



SPORT SCIENCE WORKSHOPS

PREPARATION & RECOVERY

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Today's Workshop

1. PERIODISATION & TAPERING
2. SLEEP
3. SUPPLEMENTARY RECOVERY MODALITIES



TRAIN BETTER

EAT BETTER

REST BETTER

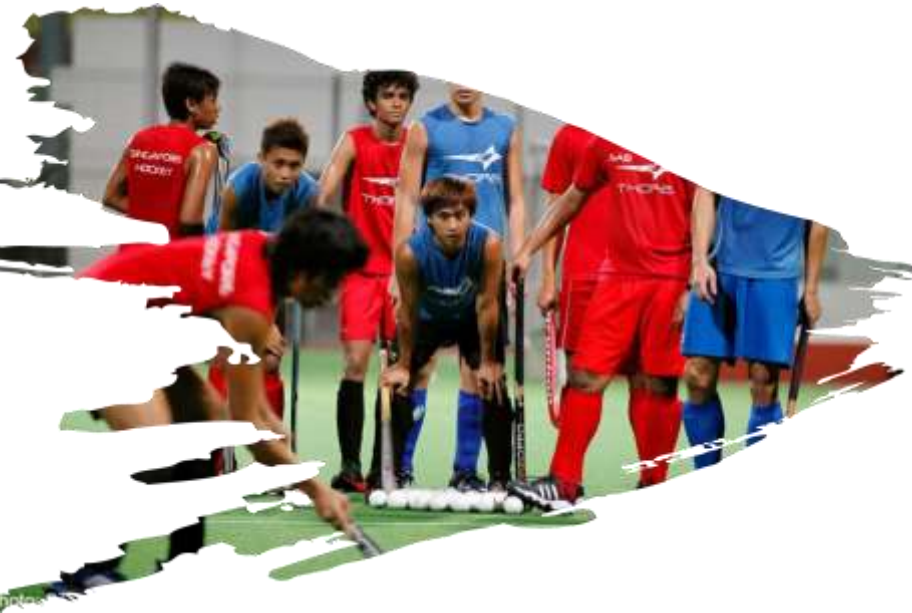


Part 1

Periodisation



Periodization-What?



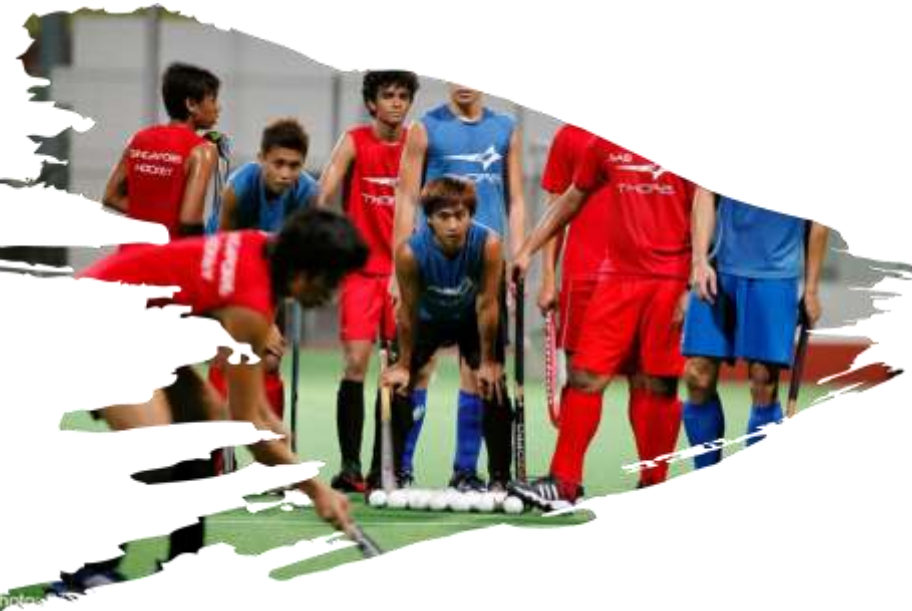
- Practical and theoretical planning paradigm
- The **organization** of training variables into a yearly training plan

Periodization-What?



- Division of training year into smaller blocks to **help athletes peak for key competitions** and manage performance in a long season

Periodization-What?



- Athlete-centric
 - Needs of athlete
 - Developmental status
 - Athlete's strengths and weaknesses

Periodization-Why?



Adaptation

=

overload

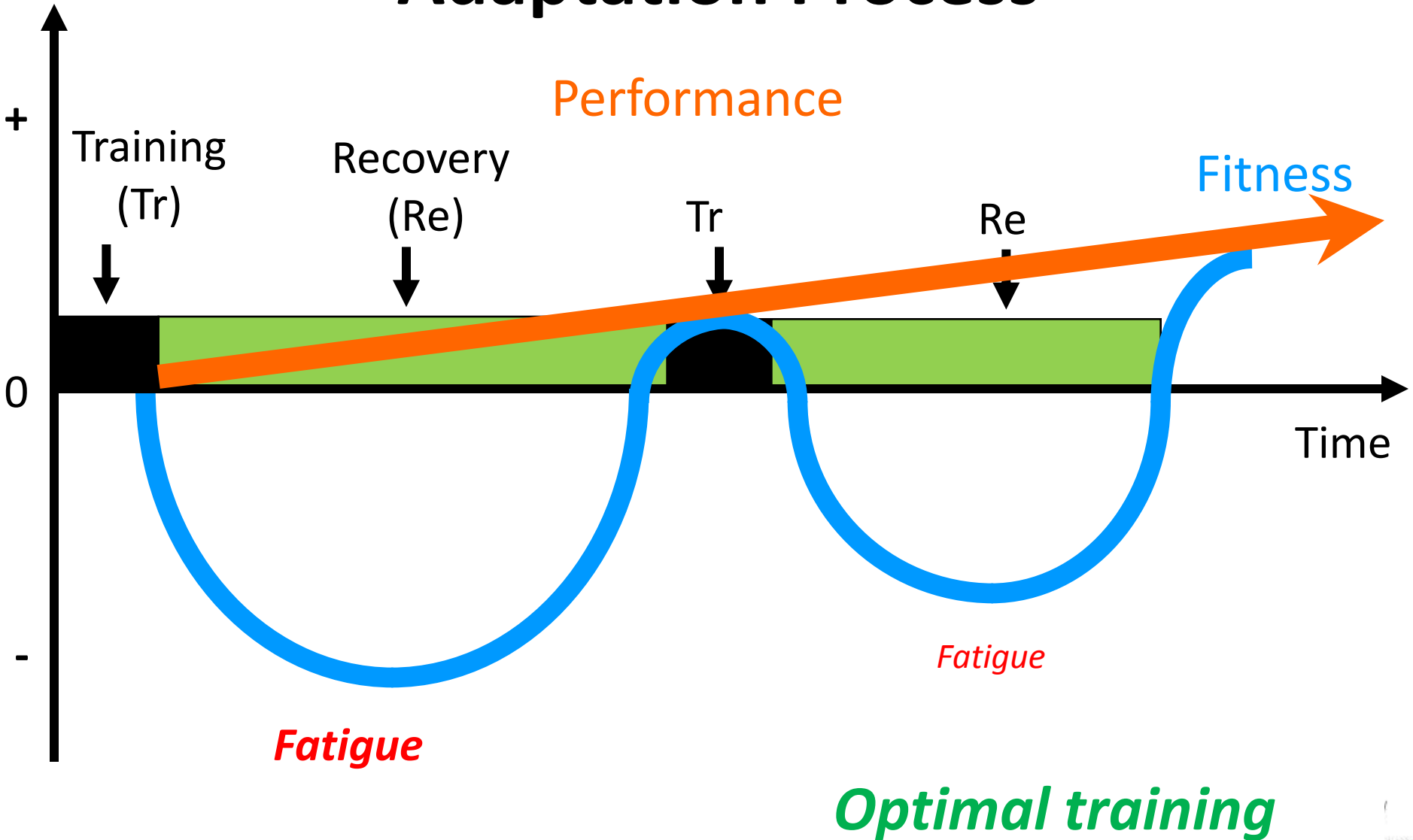
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Recovery

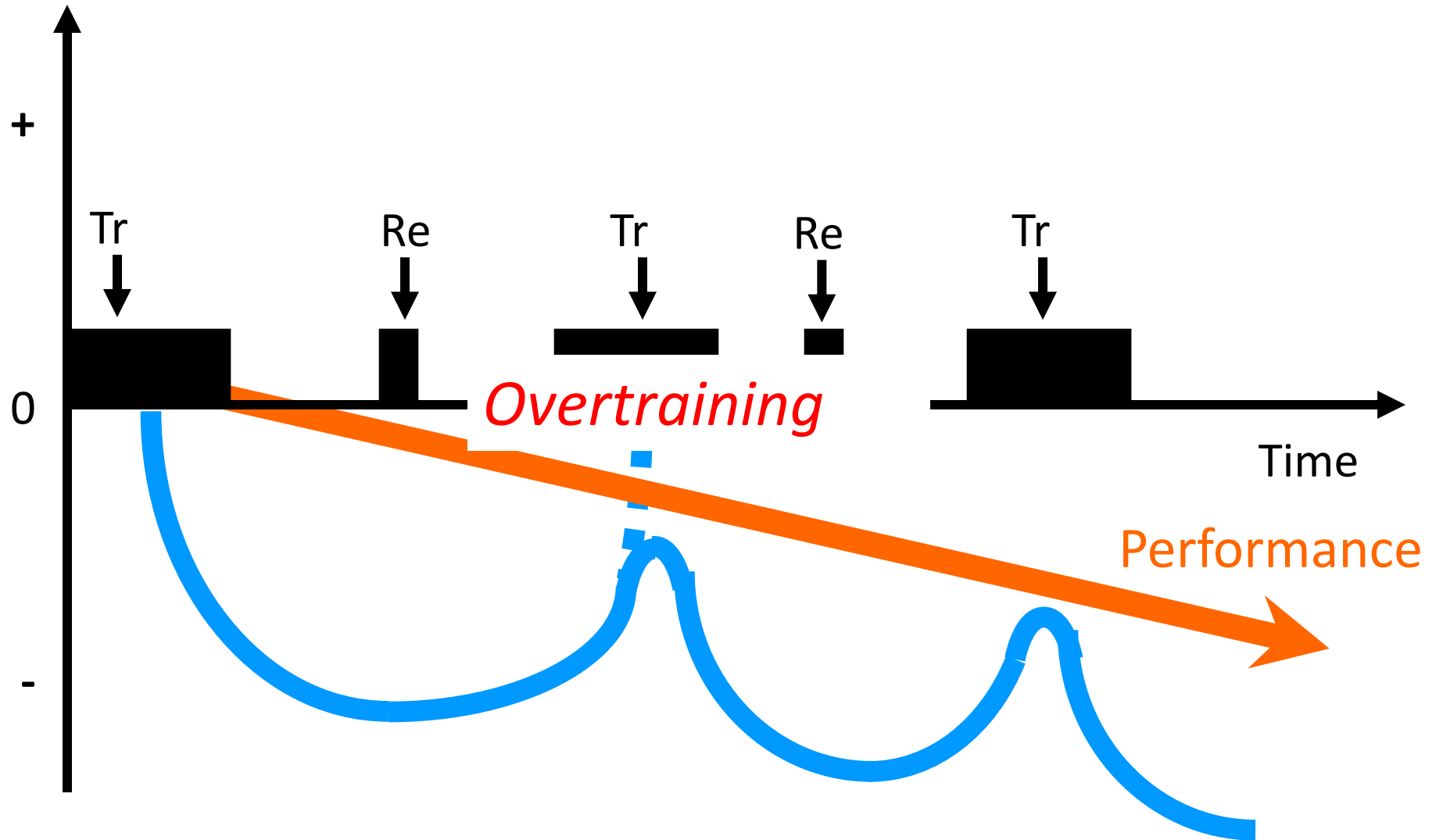
+

peaking

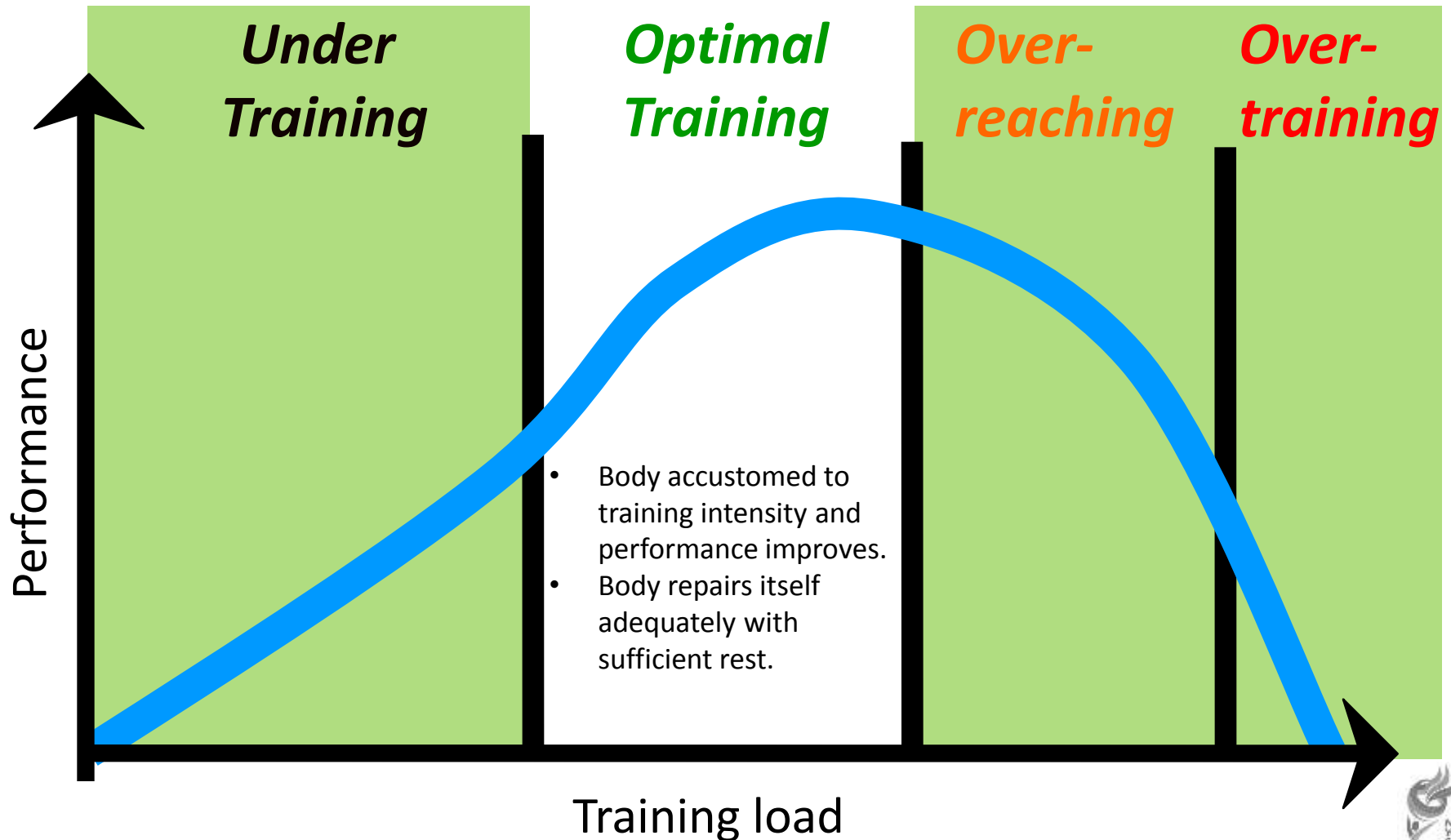
Principles of Training: Adaptation Process



Mal-adaptation Process



Adaptation & Recovery



General Framework of Periodisation



General Framework of Periodisation

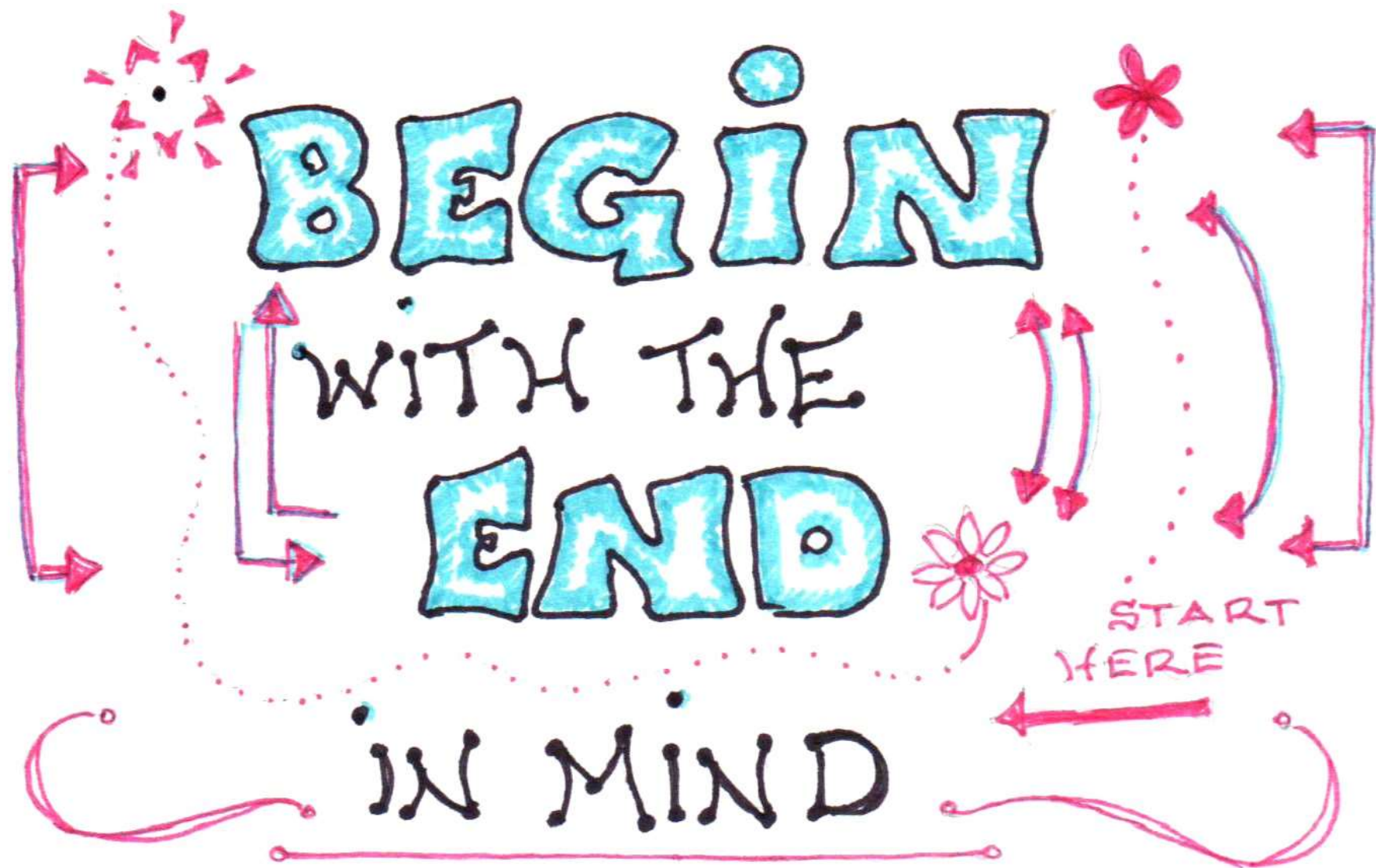
Long term plan (e.g. 4 year Olympic cycle)

Yearly plan

Season plan

Weekly plan

Daily plan



<i>Annual training plan</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Academic year	Freshman	Sophomore	Junior	Senior
Level	Foundation development	Continued development	Performance development	Peak performance
Goals	Develop key generic movement patterns associated with football	Develop key combinations of movements associated with football	Develop key movement patterns associated with football, along with the ability to read and react to football-specific stimuli	Optimize movement ability in soccer-specific situations
Period	Preparatory	Preparatory	Preparation to competition	Preparation to competition
Major periodization phases	General preparatory	General to specific preparatory	General to specific preparatory to pre-competitive and competitive	General to specific preparatory to pre-competitive and competitive

Source: adapted from Jeffreys, 2008.

General Framework of Periodisation

Achieving peak performance?

Maintaining peak performance?

Transiting after peak performance?

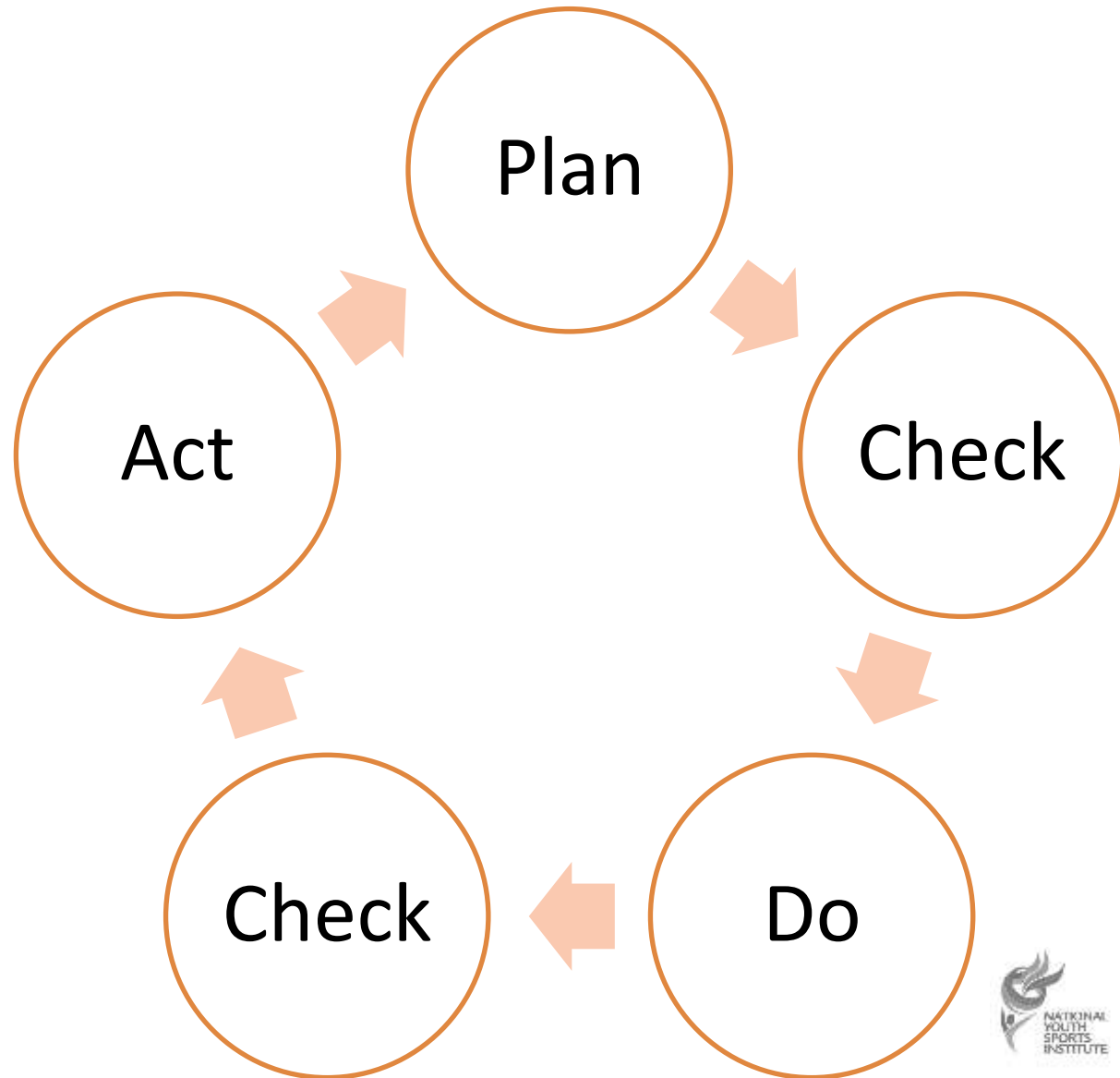
Key considerations

- Growth & Development
- Relative Age Effect (RAE)



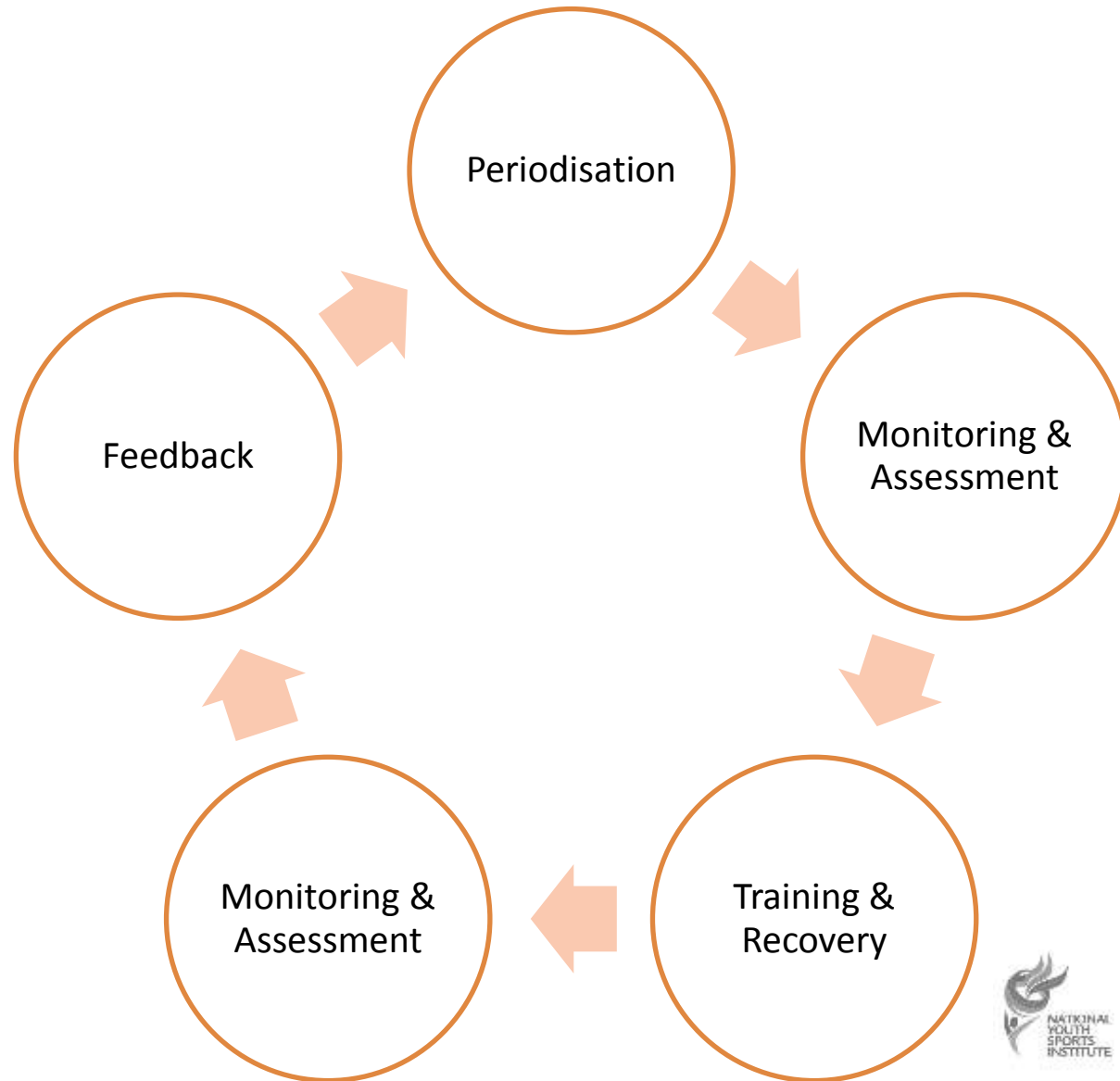
Periodization-How?

PCDCA Cycle



Training plan

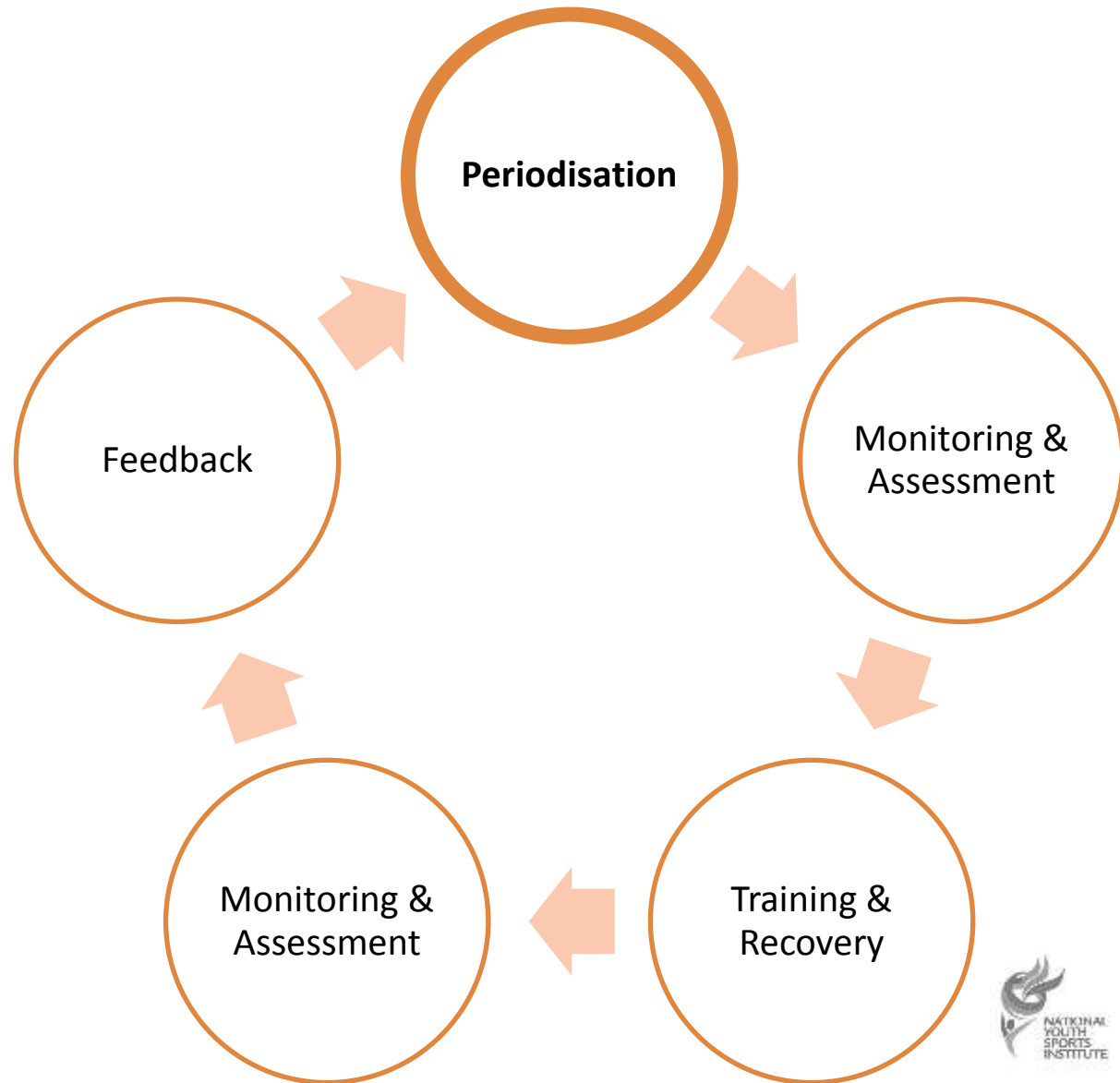
Periodization-How?



Periodization-How?

Consider:

- Objective
- Athlete/Team targets



Different goals/considerations



- Academic goals
 - PSLE/O'/A' Levels
- Regular
- Fun/Enjoyable
- Appropriately challenging
- Varied
- Safe
- Biological changes
 - Performance variability



- Academic goals
- Regular
- Post-pubertal
 - Significantly lesser performance variability
- **Sustained world-class success**

Different goals/considerations

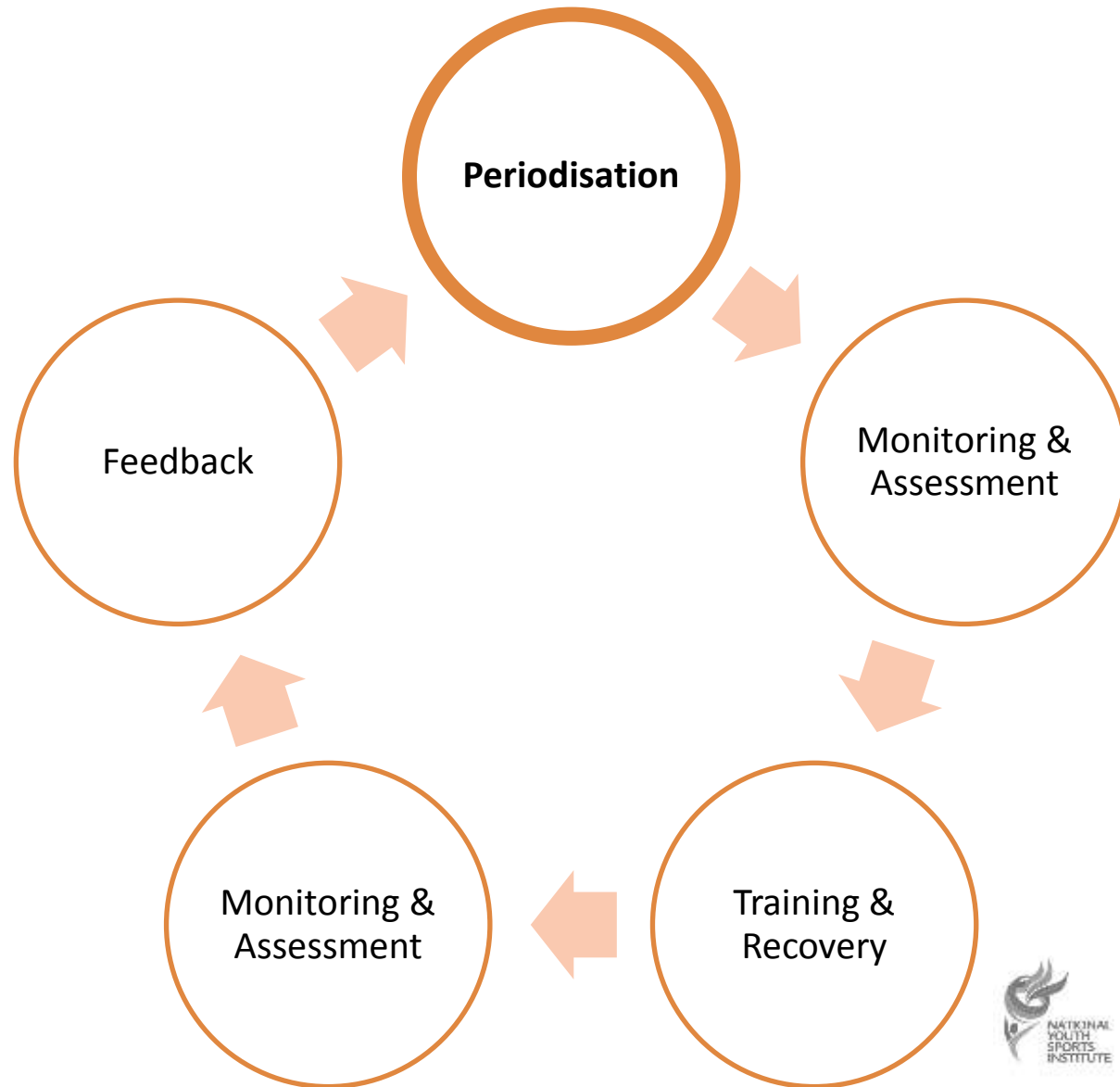


Shouldn't periodisation / training plans be different?

Periodization-How?

Consider:

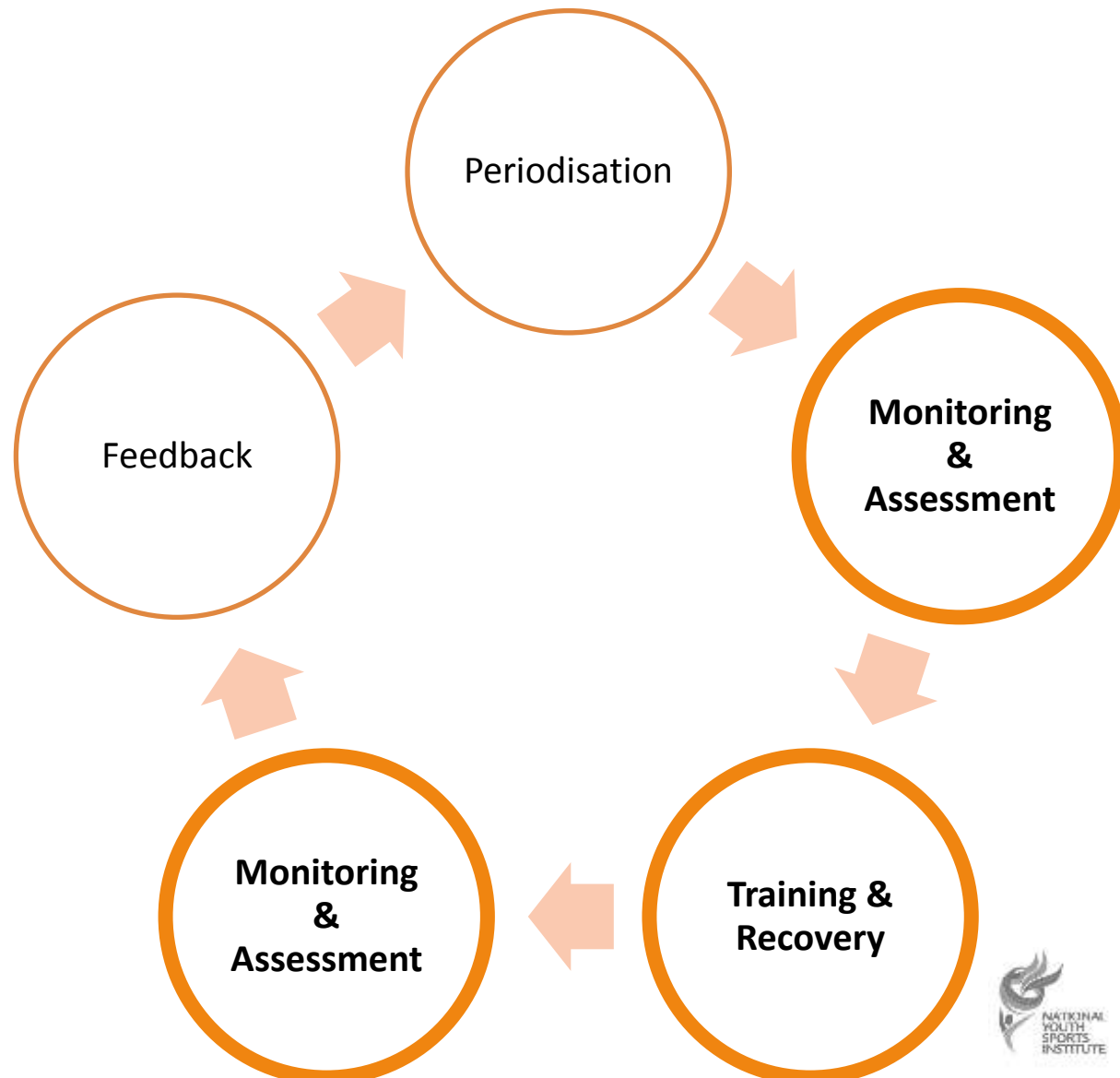
- Objective
- Athlete/Team targets
- Competitions



Periodization-How?

Consider:

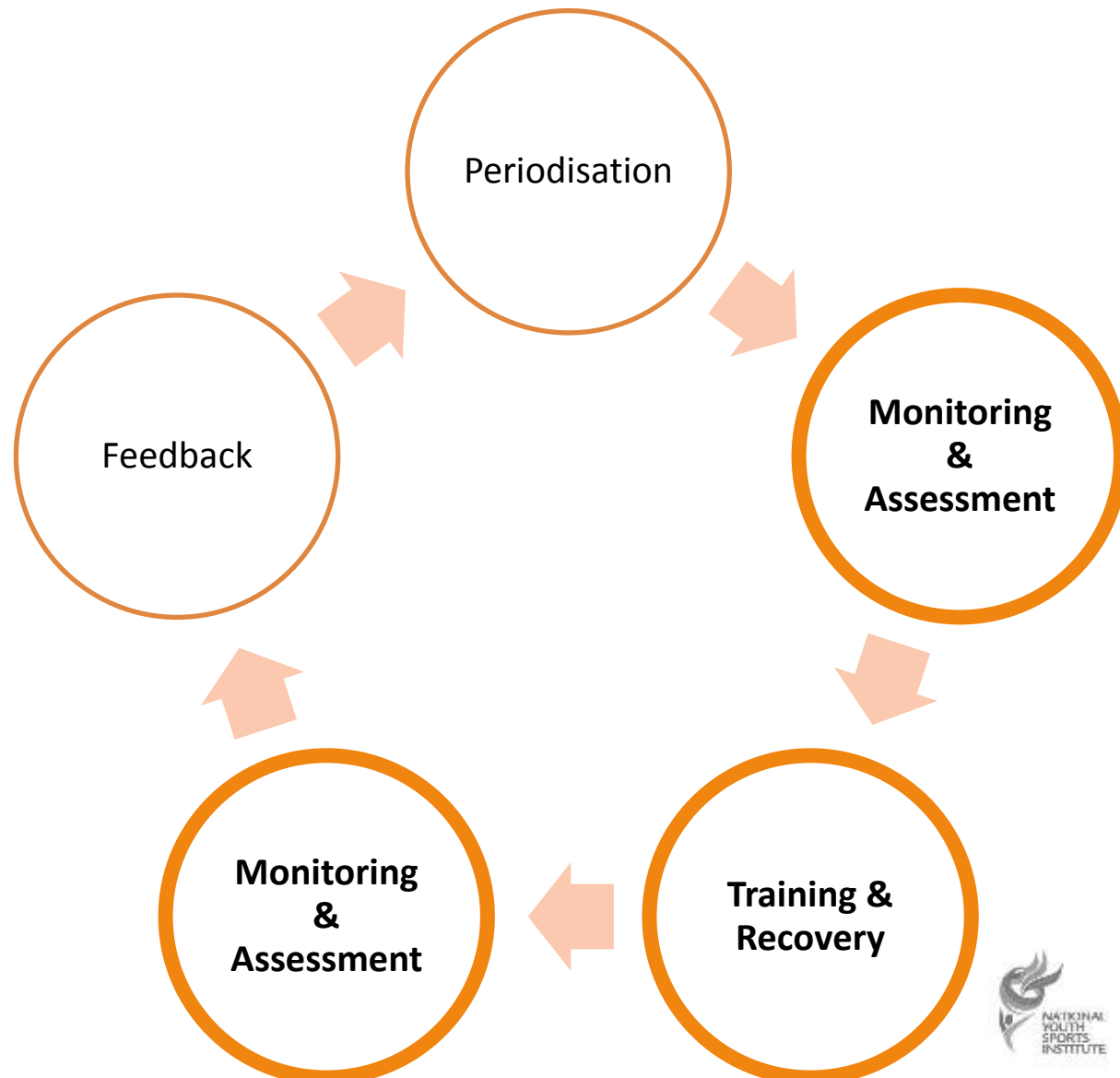
- **Evidence**
- **Needs analysis**
 - Sport/Position
 - Athlete
- Manpower
- Time to competition
- Facilities
- Budget



Periodization-How?

Document:

- Training load
- Results
- Changes
- Athletes' wellness
 - Perceived stress
 - Fatigue
 - Soreness
 - Sleep quality



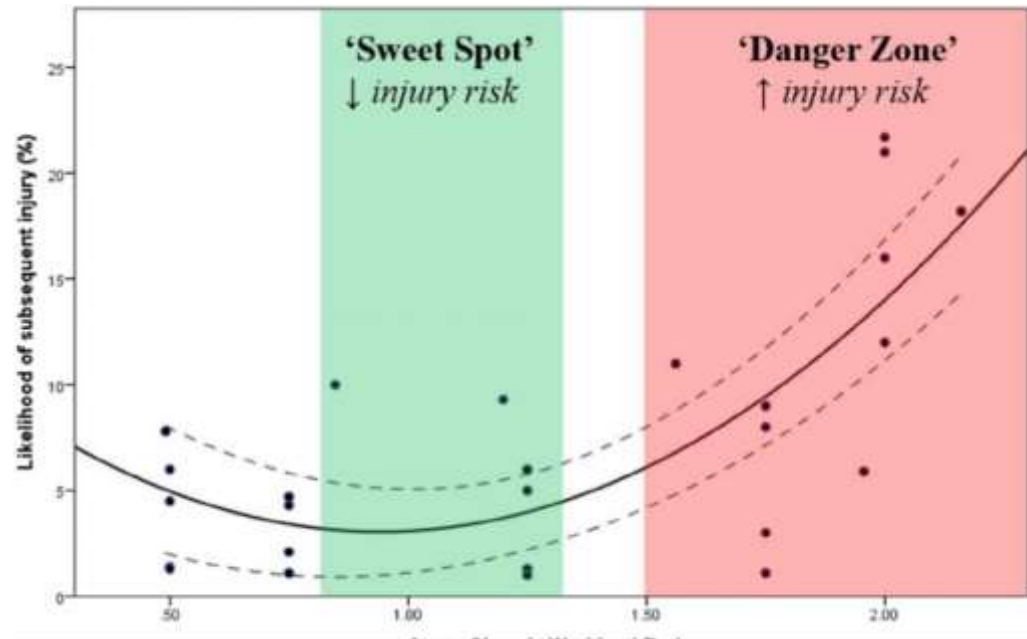
Athlete preparation

- Training should periodically aim to mimic the demands of the game
- Overly low or high training loads pre-dispose athletes to greater injury risks



Monitor & Adjust

- Training load
 - Session RPE x training duration (min)
 - Arbitrary units
 - Within 20 min following cessation of session
- Perceived ratings of wellness (7-point likert scale)
 - Overall fatigue
 - Sleep quality
 - Delayed onset muscle soreness



Keep it fun

Fun ≠ Ineffective

- Small sided games as effective as interval training in maintaining aerobic fitness over 8 weeks
 - 3 bouts x 4 mins
- Athlete rated SSG as more Fun/Enjoyable



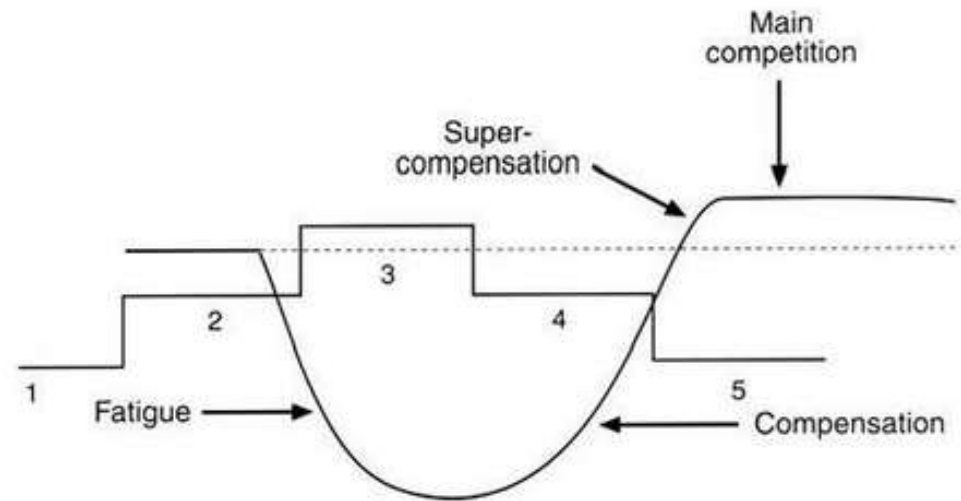
Table 1. Small-sided Games training program.

W	S	Format	Goals	Touches
1	1	(4 vs 4) + 2F _{off}	2 mini-goal	no restriction / F: 2 touches
	2	(4+G) vs (4+G) + 2F _{off}	2 official	no restriction / F: 2 touches
2	1	(4 vs 4) + 2F _{off} /1F _{in}	2 mini-goal	3 touches / F: 2 touches
	2	(4+G) vs (4+G) + 2F _{off}	2 official	3 touches / F: 2 touches
3	1	(4+G) vs (4+G) + 2F _{off} /1F _{in}	2 official	3 touches / F: 2 touches
4	1	(4 vs 4) + 1F _{in}	4 mini-goal	no restriction
	2	(4+G) vs (4+G) + 1F _{in}	2 official	no restriction
5	1	(3 vs 3) + 1F _{in}	4 mini-goal	no restriction
	2	(4+G) vs (4+G) + 2F _{off}	2 official	no restriction
6	1	(4 vs 4) + 1F _{in}	4 mini-goal	no restriction
	2	(4+G) vs (4+G)	2 official	no restriction

W = Week; S = Session; G = Goalkeeper; F = Floater; F_{off} = Floater off field; F_{in} = Floater in the field

Tapering

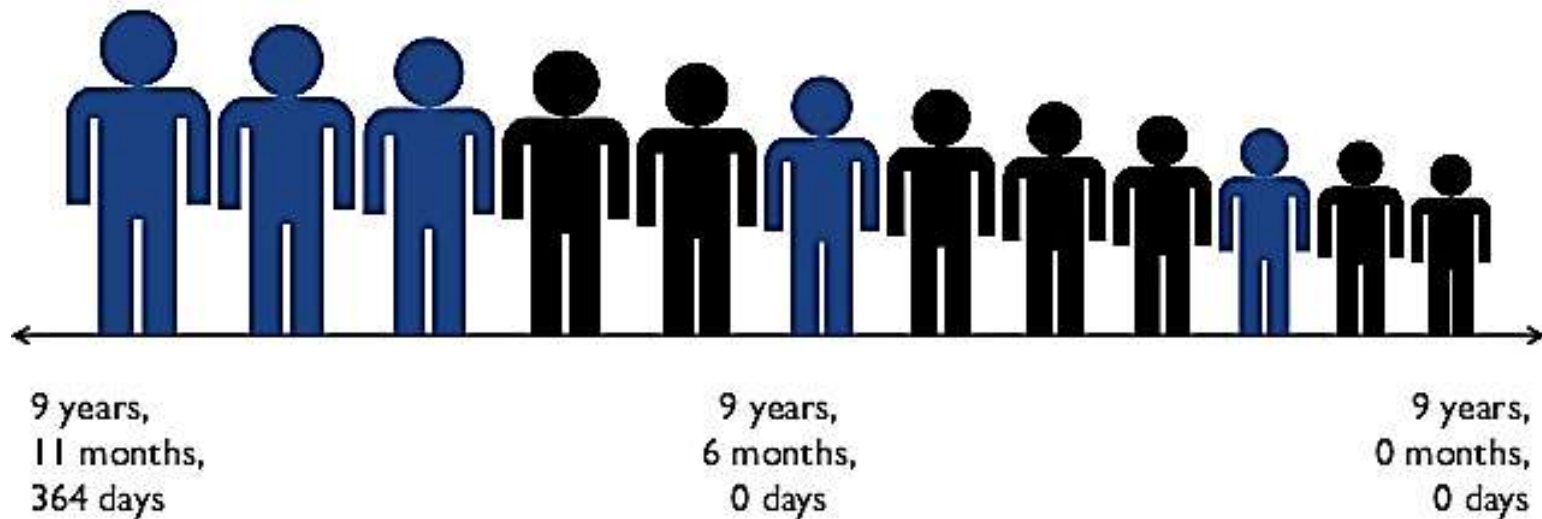
- Based on the concept of super-compensation
- Maintenance of intensity
- Reduction in volume/frequency
- Adjustments are generally dependent on sporting calendar
 - Team sports vs. Individual sport
 - 1-day to several weeks
- Considerations for training availability in youth athletes
 - Are they training enough to require a taper





**CHANGE
AHEAD**

Relative Age Effect



Relative Age Effect



Relative Age Effect

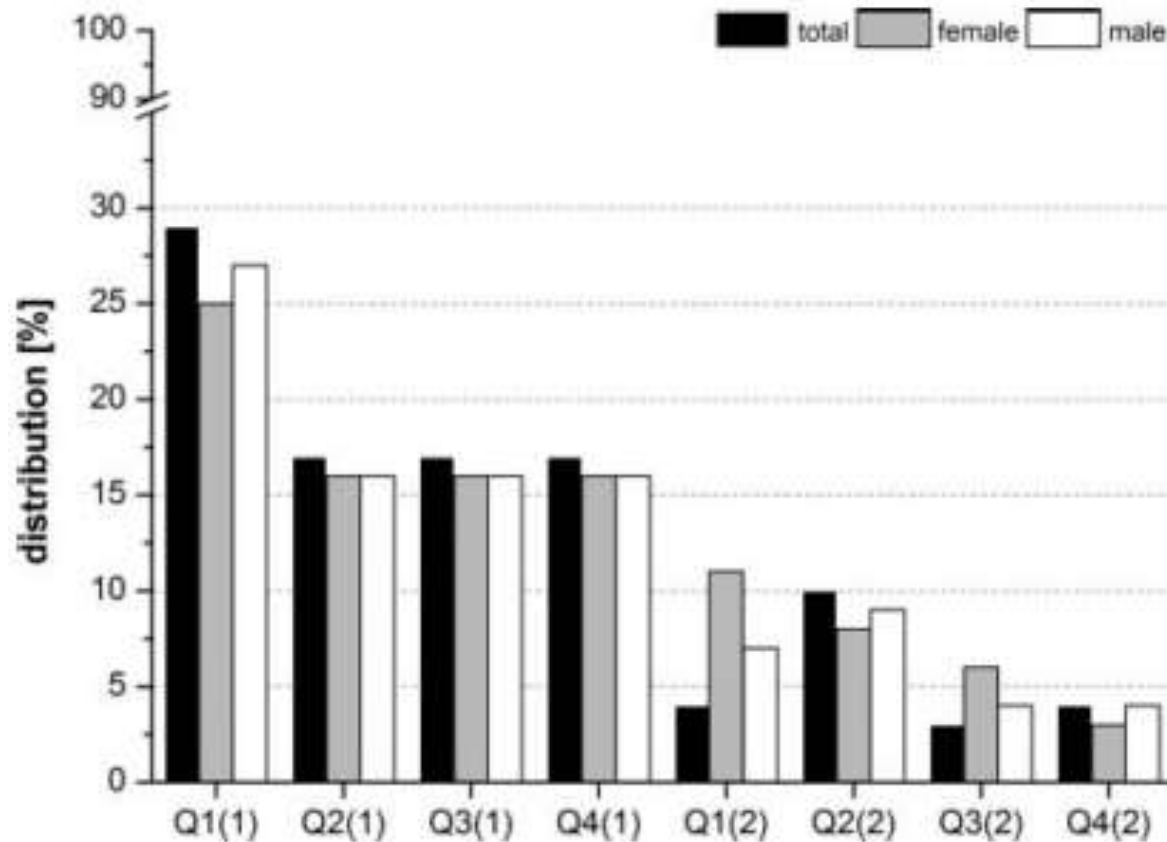


figure 3 Quartile distribution of all medal winners according to sex.

Overcoming RAE in training

- RAE affects
 - Perception of athletes' ability
 - Perception of 'trainability'
 - Selection into team/squad
 - **Response/adaptability /recovery to training stimulus**



Overcoming RAE in training

- Solutions?
 - Age-ordered shirt numbering
 - Colour-banded jerseys
 - Jan-Mar: 75-85
 - Apr-Jun: 55-65
 - Jul-Sep: 35-45
 - Oct-Dec: 15-25



Different rates of growth

DEVELOPMENTAL AGE

77

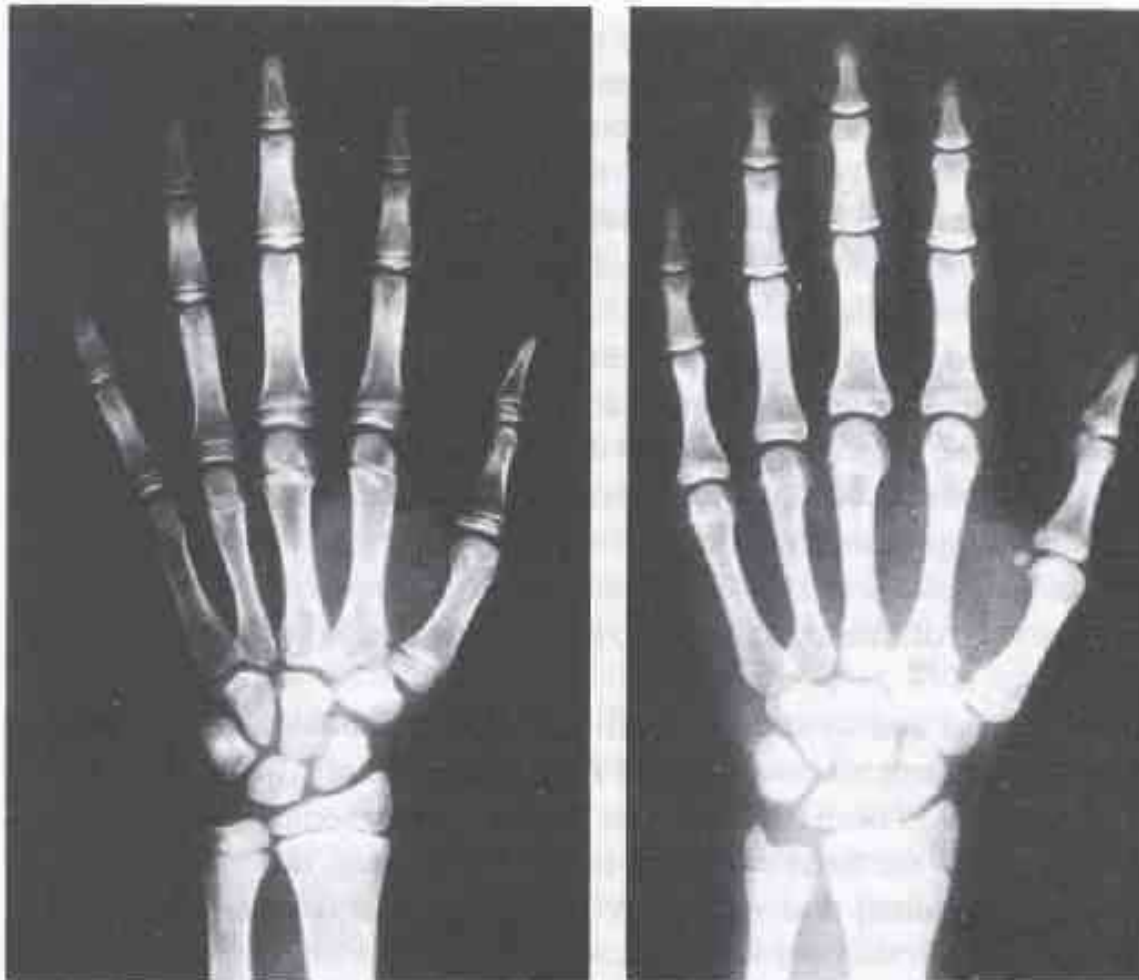
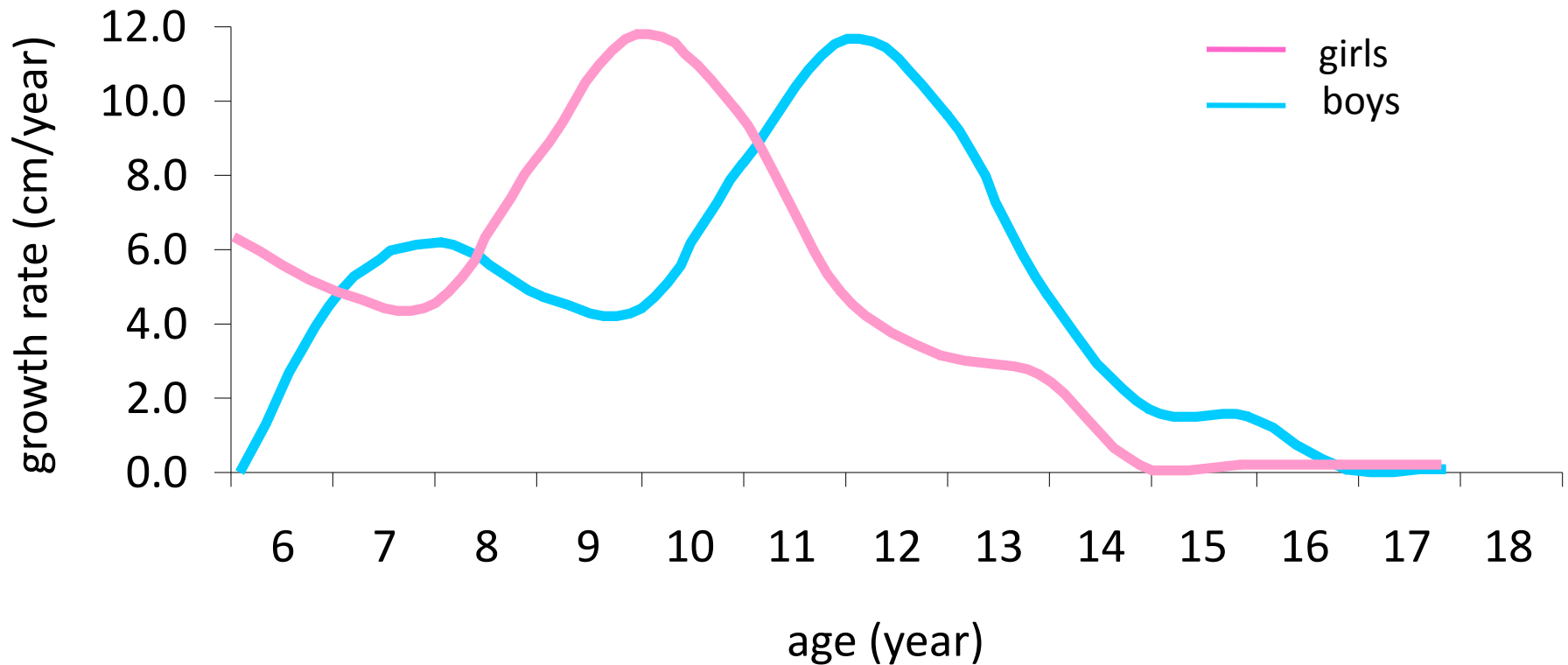


Figure 29 Radiographs of two boys both aged 14.0 years: (left) bone age 12.0 'years'; (right) bone age 16.0 'years'

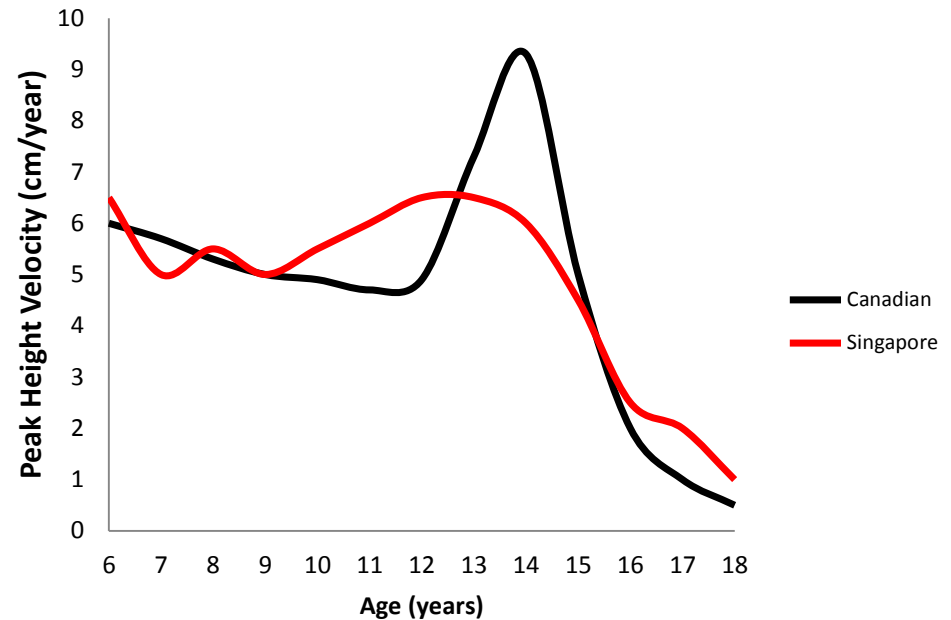
Biological vs. Chronological Age

Peak Height Velocity

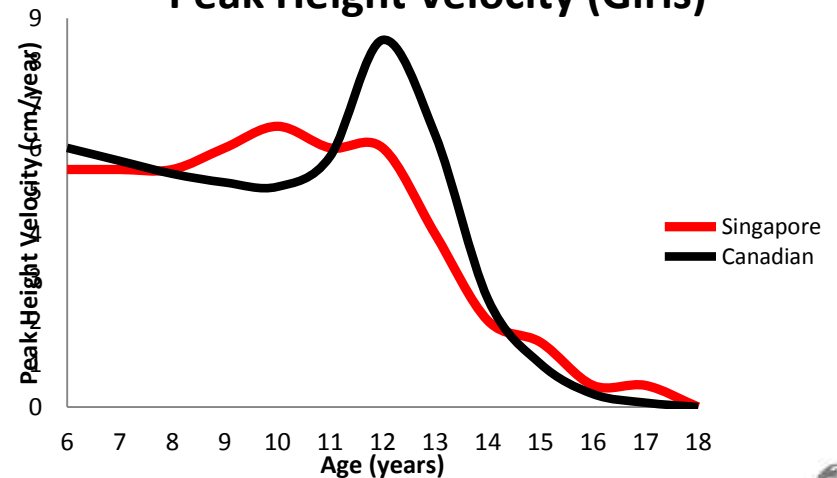


Earlier onset of PHV in Singaporean youth

Peak Height Velocity (Boys)

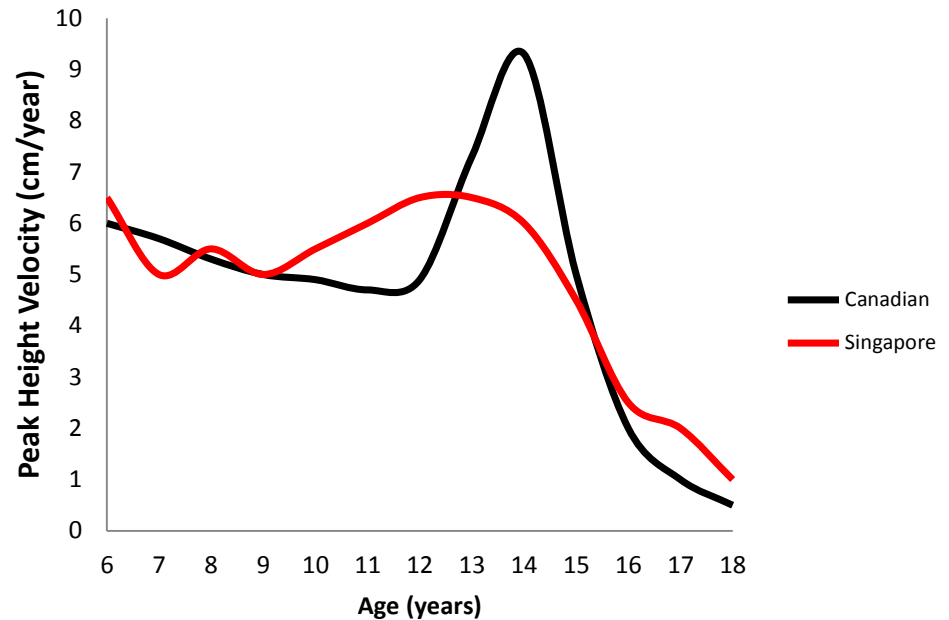


Peak Height Velocity (Girls)

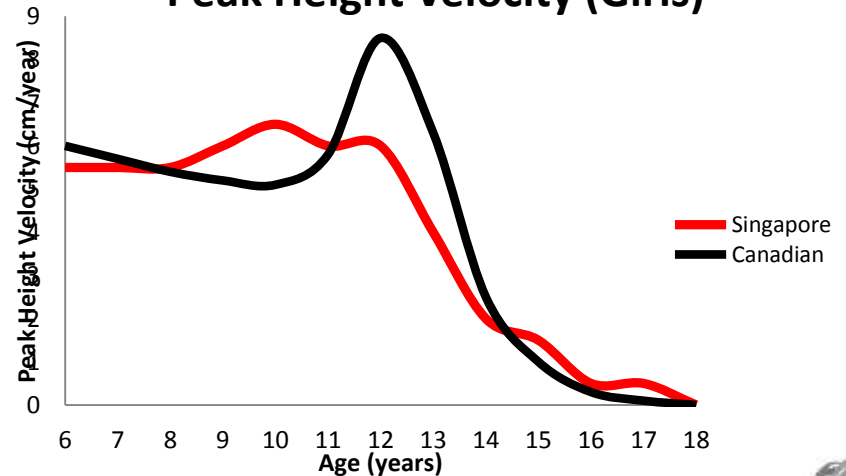


Reduced peak height increment in Singaporean youth

Peak Height Velocity (Boys)



Peak Height Velocity (Girls)



The Influence of Maturation on Sprint Performance in Boys over a 21-Month Period

ROBERT W. MEYERS¹, JON L. OLIVER^{1,2}, MICHAEL G. HUGHES¹, RHODRI S. LLOYD^{1,2},
and JOHN B. CRONIN^{2,3}

¹Youth Physical Development Unit, Cardiff School of Sport, Cardiff Metropolitan University, Cardiff, UNITED KINGDOM;

²Sports Performance Research Institute, AUT University, Auckland, NEW ZEALAND; and ³School of Exercise, Biomedical and Health Science, Edith Cowan University, Perth, AUSTRALIA

- Rate of sprint performance improvement dependent on period of peak height velocity (PHV)
- Smaller increases in max. sprint speed for those that did not experience growth 'spurt' when compared to those that did
 - 5.6 vs. 10.4 % improvement in 30m sprint times



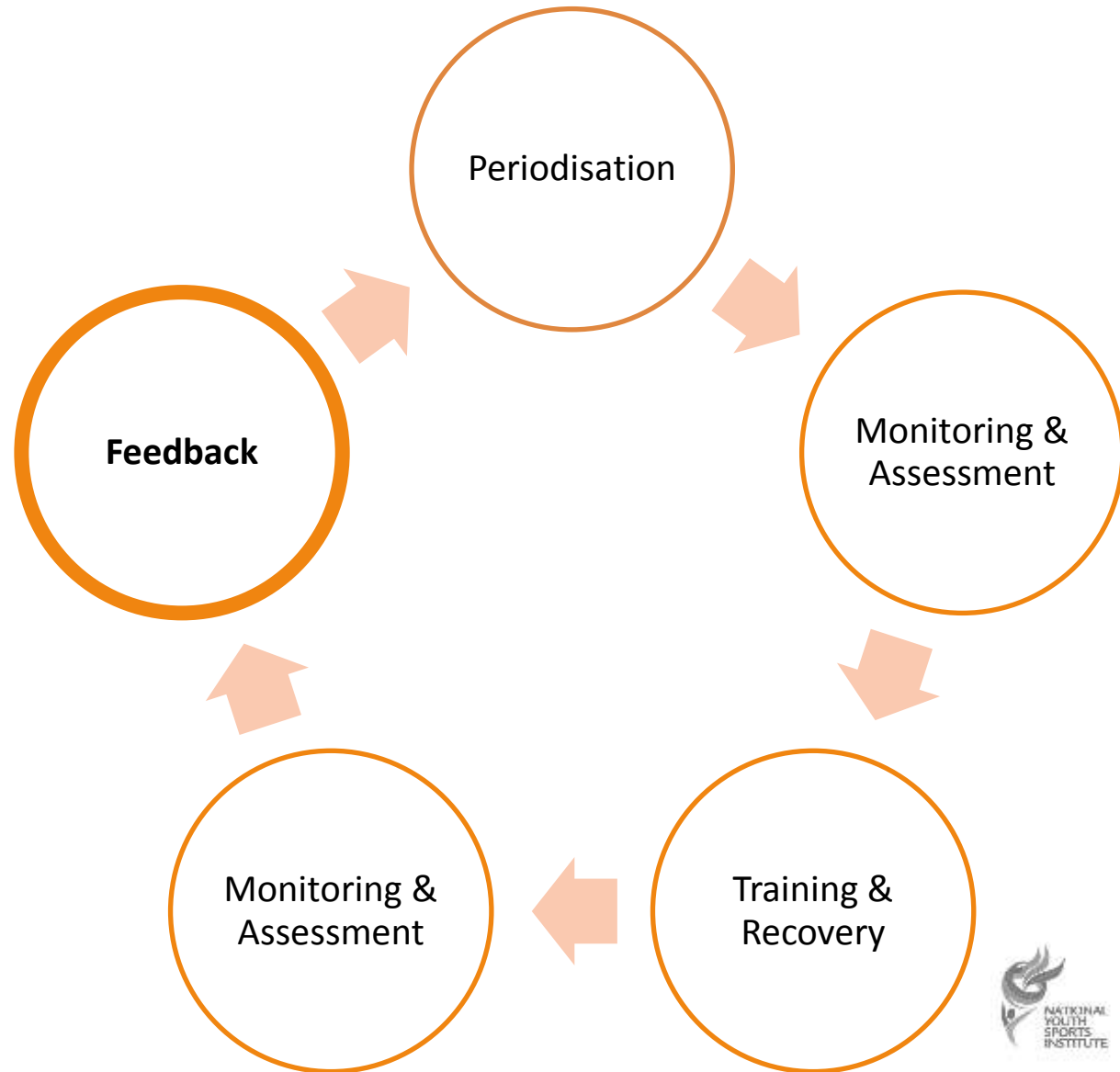
When does peak
performance occur in
sport?



Event type, sport and study	Event	Event duration ^a	Men ^b	90 % CL	Women ^b	90 % CL
			Age of peak		Age of peak	
Explosive/sprint						
Athletics						
Berthelot et al. [25]	Sprints ^c	10–50 s	25.8	?	25.7	?
Hollings et al. [5]	Sprints, hurdles ^d	10–55 s	25.2 ± 2.3	0.3	25.7 ± 2.4	0.3
	Jumps ^e	5 s	25.8 ± 2.1	0.3	25.6 ± 2.7	0.4
	Throws ^f	1–5 s	28.0 ± 2.5	0.4	26.7 ± 3.3	0.6
Tilinger et al. [26]	Sprints ^g	10–20 s	24.5	?	–	–
	Jumps ^h	5 s	24	?	–	–
	Throws ⁱ	1 s	26.5	?	–	–
Swimming						
Allen et al. [4]	50–100 m all Olympic events	21–65 s	25.0 ± 1.9	0.3	23.3 ± 2.8	0.6
Berthelot et al. [25]	50–100 m free	21–54 s	22.4	?	22.8	?
Sokolovas [3]	50–100 m all Olympic events	21–65 s	23.1 ± 2.6	0.6	21.3 ± 4.1	1
Wolfrum et al. [19]	50–100 m breast	27–65 s	26–27		22–23	
	50–100 m free	21–54 s	28–29		24–27	

Event type, sport and study	Event	Event duration ^a	Men ^b		Women ^b	
			Age of peak	90 % CL	Age of peak	90 % CL
Cycling						
Anderson [24]	Cyclo-cross	1 h	30.2	?	–	–
Shoak et al. [12]	Ultra-distance	27–29 h	38	1.8	39	2.5
Swimming						
Allen et al. [4]	200–1500 m all Olympic events	0.03–0.25 h	23.6 ± 1.9	0.3	22.1 ± 2.0	0.3
Berthelot et al. [25]	200–1500 m free	0.03–0.25 h	20.4	?	20	?
Sokolovas [3]	200–1500 m all Olympic events	0.03–0.25 h	21.7 ± 2.5	0.5	19.8 ± 3.1	0.6
Wolfrum et al. [19]	200 m breast	0.04 h	20–21		22–23	?
	200 m free	0.03 h	22–23		22–23	?
Triathlon						
Malcata et al. [20]	Olympic-distance	1.8–2.1 h	27.6 ± 2.1	0.6	27.1 ± 3.6	1.1
Rüst et al. [15]	Ironman	8–9 h	32 ± 3	0.4	34 ± 4	0.5
Mixed						
Ice hockey						
Brander et al. [17]		1 h	27–29		–	–

Periodization-How?



Review:

- Was the periodisation plan successful?
- Implications on competition performance?

RECOVERY







**Training only accounts for 30% of
the improvements in
performance**



Adaptations that occur **between training sessions** play a key role in performance changes

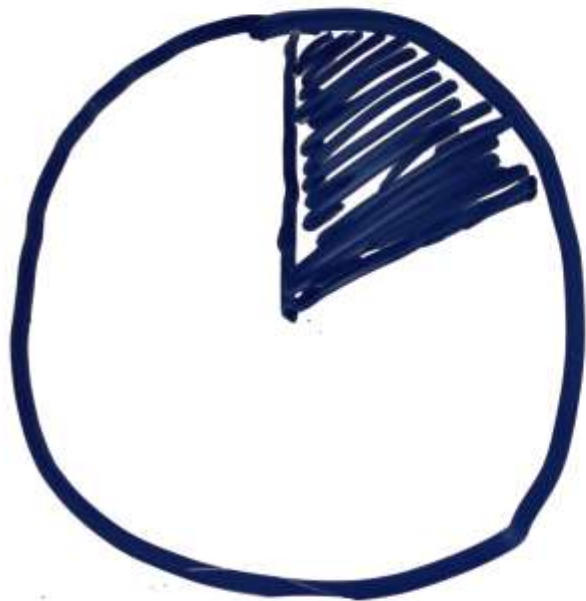




The fundamentals

Nutrition. **E**xercise. **W**ater. **S**leep.

INPUTS



20%

=

OUTPUTS



80%

Optimal training plan =



Part 2

Sleep





**890 Elite athletes
were asked to rate
recovery modalities
most important to
their recovery**

(Venter, 2012)



Sleep was perceived as the most important recovery factor compared to other common modalities

(Venter, 2012)

Why sleep?



- Restoration of physical functioning and health
- Energy conservation
- Brain plasticity

Sleep for health



2.94 times more likely to develop a cold with < 7 hours of sleep vs. ≥ 8 hours of sleep

Sleep for health



Sleep loss of 2-8% (10-38 mins) was associated with **3.9 times** the risk of developing a cold

Sleep for health



Illnesses (cold, flu, gastroenteritis and other infections diseases) are **more frequent in adolescents with shorter sleep**

(Orzech et al., 2013)

Sleep for health



Illnesses occurred
**after periods of
shorter sleep**

(Orzech et al., 2013)



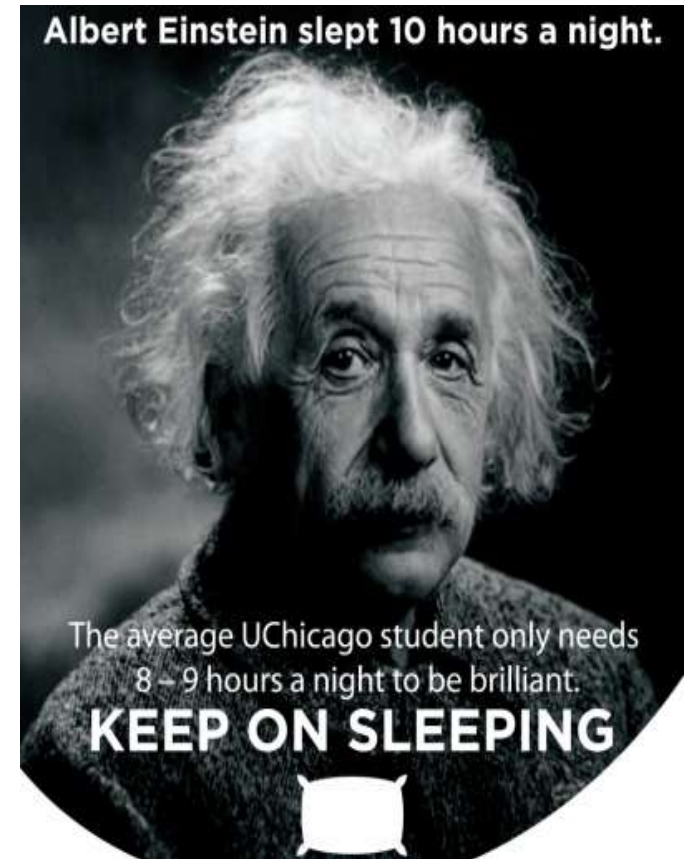
*“Sleep is **the most effective** cognitive enhancer
we have.”*

—Russell Foster, Ph.D., F.R.S., Professor of Circadian Neurosciences, Head of the Nuffield Laboratory of Ophthalmology, Director of the Sleep and Circadian Neuroscience Institute, University of Oxford.

Sleep for cognition

Insufficient sleep impacts:

- Learning and memory consolidation
(Diekelmann & Born, 2010; M. P. Walker & R. Stickgold, 2006)
- Creativity
(Cai, Mednick, Harrison, Kanady, & Mednick, 2009)
- Abstract thinking
(Curcio et al., 2006)
- Motor learning
(Tamaki et al., 2013)
- Academic performance
(Fredriksen, Rhodes, Reddy, & Way, 2004)



Can sleep improve academic performance?





Sleep



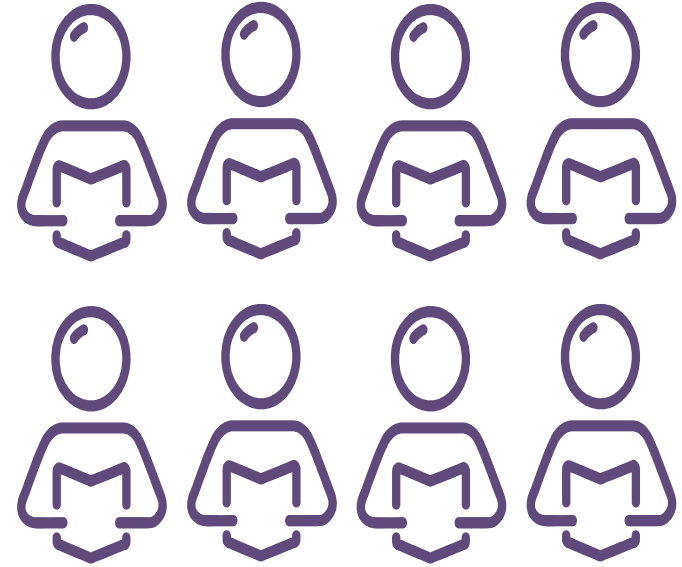
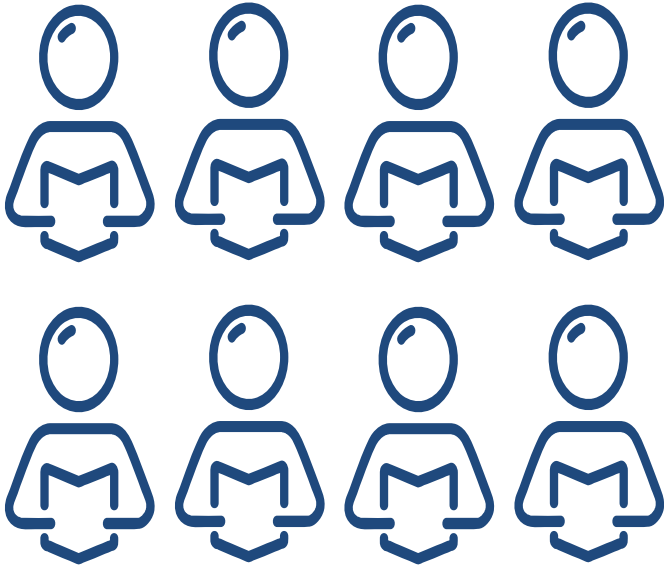
No sleep



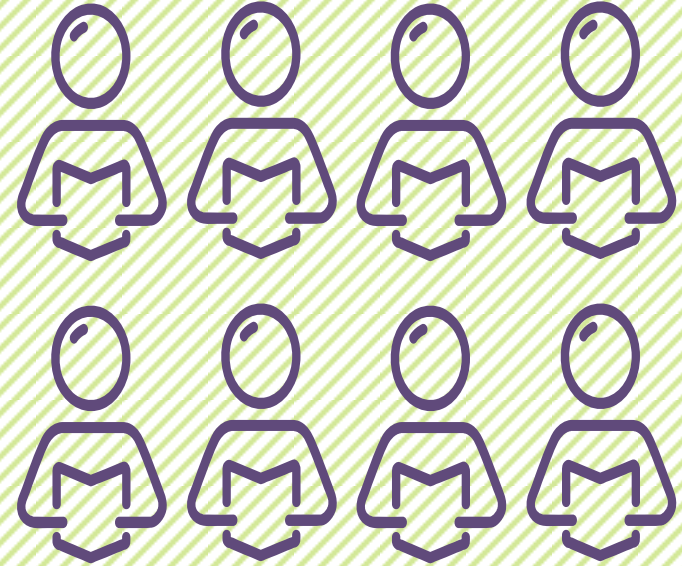
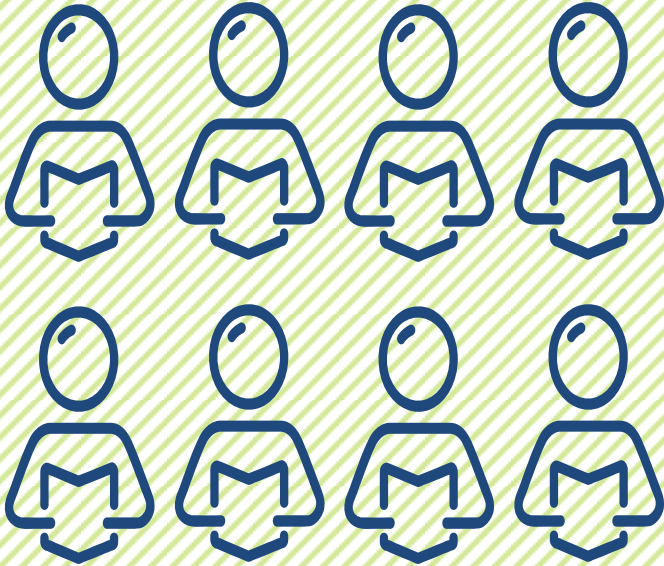
Sleep

No sleep

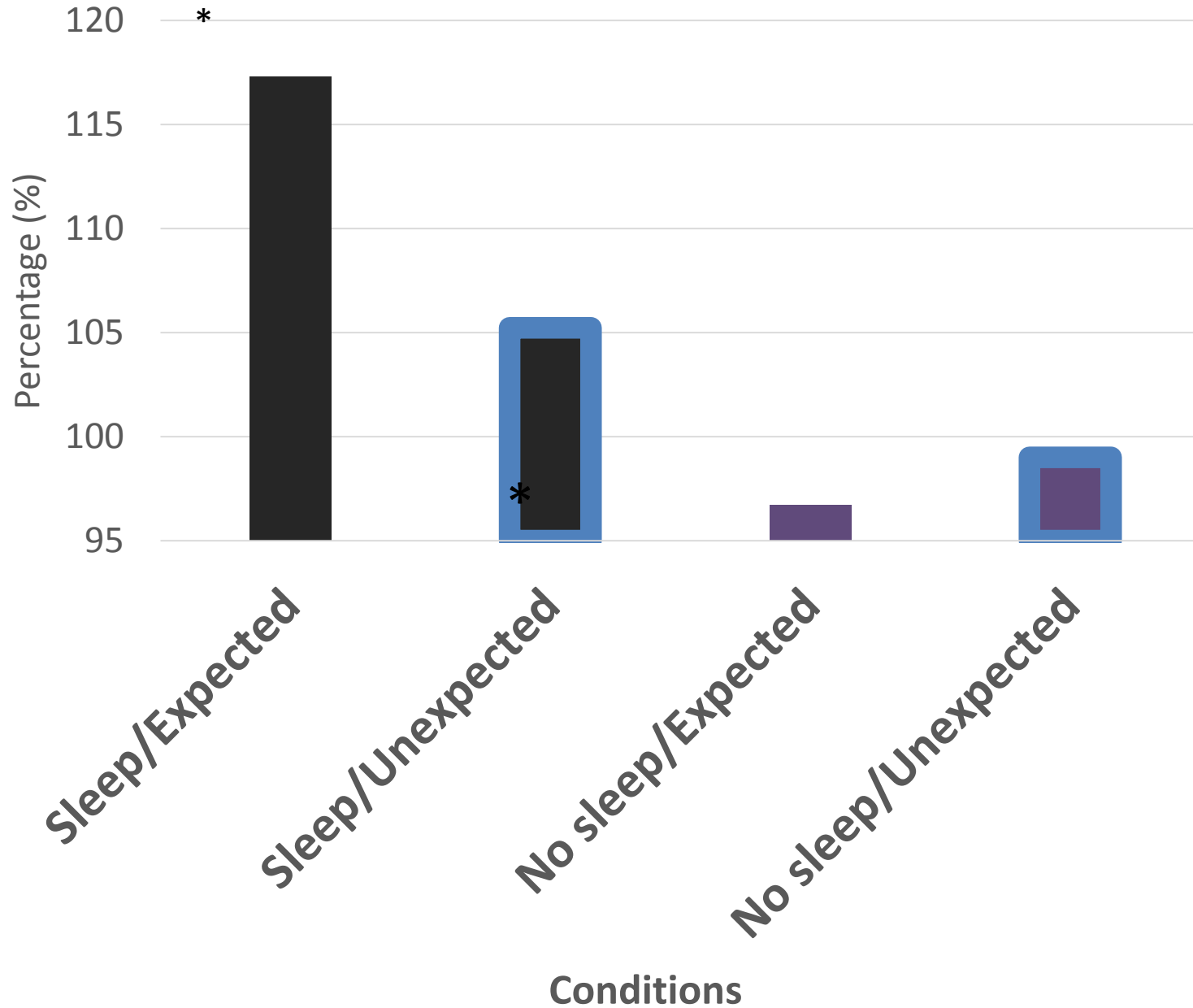
Expected



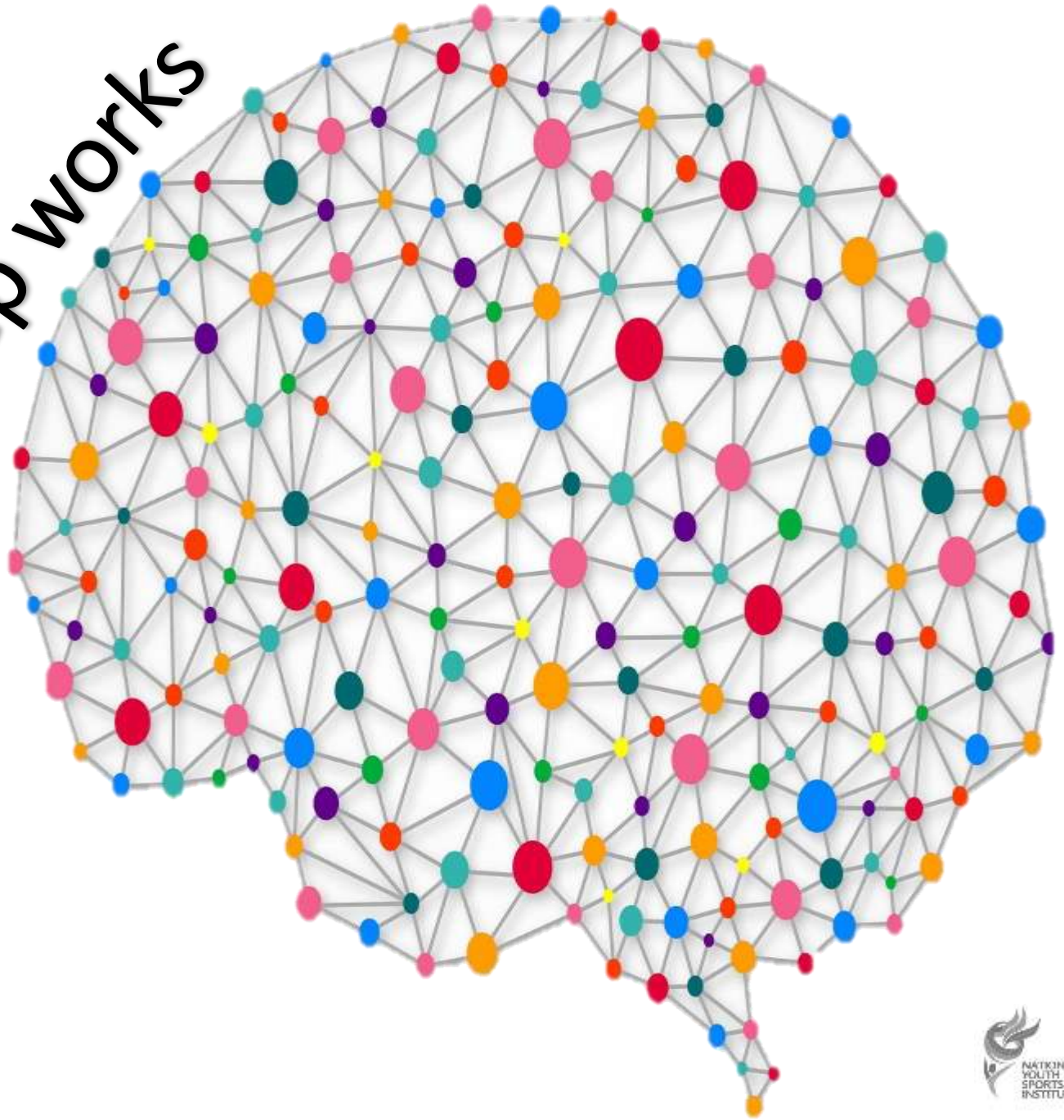
Unexpected



Memory recall



How sleep works



How sleep works (very briefly)

- Neurotransmitters in various parts of the brain control whether we are sleep or awake
- A **2-Process Model** works in harmony to control sleep and wakefulness
 - **Circadian** alerting system (Process C)
 - **Homeostatic** sleep drive (Process S)



2 Processes

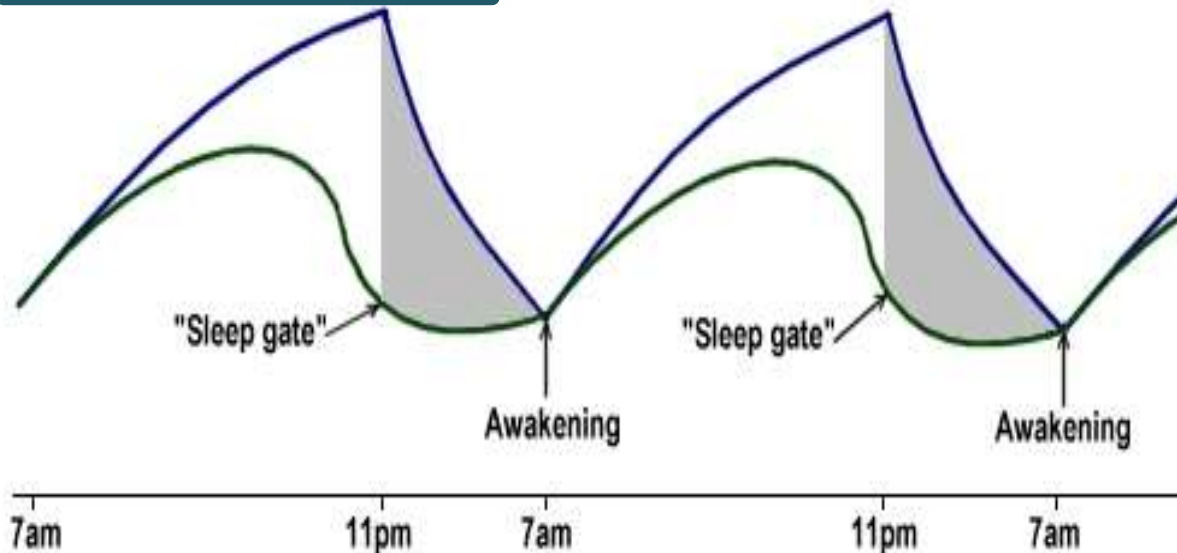


— Homeostatic sleep drive
(Process S)

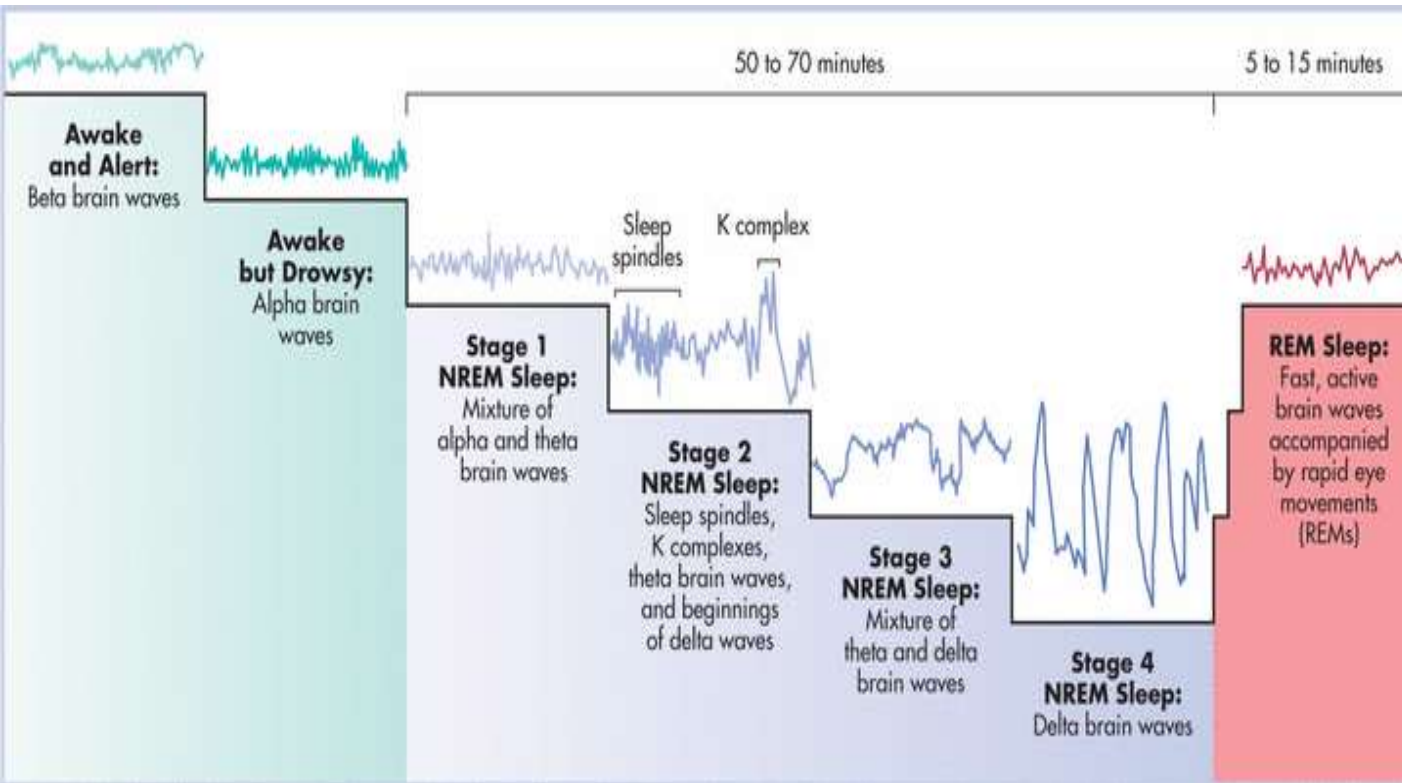


— Circadian drive for arousal
(Process C)

■ Sleep

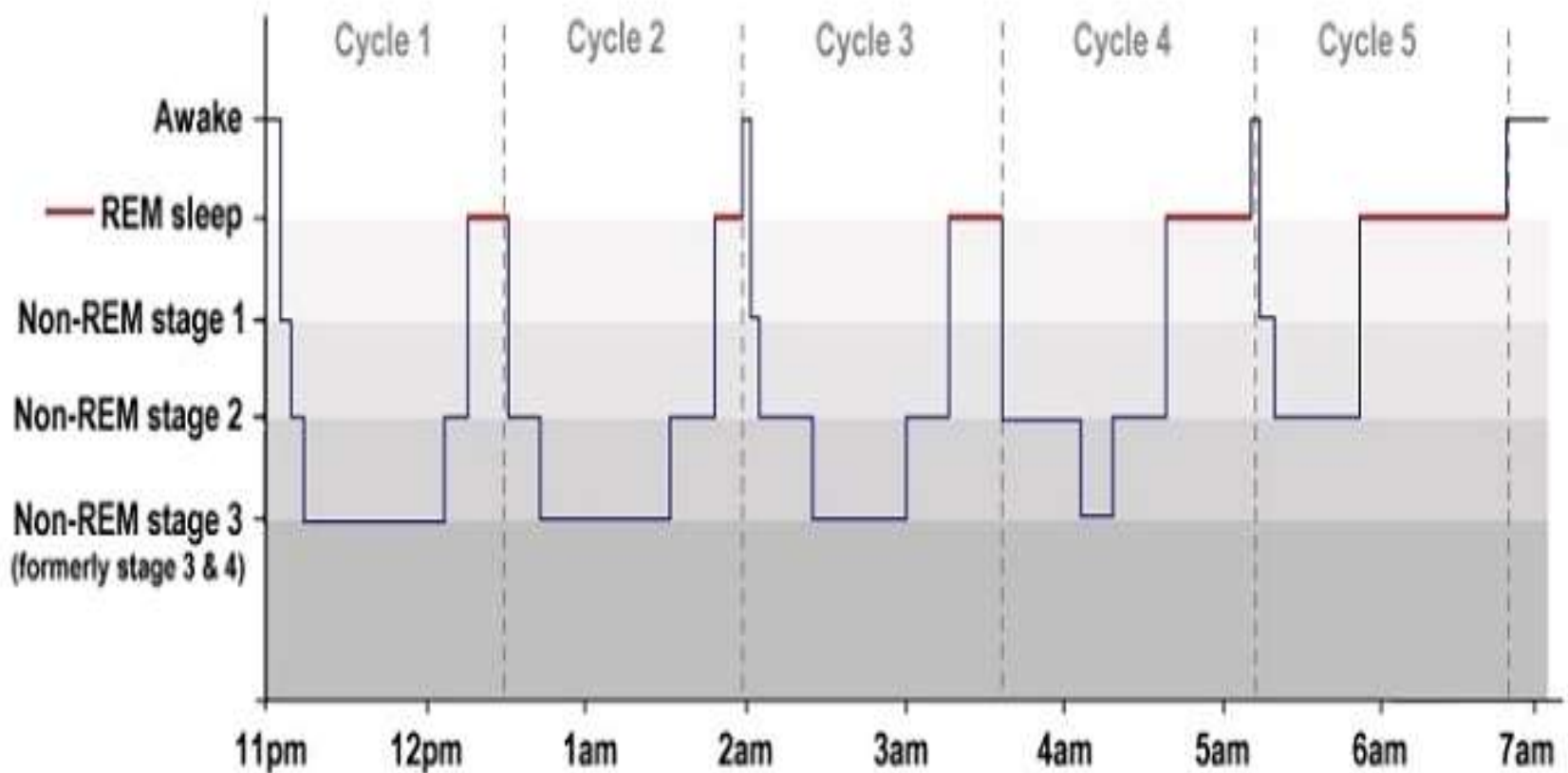


Sleep stages & sleep cycles



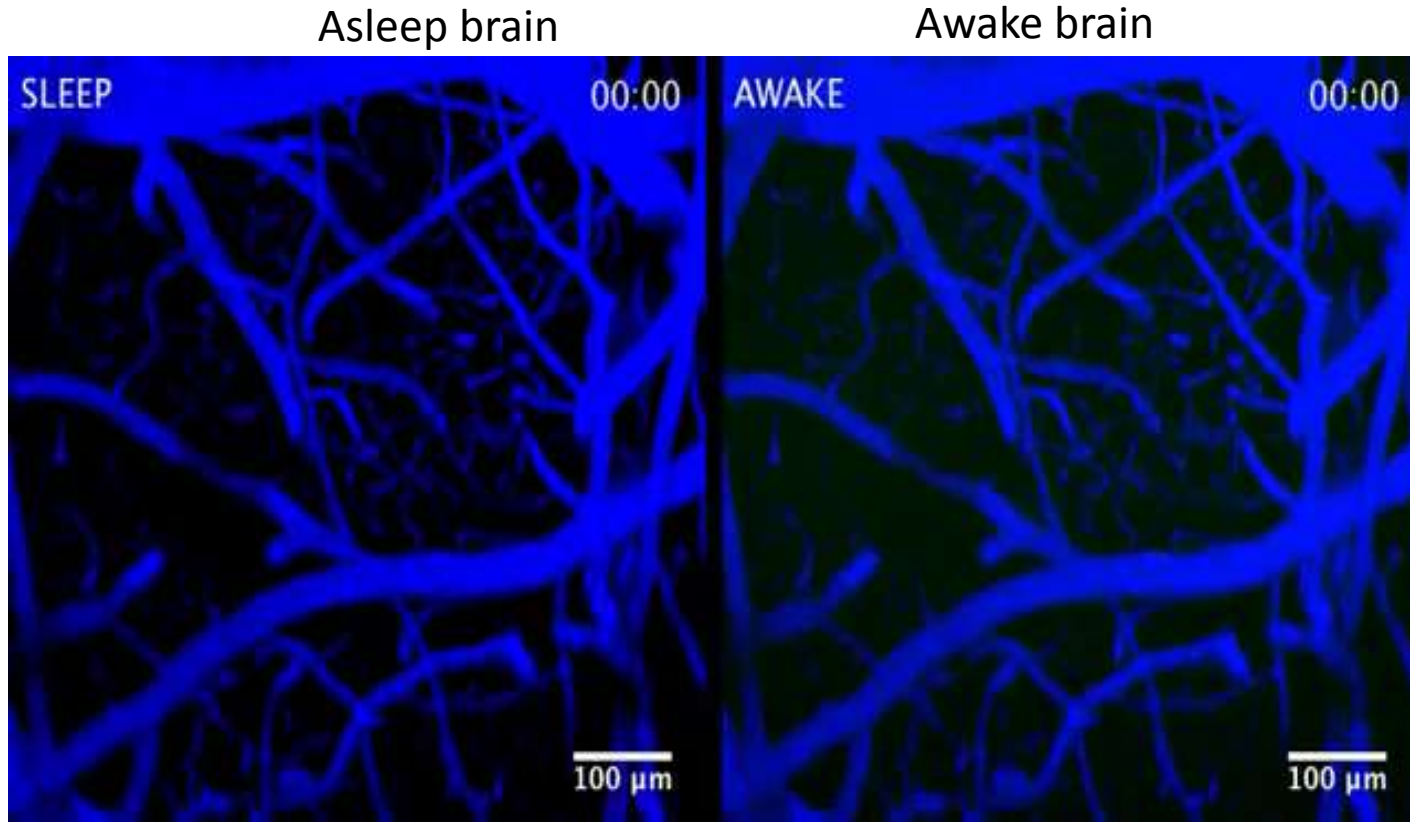
Sleep cycles last **90 minutes** on average

Sleep stages & sleep cycles



Stage 1 (Light): 5%, Stage 2 (Light): 45%, , Stage 3 (Deep): 25%, REM: 25%

Did you know sleep literally **cleans** the brain



How much sleep
do youth athletes
need?



Primary school:

9 – 11 hours

Secondary school/JC:

8 – 10 hours



Adolescent Athlete?



Neurological changes

Circadian phase delay

Hormonal changes

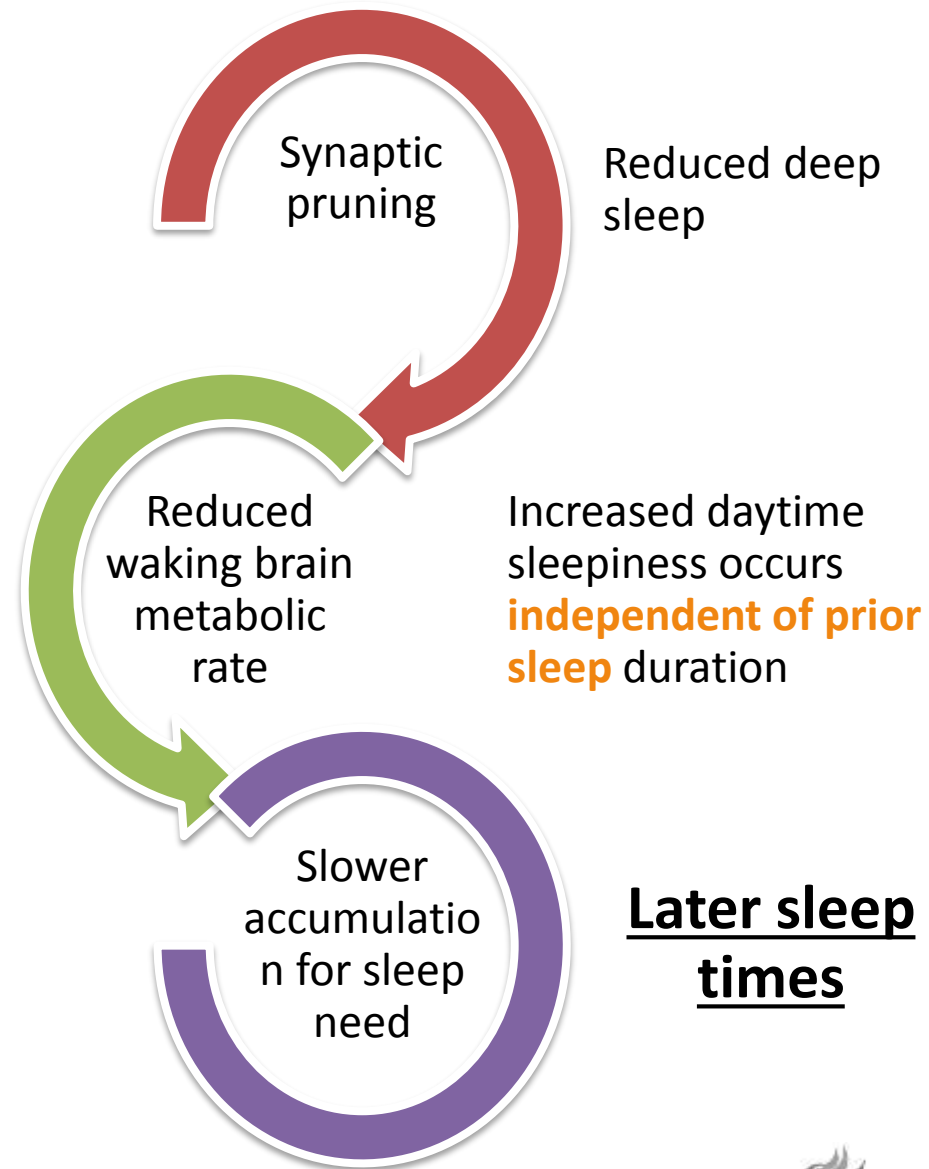
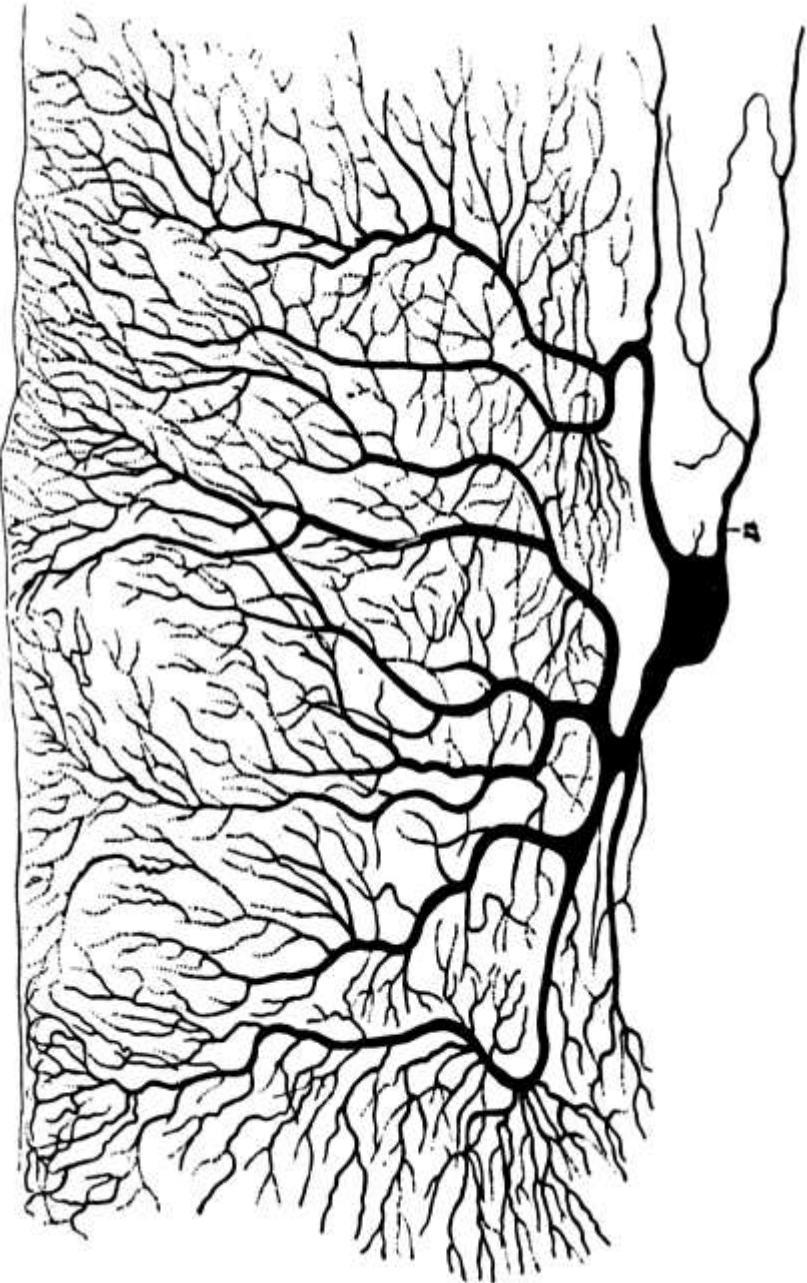
Late bedtimes &
academic
commitments

Environmental factors

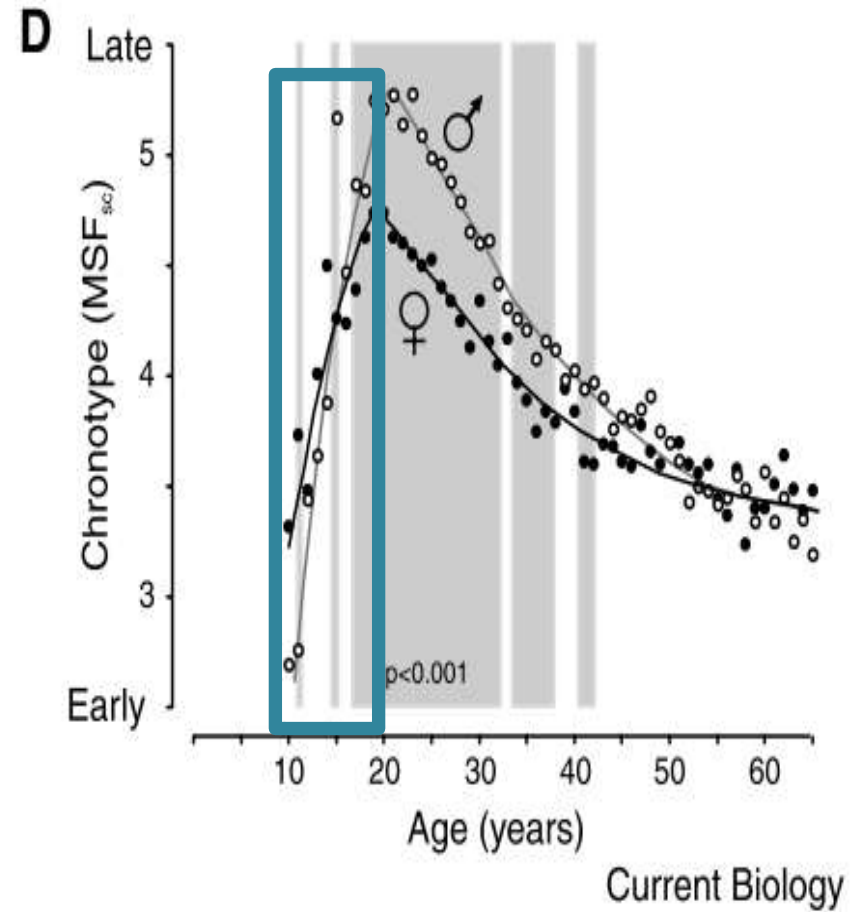
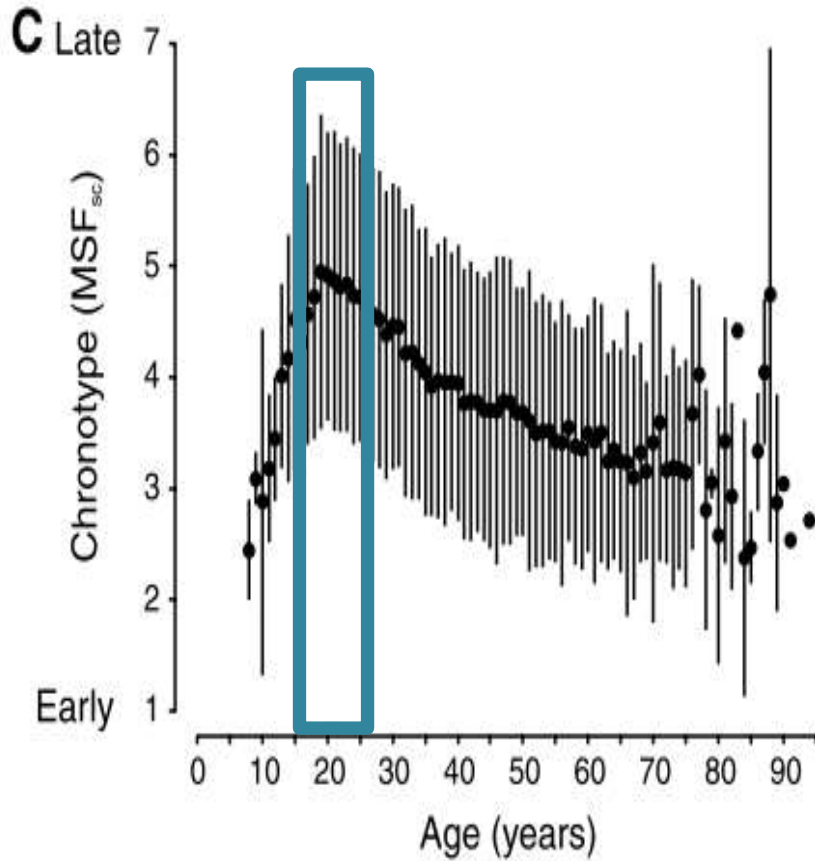
Increased physical &
psychological stress

Post-training
recovery
(Adaptations)

Cognitive demand of
sports and studies



n=25,000





Melatonin is regulated by circadian rhythm and influences “drive” to sleep

Adolescents have later melatonin onsets highlighting their **delayed circadian systems**

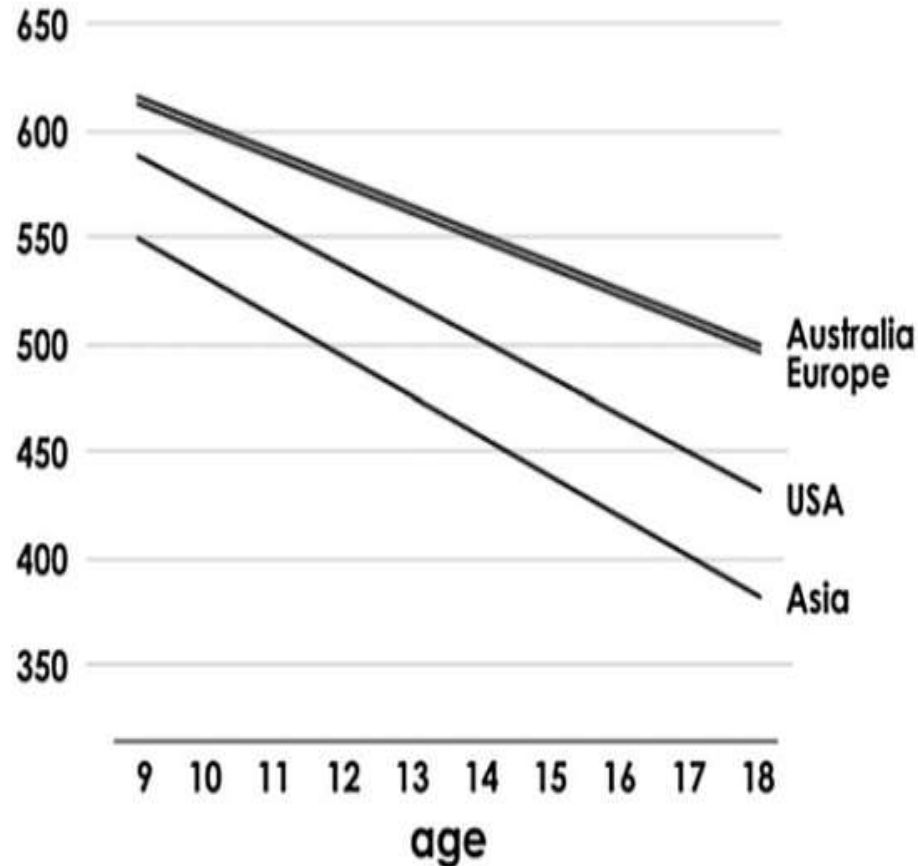
10.8
HRS

9.1
HRS

7.5
HRS

5.8
HRS

school day sleep duration (min)



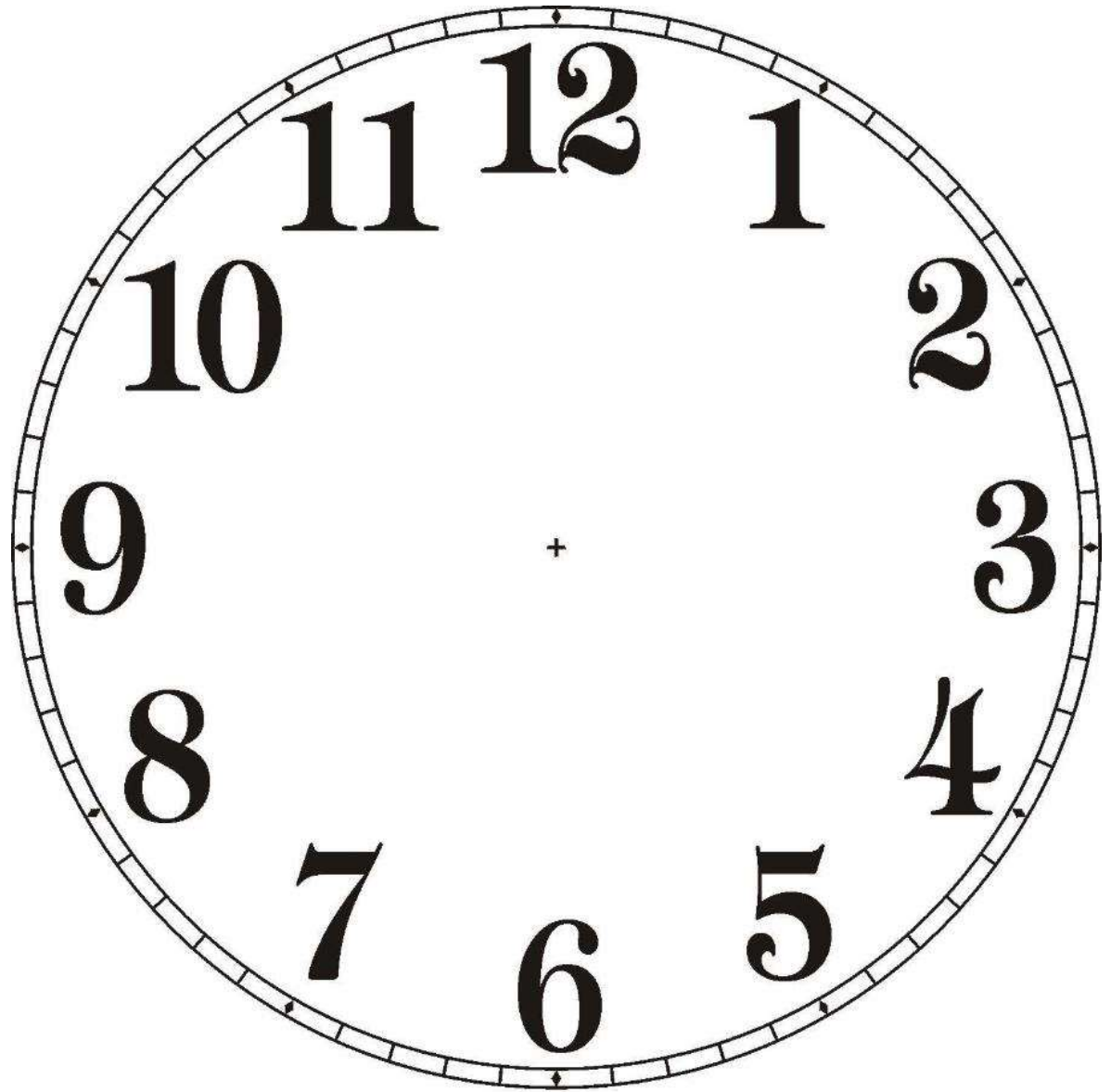
40-60 mins less
than North
Americans

60-120 mins
less than
Europeans

Activity

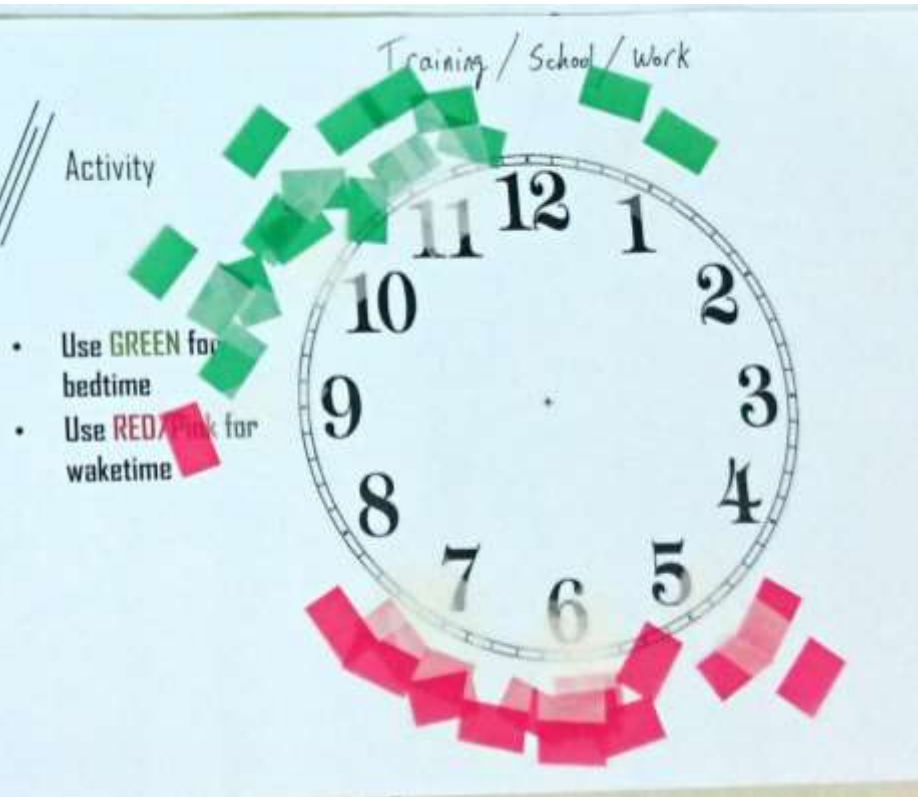
Activity

- Use **GREEN** for bedtime
- Use **RED/PINK** for waketime

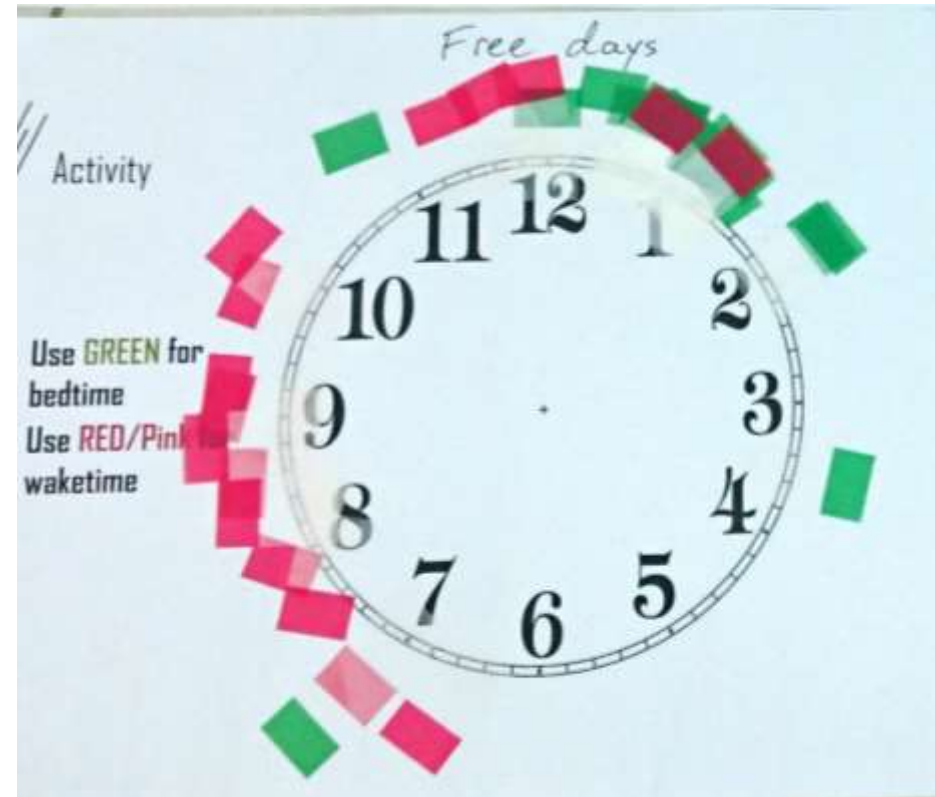


International Youth Sailors

Sleep on training/school/work days



Sleep on training/school/work days



**Shortened
sleep**

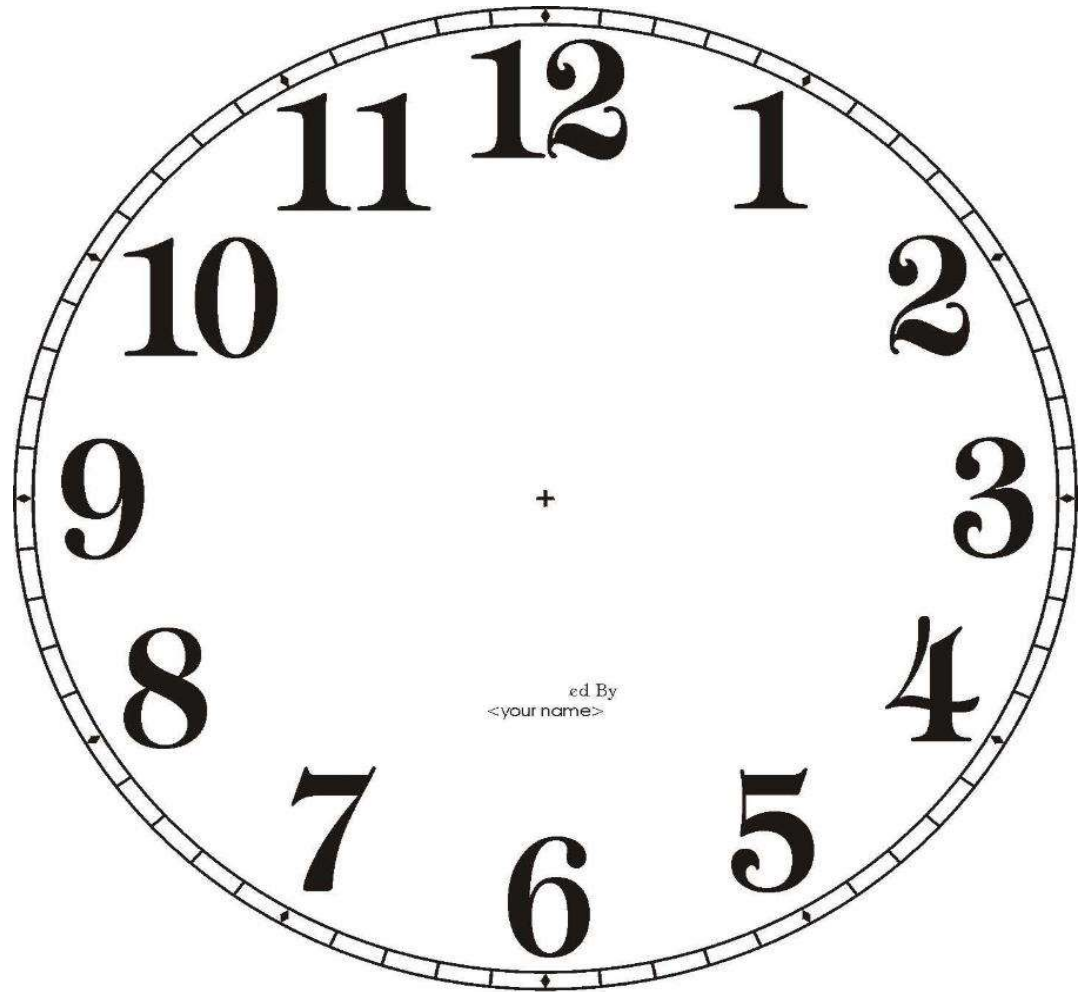
The diagram consists of three overlapping circles arranged horizontally. The leftmost circle is light blue with a blue border and contains the text 'Shortened sleep'. The middle circle is light green with a green border and contains the text 'Chronic sleep deprivation'. The rightmost circle is light pink with a red border and contains the text 'Sleep debt'. The circles overlap such that the right side of the blue circle is inside the green circle, and the right side of the green circle is inside the pink circle. The background is a grayscale image of a person's face, heavily shadowed and appearing to be in a state of distress or exhaustion.

**Chronic
sleep
deprivation**

Sleep debt

$$\begin{array}{l} \text{Amount of} \\ \text{sleep you} \\ \text{should be} \\ \text{getting} \end{array} - \begin{array}{l} \text{Amount of} \\ \text{sleep you} \\ \text{actually get} \end{array} = \text{Sleep Debt}$$

Remember this?

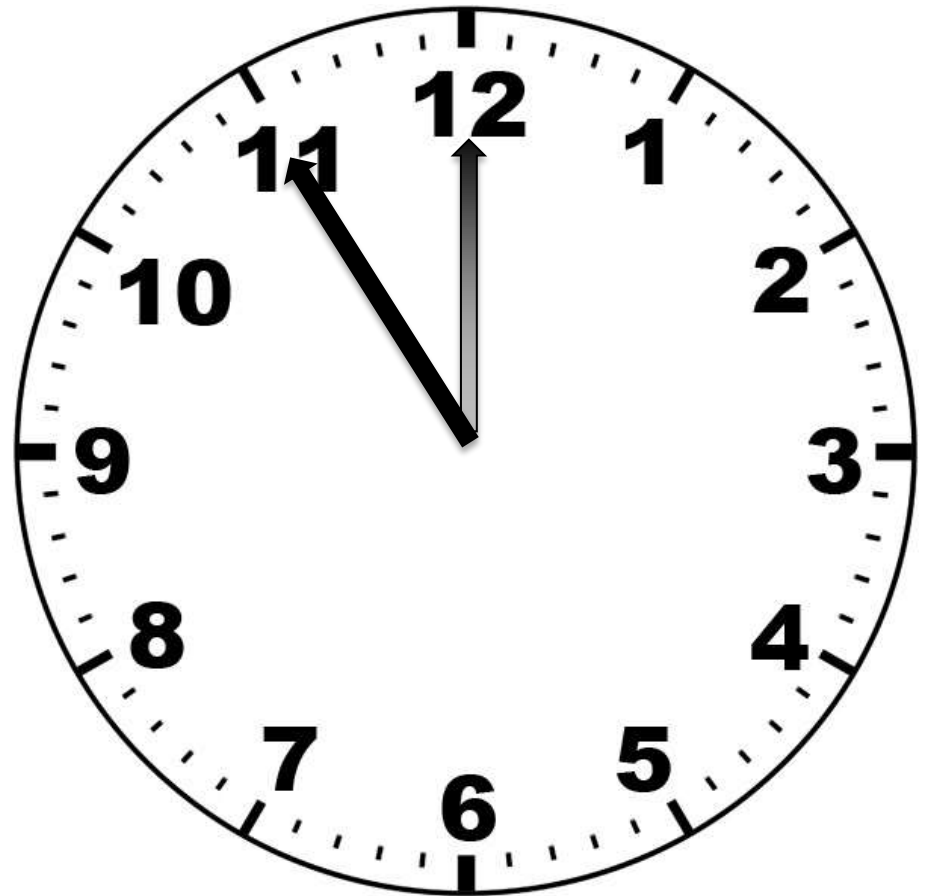


Sleep debt

8 hours of sleep

**Ideal bedtime &
waketime:**

11 p.m. – 7 a.m.



Sleep debt

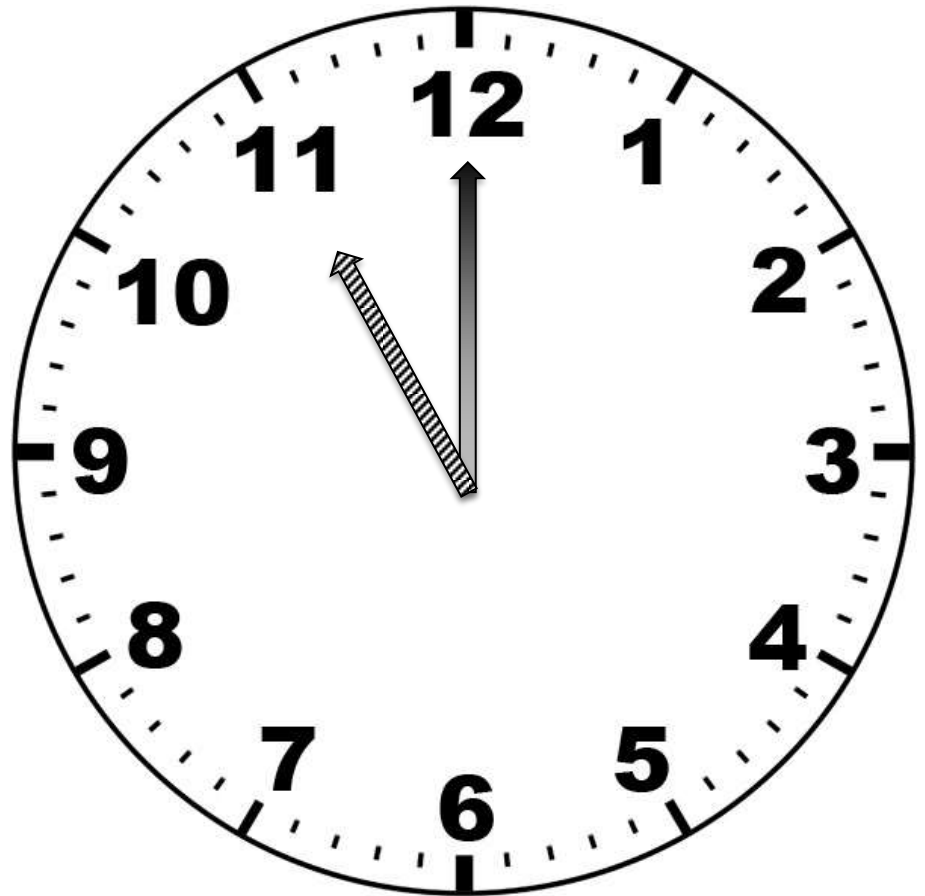
8 hours of sleep

**Ideal bedtime &
waketime:**

11 p.m. – 7 a.m.

Reality:

11 p.m. – 5 a.m.



Sleep debt

8 hours of sleep

**Ideal bedtime &
wakettime:**

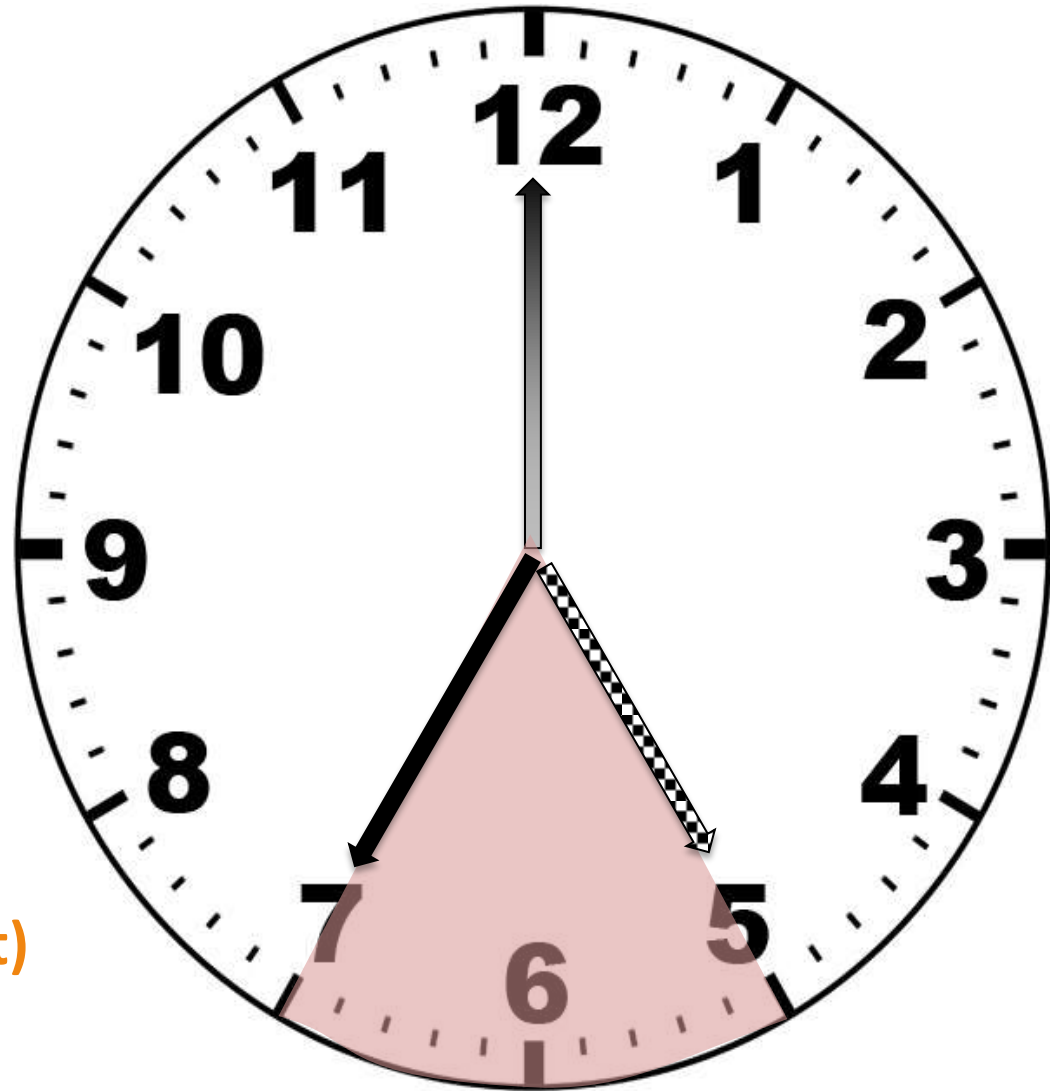
11 p.m. – 7 a.m.

Reality:

11 p.m. – 5 a.m.

**-Sleep debt over 5 weekday
nights**

- 5 x 2 hours = 10 hours (debt)



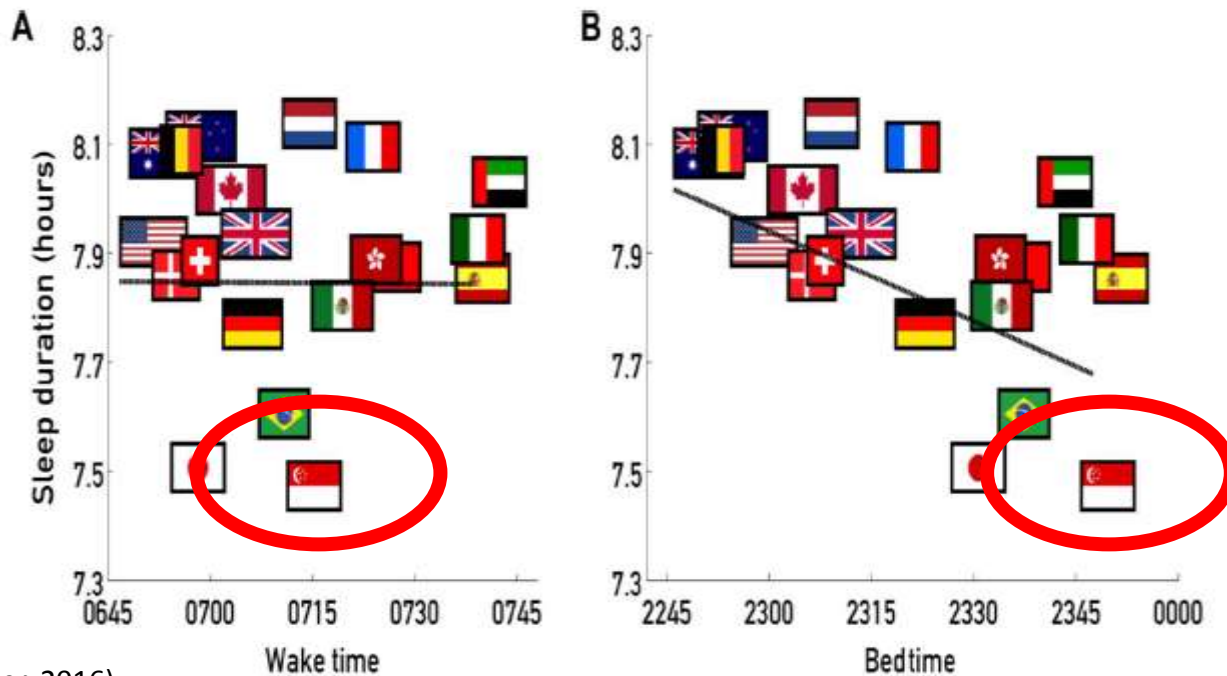
The need to consider context & culture

RESEARCH ARTICLE

SLEEP RESEARCH

A global quantification of “normal” sleep schedules using smartphone data

Olivia J. Walch,¹ Amy Cochran,¹ Daniel B. Forger^{1,2*}



(Walch, Cochran, & Forger, 2016)

Effects of light exposure have a **greater effect on adolescents**



(Crowley, 2015)

Sleep characteristics of athletes

- Fixed **training/competition** schedules
- Competition **anxiety**
- Overly **intense** training
- Jet lag



Sleep characteristics of elite athletes



(Erlacher et al., 2011)

76% slept worse
before competitions
43% woke up earlier
in the morning



(Venter, 2012)

75% slept between
6-8 hrs.
11% slept less than
6hrs. on WE



(Leeder et al., 2012)

Athletes

TIB: 8 hr 36 mins
Efficiency: 80.6%
Actual sleep: **6 hr 55 min**

Non-athletes

TIB: 8 hr 7 mins
Efficiency: 88.7%
Actual sleep: **7 hr 11 min**



(Lastella et al., 2014)

Individual sports

Bedtime: **22:27 hrs**
Waketime: **06:42 hrs**
TIB: 8.2 hrs
Actual sleep: **6.5 hrs**

Team sports

Bedtime: **23:24 hrs**
Waketime: **07:56 hrs**
TIB: 8.5 hrs
Actual sleep: **7 hrs**

FEEL ITS FURY

GEORGE
CLOONEY

A WOLFGANG PETERSEN Film

MARK
WAHLBERG

THE
PERFECT STORM

Effects of poor/insufficient sleep

- Physiological functioning
- Cognition
- Academic performance
- Immunity & health
- Psychological well-being
- Hormonal regulation
- Mood and behaviour
- Increased injury risk





**What happens
when athletes
don't get
enough sleep?**



Physiological responses to sleep loss include:

- **↑ heart rate**
- **↑ lactate following sub and max exercise**
- **↑ perceived effort**
- **↑ stress hormones during training**
- **↑ pro-inflammatory markers**
 - **Poorer metabolism**



Effects on cognition:

- ↑ reaction time
- ↓ motor learning ability
- ↓ skill acquisition
- ↓ vigilance
- ↓ decision making

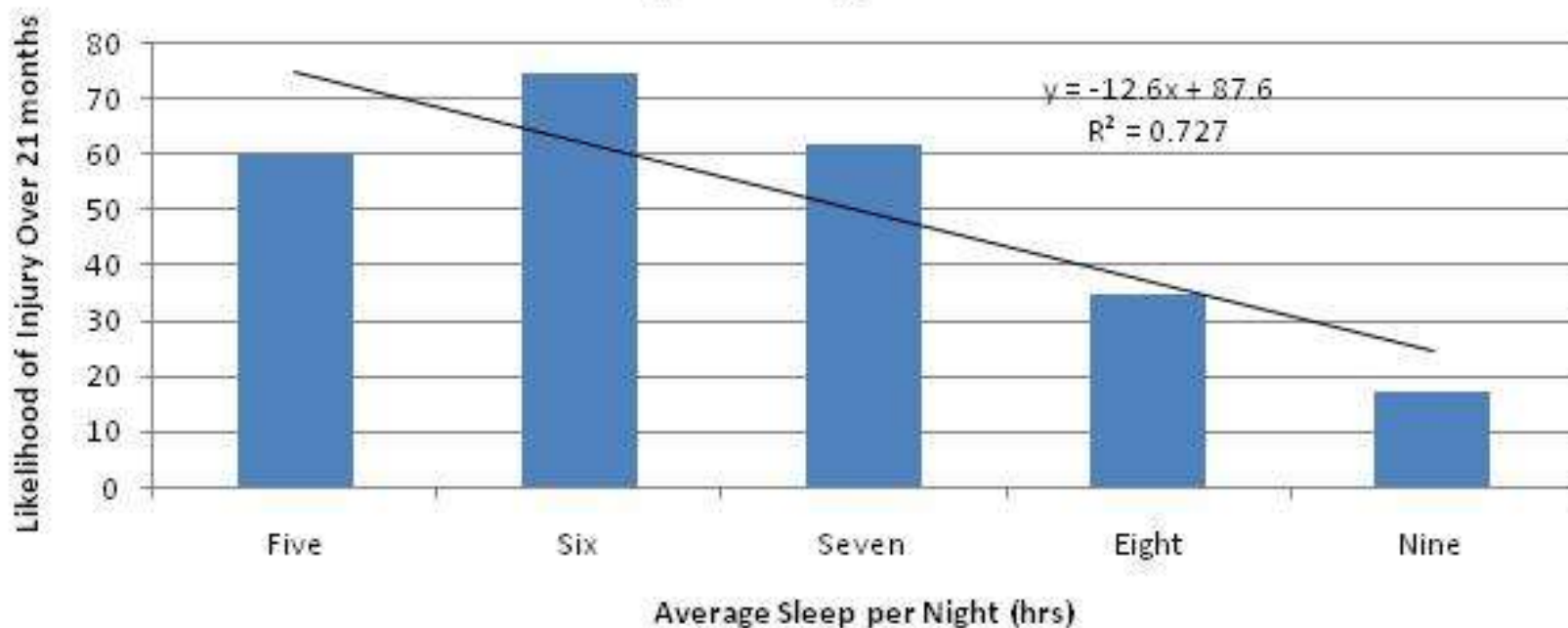


Increased risk of
sports injuries in
adolescent-athletes



Adolescents that slept
<8 hours were nearly
2 times more likely to
have an injury

Likelihood of Injury Based on Hours of Sleep per Night



What happens when
athletes get **extra**
sleep?



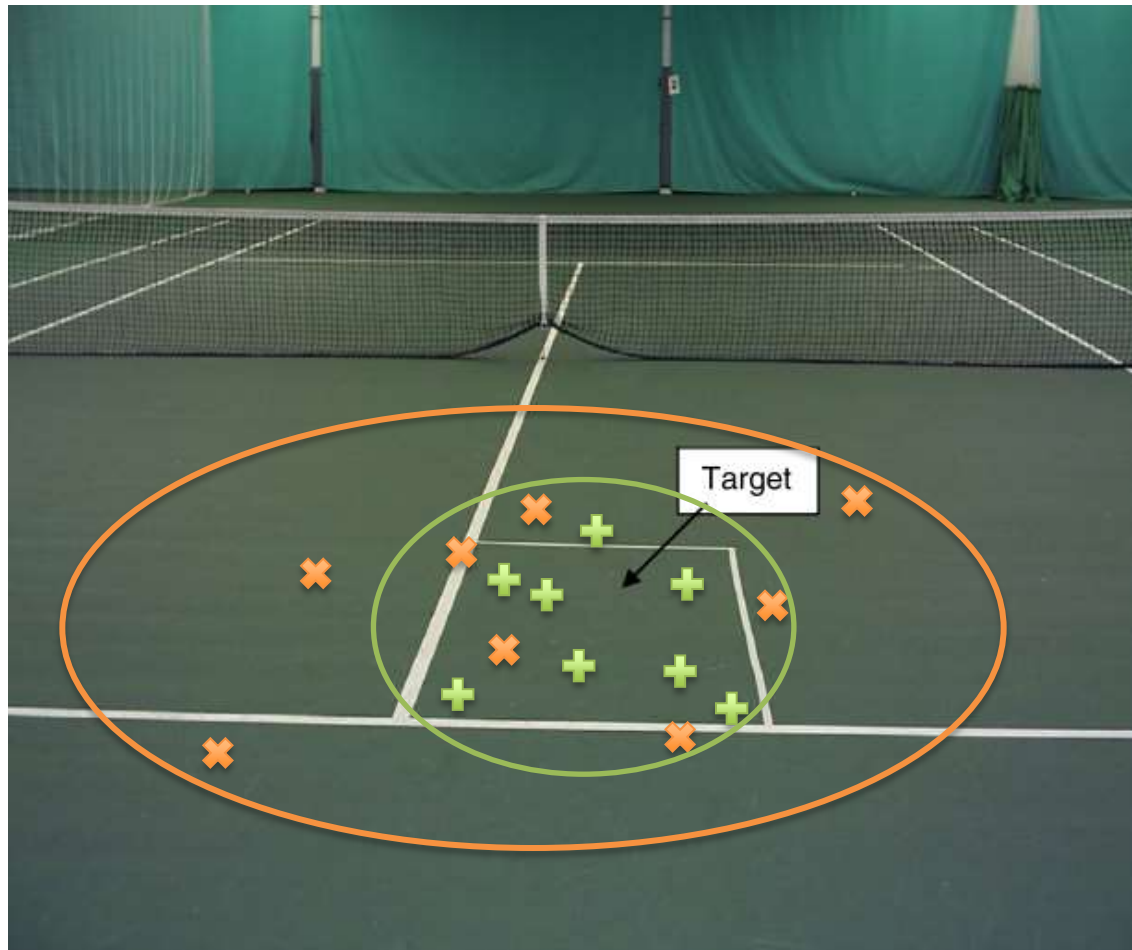
Sleep extension
(6.6 to 8.5 hrs.)

- Faster sprint times
- Improved accuracy



Sleep and Tennis performance

Less
sleep
than
usual



Normal
amount
of sleep

Participants taught
new trampoline
movements

Improved performance
occurred with
increases in **REM
sleep**

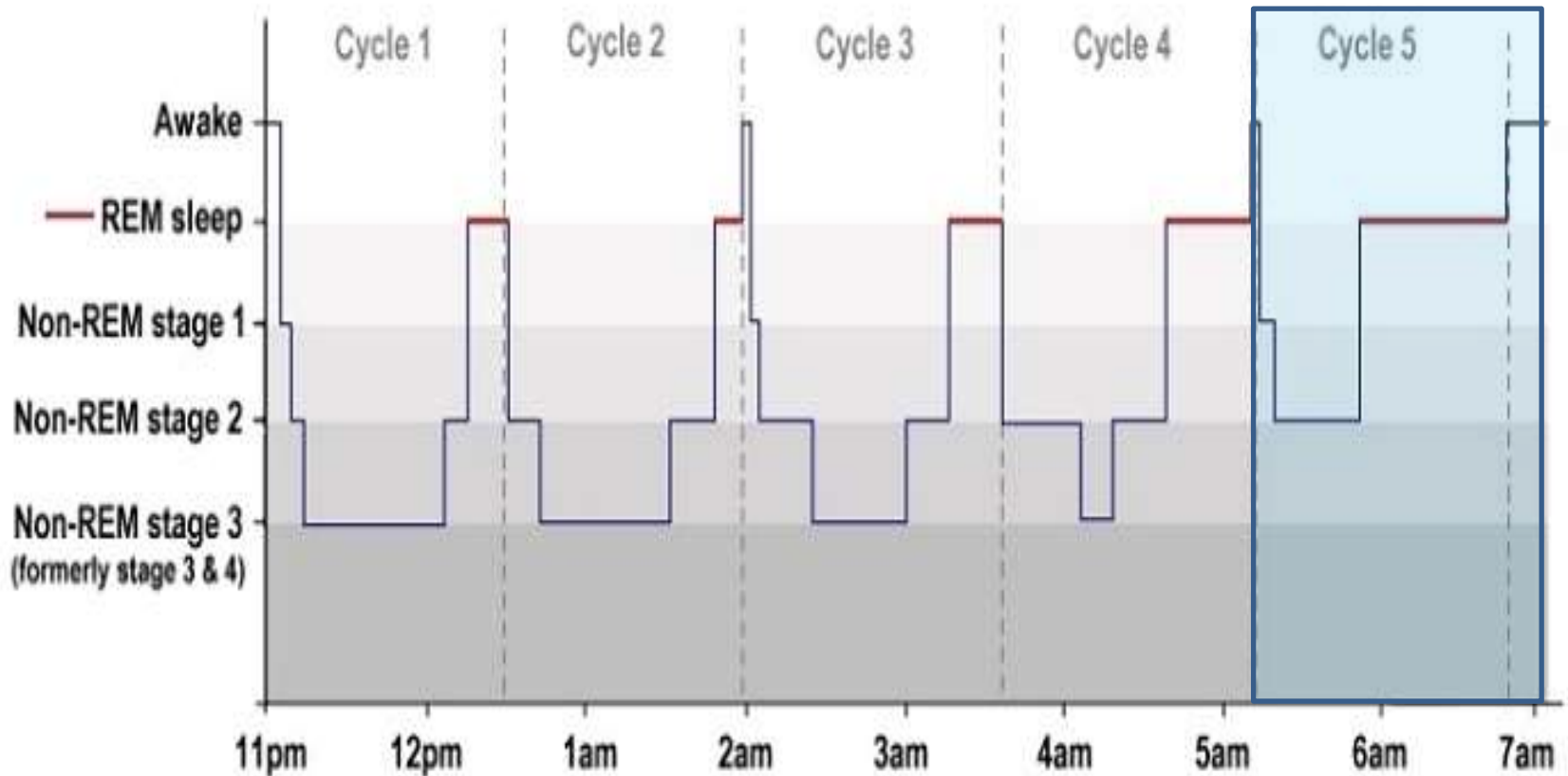
(Buchecker et al., 1991)



Stage 2 (light sleep) and REM sleep is critical in the refinement of fine motor skills

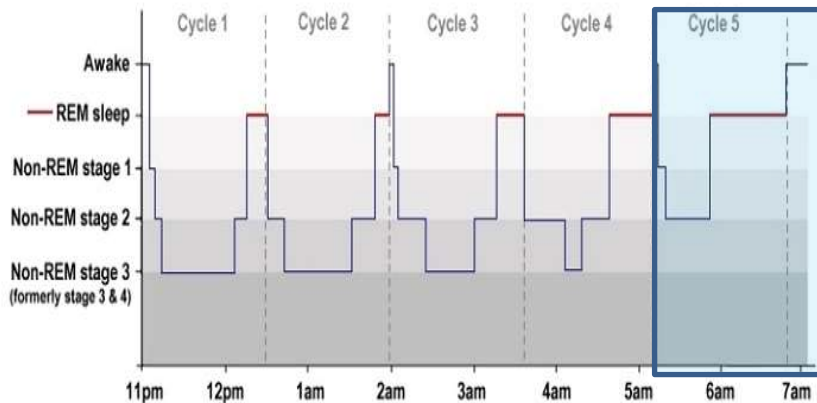


Sleep stages & sleep cycles



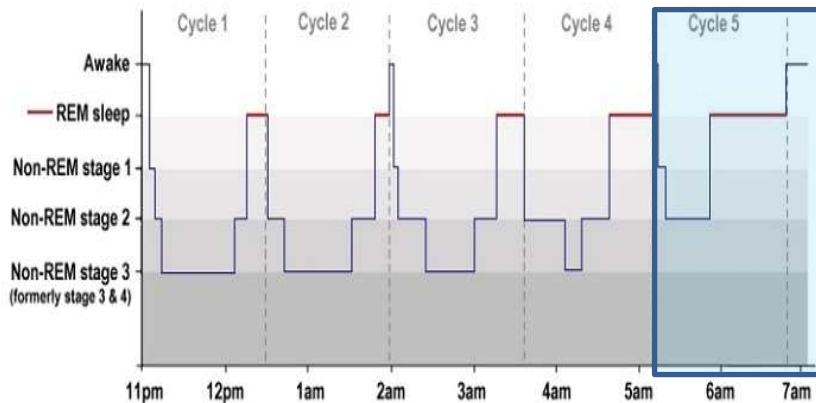
There is a larger proportion of stage 2 and REM sleep at the end of the night

Sleep stages & sleep cycles

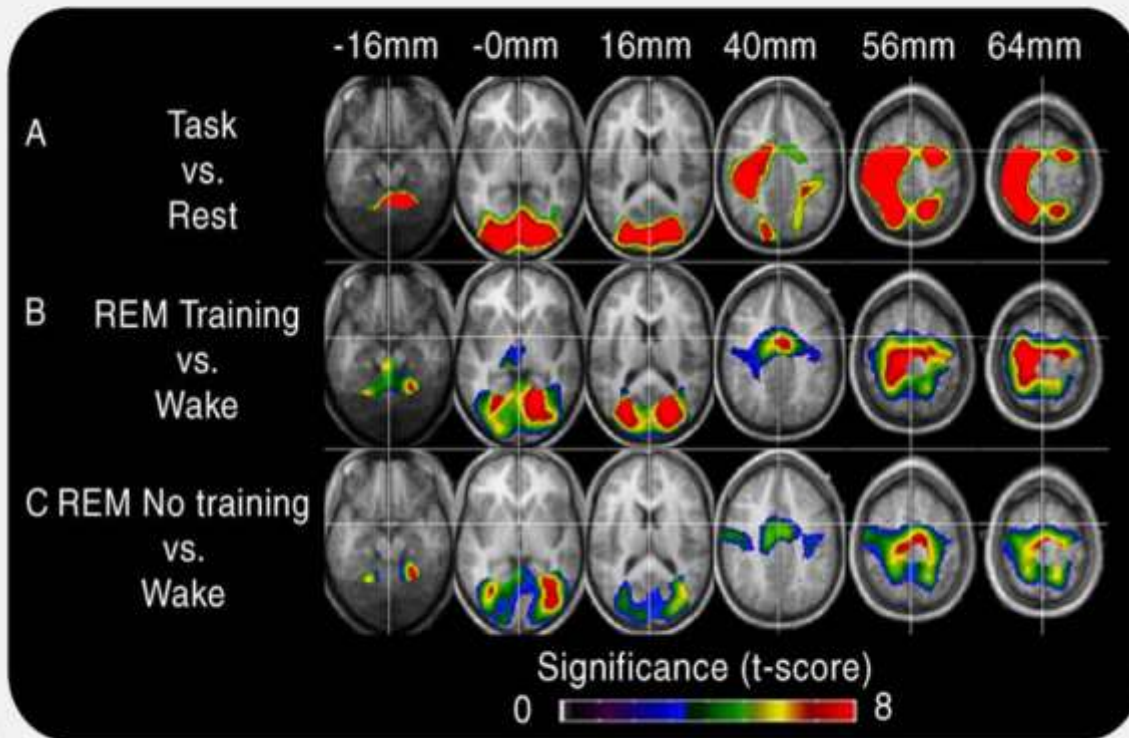


**Adolescents
potentially lose later
stages of sleep with
the most amount of
stage 2 & REM sleep**

Sleep stages & sleep cycles



**‘Offline’
consolidation of
learning and skill
acquisition from
previous practice
diminished**

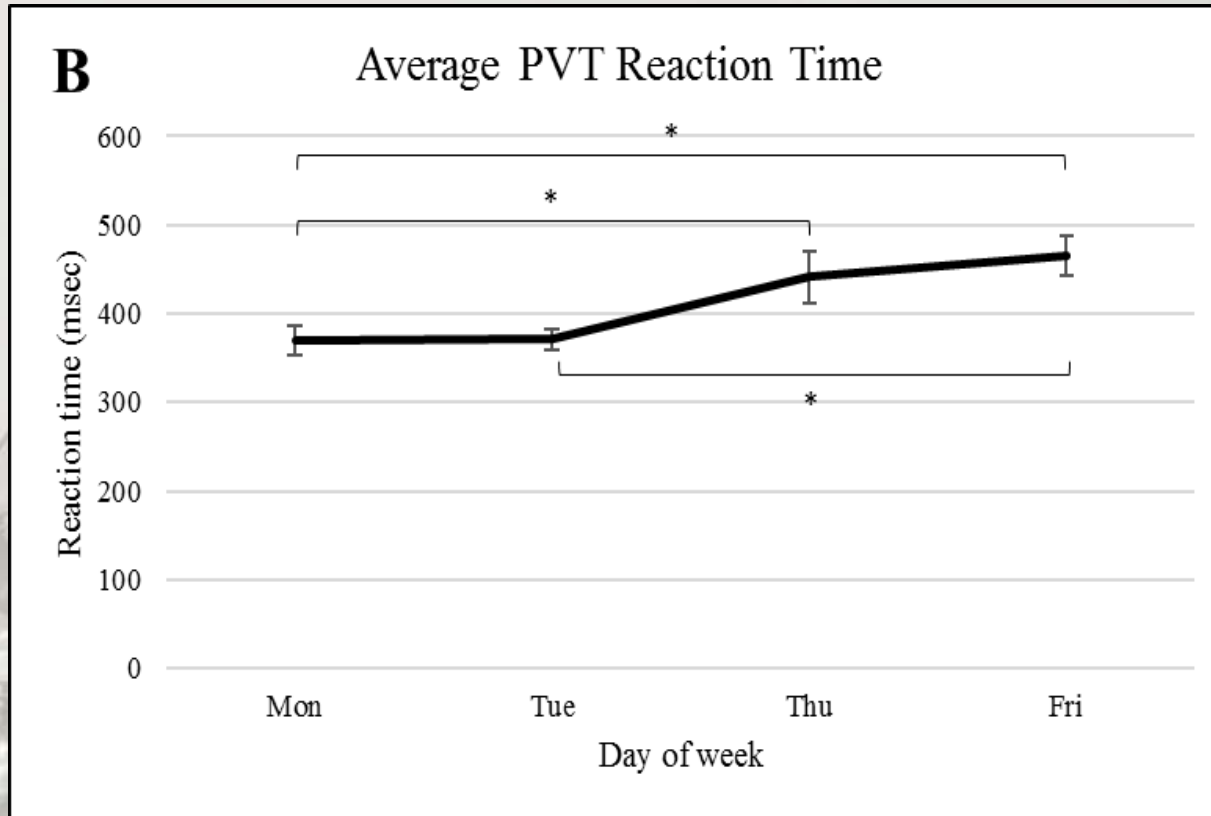


Brain regions involved in learning of a new motor skill re-activates during REM sleep

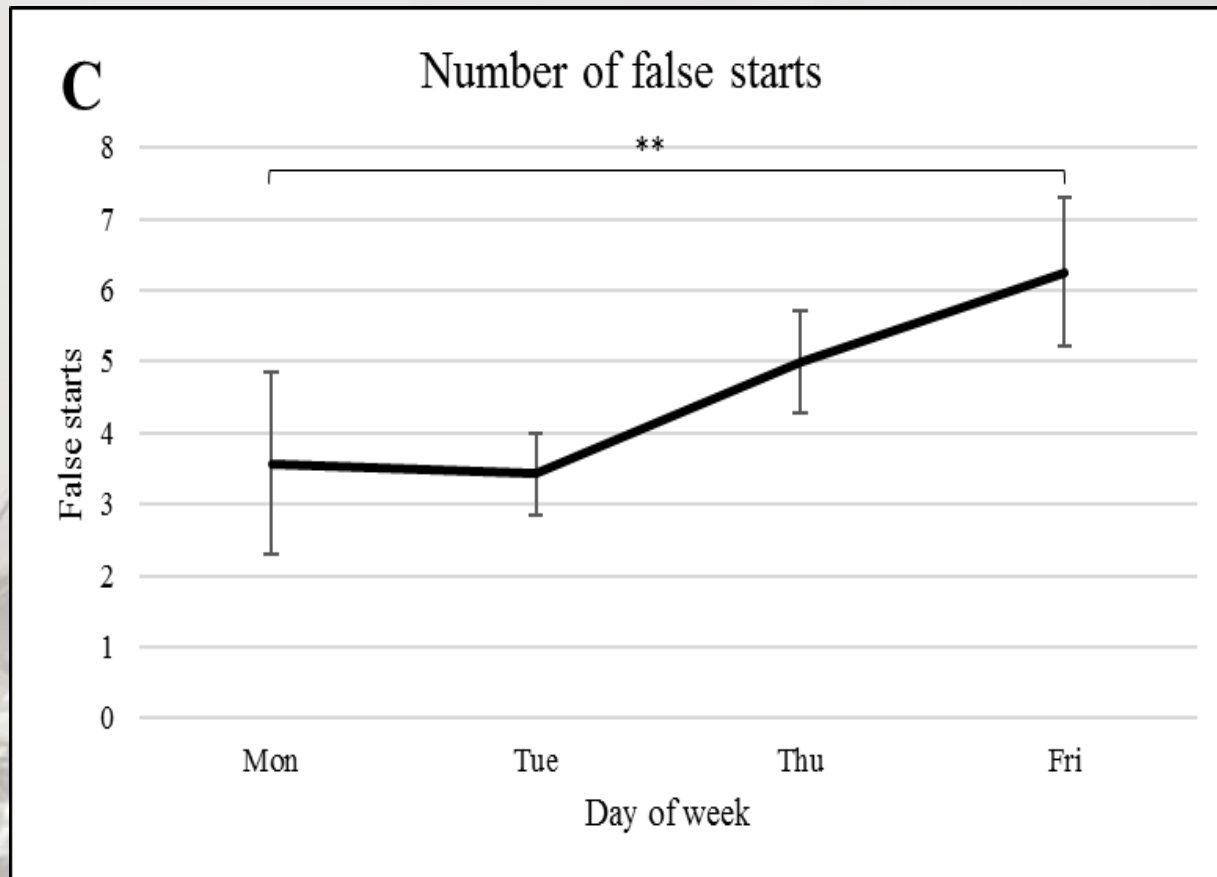
What are the
effects of **sleep
debt** on
adolescent-
athletes?



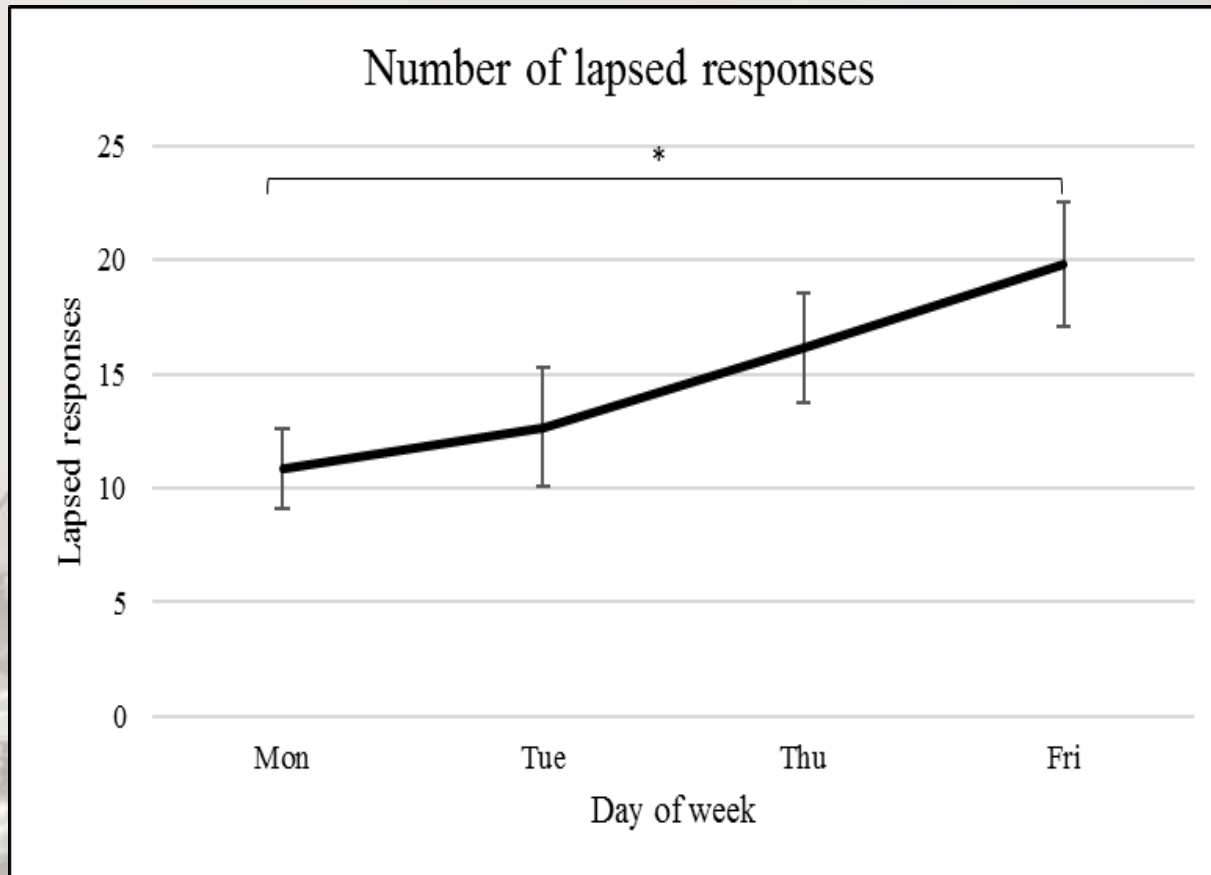
Average reaction time



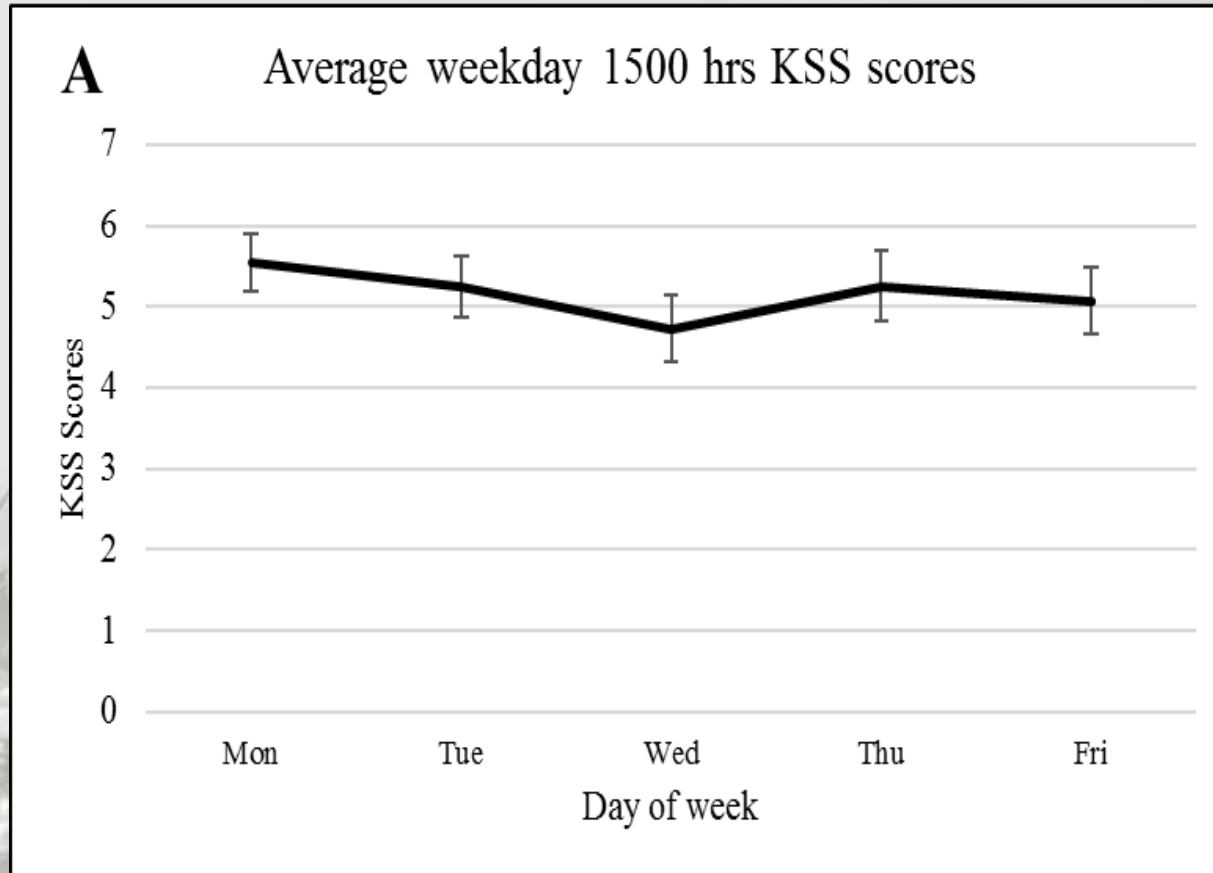
False starts (<100 msec)



Lapsed responses (>500 msec)



Subjective sleepiness



Chronic sleep restriction (sleep debt)
results in poorer performance by the
end of the week





Dr. Christopher Winter

Medical Director, Martha Jefferson Hospital Sleep Medicine Center, sleep medicine, neurology specialist

GET UPDATES FROM DR. CHRISTOPHER WINTER



Why Is the NBA Treating Sleep Like a Performance-Enhancing Substance?

Posted: 12/02/2012 12:53 pm



MAVS FIRST TO DIVE INTO FATIGUE ANALYSIS

October 16, 2013 - 2:07PM



POSTED BY:
JEFF CAPLAN

EMAIL JEFF | FOLLOW ON

DALLAS – In the next few days, the Dallas Mavericks will become the first team in the NBA to have their players wear black, digital wristwatches that don't tell time.

The watches will tell when the players are sleeping, and for how long and how deeply they're doing so. The

By Ralph Ellis | 1 Comment | 16 Jul 2013 22:30

Wimbledon men's final: Andy Murray reveals 12 HOURS of sleep a day is his secret to success

The No 2 seed will face Novak Djokovic later today - but not before putting his feet up in an attempt to feel as fresh as possible

Tweet 37 Like 48 Stumble



Studies link fatigue and sleep to MLB performance and career longevity

| | Bookmark this page | Print

American Academy of Sleep Medicine
Thursday, May 30, 2013





Waking dream: sleep consultants help prepare athletes to chase late-night glory at Rio 2016

14/06/2016 — 10H22

By Denise Mirás

Artificial light and adjusted eating habits among other tactics used by athletics, swimming and volleyball competitors.



As at London 2012, athletes such as long jump champion Greg Rutherford will be competing at night in Rio (Photo: Getty Images/Stu Forster)

Tips for better sleep





Tips for better sleep

Use an alarm clock to start your pre-bedtime routine (e.g. 9:00 p.m. bedtime)

8:00 p.m. – No more electronics

8:10 p.m. – Warm shower

8:20 p.m. – Pack school bag

8:30 p.m. – Read book

8:45 p.m. – Lights off

TRAIN LIKE AN
ATHLETE

EAT LIKE A
NUTRITIONIST

**SLEEP LIKE A
BABY**



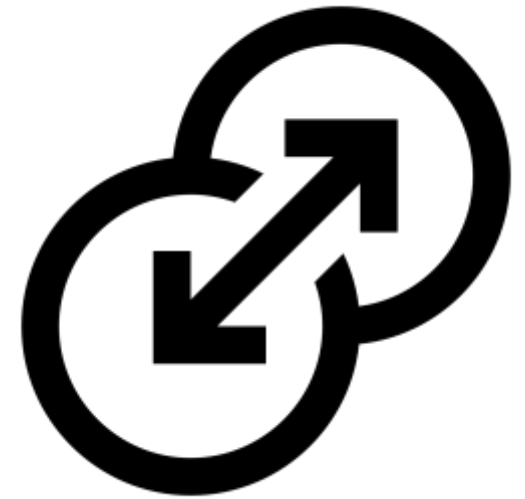
WIN LIKE A CHAMPION

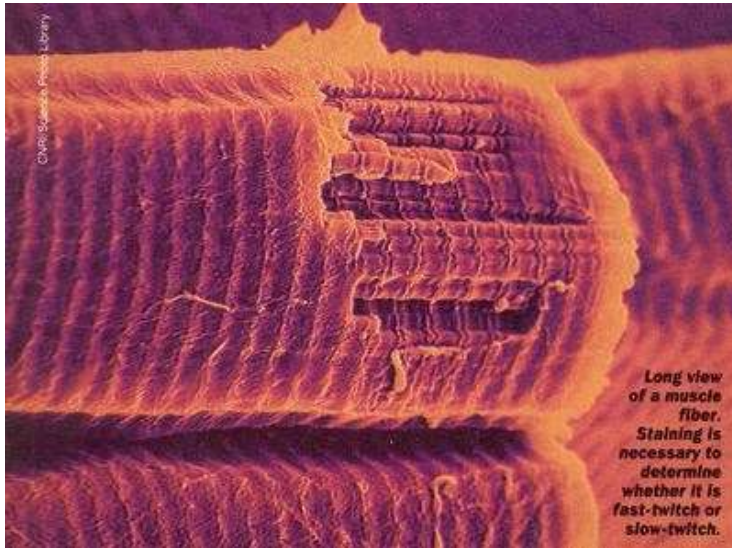
DAILY PRE-SLEEP ROUTINE

Time	Activity
e.g. 9.30 p.m.	Dim lights / No more mobile devices
10.00 p.m.	Warm bath
10.15 p.m.	Music / Dim lights
10.30 p.m.	Lights off/ Bedtime
Aim for a minimum of 8.5 hours in bed	

Part 3

Other Recovery Modalities





(Hauswirth & Mujika, 2013)

Let's not forget mental recovery

- Mental fatigue can impair sport performance
- Impaired running speed
- Increased perception of difficulty



Let's not forget mental recovery

- Considerations for the student-athlete
- Can different “mental-load” affect their ability to train?



A need to consider recovery



Key elements of recovery

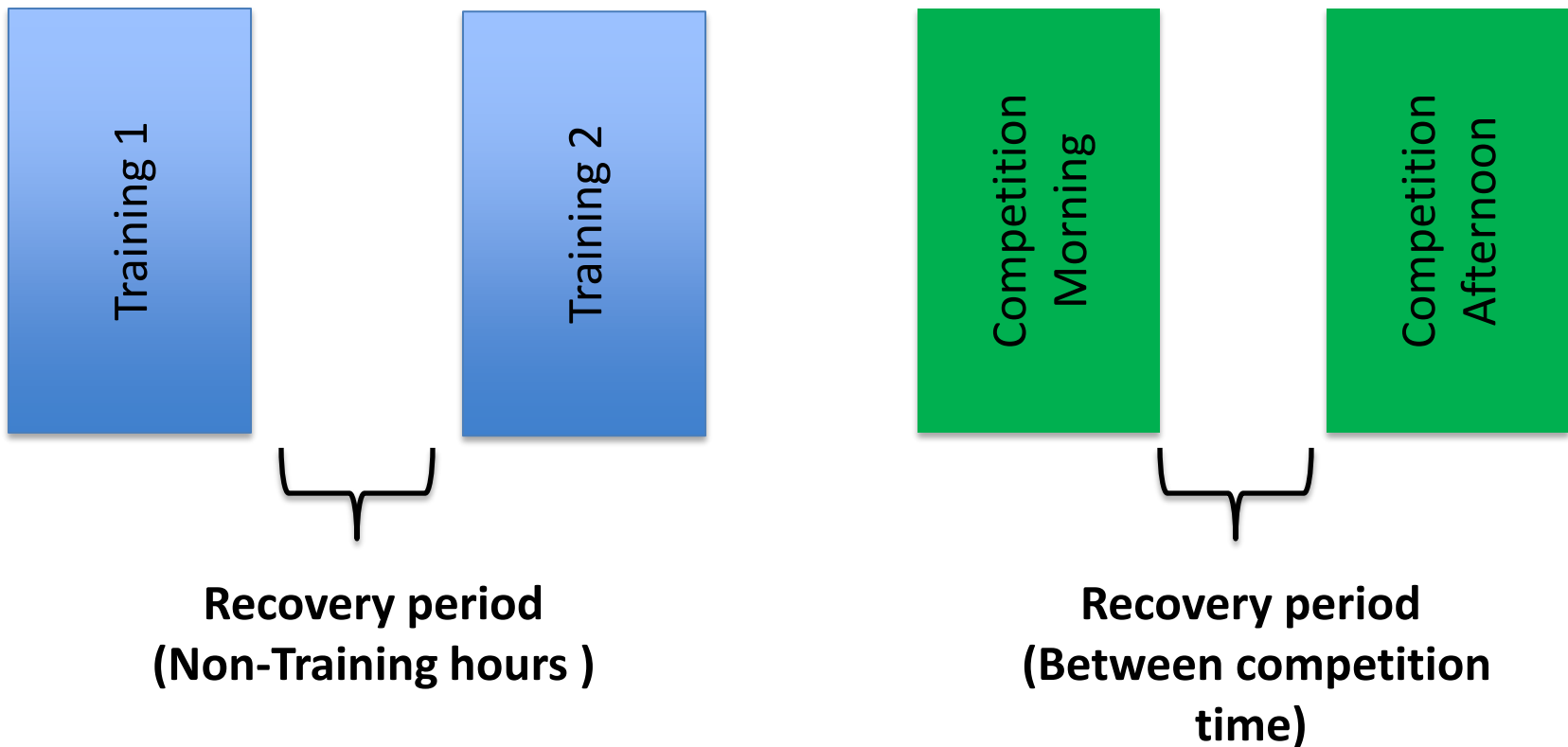


Physical

Psycho-
social

When?

Training recovery occurs
between successive **training
sessions** or **competitions**



CALENDAR

Training

Competition

**Objective of recovery
Evidence (Youth)
Resources**

Training or Competition

- Some recovery methods may interfere with the normal, positive training adaptations, i.e. inflammation and swelling for muscle repair



Training or Competition

- Consider when you need to recover (fast) and why
- Sometimes (i.e. training) you can delay recovery to increase/prolong the stress and therefore adaptation





Training Load adjustment



Recovery sessions

- Designed to reduce training stress and speed up restoration of muscular function
- Program into training sessions
- Low intensity sessions



Active Recovery

Part of training session or during the cool-down phase

Day after intense training or competition

**Very low to low intensity
(10 – 20mins)**

Recovery sessions



Stretching



- Evidence level is debatable
- When used by itself, is generally not effective
- Emphasize on dynamic movement/stretching (recovery sessions)

(Sands et al., 2013)

Stretching



- Avoid stretching after high-intensity sessions and strength training
- Avoid for muscles groups experiencing DOMS

Massage



- Very little scientific evidence
- Typically improve perception of recovery
- At youth level, generally not encouraged

(Poppendieck et al. 2016)

Foam rolling



- Lessen decrement in muscle performance
- Reduce DOMS

(Cheatham et al. 2015)

Compression garments



- Perceived recovery and reduction in muscle damage
- Needs to be adapted to athlete size
 - Progressive pressure profile of garment
- Muscle function not supported by research

(Hill et al. 2013)

Cold water immersion



Immersion to water temp. of 10°C-15°C, 8-15 min

- Compressive pressure and cooling of body tissue
- Reduce inflammation
- Performed at hip level or shoulders

When?

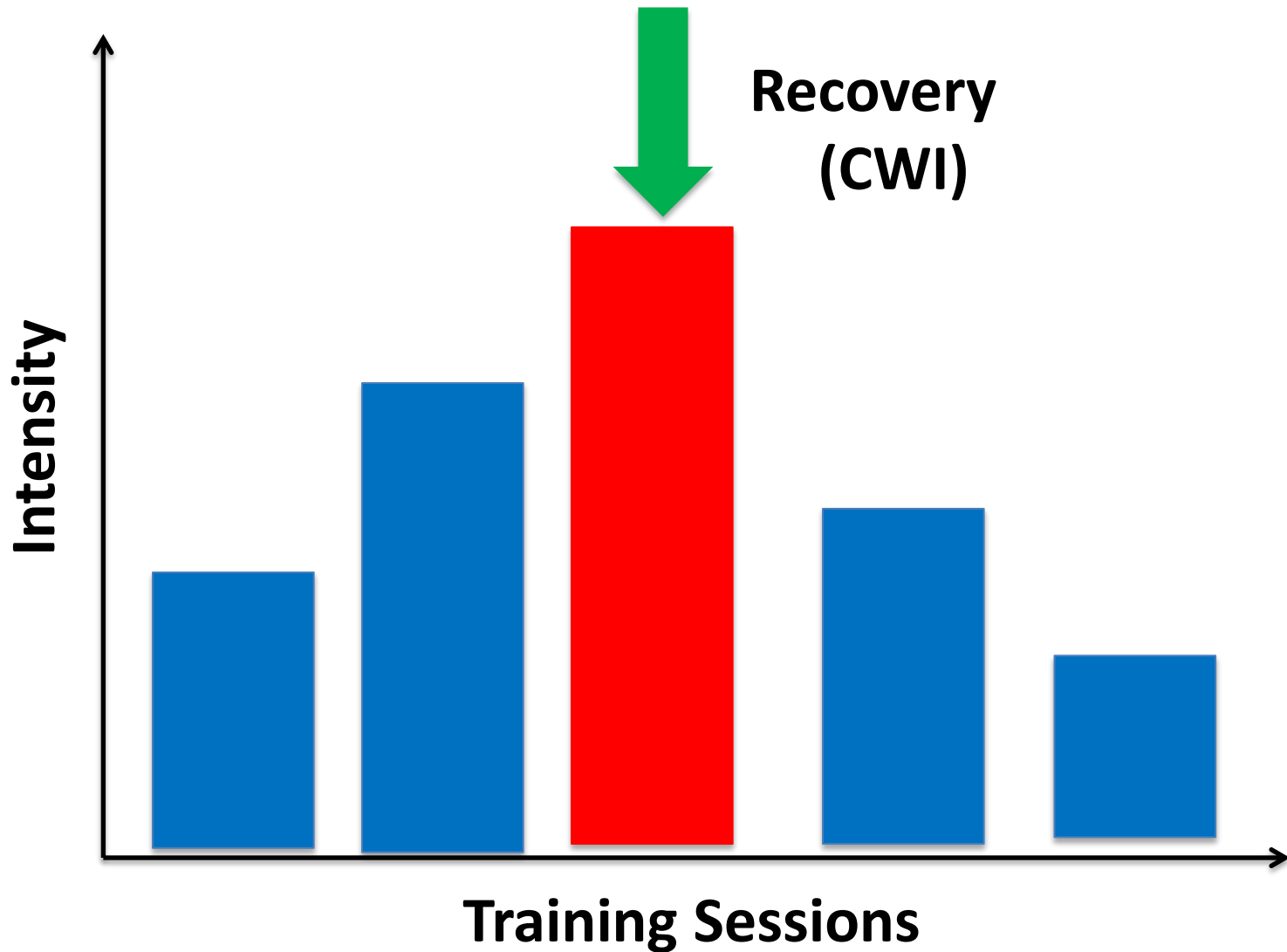
Training

Competition

Yes/Maybe/No

Yes

Training



During Competition



Evidence unclear with swimmers



Contrast water immersion



Similar or no superior advantage to just using COLD

- Inclusion of hot/warm immersion
- Finish on cold for aggressive recovery, hot for relaxation
- Increase blood flow, improve nutrient delivery and metabolism

Cold Water Immersion for Athletic Recovery: One Size Does Not Fit All

Article in International Journal of Sports Physiology and Performance · May 2016



Limited evidence on adolescent population

- Small beneficial effects on physiological, power and endurance factors
- Largely perceived benefits
- **Youth may not tolerate long duration of cold water exposure**

Potential diminishing effects of training gains

Training adaptation

Strategy Adaptation

Individual Variation





“Develop healthy, capable and resilient young athletes, while attaining widespread, inclusive, sustainable and enjoyable participation and success for all levels of individual athletic achievement.

(Bergeron et al., 2015)

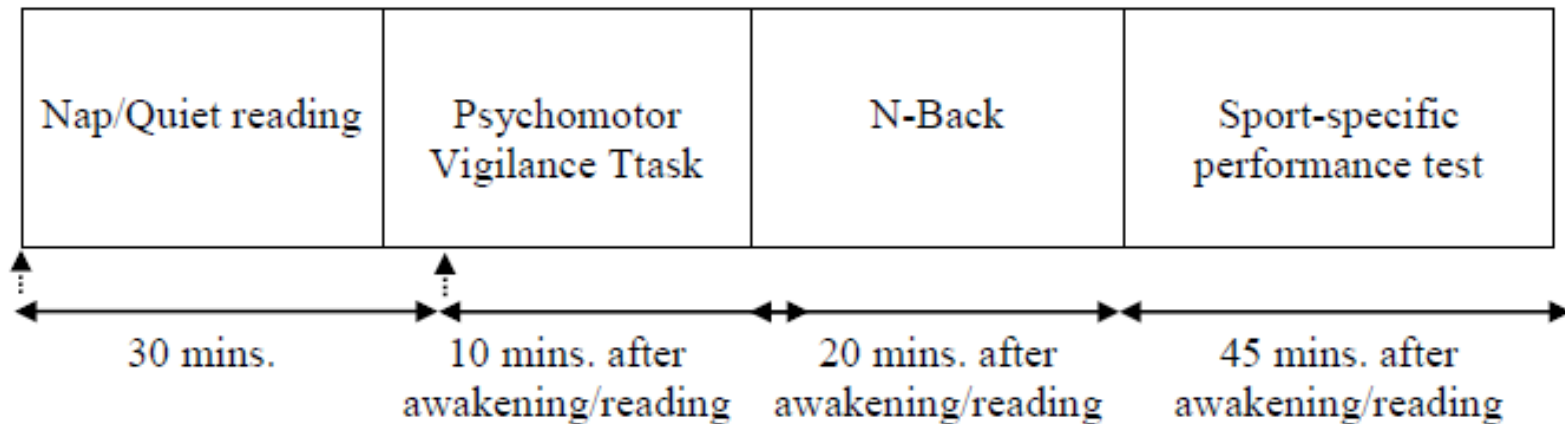
Summary

- There is a long runway to sporting success
- Athletes of the same age may be at different stages of development
- Recovery is as important as training
- A periodised training programme is varied in intensity, volume and activity-type



Napping?

How does a short nap impact sport performance?



20-m sprint
test

20 –shot simulated
competition

How does a short nap impact sport performance?



- No effect on shooting performance



- Worsened 20-m timings
3.411 (0.143) s vs. **3.385** (0.128) s

How does a short nap impact sport performance?

- Naps may have variable effects depending on the performance measure
- Not recommended to use immediately prior to competition unless performance has been assessed
- Try it out

