

SINGAPORE SPORT & PERFORMANCE CONFERENCE 2022

**From Youth to Elite Sport:
Harnessing Potential and the Pursuit of Excellence**

2nd - 4th November 2022

Organised by



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From Youth to Elite Sport: Harnessing Potential and the Pursuit of Excellence

Circadian Rhythms in Physical Performance: Implications for Time-zone Shifts and Training

Teo Wei-Peng, PhD CSCS

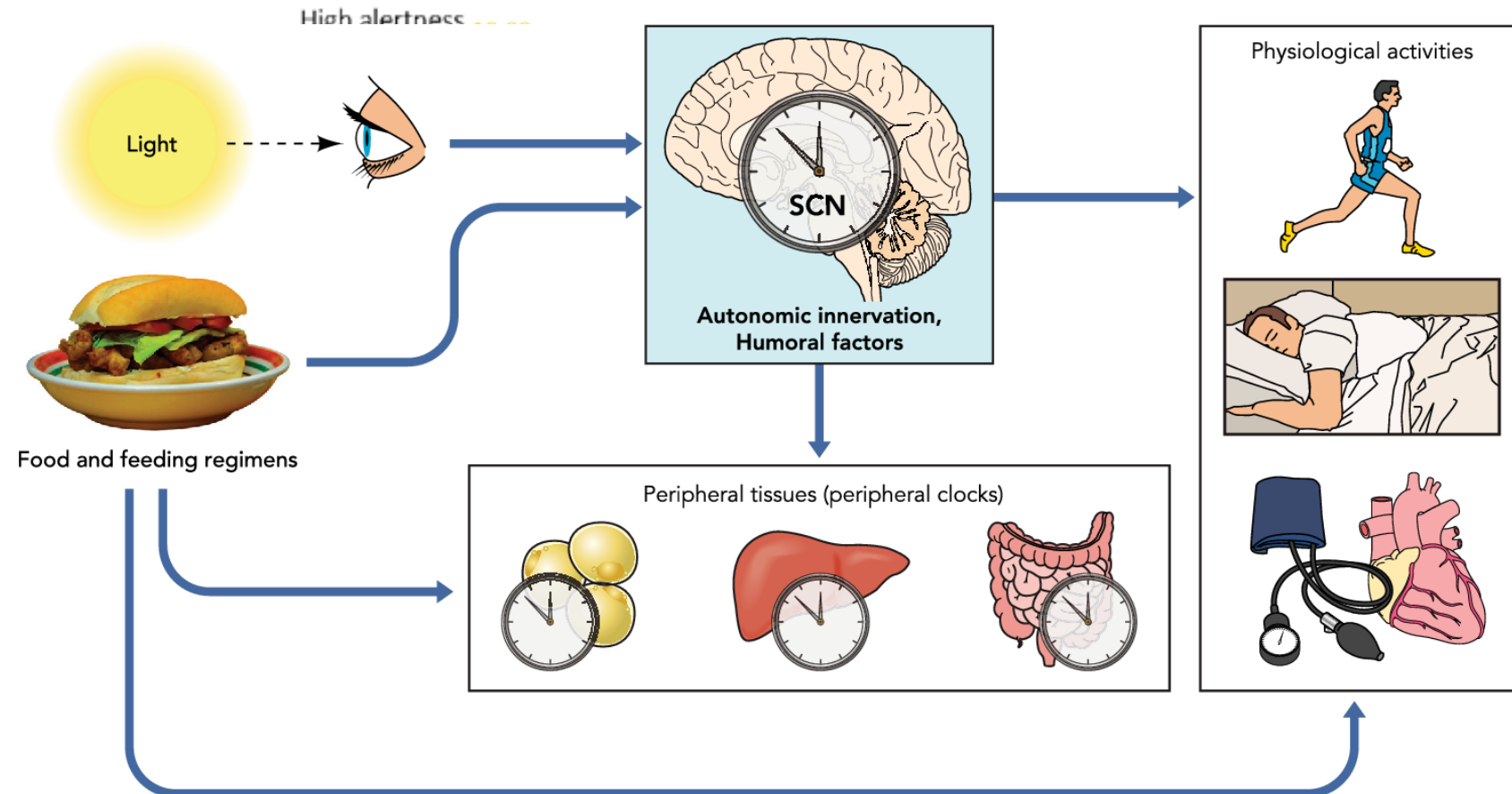
Assistant Professor

National Institute of Education

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Circadian rhythms (CR)..

- Circa+Diem = "around a day"
- Sleep-wake cycle
- Suprachiasmatic Nucleus (SCN, Timekeeper)
- Pineal glands
 - Melatonin



Circadian rhythm

- Almost all bodily function follow a CR

300
250

(n=10, males)

Rest

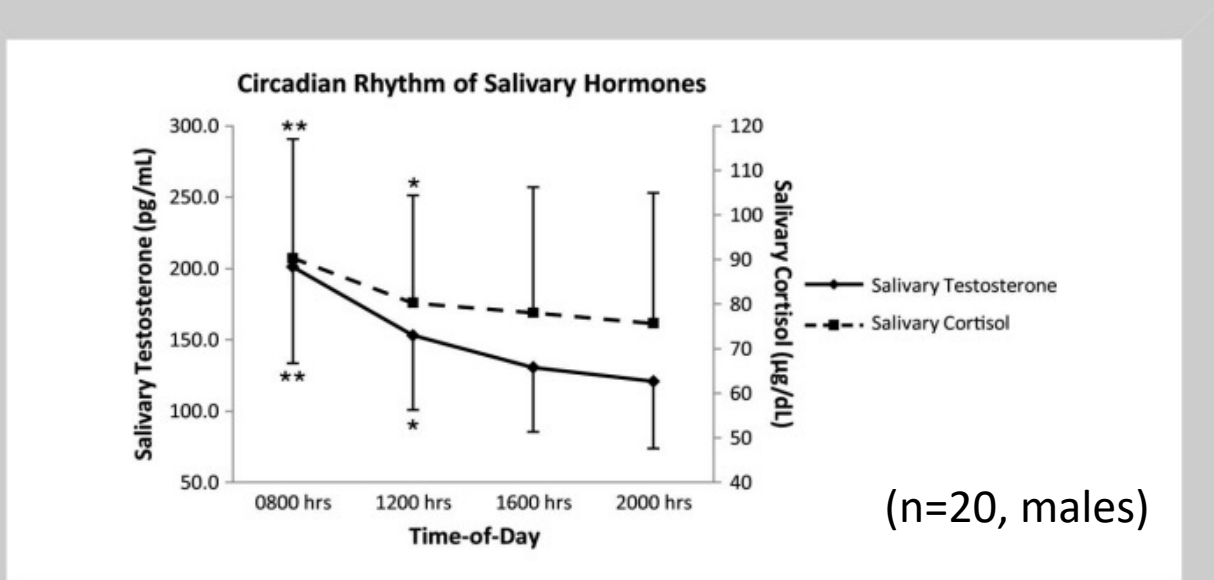
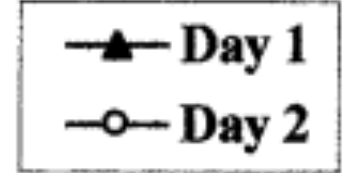


Figure 2. Mean ($\pm SD$) salivary testosterone and cortisol at different times of the day ($n = 20$). **Statistical significance ($p < 0.001$) when compared to 1600 hours. *Statistical significance ($p < 0.05$) when compared to 1600 hours.

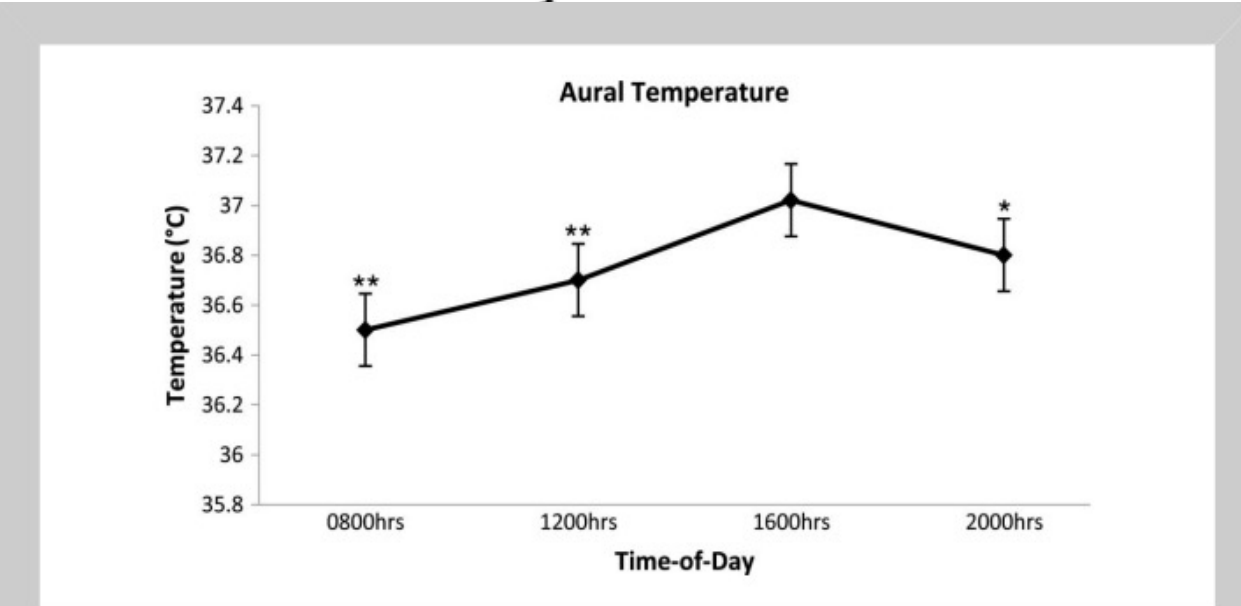


Figure 3. Mean ($\pm SD$) aural temperature at different times of the day ($n = 20$). **Statistical significance ($p < 0.001$) when compared to 1600 hours. *Statistical significance ($p < 0.05$) when compared to 1600 hours.

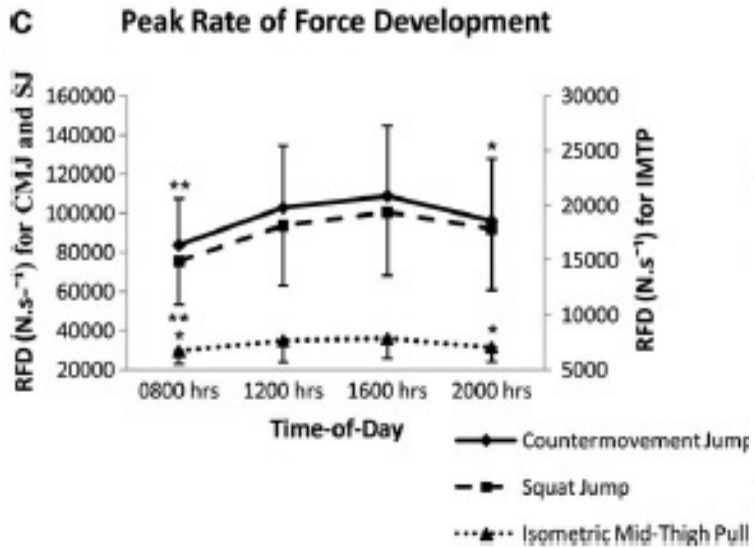
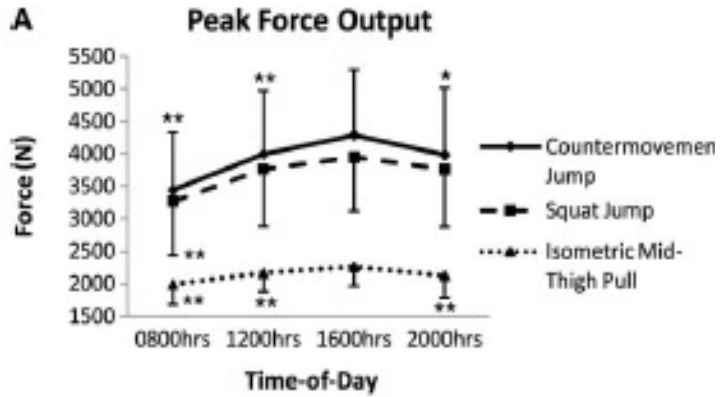
Older adults

(Teo et al. 2011)

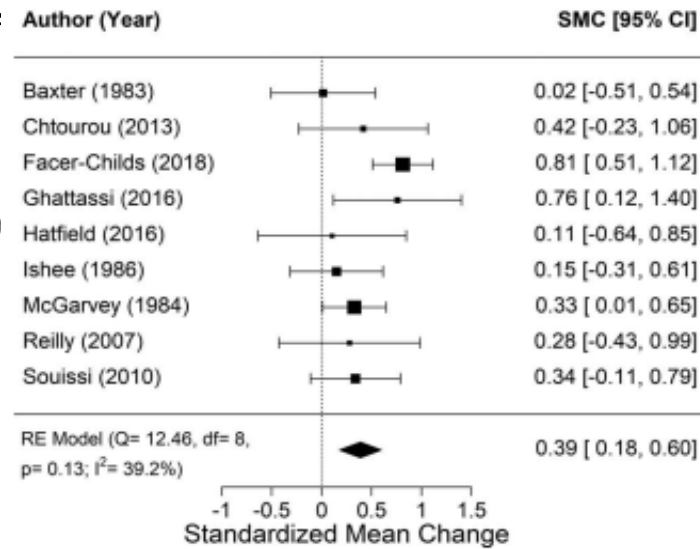
(Hood et al. 2017)

CR in physical performances..

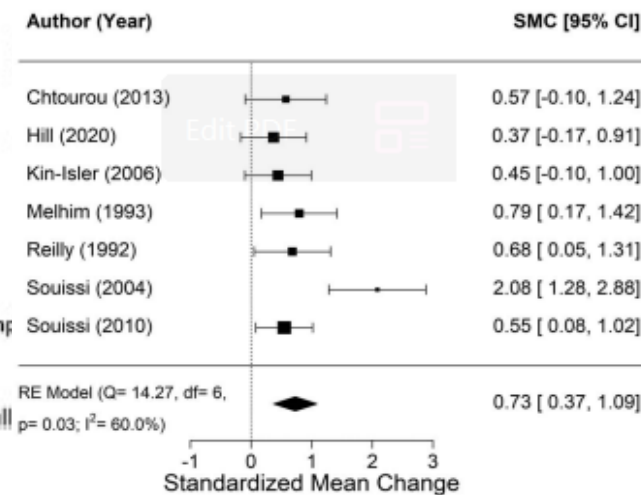
Neuromuscular Strength/Power



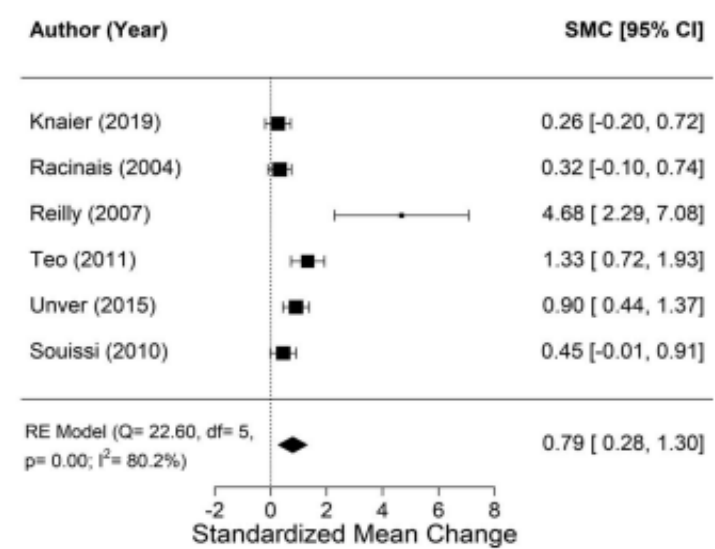
C Hand grip strength test



B 30-s Wingate test



D Jump height test



(Knaier et al., 2021)

CR in physical performances..

Aerobic/Endurance

Author (Year)

SMC [95% CI]

Table I. Mean values (\pm standard deviation) for the dependent variables measured under the four experimental conditions during the time trial (after the time trial for lactate concentration)

Variable	“Cold” at 07:30 h	“Warm” at 07:30 h	“Cold” at 17:30 h	“Warm” at 17:30 h	Effect of time of day	Effect of warm-up
Performance time (s)	1426 \pm 104	1405 \pm 97	1370 \pm 99	1362 \pm 91	$F_{1,7} = 51.3$ ($P = 0.0002$)	$F_{1,7} = 5.6$ ($P = 0.05$)
Power (W)	227 \pm 47	232 \pm 41	252 \pm 48	254 \pm 43	$F_{1,7} = 20.2$ ($P = 0.003$)	$F_{1,7} = 1.4$ ($P = 0.3$)
Intra-aural temperature ($^{\circ}\text{C}$)	36.6 \pm 0.5	36.6 \pm 0.4	37.4 \pm 0.5	37.3 \pm 0.9	$F_{1,7} = 24.0$ ($P = 0.002$)	$F_{1,7} = 0.0$ ($P = 0.9$)
Heart rate (beats \cdot min $^{-1}$)	162 \pm 16	168 \pm 10	169 \pm 9	169 \pm 12	$F_{1,7} = 1.2$ ($P = 0.3$)	$F_{1,7} = 1.6$ ($P = 0.3$)
CR-10	6.2 \pm 1.0	5.8 \pm 0.9	5.8 \pm 0.9	5.8 \pm 1.0	$F_{1,7} = 2.5$ ($P = 0.2$)	$F_{1,7} = 0.7$ ($P = 0.4$)
Blood lactate (mmol \cdot l $^{-1}$)	8.5 \pm 0.7	10.2 \pm 1.4	11.9 \pm 2.3	10.8 \pm 2.8	$F_{1,7} = 8.4$ ($P = 0.02$)	$F_{1,7} = 0.2$ ($P = 0.7$)

(Knaier et al., 2021) (Atkinson et al., 2005)

Factors affecting CR..

Several factors affect CR in performance:

1. Environmental pollution
2. Altitude
3. Light
4. Sleep deprivation
5. Shifts in time zone..

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Sleep (or the lack thereof)..

Review

Effects of training and competition on the sleep of elite athletes: a systematic review and meta-analysis

Spencer Stuart Haines Roberts, Wei-Peng Teo, Stuart Anthony Warmington

Summary findings:

- Total sleep time and sleep efficiency ↓ at least 2 nights before and during night of competition
- Total sleep time reduced by 60mins during the night of competition
- Reasons for lack of sleep include early training schedules (<7am), greater training loads (>25%), late night/early morning travel time, Jetlag and Eastward travel.

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Extended Sleep Maintains Endurance Performance Better than Normal or Restricted Sleep

SPENCER S. H. ROBERTS¹, WEI-PENG TEO^{1,2}, BRAD AISBETT¹, and STUART A. WARMINGTON¹

¹*School of Exercise and Nutrition Sciences, Institute for Physical Activity and Nutrition, Deakin University, Burwood, Victoria, AUSTRALIA;* and ²*Physical Education and Sports Science Academic Group, National Institute of Education, Nanyang University, SINGAPORE*

Summary findings:

- Over 4 days of endurance time trials (TT), sleep restriction resulted in slower TT with sleep extension resulting in faster TT
- Poorer mood outcomes and and psychomotor vigilance associated with sleep restriction

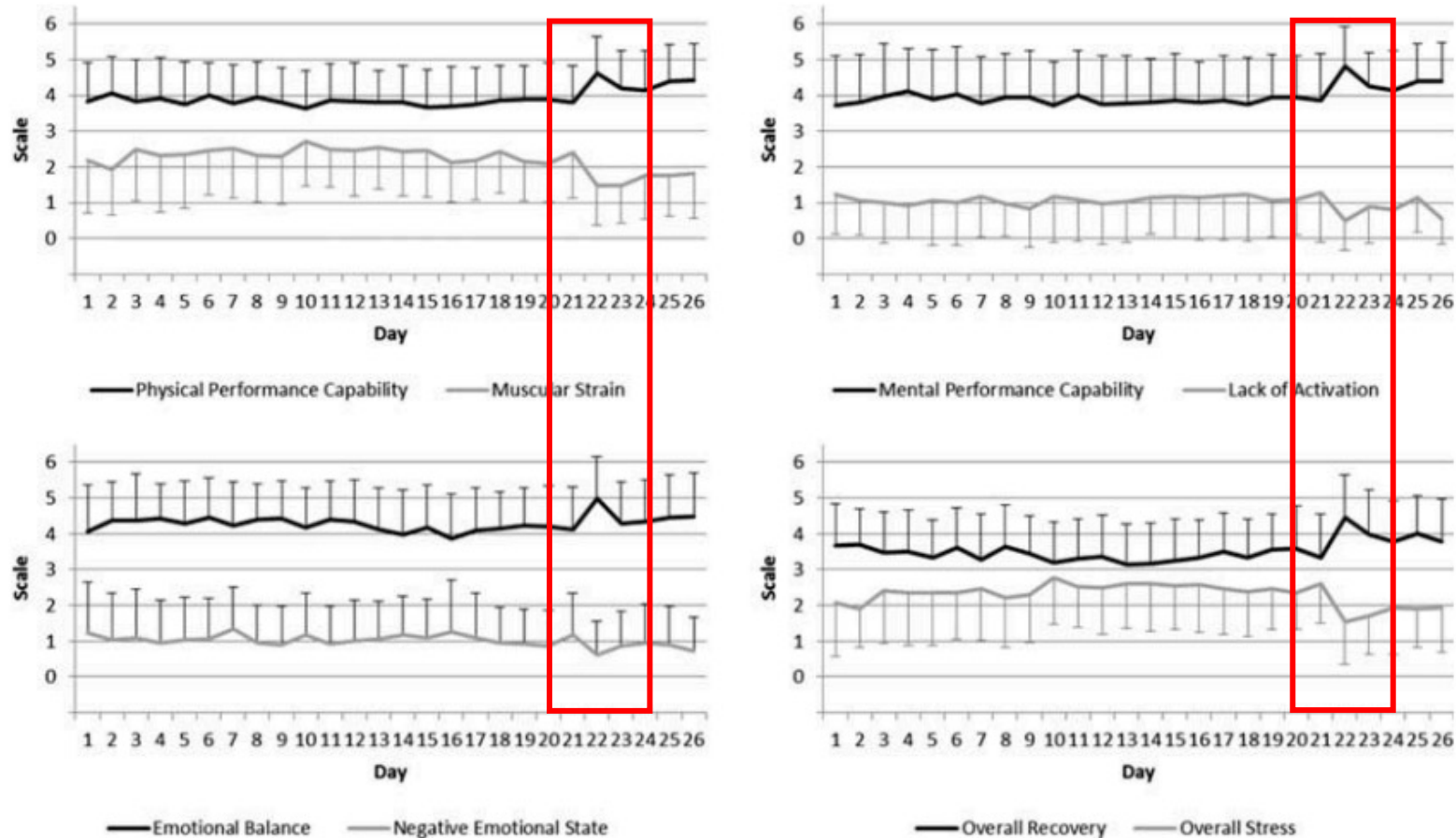
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ORIGINAL ARTICLE

The longer the better: Sleep–wake patterns during preparation of the World Rowing Junior Championships

Sarah Kölling^a, Jürgen M. Steinacker^b, Stefan Endler^c, Alexander Ferrauti^a, Tim Meyer^d, and Michael Kellmann^{a,e}



Sleep, Travel, and Recovery Responses of National Footballers During and After Long-Haul International Air Travel

JOURNAL OF SPORTS SCIENCES, 2017
VOL. 35, NO. 22, 2240–2248
<https://doi.org/10.1080/02640414.2016.1265141>

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David Wi

 Routledge
Taylor & Francis Group


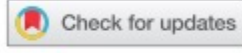
International Journal of Sports Physiology and Performance, 2021, 16, 1490-1501

EUROPEAN JOURNAL OF SPORT SCIENCE
<https://doi.org/10.1080/17461391.2022.2109065>



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ON

 OPEN ACCESS 

Assessing climatic, travel, and methodological influences on whole-match and worst-case scenario locomotor demands of international men's rugby sevens match-play

Eliza Ullersperger^a, Samuel P. Hills ^b, Mark Russell^c, Mark Waldron ^{a,d}, David Shearer^{d,e}, Ben Lonergan^f, Tom Farrow^g, Robin Fager^h and Liam P. Kilduff^{a,d}

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n, Ulm,
ustralia

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Recommendations for the practitioner

- CR affects physical performance, knowing when to train may maximum training adaptations.
- Training at specific times lead to time-specific adaptations
- Body temp seems to be biggest factor for time-of-day performance
- Lack of sleep is highly detrimental
- Extended sleep schedules may improve performance outcomes
- Westward travel does not seem to affect performance too much
- Eastward travel may be detrimental to performance.

Thank you for listening..

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