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Sport Ireland Institute

Sleep & Nutrition: Implications for Athletes

MILK IT FOR ALL IT'S WORTH™

Belfast 14th November 2024

SPORT IRELAND INSTITUTE

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Topics

- **What is sleep?**
  - Sleep regulation
  - Sleep & training
- **Sleep & recovery for athletes**
  - Athlete sleep issues
  - Sleep & recovery
- **How much sleep do athletes need?**
  - Sleep recommendations
  - Wearables
  - Napping
- **Sleep & nutrition**

Sleep

Sleep: is a complex reversible behavioural state where an individual disengaged and unresponsive to their environment.

2 basic states NREM and REM sleep.

Sleep stages: fall along a continuum from fully awake to deep sleep.

Good sleep health = satisfaction, appropriate timing, adequate duration, high efficiency and sustained alertness during waking hours.

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Tired
Sleep
Recover

Sleep is a dyna s largely regulated by two factors; the circadian systems and the s eosta

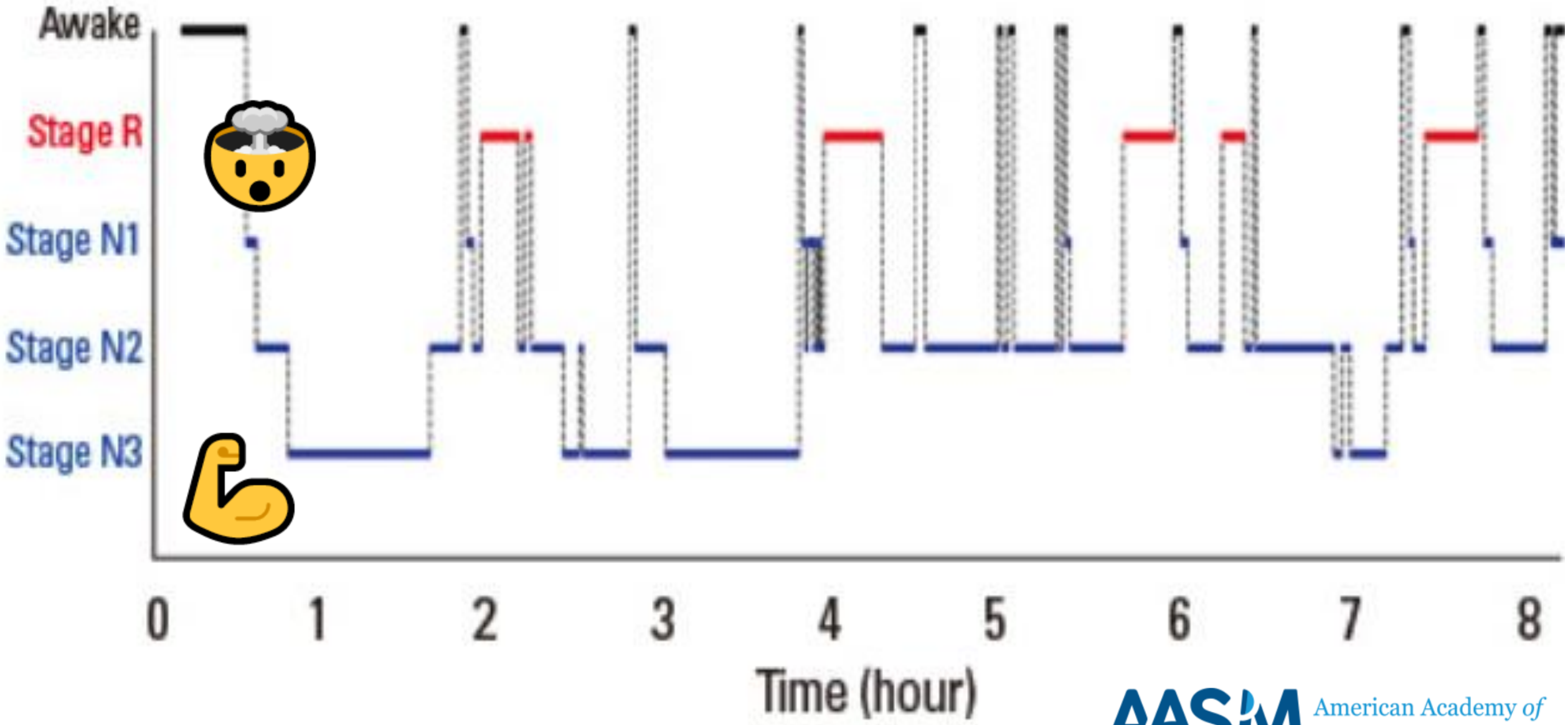
rcadia
Clock
(Process C)

Sleep
Homeostasis
(Process S)

Alerting Signal

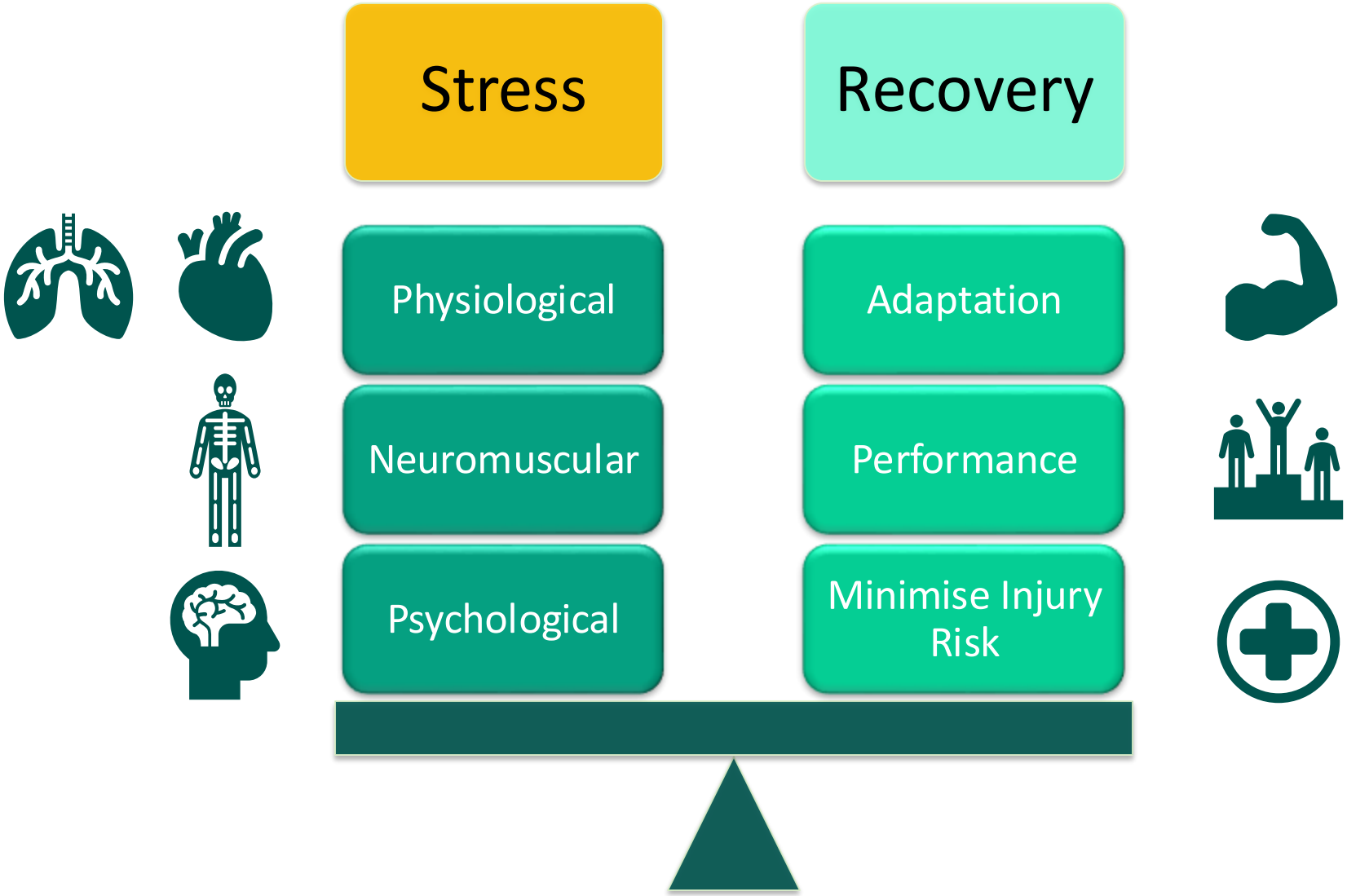
Sleep Pressure

Sleep-Wake
Cycle



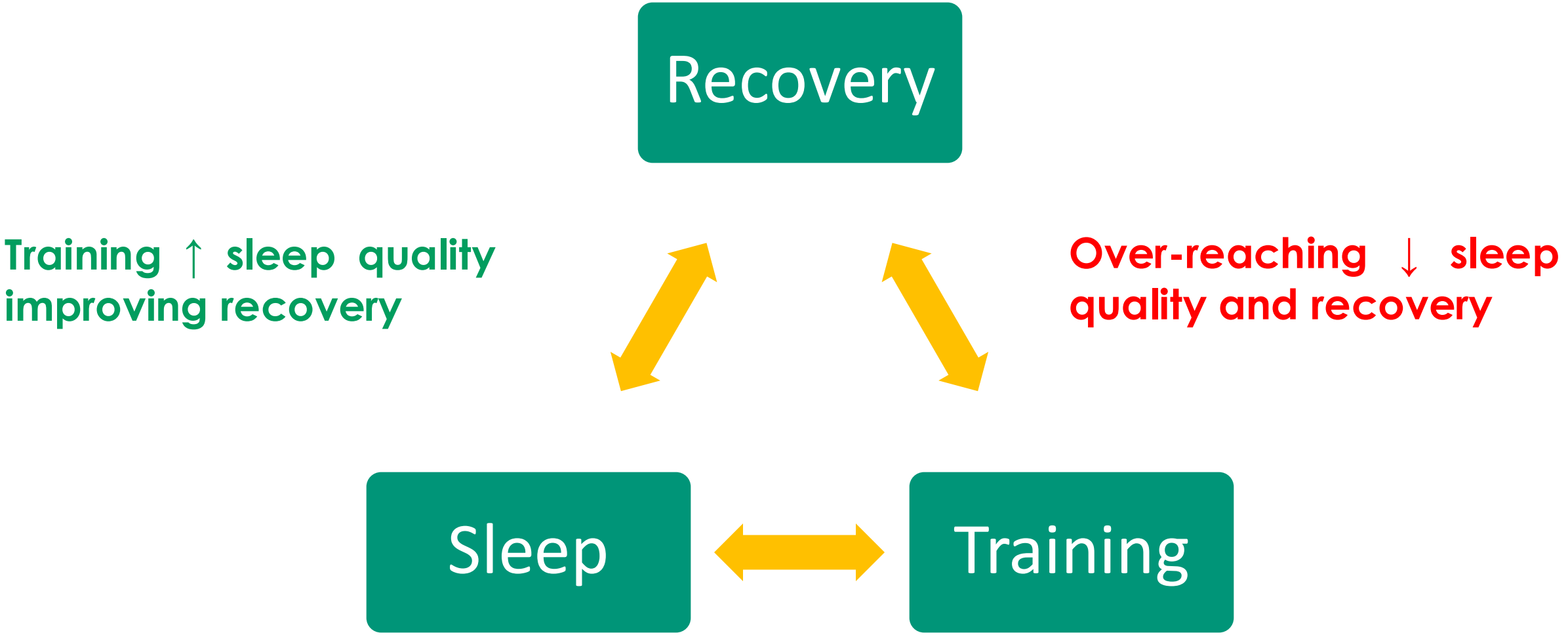
AASM American Academy of SLEEP MEDICINE™

Recovery:Stress Balance



Sleep & Recovery

Sleep and Training



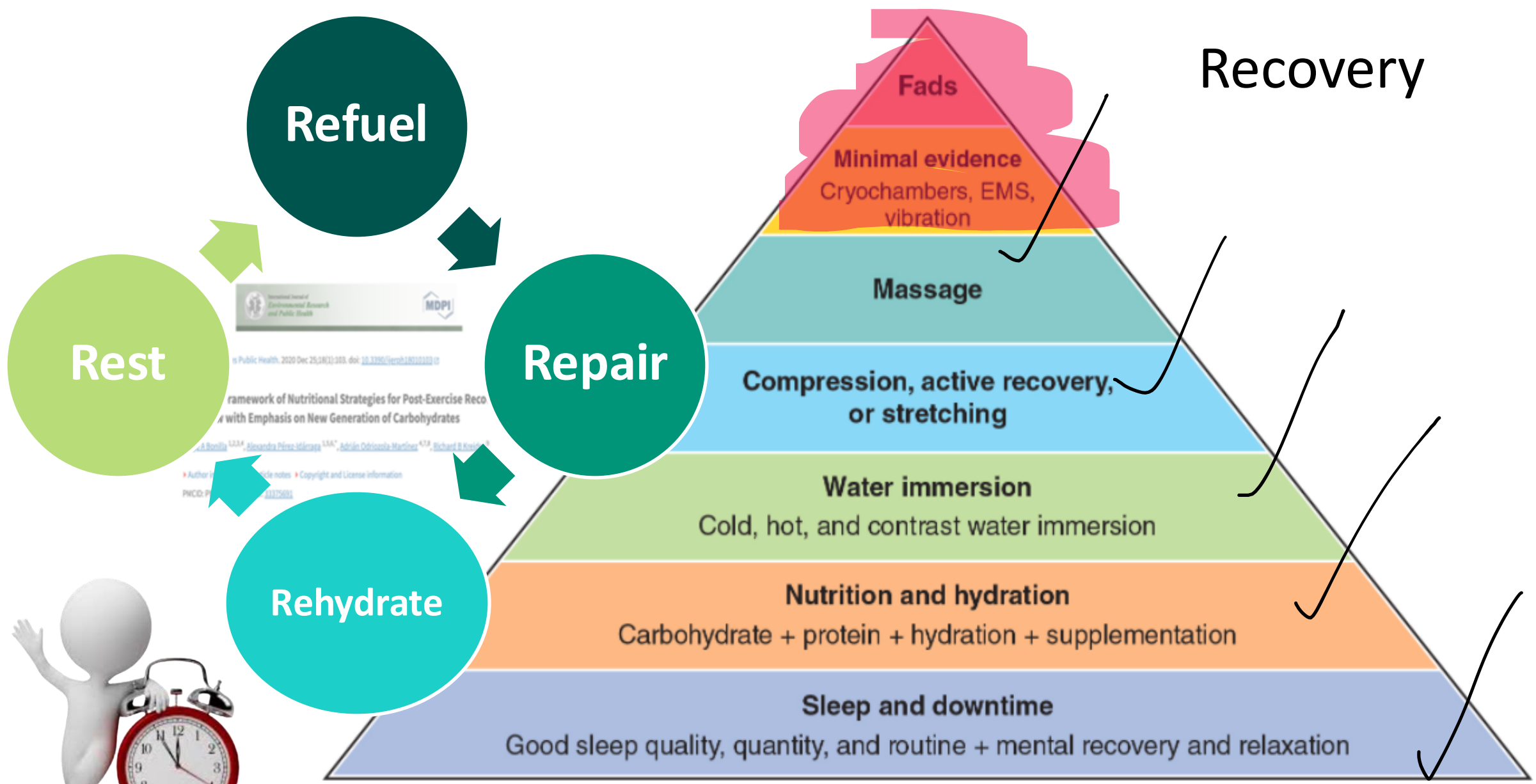
Recovery

Refuel

Repair

Rehydrate

Rest



Athletes Sleep Issues

Increased injury risk < 8 hours sleep

↓ sleep efficiency

↓ time in bed

Travel

↓ total sleep time

↓ sleep quality

↓ recovery

Waking early

↑ sleep fragmentation

Anxiety

Irregular sleep patterns

Hydration

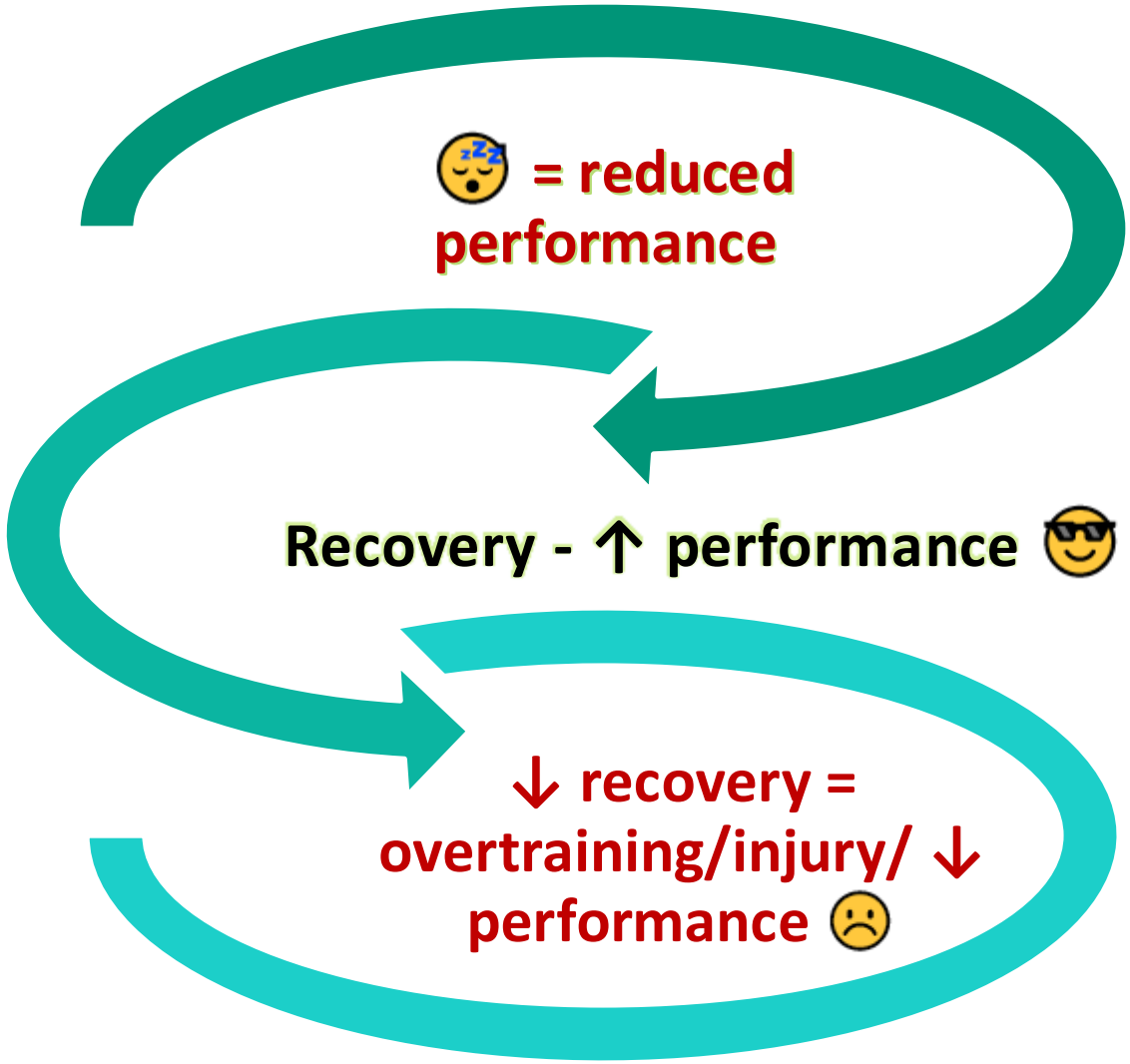
↑ sleep on rest days

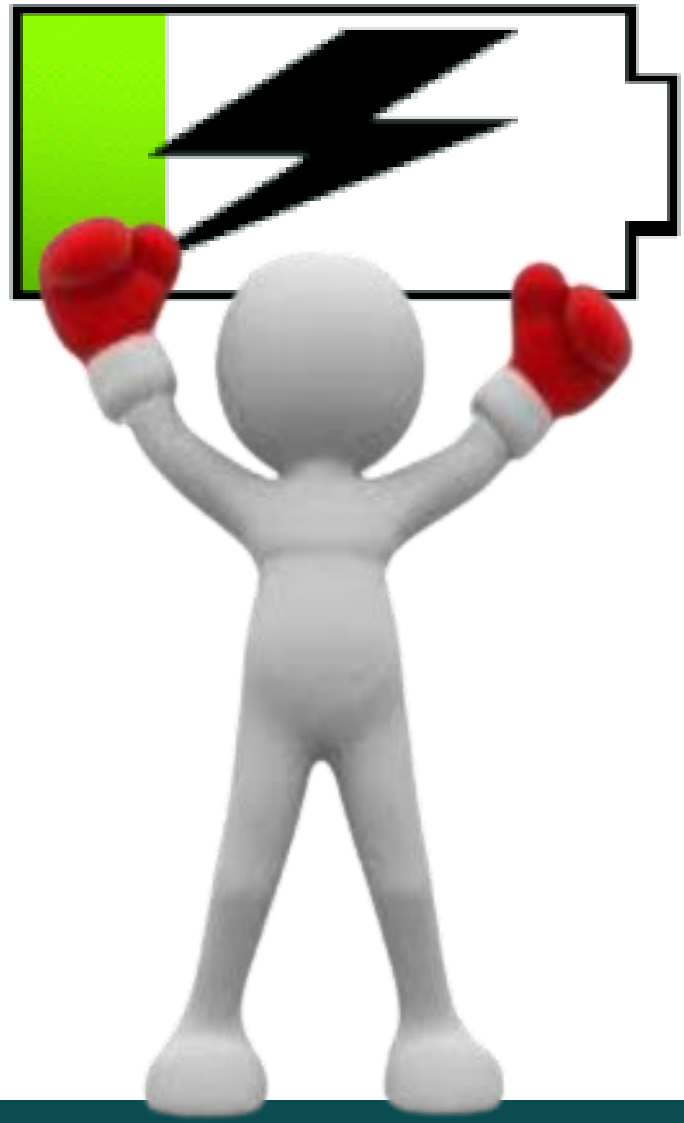
Noise

Room sharing

Light - technology

Sleep & Recovery





Signs of Insufficient Sleep in Athletes

How much sleep do athletes need?

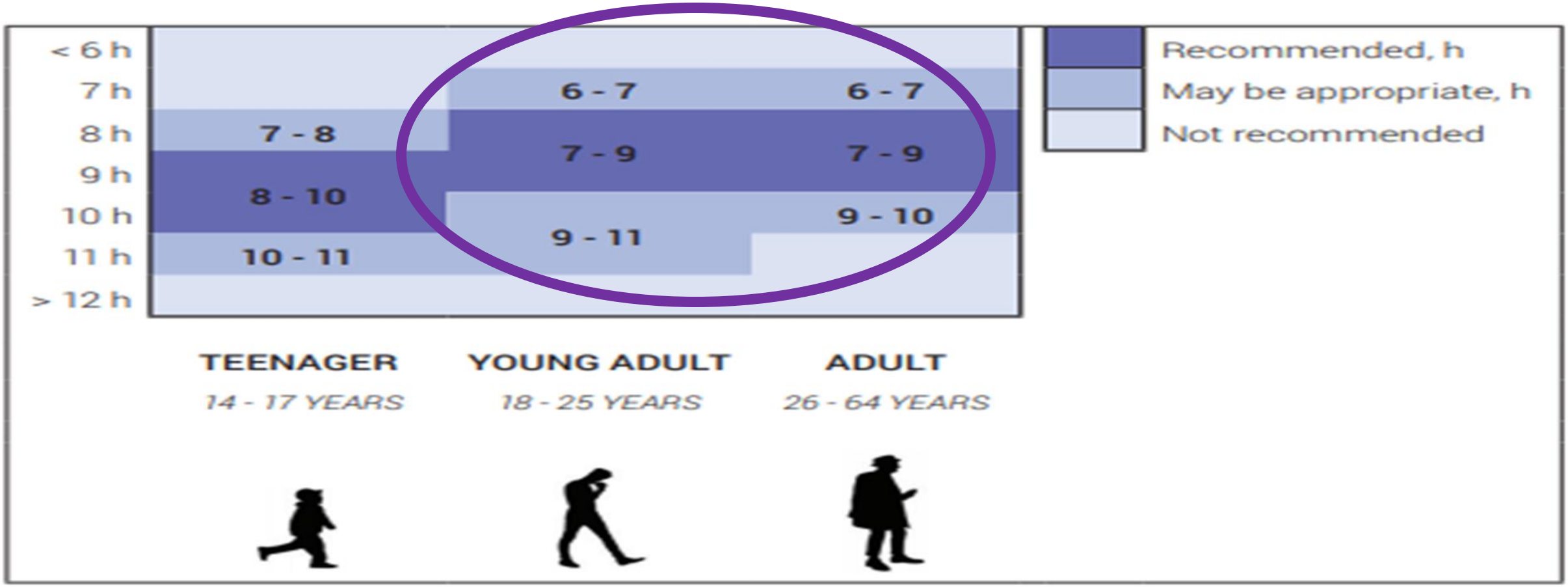


Figure 1.3. Sleep duration recommendations for relevant age groups as formulated by the National Sleep Foundation[13].

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Human Kinetics
ORIGINAL INVESTIGATION

How Much Sleep Does an Elite Athlete Need?

Charli Sargent, Michele Lastella, Shona L. Halson, and Gregory D. Roach

Purpose: Anecdotal reports indicate that many elite athletes are dissatisfied with their sleep, but little is known about their actual sleep requirements. Therefore, the aim of this study was to compare the self-assessed sleep need of elite athletes with an objective measure of their habitual sleep duration. ***Methods:*** Participants were 175 elite athletes (n = 30 females), age 22.2 (3.8) years (mean [SD]) from 12 individual and team sports. The athletes answered the question "how many hours of sleep do you need to feel rested?" and they kept a self-report sleep diary and wore a wrist activity monitor for ~12 nights during a normal phase of training. For each athlete, a sleep deficit index was calculated by subtracting their average sleep duration from their self-assessed sleep need. ***Results:*** The athletes needed 8.3 (0.9) hours of sleep to feel rested, their average sleep duration was 6.7 (0.8) hours, and they had a sleep deficit index of 96.0 (60.6) minutes. Only 3% of athletes obtained enough sleep to satisfy their self-assessed sleep need, and 71% of athletes fell short by an hour or more. Specifically, habitual sleep duration was shorter in athletes from individual sports than in athletes from team sports ($F_{1,173} = 13.1$, $P < .001$; $d = 0.6$, medium), despite their similar sleep need ($F_{1,173} = 1.40$, $P = .24$; $d = 0.2$, small). ***Conclusions:*** The majority of elite athletes obtain substantially less than their self-assessed sleep need. This is a critical finding, given that insufficient sleep may compromise an athlete's capacity to train effectively and/or compete optimally.

Keywords: sleep duration, sleep need, sleep deficit, recovery

How much sleep do athletes need?

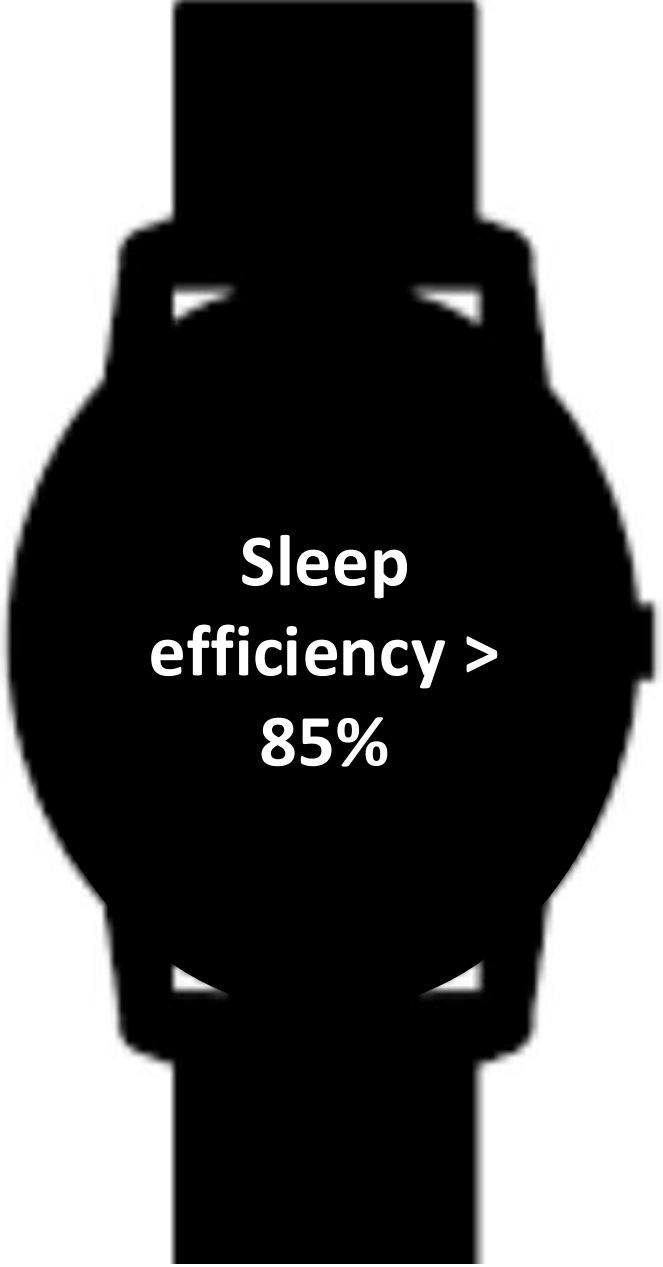
8.3 ± 0.9 h to feel rested

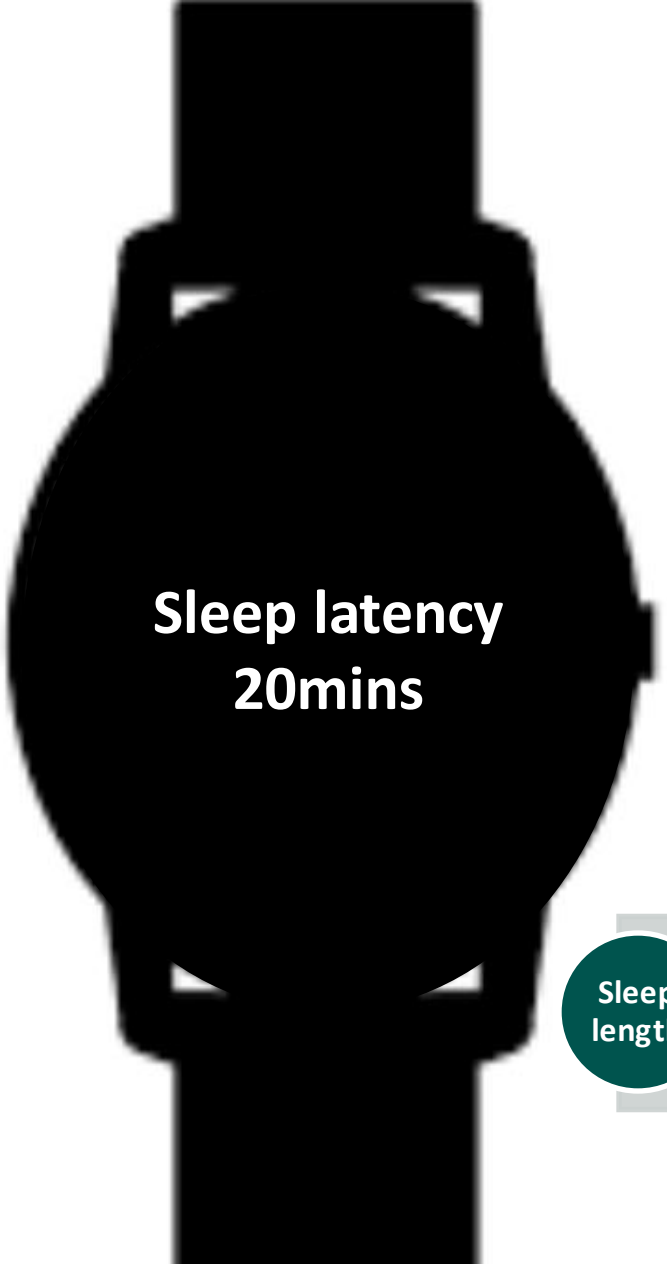
Sleep duration 6.7 ± 0.8h

71% > 1h deficit

TST ↓ individual athletes

Wearables/Nearables





Sleep length
- Duration (h/n)
- + Naps

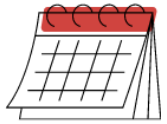
Quality
- Experience
- Perceived adequacy

Phase
- Circadian timing of sleep

Normal Vs Insufficient Sleep

ATHLETE SLEEP PROMOTION

What's Normal?



8 - 10 hrs/night
(including naps) or
~60 - 65 hrs/week

Feel energised & refreshed
within 30 mins of wakening

Can fall asleep within
15-30 mins of trying

Also Normal

Wake during the night but fall back to sleep

Harder to sleep after late night training/ competition

Struggle to sleep after later caffeine intake

Life stress interrupts ability to fall asleep

If Tracking Sleep

Focus on weekly & monthly reports

Duration accuracy is most valid (80-90%)

Sleep stage accuracy is improving but still varies 50-70%

How YOU feel is more accurate than any recovery algorithm

Sleep Duration

- **Ideally aiming 8+ hours per night**
- **Reality might be 56 + hours across week**
- **Plan week ahead**
- **Later or earlier training sessions?**
- **Sleep & training schedule**

Nature and Science of Sleep

Dovepress
open access to scientific and medical research

Open Access Full Text Article

REVIEW

To Nap or Not to Nap? A Systematic Review Evaluating Napping Behavior in Athletes and the Impact on Various Measures of Athletic Performance

Michele Lastella [1]
Shona L Halson [2]
Jacopo A Vitale [3]
Aamir R Memon [4]
Grace E Vincent [1]

[1]Appleton Institute for Behavioural Science, Central Queensland University, Adelaide, Australia; [2]School of Behavioural and Health Sciences, Australian Catholic University, Brisbane, Australia; [3]Laboratory of Movement and Sport Science, IRCCS Istituto Ortopedico Galeazzi, Milan, Italy; [4]Institute of Physiotherapy & Rehabilitation Sciences, Peoples University of Medical & Health Sciences for Women, Nawabshah, Shaheed Benazirabad, Pakistan

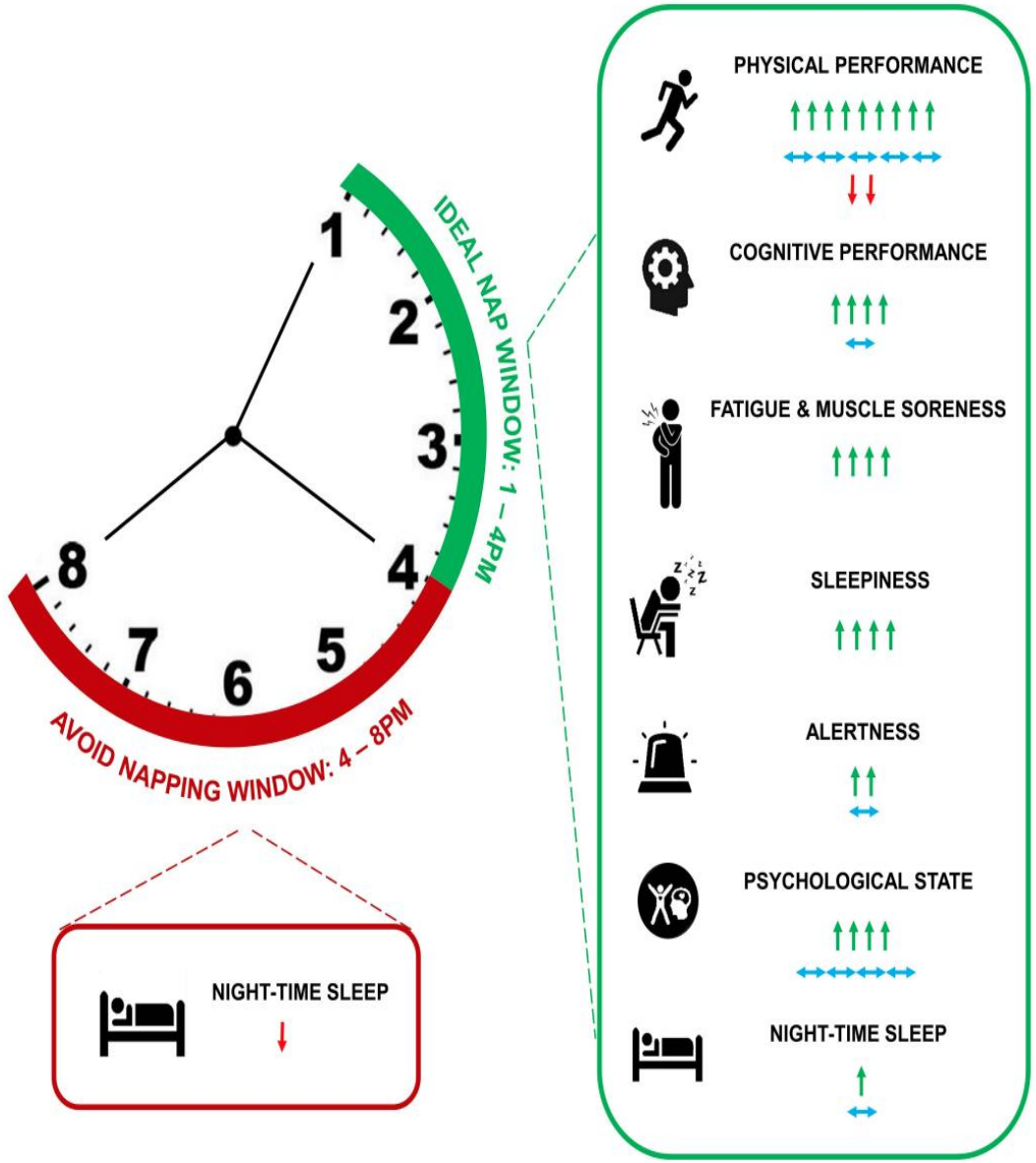
Purpose: The objective of this systematic review was to 1) determine how studies evaluated napping behavior in athletes (frequency, duration, timing and measurement); 2) explore how napping impacted physical performance, cognitive performance, perceptual measures (eg, fatigue, muscle soreness, sleepiness and alertness), psychological state and night-time sleep in athletes.

Methods: Five bibliographic databases were searched from database inception to 11 August 2020. Observational and experimental studies comprising able-bodied athletes (mean age ≥12 years), published in English, in peer-reviewed journal papers were included. The Downs and Black Quality Assessment Checklist was used for quality appraisal.

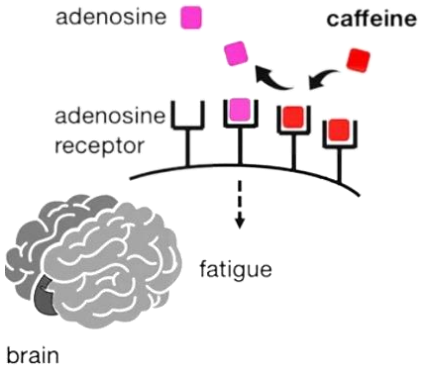
Results: Thirty-seven studies were identified of moderate quality. Most studies did not include consistent information regarding nap frequency, duration, and timing. Napping may be beneficial for a range of outcomes that benefit athletes (eg, physical and cognitive performance, perceptual measures, psychological state and night-time sleep). In addition, napping presents athletes with the opportunity to supplement their night-time sleep without compromising sleep quality.

Conclusion: Athletes may consider napping between 20 to 90 min in duration and between 13:00 and 16:00 hours. Finally, athletes should allow 30 min to reduce sleep inertia prior to training or competition to obtain better performance outcomes. Future studies should include comprehensive recordings of nap duration and quality, and consider using sleep over a 24 hour period (daytime naps and night-time sleep period), specifically using objective methods of sleep assessment (eg, polysomnography/actigraphy).

Keywords: athlete, health behavior, performance, physical health, psychological health, sleep, sports



Nap wisely



12h from the middle of your usual sleep period

If you can't sleep meditate instead

Lying down eyes closed and deep breathing = Nap

It is not an issue if you don't sleep as long as you feel rested.

Coffee beforehand to limit sleep inertia

e.g. sleep 11am-7am then 3pm

30mins

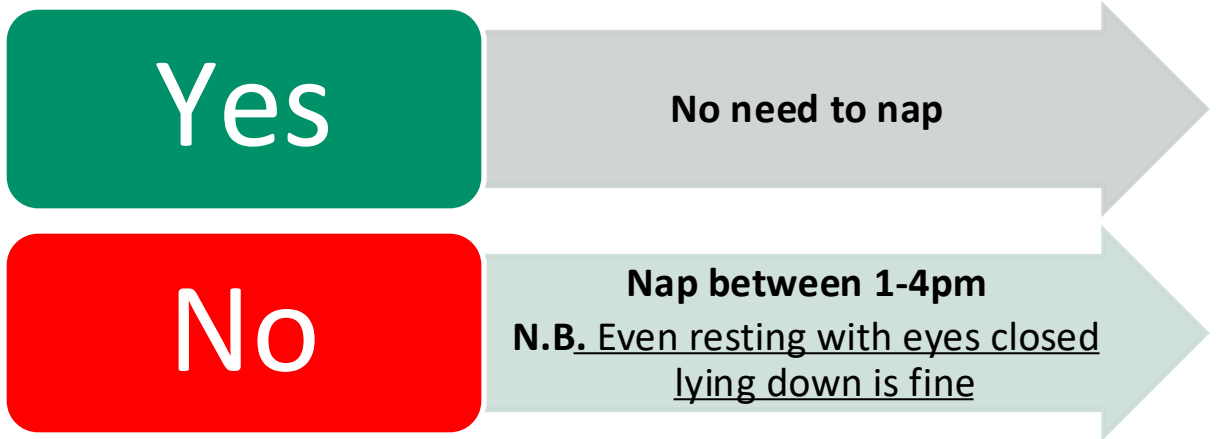
Sleep

1 **Understand what is ‘normal’ for you**

2 **Napping is really only useful if getting < 8 hours quality sleep per night.**

3 **If you are refreshed and alert within 30mins of waking it’s not necessary.**

4 **Are you well rested when you wake up?**



Annual Review of Nutrition

Sleep and Diet: Mounting Evidence of a Cyclical Relationship

Faris M. Zuraikat,[1,2] Rebecca A. Wood,[2] Rocío Barragán,[1,3,4] and Marie-Pierre St-Onge[1,2]

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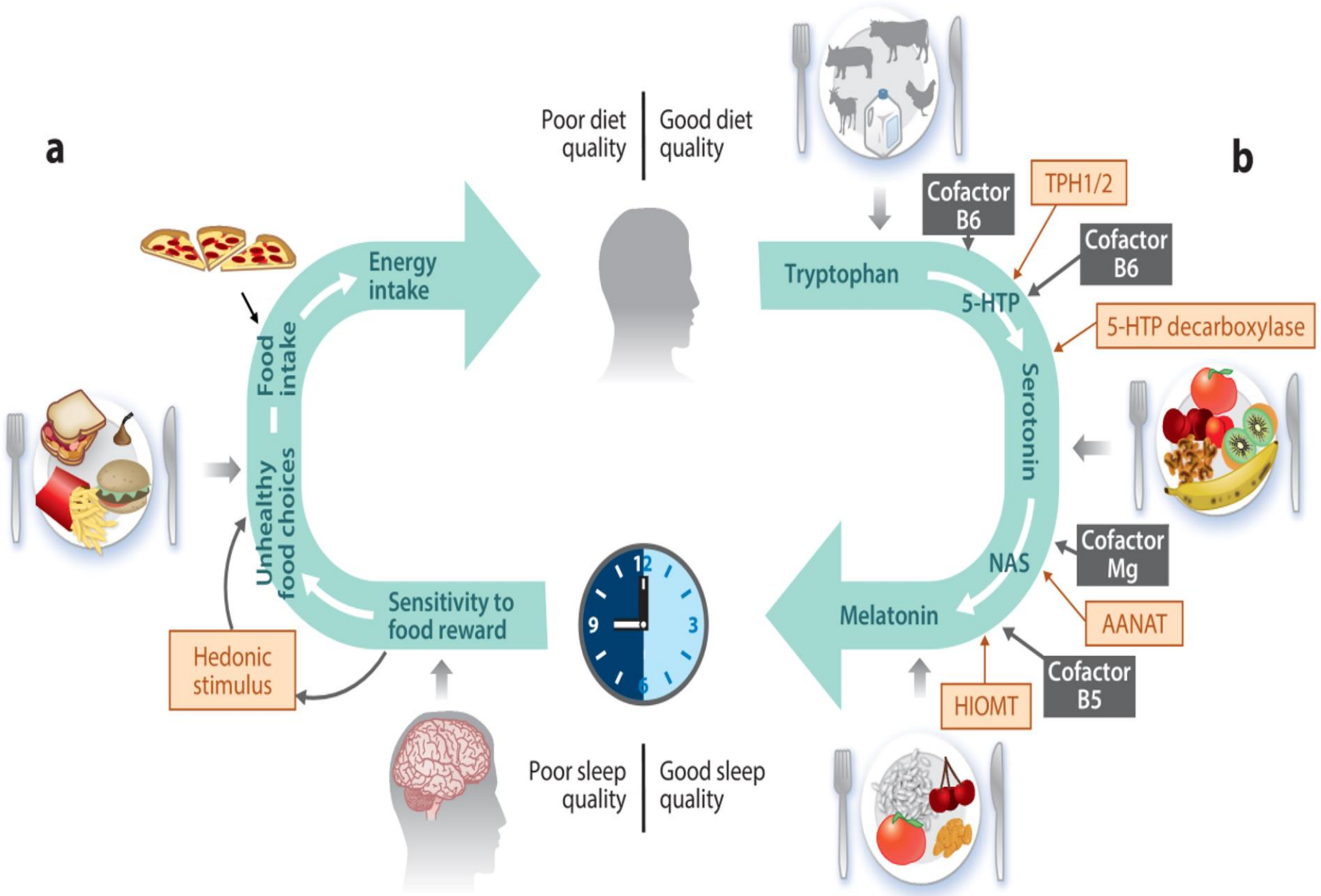

Sleep & Nutrition

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SLEEP AND ATHLETIC PERFORMANCE (M GRANDNER, SECTION EDITOR)

Sleep and Nutrition in Athletes

Rónán Doherty[1,2] · Sharon Madigan[2,3,4] · Giles Warrington[3,4] · Jason G. Ellis[5]

Accepted: 7 November 2022 / Published online: 7 January 2023

Abstract

Purpose of Review Whilst it is known that athletes are particularly vulnerable to sleep difficulties due to high training and competition demands, the relationship between sleep and nutrition in this population is less clear.

Recent Findings Nutrition is becoming an area of increased interest in relation to athlete sleep and recovery. The adaptive response to training is dictated by a number of variables: duration, intensity, frequency and type of exercise in combination with nutrition both pre- and post-exercise. Training adaptations and recovery including sleep can be optimised by appropriate nutrition practises. There are numerous nutrients that show promise in relation to the promotion of sleep and athlete recovery which are discussed in this article.

Summary Whilst the number of studies investigating the effect of nutritional interventions on sleep in athletes is increasing, more research is necessary in elite athletic populations.

Keywords Athletes · Sleep · Nutrition · Recovery

nutrients MDPI

Review

Sleep and Nutrition Interactions: Implications for Athletes

Rónán Doherty [1,2,3,*], Sharon Madigan [2], Giles Warrington [4,5] and Jason Ellis [3]

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Received: 4 February 2019; Accepted: 10 April 2019; Published: 11 April 2019

Abstract: This narrative review explores the relationship between sleep and nutrition. Various nutritional interventions have been shown to improve sleep including high carbohydrate, high glycaemic index evening meals, melatonin, tryptophan rich protein, tart cherry juice, kiwifruit and micronutrients. Sleep disturbances and short sleep duration are behavioural risk factors for inflammation, associated with increased risk of illness and disease, which can be modified to promote sleep health. For sleep to have a restorative effect on the body, it must be of adequate duration and quality; particularly for athletes whose physical and mental recovery needs may be greater due to the high physiological and psychological demands placed on them during training and competition. Sleep has been shown to have a restorative effect on the immune system, the endocrine system, facilitate the recovery of the nervous system and metabolic cost of the waking state and has an integral role in learning, memory and synaptic plasticity, all of which can impact both athletic recovery and performance. Functional food-based interventions designed to enhance sleep quality and quantity or promote general health, sleep health, training adaptations and/or recovery warrant further investigation.

Keywords: sleep; athletes; chrononutrition

nutrients MDPI

Article

The Impact of Kiwifruit Consumption on the Sleep and Recovery of Elite Athletes

Rónán Doherty [1,2,3,*], Sharon Madigan [2,4,5], Alan Nevill [6], Giles Warrington [4,5] and Jason Gordon Ellis [3,4,5]

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nutrients MDPI

Article

The Sleep and Recovery Practices of Athletes

Rónán Doherty [1,2,3,*], Sharon M. Madigan [2], Alan Nevill [4], Giles Warrington [5,6] and Jason G. Ellis [3]

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Table 1 Practical application of nutrition in relation to sleep in athletes

Food/nutrient	Potential benefit
Tryptophan	↓ SOL
Tart cherries	Sleep: ↑ TST, TIB & SE ↓ daytime sleepiness Recovery: ↓ muscle soreness & ↓ inflammatory response (may be useful during period[illegible]very e.g. multi-heat events
Nitrate	↑ Subjective sleep quality & ↓ global PSQI score
Kiwifruit	↑ Subjective sleep quality
Warrants further investigation	
Antioxidants	The specific antioxidant ingested, dose and timing of ingestion all affect outcomes Food-based interventions warrant investigation in relation to sleep promotion and recovery in athletic populations
Kiwifruit	Kiwifruit consumption to promote sleep and recovery in athletes Kiwifruit products/supplements in relation to athlete sleep/recovery
Protein supplementation	Effect of 40 g dose < 60 min pre-sleep on sleep and recovery Effect of casein ingestion pre sleep on sleep
Magnesium	Potential sleep promotion effects > 12 weeks of follow-up if necessary Research warranted in athletic populations
Tryptophan-rich protein	Consumption of whole food sources and their impact on athlete sleep and recovery (e.g. meals containing combinations of tryptophan rich protein)
Probiotics	The impact of supplementation/different strains on sleep in athletes
Nitrate	The impact of nitrate ingestion on the sleep and recovery of athletes

Creatine an emerging option to counteract the cognitive decline associated with 1 poor night's sleep

nutrients

MDPI

Review

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Received: 4 February 2019; Accepted: 10 April 2019; Published: 11 April 2019

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Keywords: sleep; athletes; chrononutrition

Sleep and Nutrition

Foods and drinks can have a positive or negative impact on sleep

Team Ireland

Consume these to promote sleep

High GI CHO evening meal

Jasmine rice, potato, corn, noodles, bread

Tryptophan rich protein

Milk, fish, chicken, turkey, eggs, pumpkin seeds, beans, peanuts, cheese

Tart cherry juice

High **melatonin** content - may reduce sleep onset time & increase sleep duration

1 x morning & 1 x evening, **anti-inflammatory** properties

Kiwi fruit

2 x Kiwi fruit
1 hour before bed

Avoid these to limit negative impact on sleep

Large portions

Avoid late in the evening

Late meals

Avoid eating late at night unless refuelling/recovering after training/competition

Caffeine

Can promote **alertness**

Can increase sleep onset time, sleep disturbance & reduce sleep duration

Avoid +6h from bedtime (unless using in training/competition)

Alcohol

Can impact sleep, particularly REM sleep in the second half of the night

Can negatively impact **mental recovery**

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Protein
High protein diet can improve sleep quality

Carbohydrate
Carbohydrate (HGI) shorter sleep latency >1h before sleep

Fat
High fat diet may reduce sleep time

Tryptophan
Small dose (1g) can improve sleep latency and quality

Melatonin
May decrease sleep onset time

Valerian
may improve subjective sleep quality

Avoid energy restriction
Sleep quality reduced with decreased energy intake

Common Sleep Myths

01

You can get used to sleep loss…

02

Sleep duration is the only thing that matters…

03

A warm bedroom will help you sleep…

04

Nap as much as you want…

05

Alcohol will help you sleep

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Thank You!