the intervention with SleepRate and are being monitored since March 2019. They are already showing changes in their sleeping state

Example (1 night of a swimmer):

Hypnogram



Main Dashboard



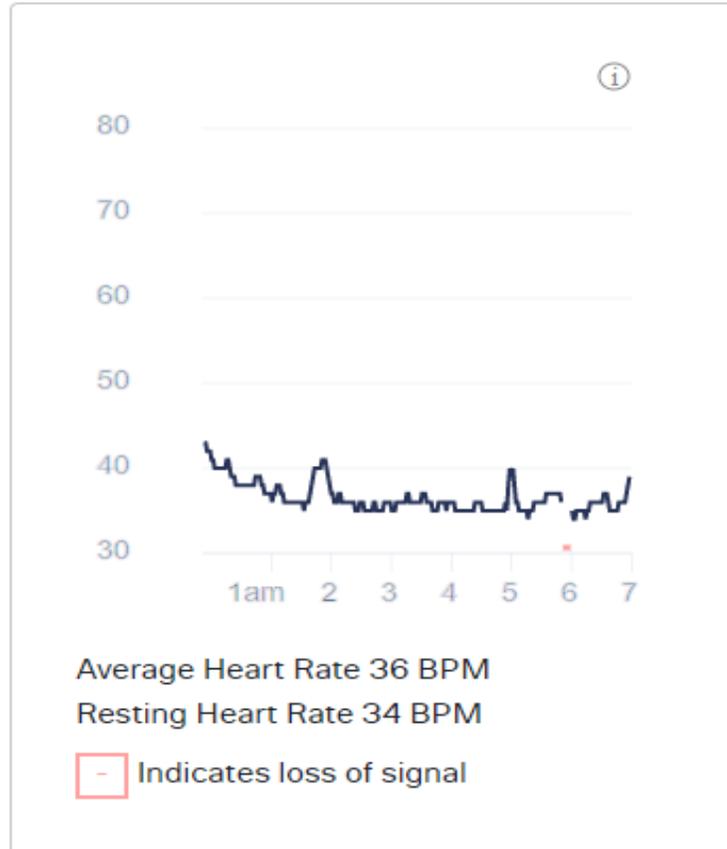
The monitored athletes

Training readiness

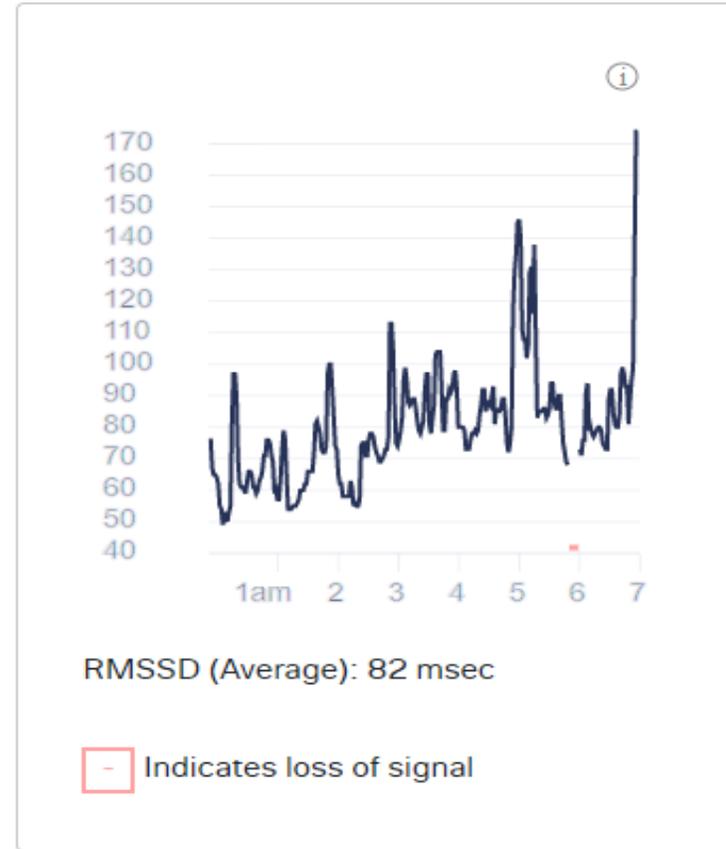


Research Dashboard

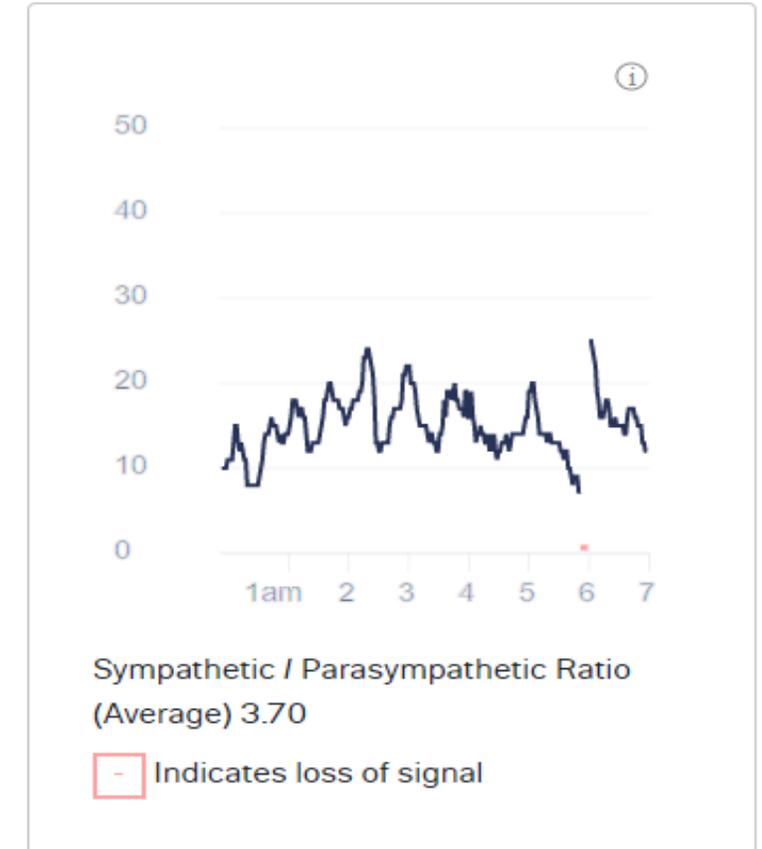
Heart Rate



Recovery Index (RMSSD)

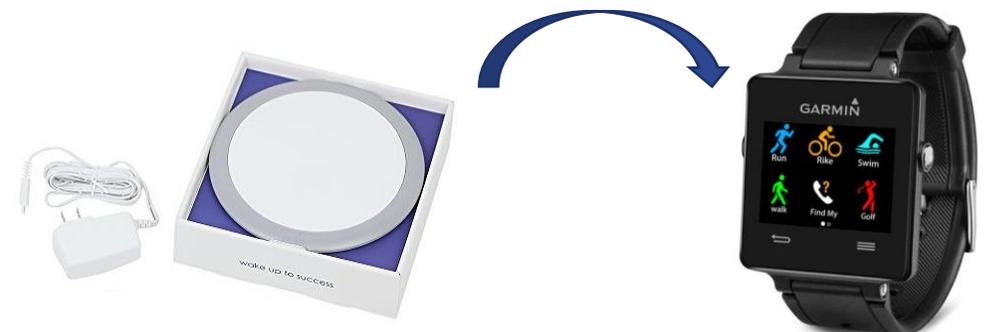


Heart Rate Variability: Stress





Soon, the sensor will be replaced by a Garmin watch, allowing monitoring of both sleep-related information, and training intensity.



Thank you

