

Wake up to Sleep!

The Role of Sleep in Recovery, Athletic Performance & Injury Prevention: What We Know So Far!

Dr Giles Warrington PhD, FACSM



UNIVERSITY OF
LIMERICK
OLLSCOIL LUIMNIGH

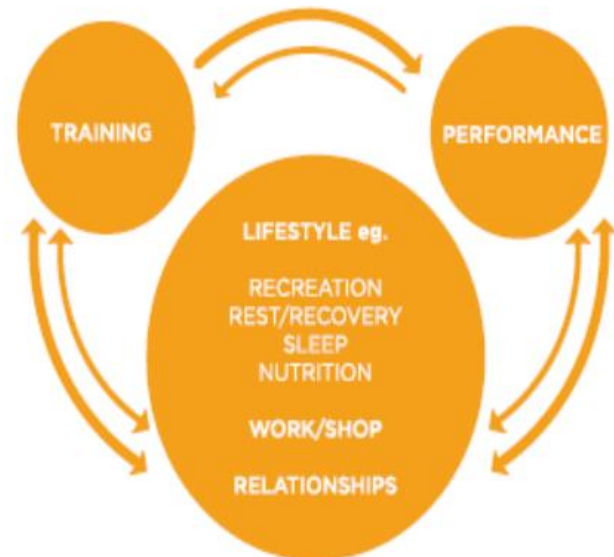
Department of
Physical Education
and Sport Sciences

Determinants of Performance:

1. Genetics

2. Environment

- Training: Technical/Tactical/Physical/Mental
- Lifestyle
 - **Sleep**/recovery/rest
 - Nutrition
 - Health
 - Work/Education
 - Recreation
 - Others



(Coaching Ireland)

PERFORMANCE

LIFESTYLE

PHYSICAL

MENTAL

TACTICAL

TECHNICAL

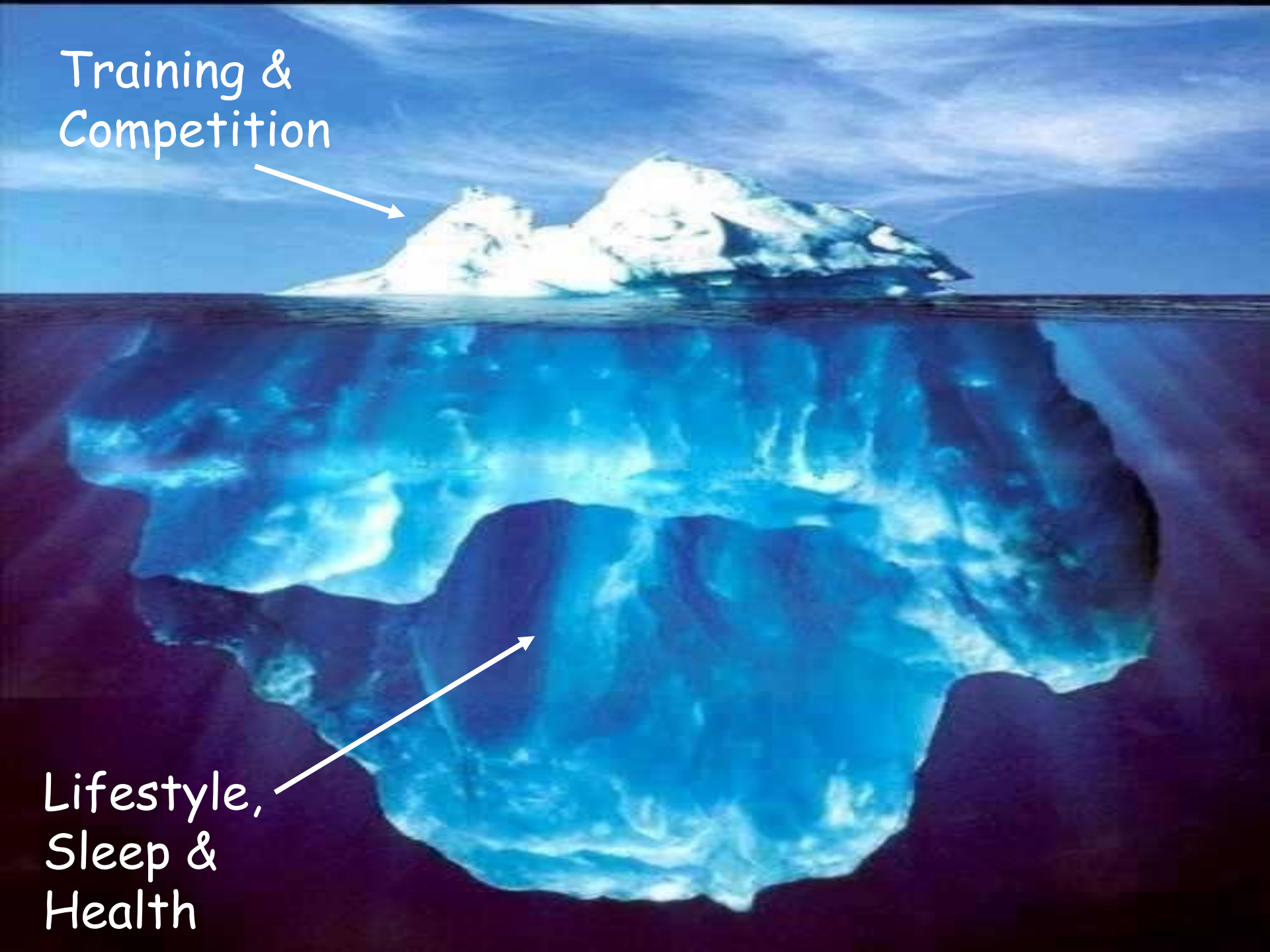
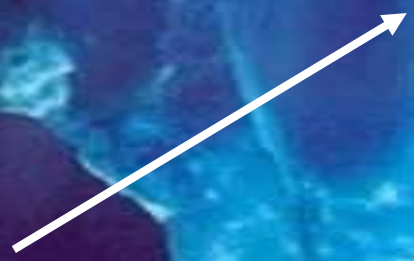
SLEEP & HEALTH



Training &
Competition

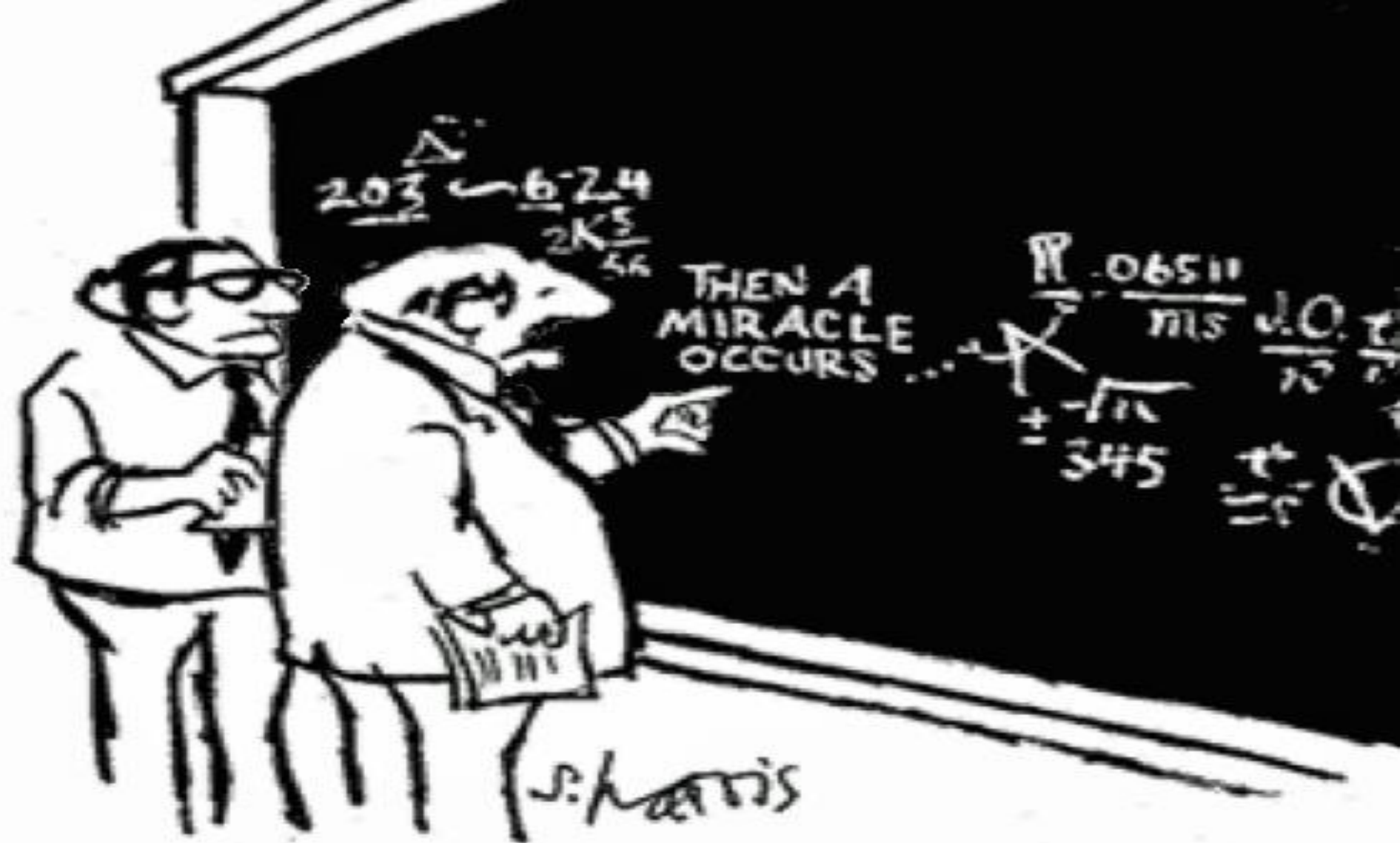


Lifestyle,
Sleep &
Health









"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Sleep



Sleep

..... Your Natural Recovery Strategy !



... "A New Frontier in Performance Enhancement"

(Leeder et al., 2012).

(www.Humankinetics.com)

Shakespeare on Sleep

"O sleep, O gentle
sleep, Nature's soft
nurse."

Henry IV Part 2

"We are such stuff as
dreams are made on,
and our little life is
rounded with sleep."

The Tempest



1564-1616



Energy Conservation Theory

Inactivity Theory



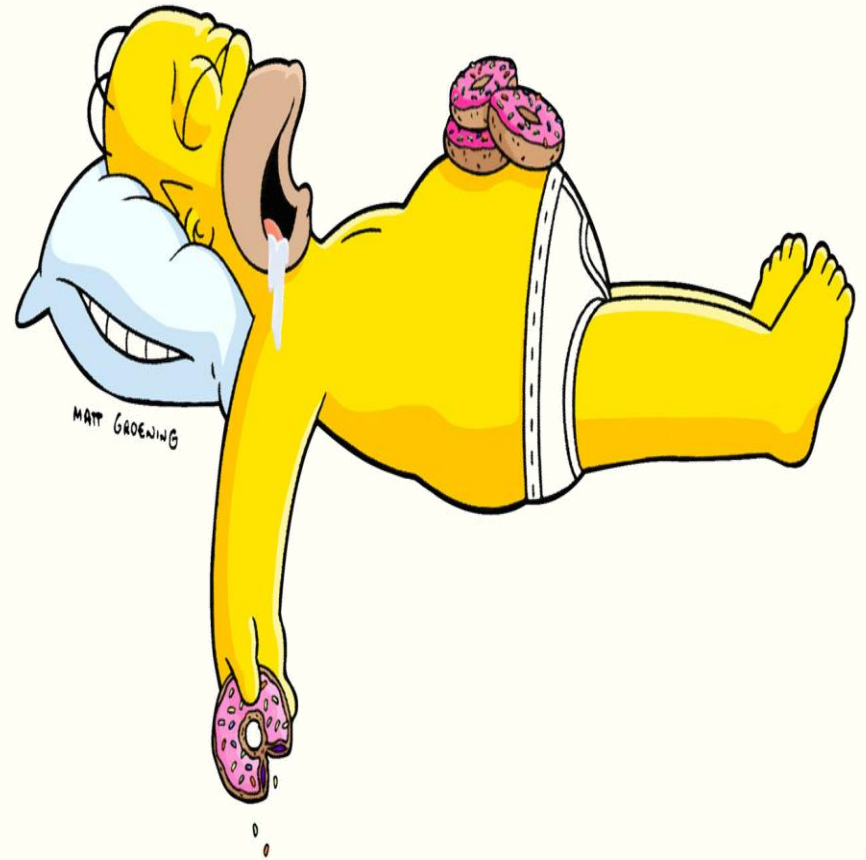
Restorative Theories

Brain Function/Plasticity Theory

There is still no clear consensus!

Sleep FAQ's

- Role and functions of sleep?
- How much sleep do I need?
- What about power naps?
- What if I can't get to sleep?



Sleep Wake Cycle: Two Process Model (Borbely, 1982)

Homeostatic
Sleep Drive

Light



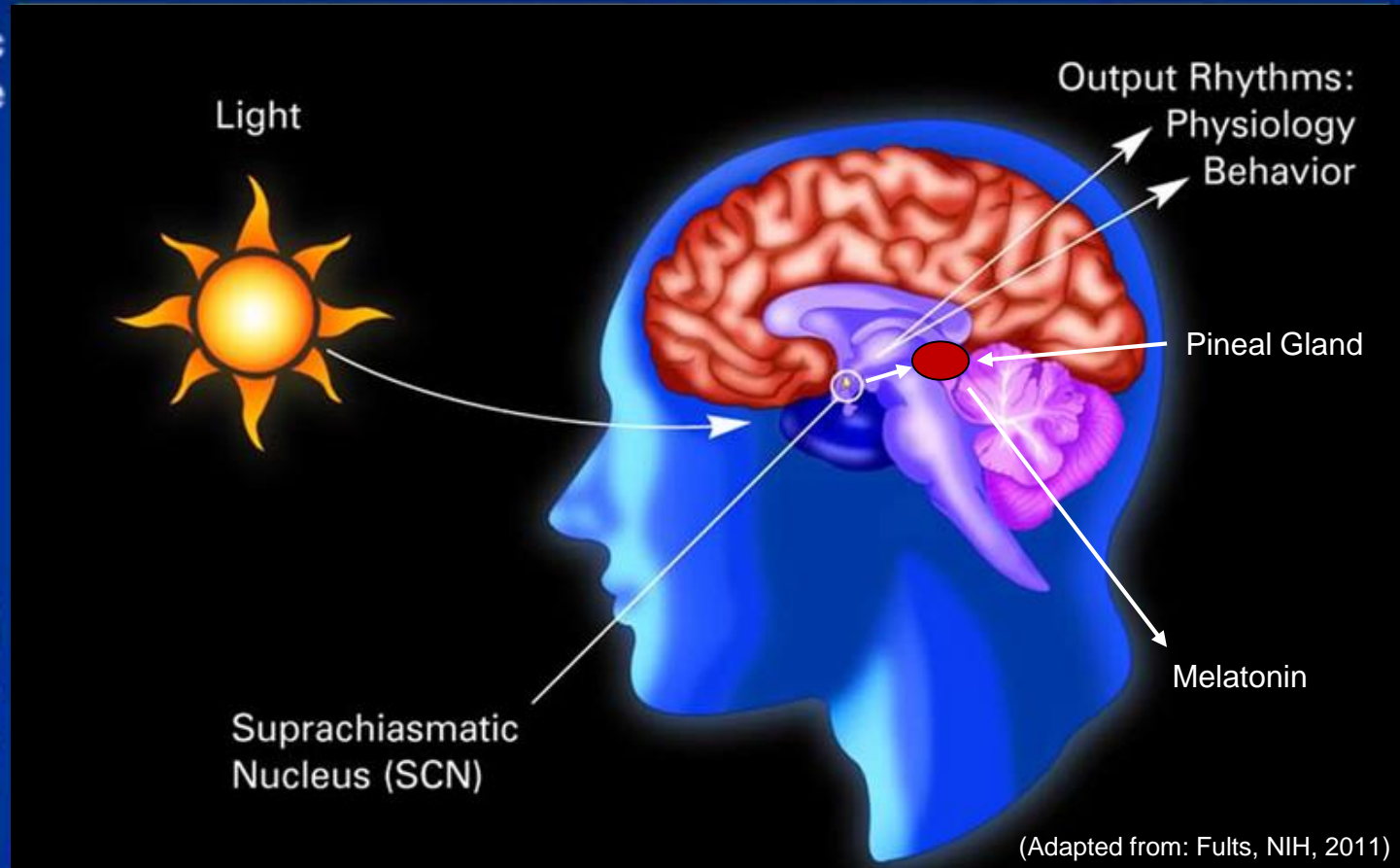
Output Rhythms:
Physiology
Behavior

Pineal Gland

Circadian
Alerting
Signal
(SCN)

Suprachiasmatic
Nucleus (SCN)

Melatonin



(Adapted from: Fults, NIH, 2011)

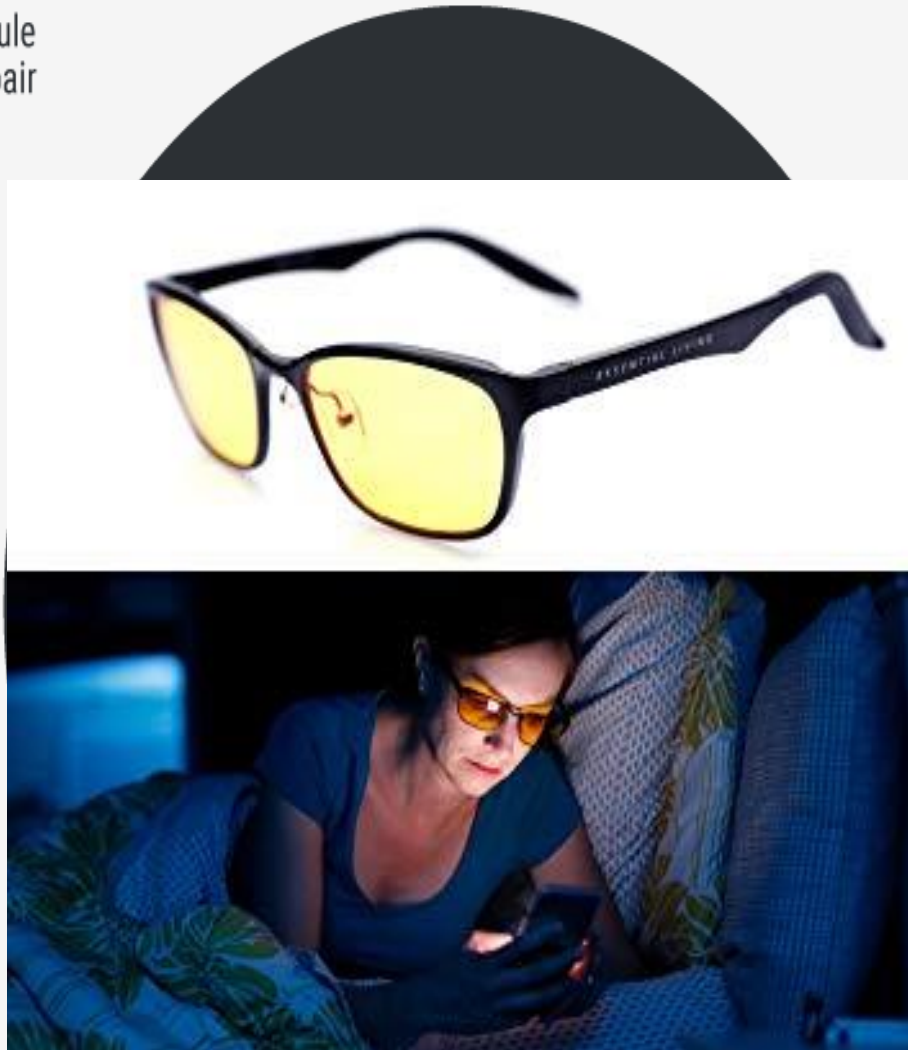
How exposure to **blue light** affects your brain and body

BY DISRUPTING MELATONIN, **SMARTPHONE LIGHT** RUINS SLEEP SCHEDULES. THIS LEADS TO ALL KINDS OF **HEALTH PROBLEMS**:

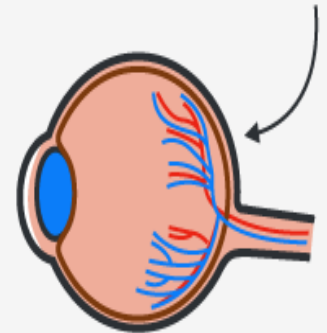
The disruption to your sleep schedule might leave you distracted and impair your **MEMORY** the next day.



A poor night's sleep caused by smartphone light can make it **HARDER TO LEARN**.



There's some evidence that blue light could damage our vision by harming the **RETINA** over time – though more research is needed.



Researchers are investigating whether or not blue light could lead to **CATARACTS**.



EXTERNAL FACTORS
(e.g. food, drugs, temperature,
stress, social factors, etc)



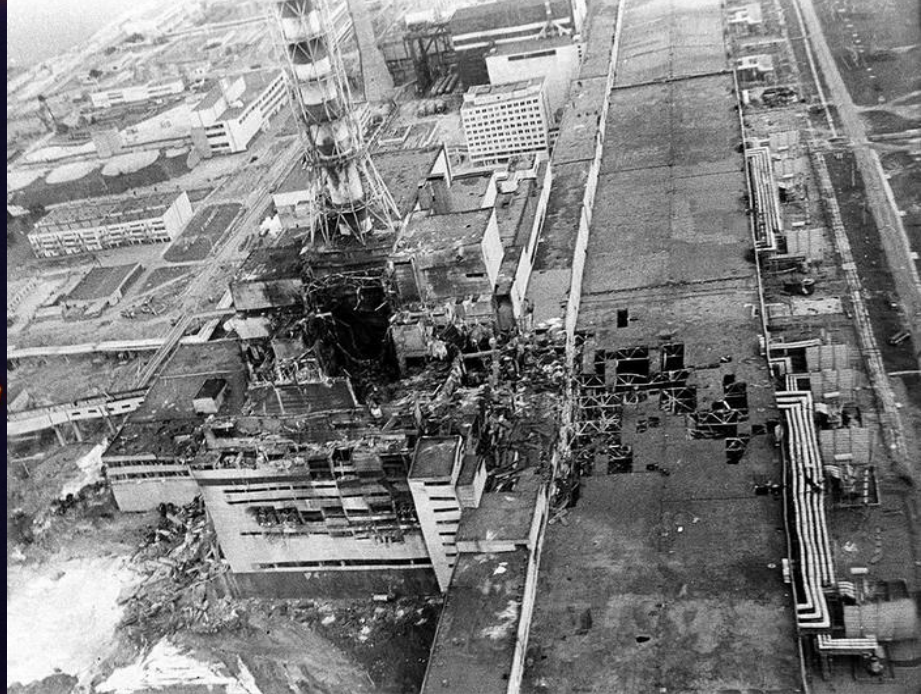
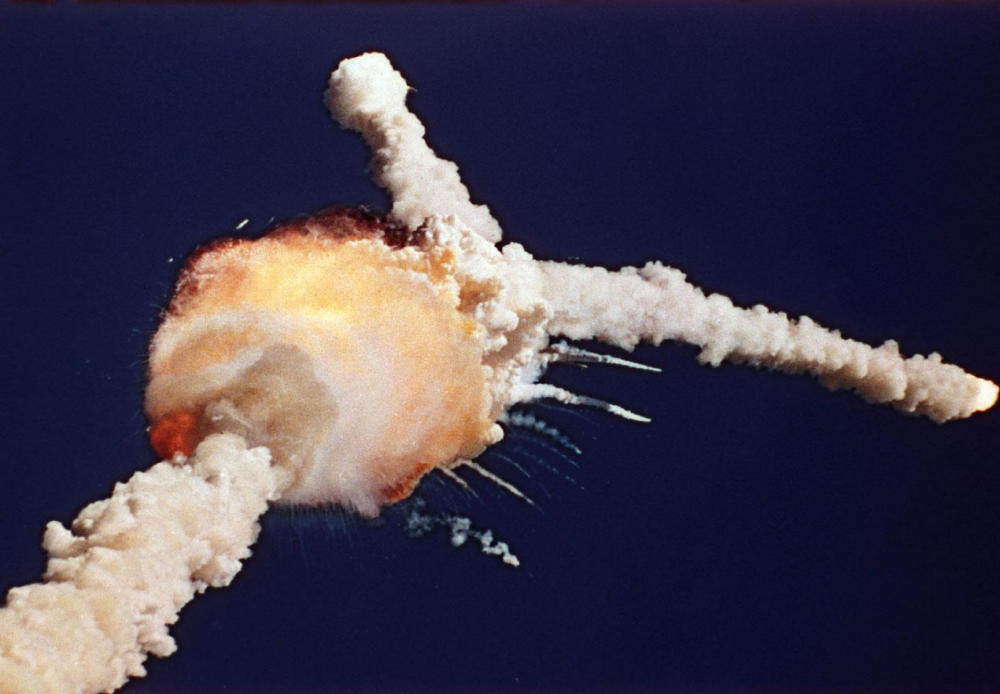
What Chronotype Are You?



Morningness



Eveningness



Sleep Deprivation, Health & Performance



Sleep Deprivation Research

Very limited research in athletes or performance

- ↓ attention and vigilance (Dinges, 1990; Helmreich et al., 2004; Lee, Kim & Suh, 2003)
- ↑ negative mood disturbances (Scott et al., 2006)
- Slower reaction times (Choo, Lee, Venkatraman, Sheu & Chee, 2005; Helmreich et al., 2004; Kim et al., 2001)
- ↓ decision-making (Harrison & Horne, 1999; McKenna et al., 2007; Philip et al., 2003); ↓ skill execution (Cook et al., 2011)
- ↓ working memory (Karakorpi et al., 2006).
- ↓ Performance (Skein et al., 2013; Abedelmalek et al., 2013)
- Poor sleep quality has previously been identified as a marker of poor recovery and an early sign of non-functional overreaching (Meeusen et al., 2012)



Roles of Sleep

- Performance
- Health
- Illness
- Injury
- Metabolism
- Cognition
- Memory
- Learning
- Mood



(Halson and Juliff, 2017; Kolling et al., 2016; Krueger et al., 2008; Simpson et al., 2016)

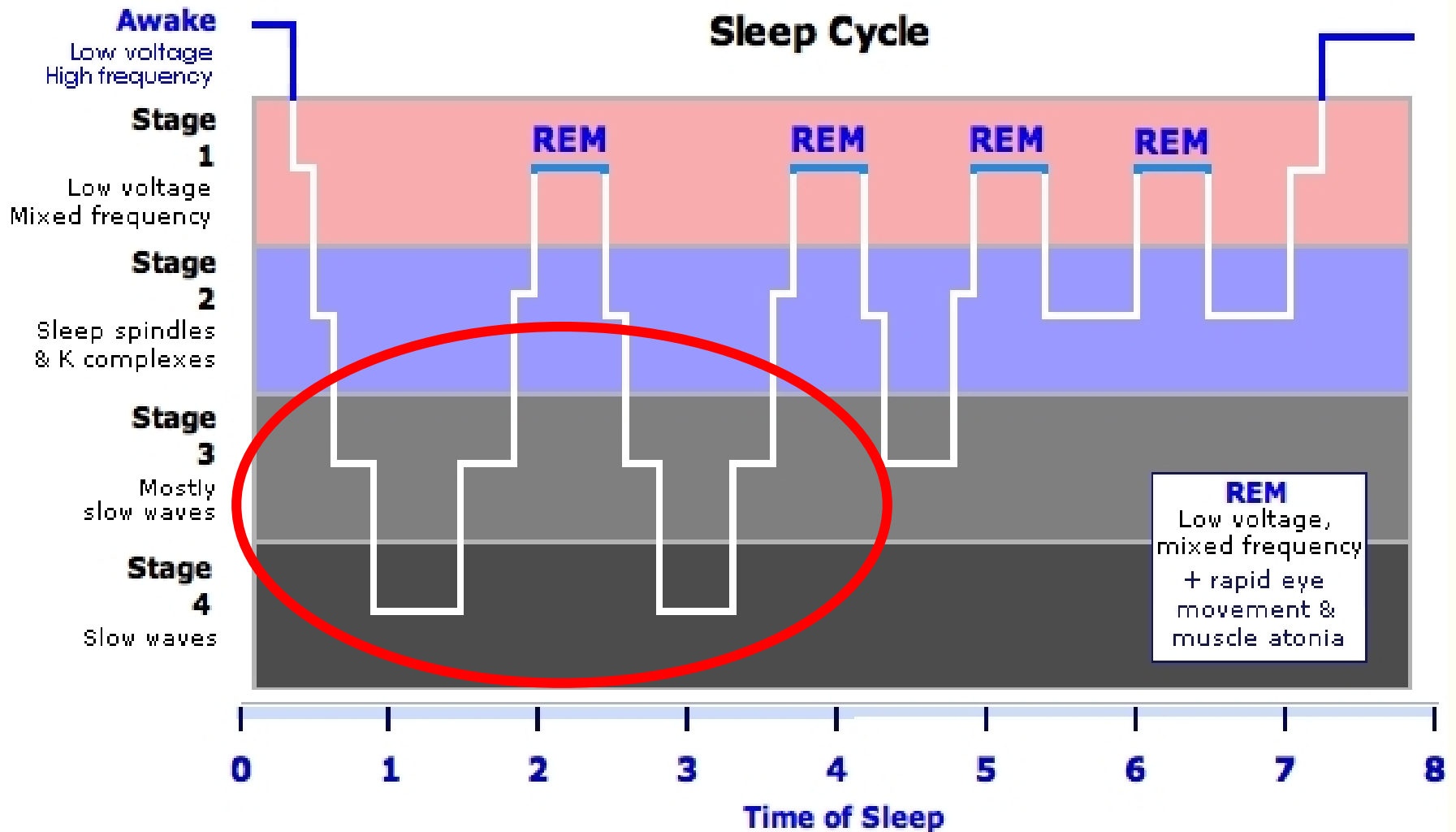
(www.Valleysleepcentre.com)

Sleep - Roles and Functions?

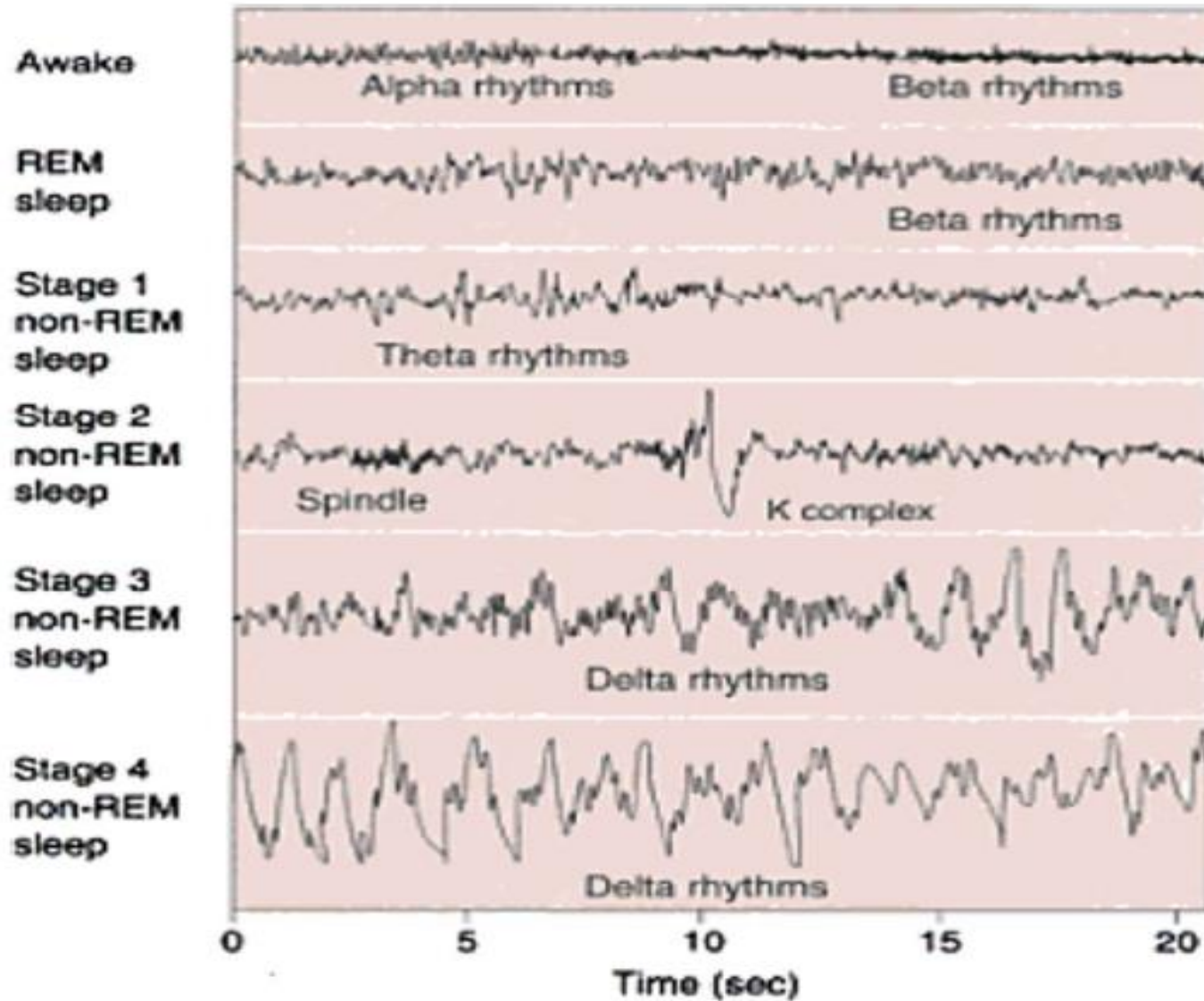
- Sleep is an important recovery strategy due to its physiological and restorative effects (Halson, 2008)
- Essential for every day health, functioning and recovery
- Improved mental aptitude (Walker 2010)
- Augmented motor learning (Walker et al., 2002; Siengsukon & Boyd, 2009)
- Early phase of sleep the most important (Halson, 2014)
- The power of napping on performance (Waterhouse et al., 2007; Walker, 2010) and immune function (Faraut et al., 2010)



Sleep Cycle



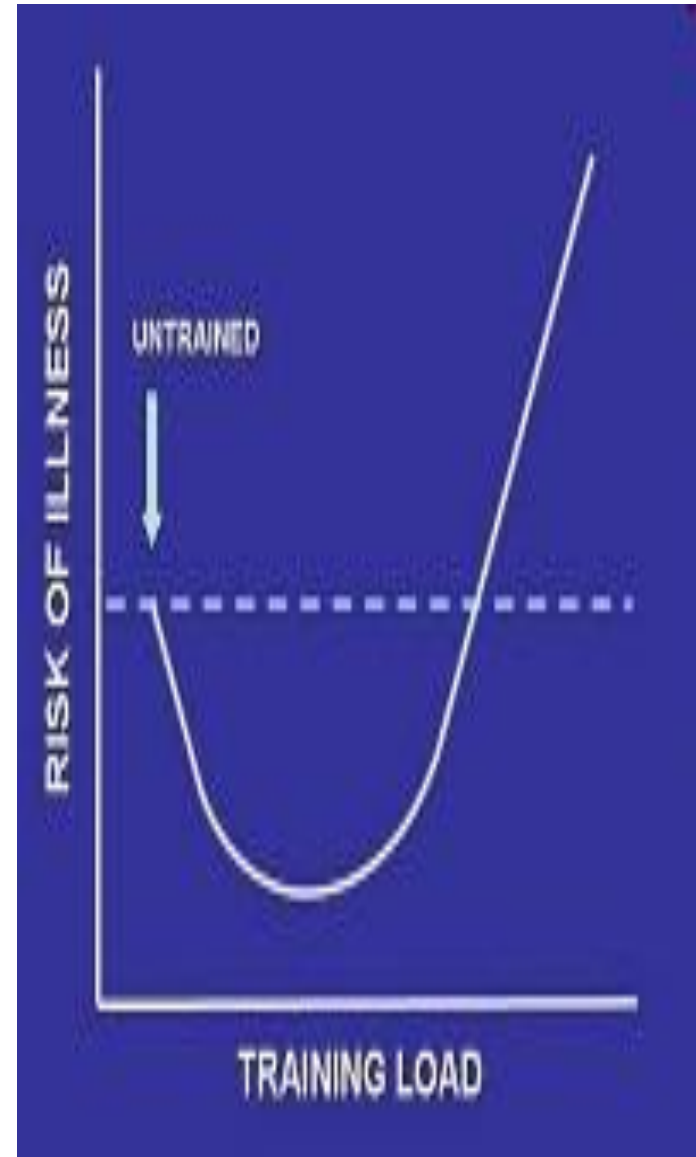
Sleep Cycle



(From: Bear et al., 2016, in Halson and Juliff, 2017)

Sleep, Illness and Infection

- Athletes may be more susceptible to immunosuppression (Walsh et al., 2011)
- Other stressors can also affect the immune system: psychosocial, nutritional plus poor sleep practices
- In contrast good sleep practices (Bollinger et al., 2010) and napping (Faraut et al., 2010) have been shown to enhance immune function.
- Self monitoring is an essential tool



Psychosocial Factors and Sport Injuries: Meta-analyses for Prediction and Prevention

Andreas Ivarsson¹ · Urban Johnson¹ · Mark B. Andersen¹ · Ulrika Tranaeus² ·
Andreas Stenling³ · Magnus Lindwall^{4,5}

ORIGINAL ARTICLE

J Pediatr Orthop • Volume 34, Number 2, March 2014

Chronic Lack of Sleep is Associated With Increased Sports Injuries in Adolescent Athletes

Matthew D. Milewski, MD, David L. Skaggs, MD, MMM,†
Gregory A. Bishop, MS,‡ J. Lee Pace, MD,† David A. Ibrahim, MD,†
Tishva A.L. Wren, PhD,† and Audrius Barzdukas, MEd‡*

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JSAMS
Journal of Science and Medicine in Sport

Original research

General health complaints and sleep associated with new injury within an endurance sporting population: A prospective study

R. Johnston^{a,i,*}, R. Cahalan^{b,c}, L. Bonnett^d, M. Maguire^e, P. Glasgow^g, S. Madigan^f,
K. O'Sullivan^{b,c,h}, T. Comyns^{a,c}



How does sleep loss influence your performance?



By @YLMsSportScience



1 A reduction in sleep quality and quantity could result in an autonomic nervous system imbalance, simulating symptoms of the overtraining syndrome



2 Growth hormone, which is fundamental to tissue regeneration and growth is released during phases of deep sleep



3 1.7 times greater risk of being injured in athletes who sleep < 8 hours per night



6 When sleep is reduced to less than 7 h in healthy adults, cognitive performance is poorer in tests for alertness, reaction time, memory, and decision making



5 Sleep loss is associated with slower and less accurate cognitive performance

4 Increases in pro-inflammatory cytokines following sleep loss could promote immune system dysfunction



7 Sufficient sleep should be obtained following training sessions, as the perceptual and motor learning processes continue into and throughout subsequent sleep



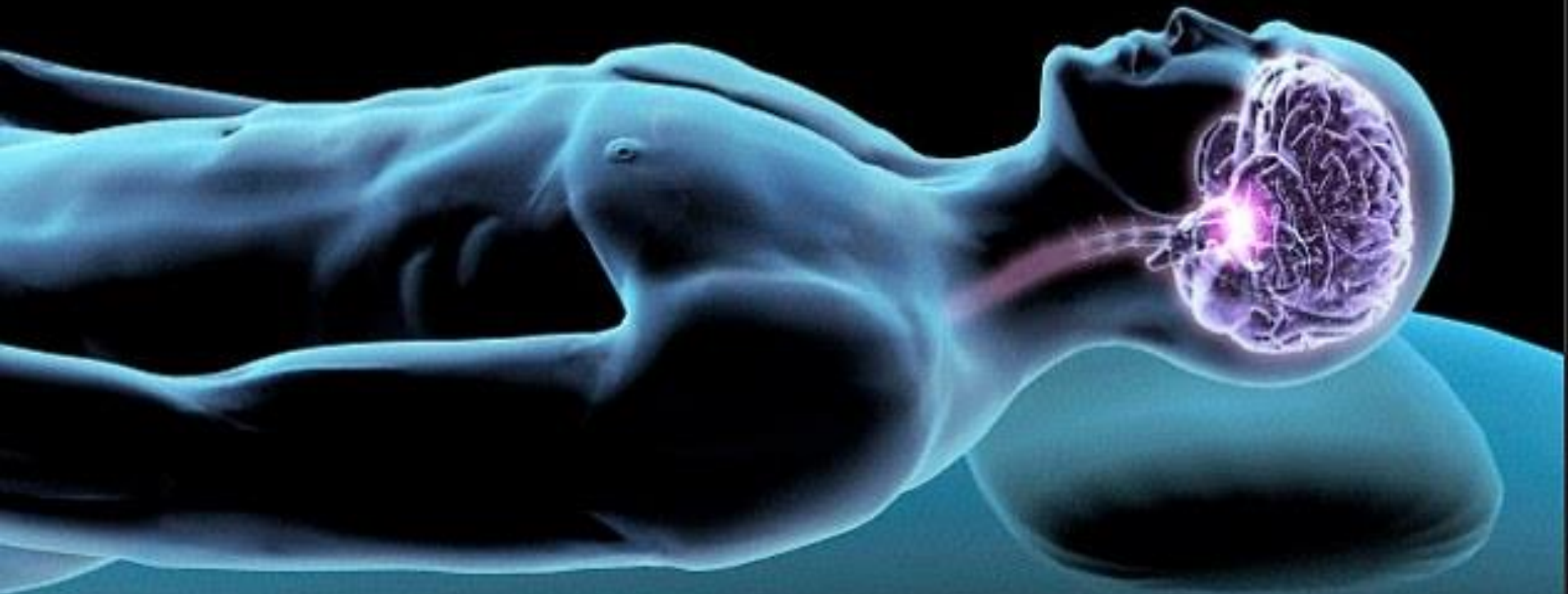
8 2-hour exposure to light exposure to light from self-luminous electronic displays can suppress melatonin by about 22% and affect sleep

Recent evidence suggests that most athletes sleep far less than either 8h per night

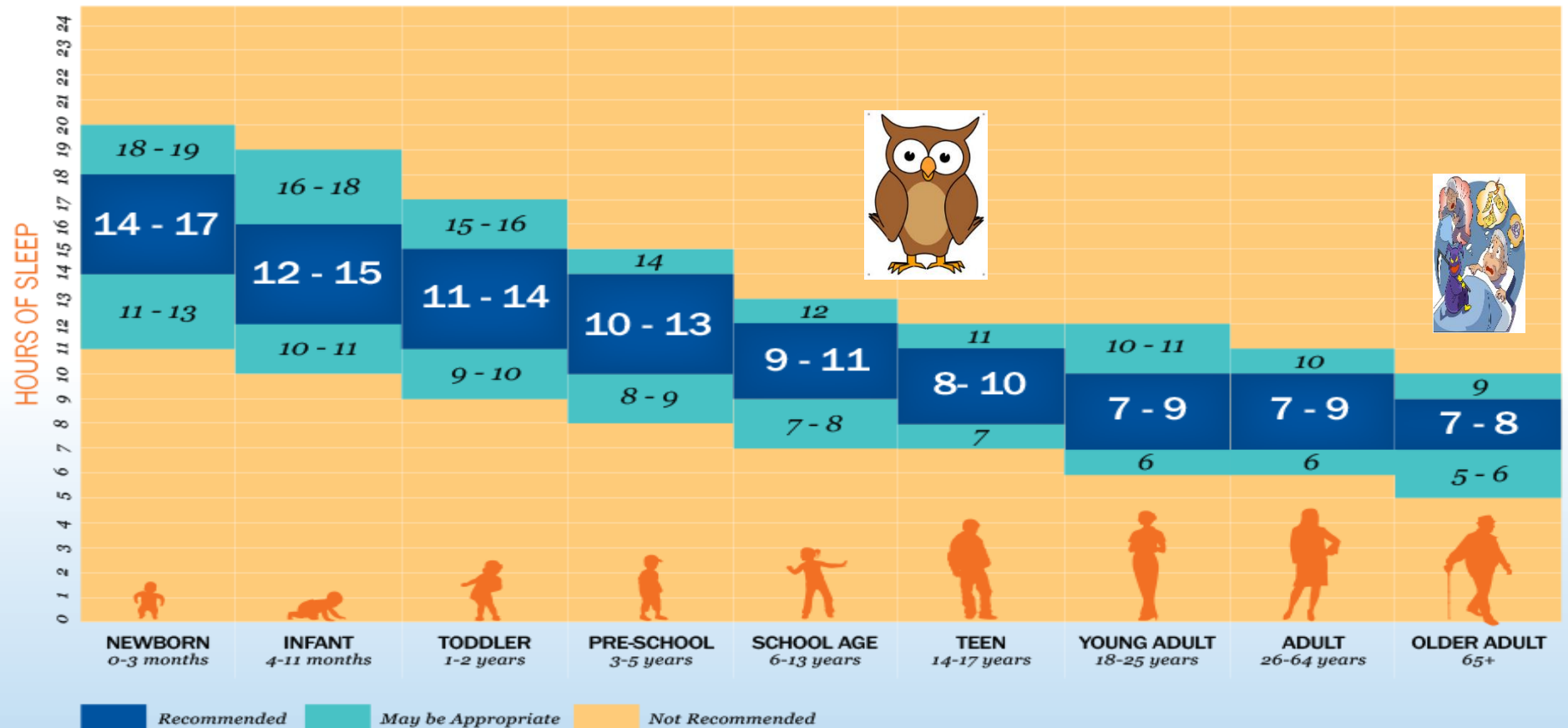


Reference: Le Meur, Skein & Duffield
In Recovery for Performance in Sport, Human Kinetics, 2013

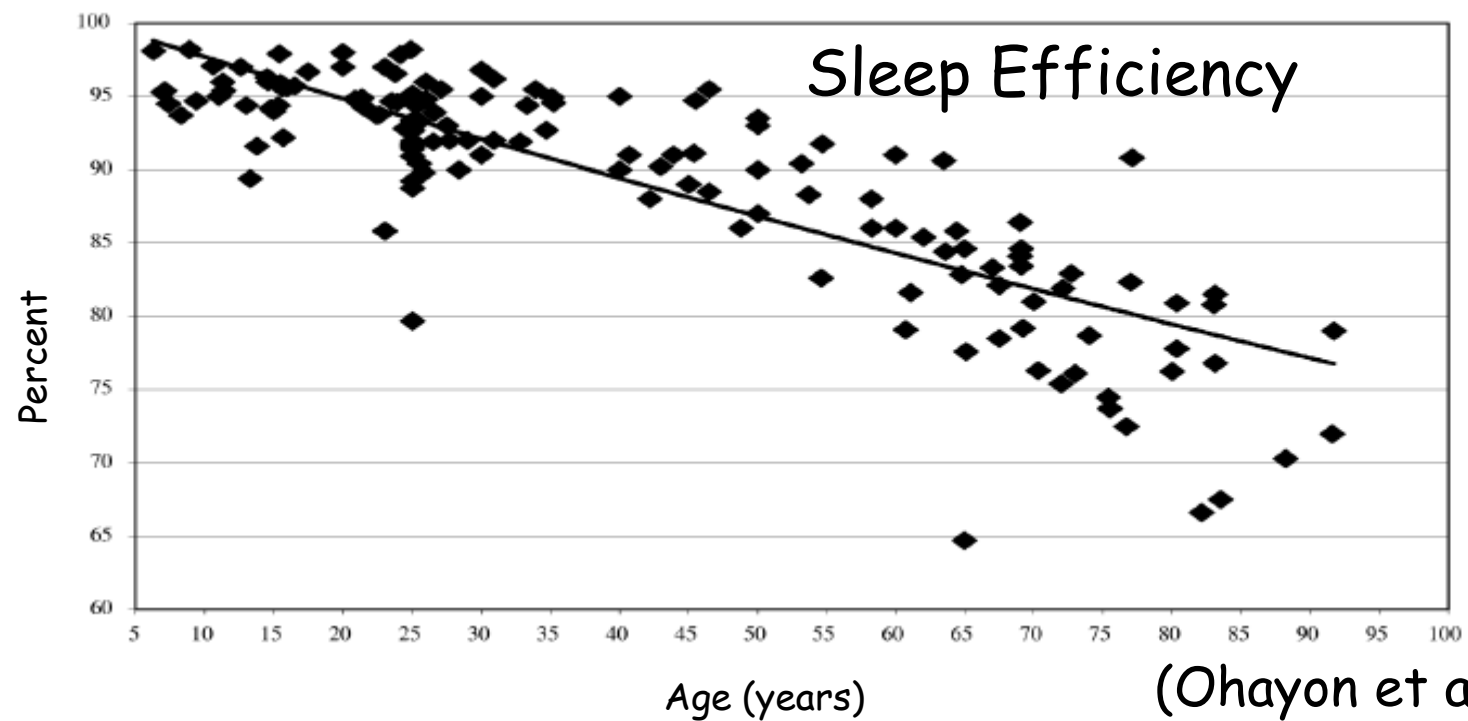
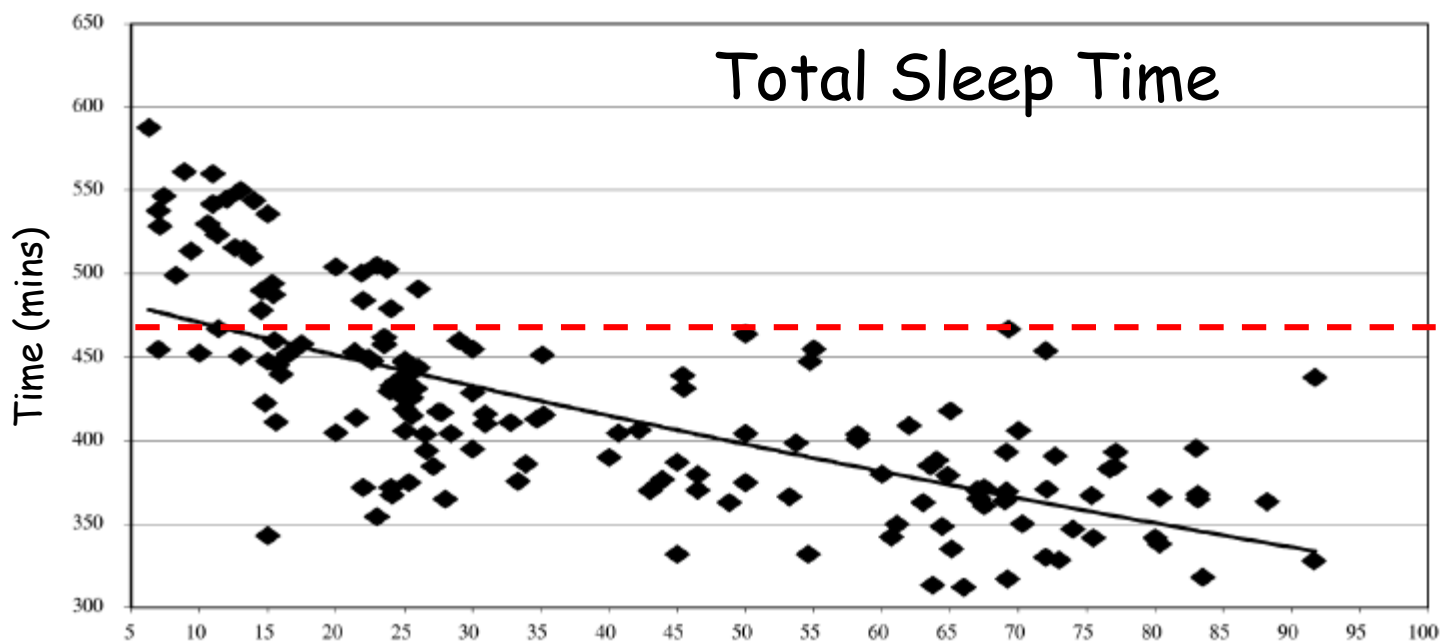
How Much Sleep Do We Need?



SLEEP DURATION RECOMMENDATIONS



SLEEPFOUNDATION.ORG | SLEEP.ORG



Athlete Sleep Data

Elite athletes identified as having poorer quality and quantity sleep than the general population

Possible Factors:

- Timing of training/competition
- Competition stress/anxiety
- Muscle soreness/pain
- Caffeine use
- Meal timing/other nutritional factors
- Environment -Travel/altitude and unfamiliar surroundings
- Technology
- Other lifestyle factors

(Halson and Juliff, 2017)

Athlete Sleep Data

- Group of international & national level athletes (n=124) slept on average 6 hours 42 min.
- Team athletes reported sleeping 30 mins longer (Lastella et al., 2015).
- Elite Australian Athletes (n=70) over 2 weeks training:
- 88% sleep duration less than 8 hours; 60% were below 7 hours and 76% of sleep periods below 90% sleep efficiency (Sargent et al., 2014).

Sleep duration and quality in elite athletes measured using wristwatch actigraphy

JONATHAN LEEDER,¹ MARK GLAISTER,² KATHLEEN PIZZO FERRO,³ JEAN DAWSON³,
& CHARLES PEDLAR⁴

¹*English Institute of Sport, Manchester, UK*, ²*St Mary's University College, London, UK*, ³*University of Surrey, Clinical Research Centre, UK*, and ⁴*St Mary's University College, Twickenham, UK*

Wristwatch actigraphy data:

- Olympic athletes (n=46) & Controls (n=20)
- Lower sleep efficiency 80.6% vs 88.7%
- Higher sleep fragmentation 36 vs 29.8
- Longer time in bed 8hrs 36mins v 8hrs 7mins
- Higher onset sleep latency 18.2mins vs 5mins
- Lower total sleep time 6hrs 55 mins vs 7hrs 11mins

Your ideas on Good Sleep Practice?



Sleep & NUTRITION INTERACTIONS

Reference: Doherty et al. Nutrients 2019

Designed by @YLMSSportScience

PROMOTE SLEEP

High glycaemic index evening meal



Tryptophan rich proteins



Milk, turkey, chicken, fish, eggs, pumpkin seeds, beans, peanuts, cheese, and leafy green vegetables

& Tart cherry juice*

may all reduce sleep onset latency & increase sleep duration by promoting the synthesis of melatonin

*its positive effect may be also related to its anti-inflammatory properties and its positive impact on muscle soreness reduction

Kiwifruit

contains a range of nutrients that can benefit sleep

especially serotonin, vitamins C & E (antioxidants) & folate (its deficiency has been linked to insomnia)

IMPAIR SLEEP

Large portions and/or meals later in the evening



can negatively impact sleep potentially due to the thermogenic effect of digestion

Alcohol

associated with poorer sleep quality and quantity, reduced REM sleep & increased sleep disturbance in the 2nd half of the night



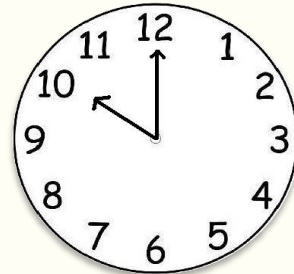
Caffeine



increases the state of alertness & sleep onset latency, reduced total sleep duration and reduced sleep quality

Sleep Hygiene

- Keep a consistent sleep schedule
- Regular bedtime
- **Hrs. sleep b4 midnight aids quality**
- Create a restful sleep environment
- Reduce light exposure 30 mins before bed time
- Not nesting habits!
- Electronic devices away.
- **Phone on silent turned upside down -out of reach.**
 - Your bedroom is a sanctuary- it should be cool, dark and quiet.
 - **Keep your room for sleep not study.**



- **Avoid smoking & alcohol**

- Moderate regular exercise can help reduce stress built up over the day
- Avoid training/ vigorous exercise 2 hours before bed time
- Stay away from big meals at night
- Minimise caffeine intake in evening
- **Don't take in too many liquids in evening**
- Use a diary to note down tasks that come into your head.
- You can then deal with them tomorrow.
- **This quietens your mind.**
- Keeping a periodic sleep diary can also be helpful

Pre & Post Competition Sleep Strategies

- If you have a late start to your event you don't have to stick to normal routine.
- **You compress your sleep- Higher Quality in less time.**



- Try have a physical boundary between competition and sleep
- Shower before bed
- Or short walk in evening.
- **To clear your head.**



- Reflect on competition within 2 hr. window.
- Have take home messages and positives
- **Then move on.**



- Try stay awake with boring task, like counting backwards
- Try reading to try kick start sleep process
- You can rest in bed which is better than up with TV

Summary of Sleep Benefits

- Immune function
- Skill acquisition & motor learning
- Injury
- Recovery enhancement
- General health benefits
- Performance
- It's free!



Future Directions

- Sleep, recovery and sports performance
- Sleep and injury
- Sleep and nutrition
- Sleep and skill acquisition and motor learning
- Sleep deprivation and mental health and wellbeing
- Sleep and disease prevention

There's still a lot we don't know!



SCHULZ