SLEEP
RECOVERY

LIFE OF AN ATHLETE
Human Performance Project

John Underwood

JOHN UNDERWOOD
HUMAN PERFORMANCE CONSULTANT FOR THE U.S. NAVY SEALS

Director Founder of the American Athletic Institute – Human Performance Project. A former NCAA All-American, International-level distance runner and World Masters Champion, John has coached or advised more than two dozen Olympians including many World and Olympic Champions. He holds three International Olympic Solidarity diplomas for coaching and has been a crusader for drug-free sport at all levels. John is an internationally recognized human performance expert, specializing in recovery, peaking training and lifestyle impact on mental and physical performance. John's innovative program "Life of an Athlete", has gained international prominence. John has worked with nearly all sport federations including the National Federation of High School Athletics, NCAA, NHL, NFL, NBA, the U.S. Olympic Committee, Sport Canada and the International Olympic Committee. John Underwood is Human Performance Consultant for the U.S. Navy SEALS.

20 years Olympic Sport
19 years HPP

108-0

USE EVERY ASSET

1% FACTOR

1:54.31
1:54.38
1:54.40
1:54.52
1:54.64
1:54.67
1:54.82
1:54.84
1:54.87
1:54.88

.57 Secs.

0.001

THE REST IS UP TO YOU

You are here…

You signed up for this…

You owe it to yourself, your teammates to be at your best!

Recovery

STRESS

RECOVERY

ADAPTATION

If you are going to train very hard …
You need to rest very hard!

REST.

(it's part of the program!)

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STRESS

GET THIS!

Elite performance will never revolve around which athletes can stand the most stress… rather to reduce as much as possible the stress and stressors that impact training recovery and performance

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How fast you can recover!

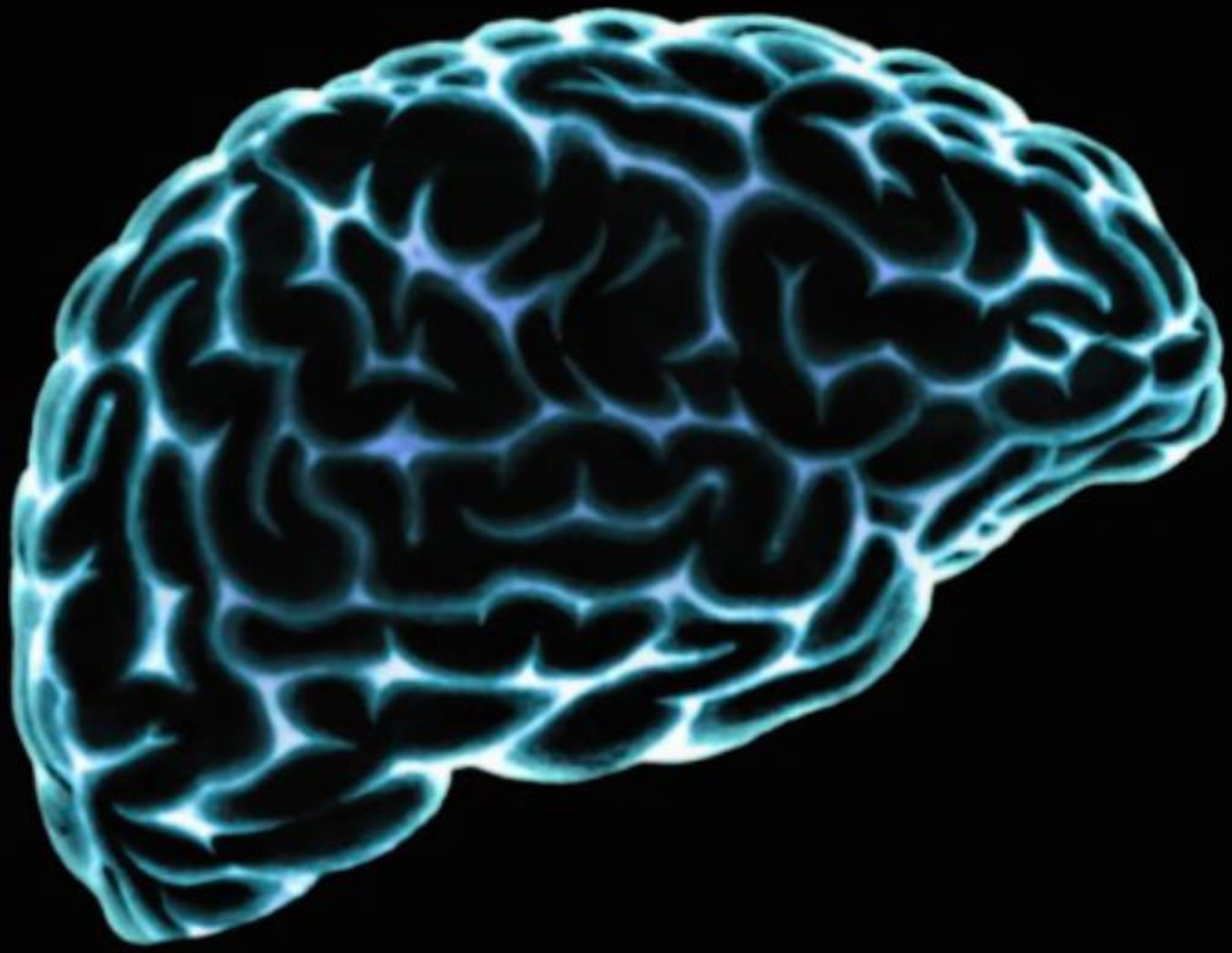
QUALITY OF TRAINING

The first hour

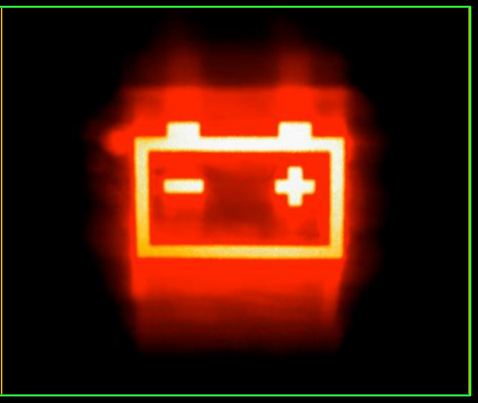
During the first hour after a workout the majority of recovery takes place and training effect is maximized.

70 20 10 Rule

Turn around time



The single most impacting factor in athlete performance is CNS READINESS



It is all in your Head…

What makes awesome happen?

Human Performance Project

BRAIN SCIENCE

- Impact of Sleep on performance
- Impact of Alcohol and Marijuana on performance
- Impact of Technology Use on performance
- Impact of Neural Fatigue on performance
- Impact of Blood Glucose on performance
- Impact of Hydration of performance
- Impact of Stress on performance
- Impact of Mood on performance
- Impact of Energy Drinks on performance
- Impact of Diet on performance

CNS READINESS

Brain function during performance is being studied world wide. Whether you are an athlete, musician, actor, dancer, or student Central Nervous System (CNS) Readiness is the single biggest factor in performance.

Neural Drive

The brain provides what is known as neural drive to the body. This is the electrical signal sent f r g h .

BRAIN MUST BE HIGHLY RESTED

recruitment. Young athletes do not yet command this process but by training over time this activation develops. Eventually the recruitment increases force development and outputs.

MUSCLES MUST BE HIGHLY RESTED

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PERFORMANCE

TRAIN

RECOVER

ADAPT

The Human Performance Project

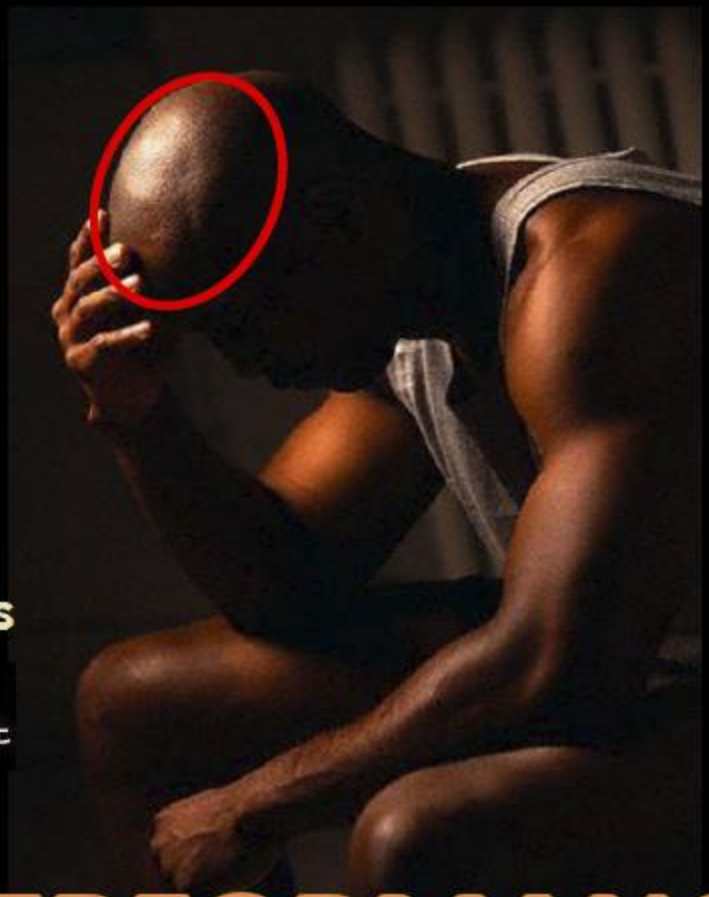
JOHN UNDERWOOD

Timing and Timelines

LIFESTYLE

NEURAL FATIGUE?

Random performance is a result of lack of attention to recovery processes and methods in body systems. Sleep, hydration, nutrient intake, compression, thermal exposure, and sleep are critical to the recovery timeline. If an athlete as random recovery process methods it almost insures random performance. When inconsistant performance occurs, many times it is a result of fatigue in the Central Nervous System. The CNS once fatigued, can take nearly twice as long to recover as the heart, lungs (Central System), and muscles. Older athletes have decreasing hormone levels that do not support 24 hour recovery to full capacities.



Pay Attention to Recovery Details

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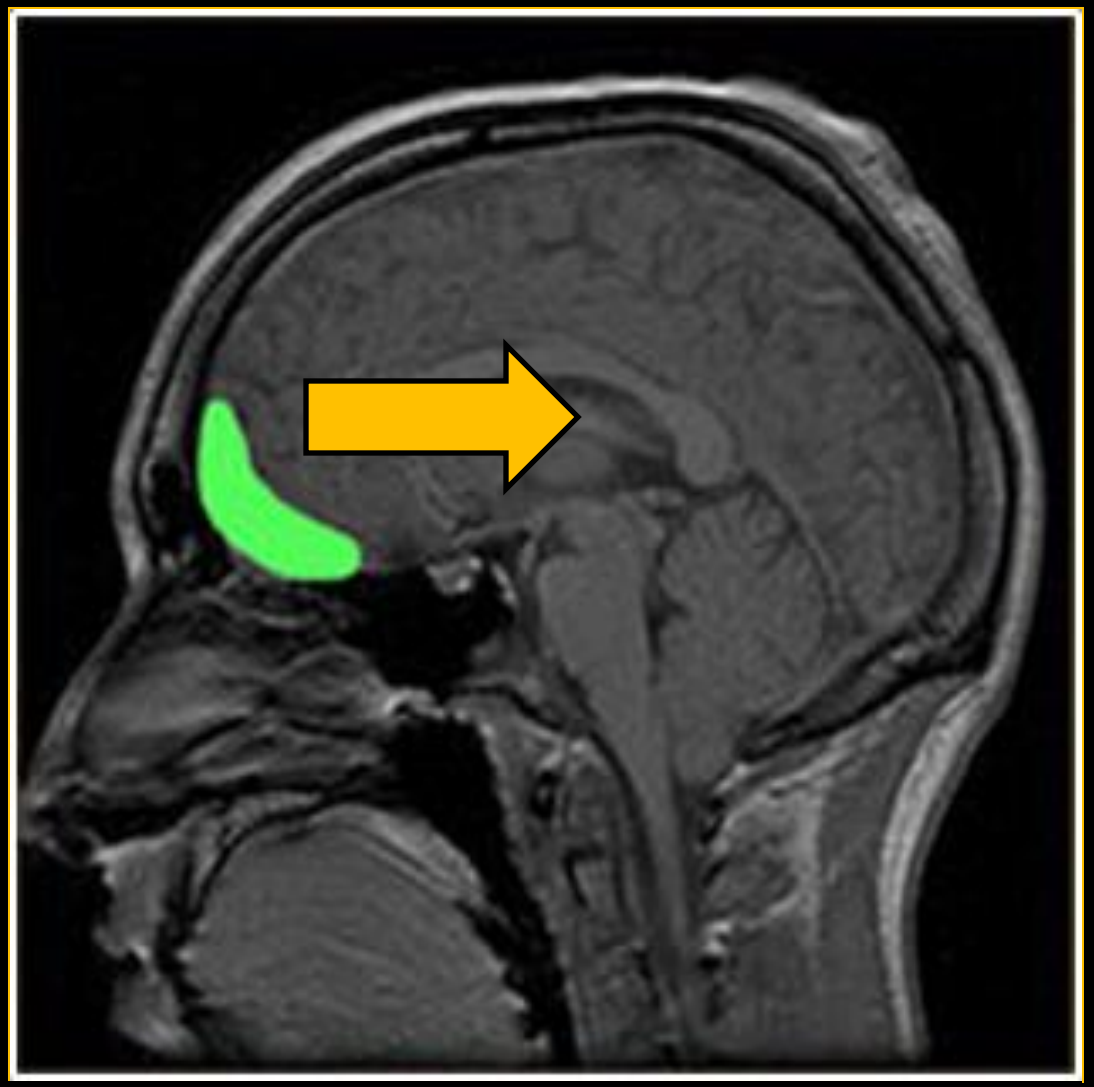
INCONSISTANT PERFORMANCE
#1 SUSPECT

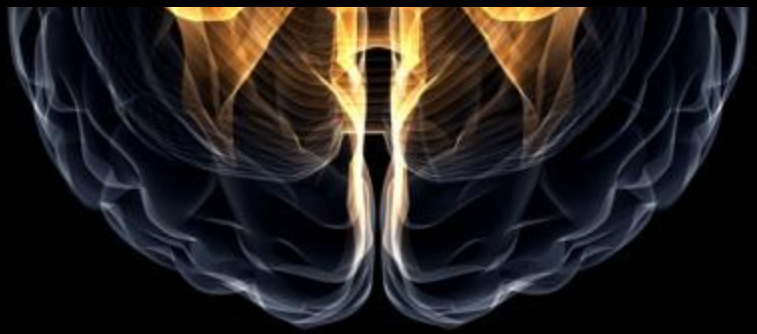
TIRED BRAIN



Neural fatigue in processing (FRONTAL CORTEX) fatigues other regions of brain function…

NEURAL FATIGUE

TOTAL QUALITY MOVEMENTS



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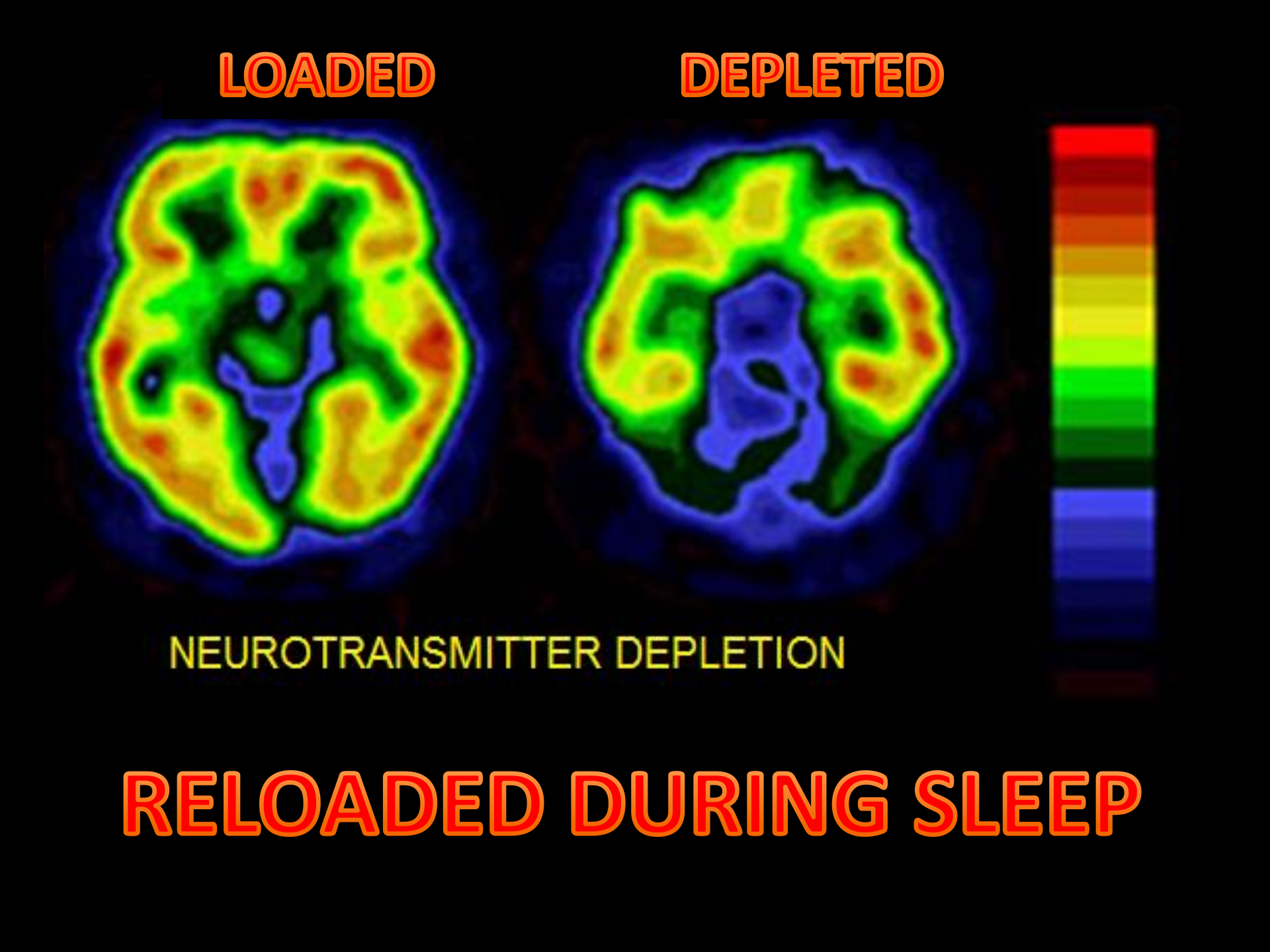
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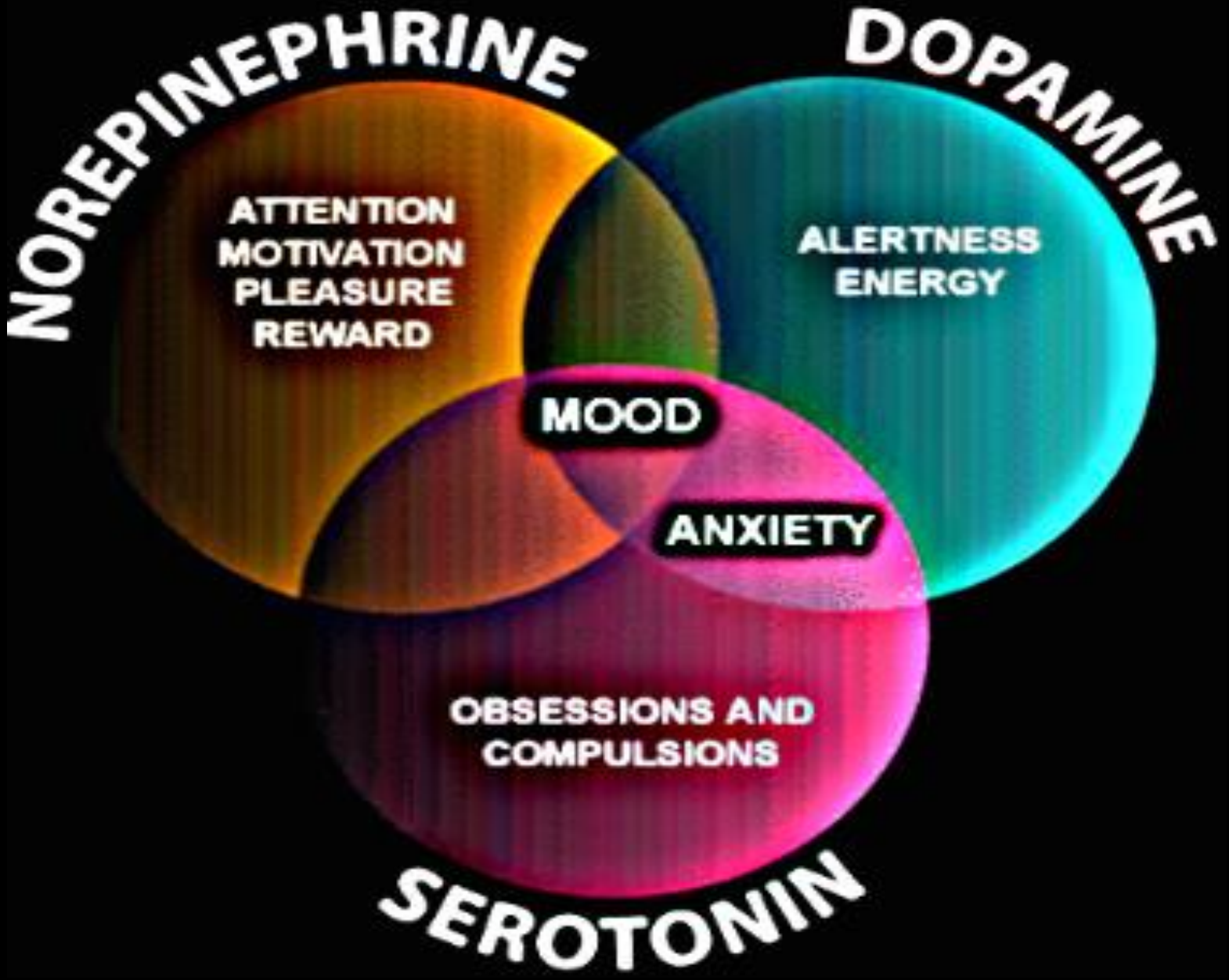
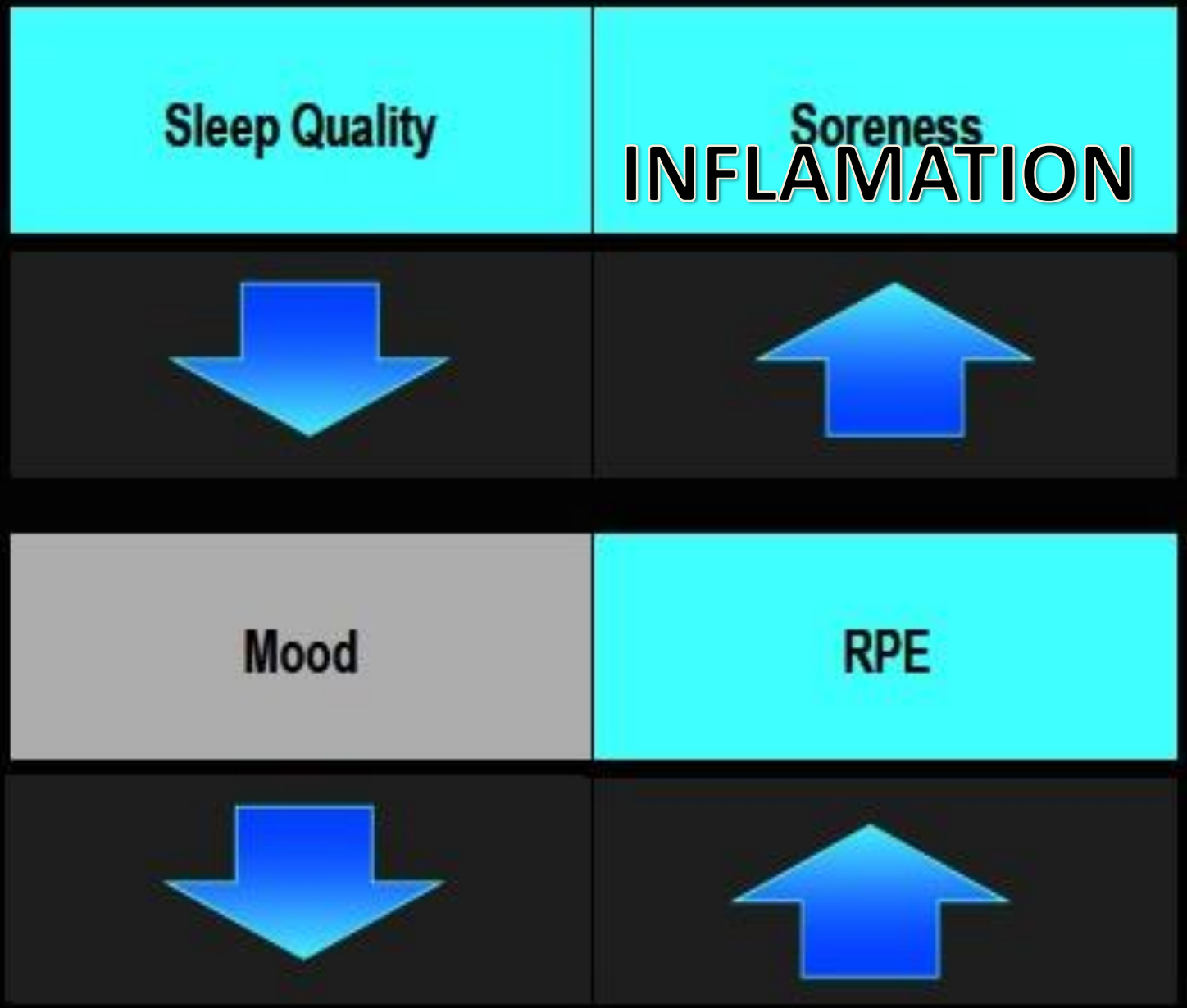
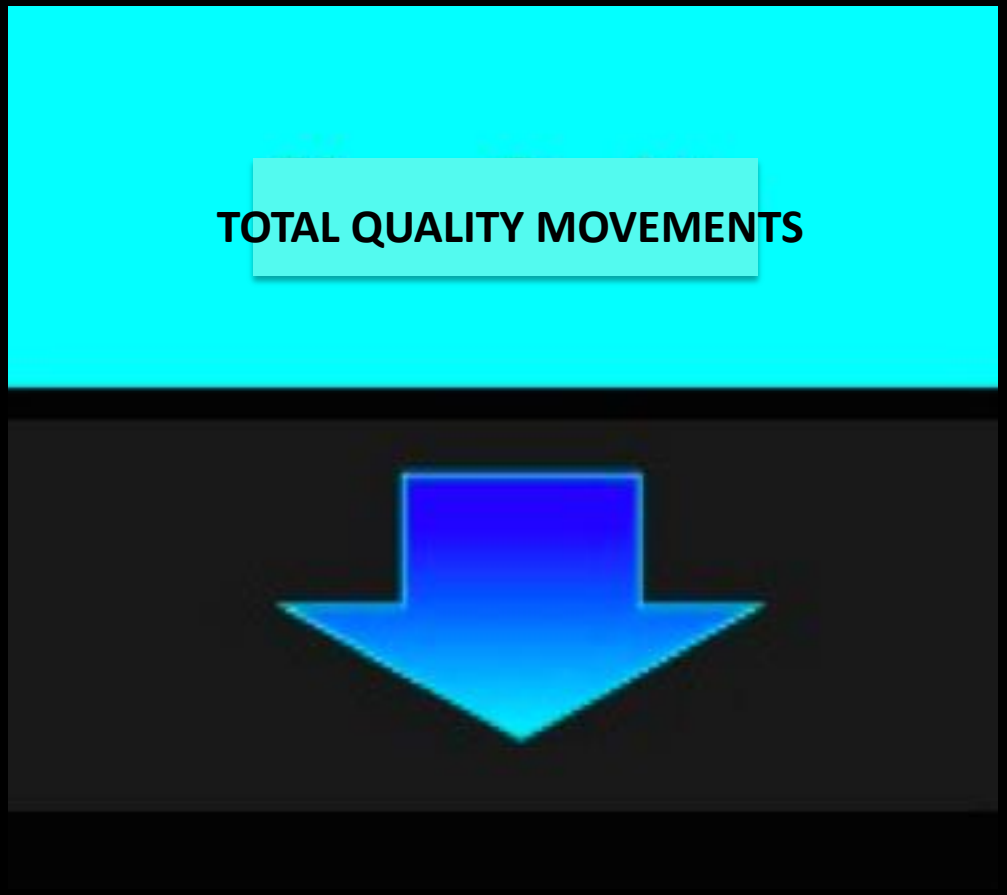
DEPLETED
NEUROTRANSMITTER DEPLETION
RELOADED DURING SLEEP


NOREPINEPHRINE
DOPAMINE
ATTENTION
MOTIVATION
PLEASURE
REWARD
ALERTNESS
ENERGY
MOOD
ANXIETY
OBSESSIONS AND
COMPULSIONS
SEROTONIN



Baylor AP 2016

TOTAL QUALITY MOVEMENTS



8.0 HOURS

ALERTNESS

SLEEP

Just a decrease of 1.5 hours of normal sleep time can result in a 30% drop in alertness

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6.5 HOURS

30% <


Every minute you spend doing this could have been spent recovering!
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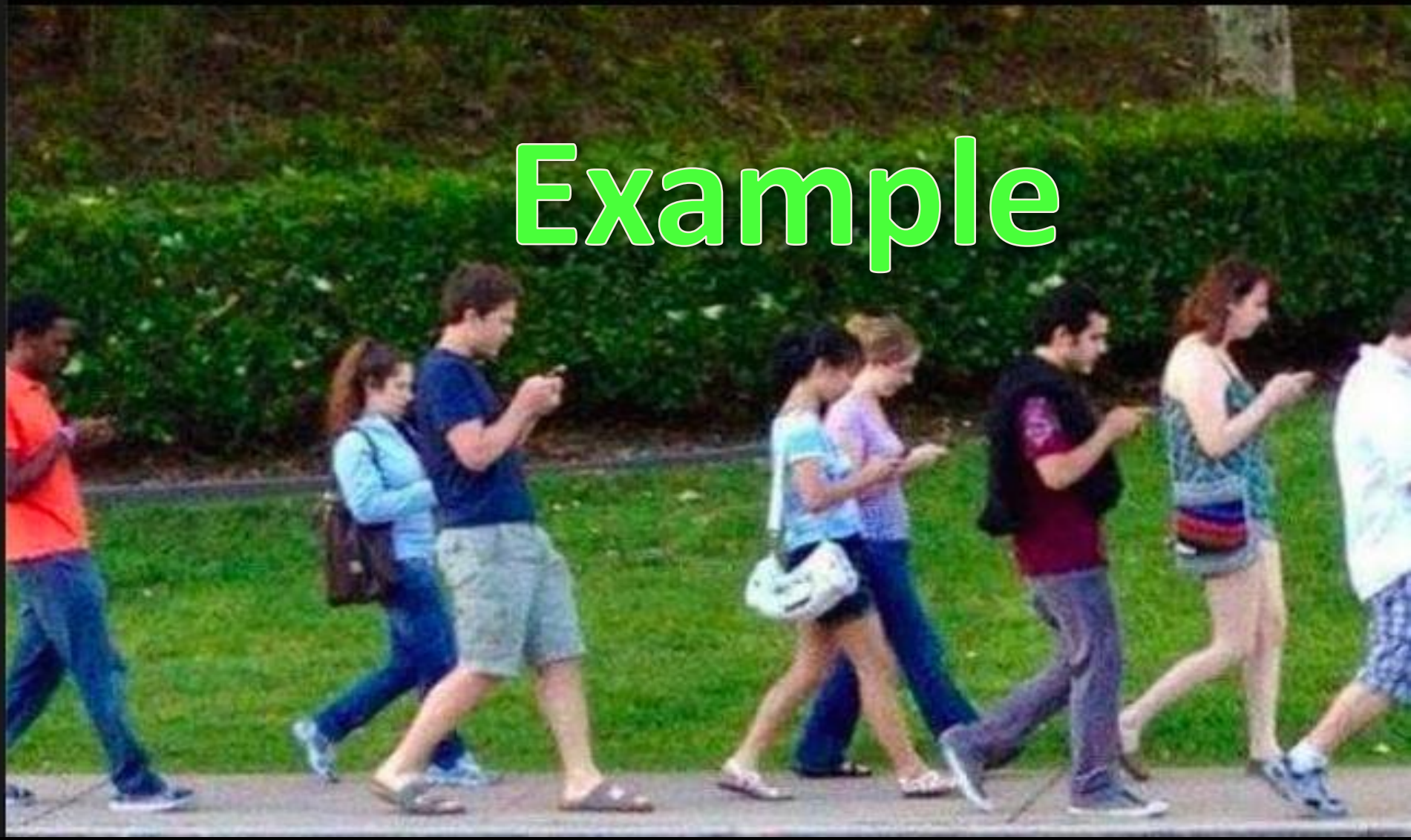
NEURAL FATIGUE
RUINS PERFORMANCE



Times change…

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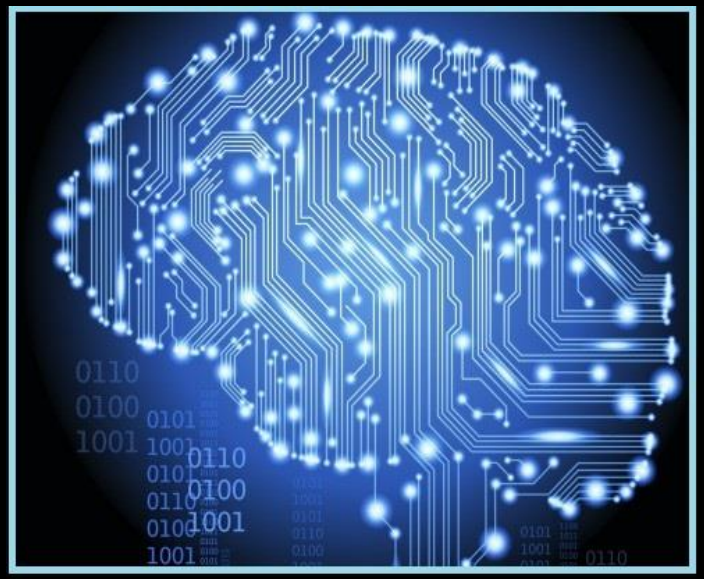
Don't waste your CNS readiness on mindless neural processes!!!

Save your energy for a chance to show what you are capable of.The CNS builds up energy reserves or deficits over 1-3 days. Overuse of technology has been linked to neural fatigue and decreased performance. Go out today and set a new personal best !

OVERSTIMULATION

USA 8.5 hours/day



Constant Stimulation

In the US, teenagers are spending 8.5 hours using computers, mobiles and other devices to learn, interact and play. This jumps to 11.5 if you take into account all of the tech multi-tasking that goes on, such as talking on the phone while you're watching TV. As they stare at these screens, they're taking in and sifting through an incredible amount of information; Constant input can create neural fatigue. When your brain is tired of processing this constant input it also begins to fatigue other critical areas of brain function. Combine these unprecedented hours of brain stim with minimal sleep and you have a generation of tired kids. Many of these individuals are athletes. Choices determine outcomes!

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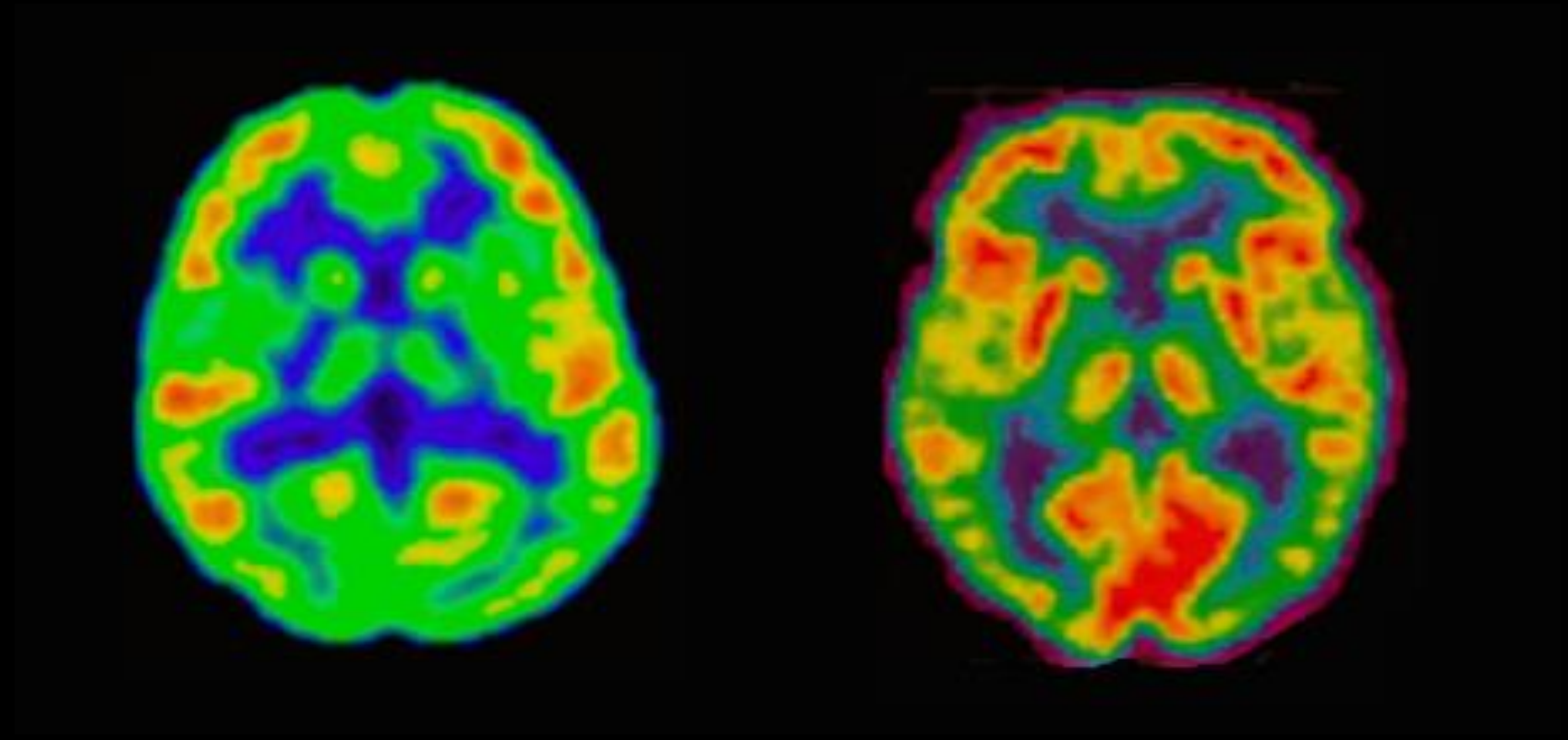
11.5 with Multitasking

LISTENING TO YOUR TUNES IS NOT RESTING YOUR BRAIN

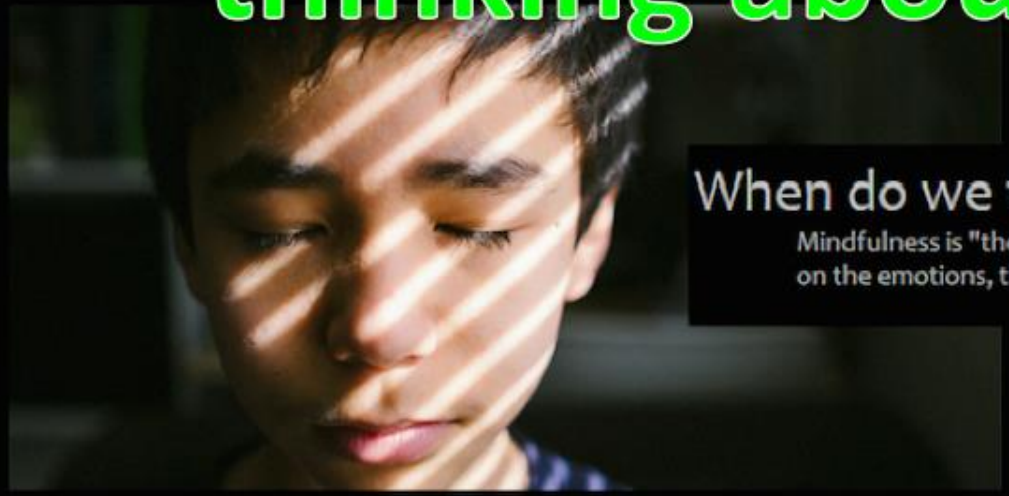
AT REST

MUSIC



Listening to music has a global effect on brain activity…

There is nothing wrong with thinking about nothing...



When do we take any time to think about nothing?

Mindfulness is "the intentional, accepting and non-judgemental focus of one's attention on the emotions, thoughts and sensations occurring in the present moment"

Mindfulness practice is being employed in sport psychology to alleviate a variety of mental and physical conditions, including mental and physical fatigue, obsessive-compulsive disorder, anxiety, and in the prevention of self medication and depression associated with social drug use. It has gained worldwide popularity as an effective method to handle mood and emotions. It can be employed by athletes to assit in recovery processes associated with stress, neural fatigue, physiological systems fatigue and quality of sleep. The emotional trauma of preparation and competition in sport is cumulative. Mindfulness can help release these stressors and create lifestyle wellness that is favorable to systemic gains in condition and performance!

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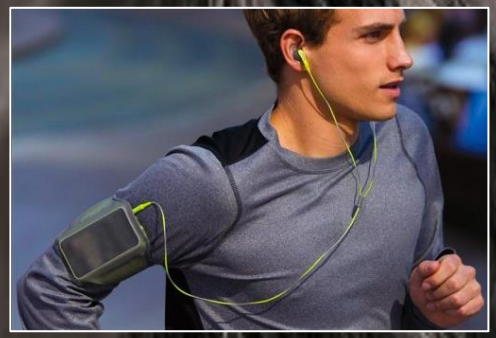
The goal during our waking hours cannot be to see how much stress we can accumulate, rather to limit the stress and stressors that impact health and optimal mental and physical performance...

Learn to relax with no stimulation

Even listening to music stimulates the brain and CNS. As a matter of fact, music's effect on the brain is global. If you want to spare CNS energy learn how to simply clear your mind and relax.



lifeofanathlete/humanperformanceproject

Morning training is worthless if you are not rested! SLEEP!

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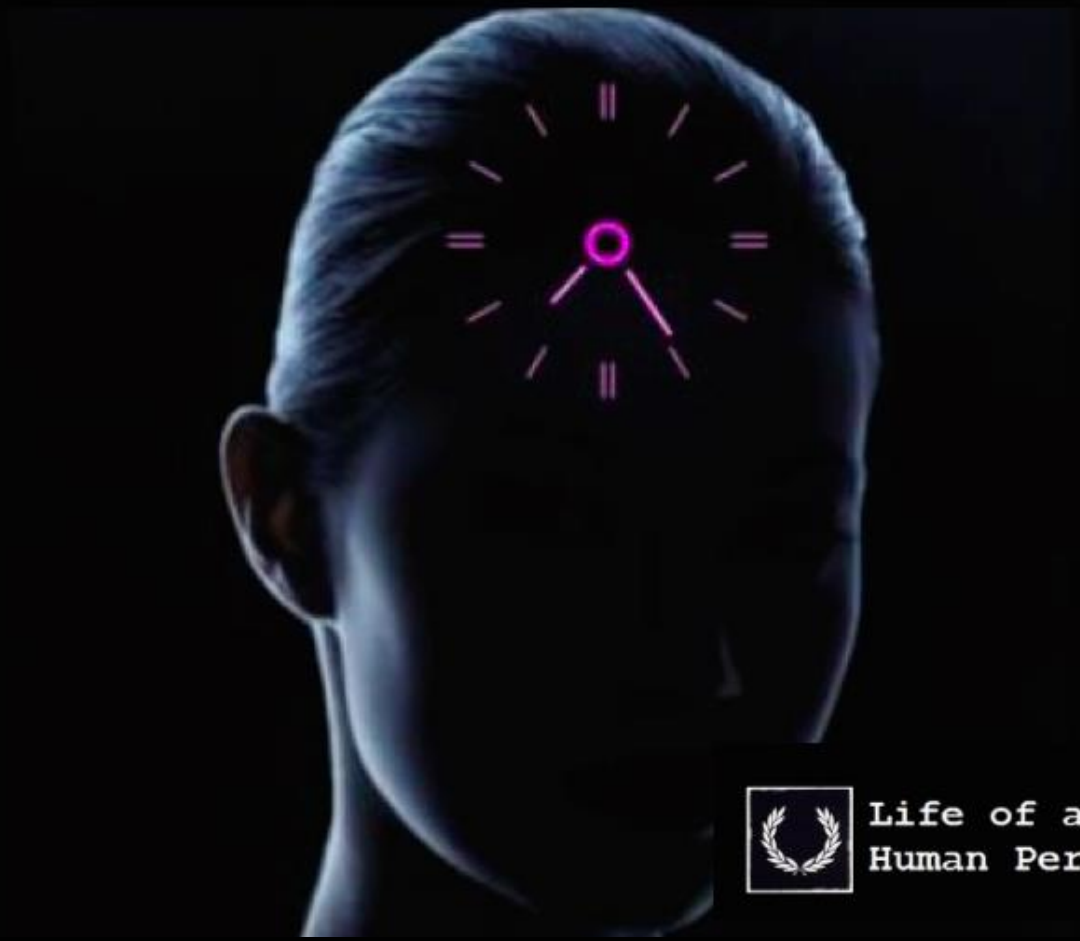
Sleep

SLEEP QUALITY SLEEP QUANTITY

You have to have sufficient SLEEP QUANTITY
to accumulate enough SLEEP QUALITY



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Lifestyle Strikes Back

Sleep

Now Clearly a Predictor of Performance

John Underwood, President & Founder, American Athletic Institute

Without any question the brain and central nervous system play the most significant role in optimal physical performance. Every movement emanates from brain CNS impulses. For an elite athlete, the CNS controls every aspect of performance potential, including function of skills, biomechanical exact movements, the firing sequences of muscles during activity, reflexes and reaction and countless interrelated physiological functions, including both the central system (heart and lungs) and the peripheral system (muscles). The most significant factor in the brain and CNS functioning at an optimal level is that it is rested. This has been documented throughout decades of studies on reflexes, reaction and many other variables which measure CNS readiness. Recent studies centering on sleep and rest as a factor in optimal physical performance have proved conclusively that sleep is clearly a predictor of performance in any skill based sport.

SO WE DID SOME SURVEYS…

No wonder you can't perform!

LOA HPP Sleep Surveys Middle and HS Athletes showed:

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27% < 6 HOURS 17% 8 HOURS>
Average sleep was 6:40

NCAA

6 HOURS 14 MINUTES

No wonder you can't perform!

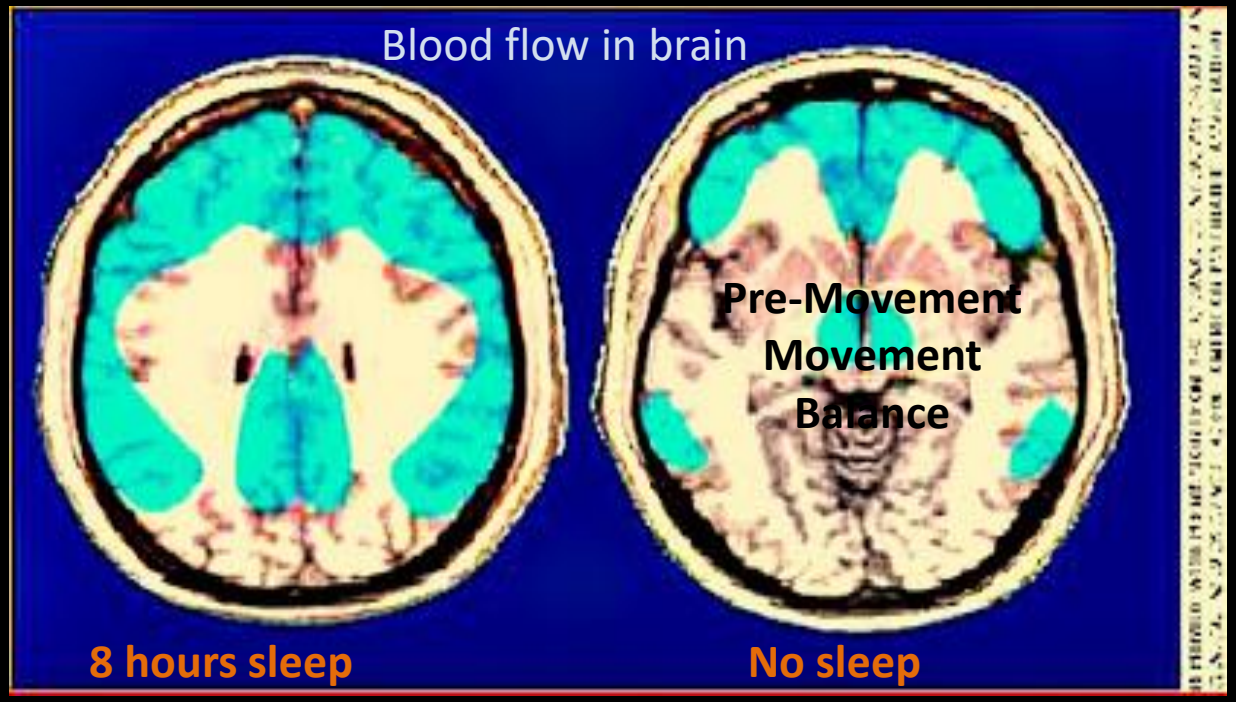
ATHLETE SLEEP SURVEYS

ELITE ATHLETES 6:30 OLYMPIC PROFESSIONAL

SLEEP Connections

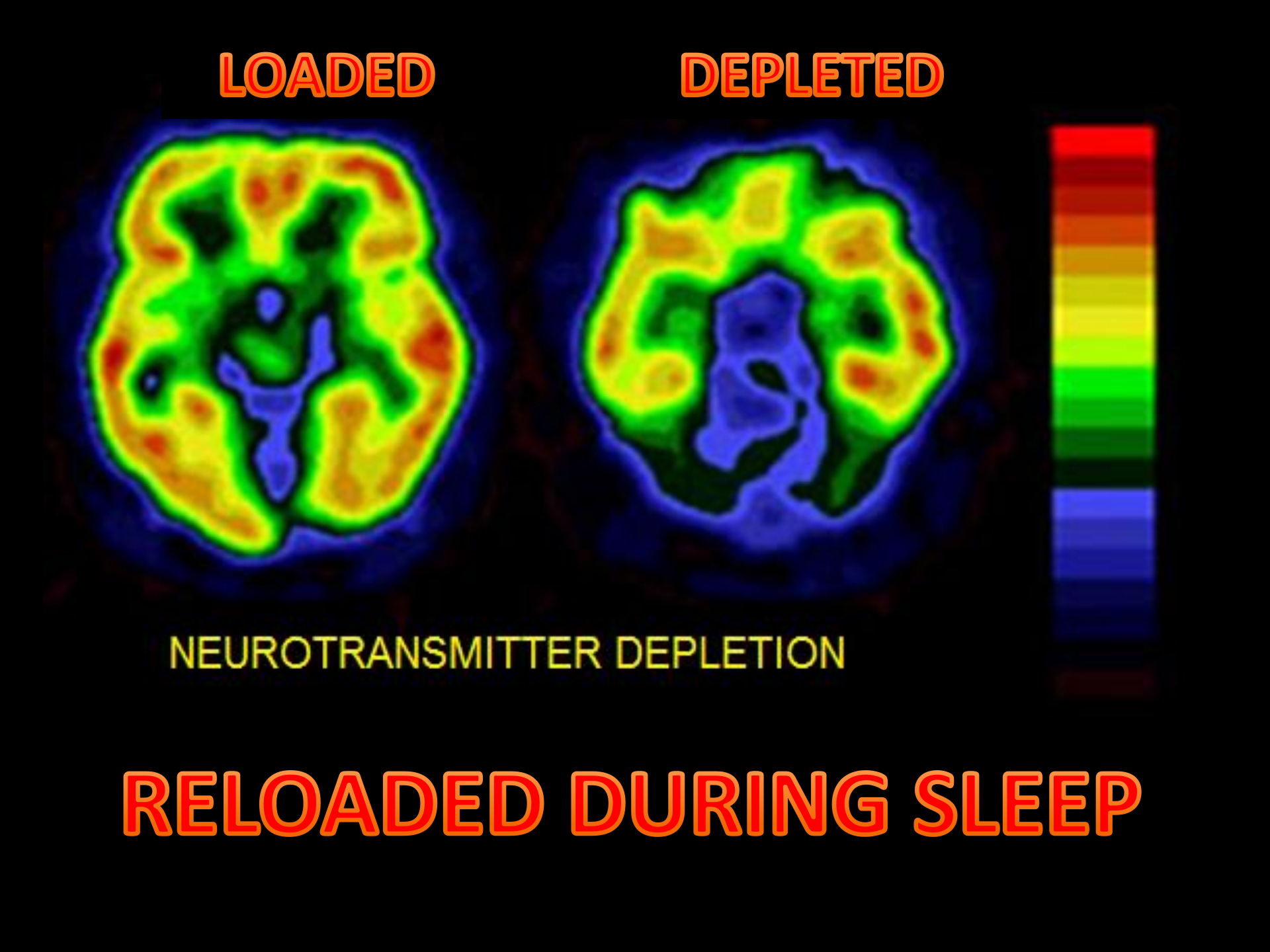
- 39% awaken feeling un-refreshed, fatigued or tired.
- 31% said they seldom get a good night sleep.
- 28% reported less than six hours of sleep per night
- 18% reported getting eight hours or more per night
- HS Average Sleep per night was 6 hours 40 minutes

Sleep No Sleep



Blood Flow in Brain

Optimal not possible


LOADED
DEPLETED
NEUROTRANSMITTER DEPLETION
RELOADED DURING SLEEP

The human body was meant to be up for 16 hours and down for eight… The body can adapt to less sleep but mental and physical performance is degraded.

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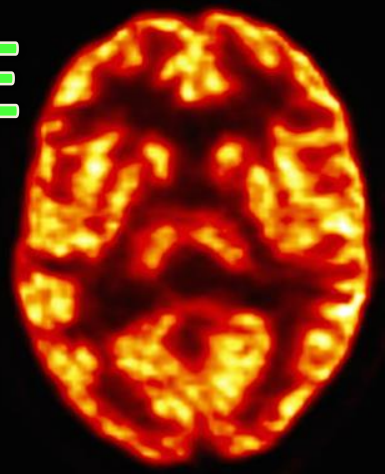
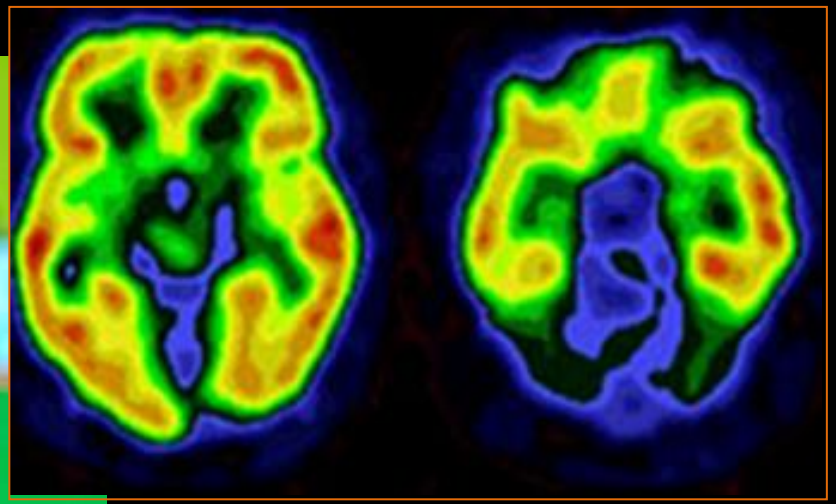
LIMITS OF PERFORMANCE

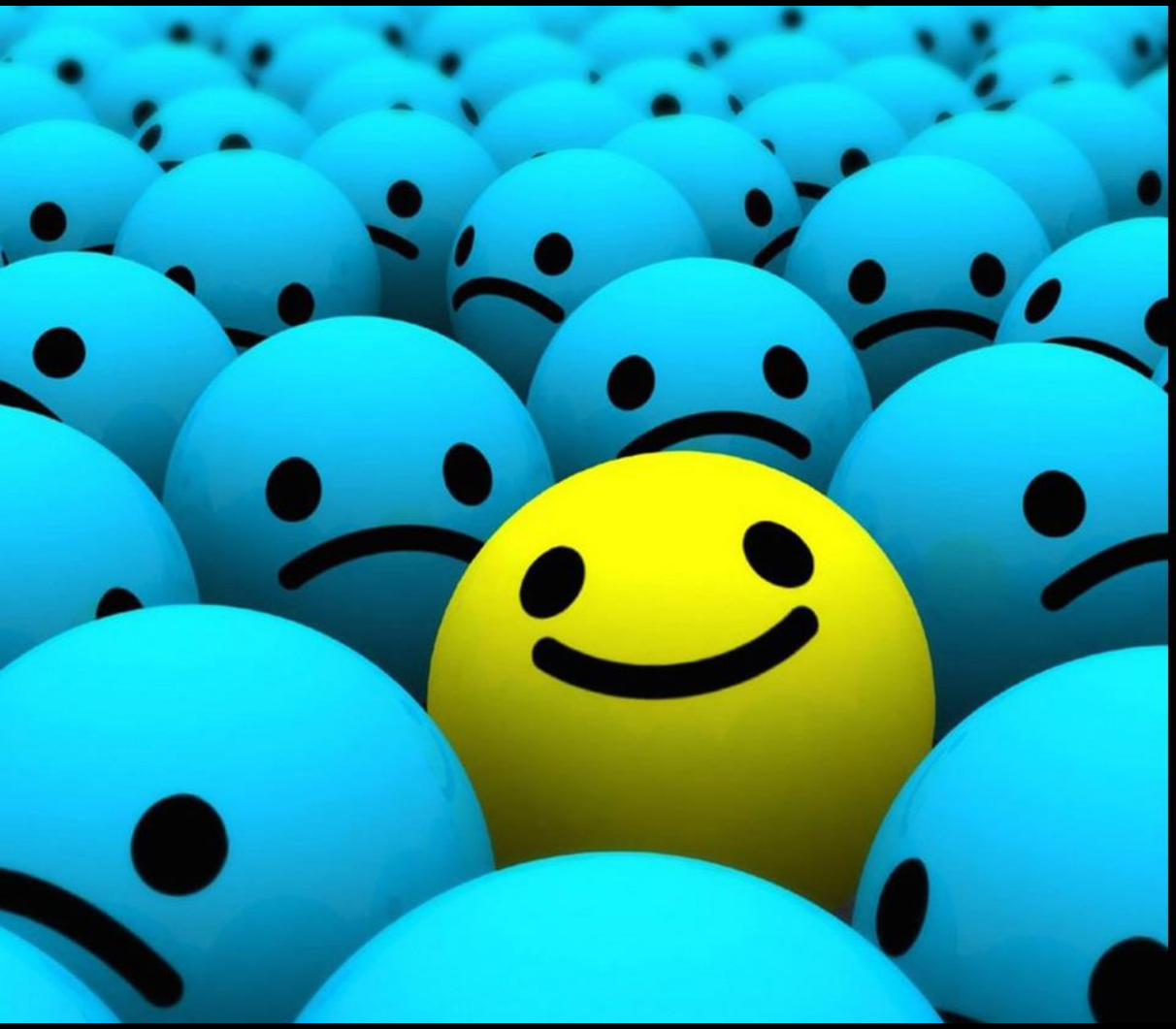
2-3 Hours 14 Hours



DEPLETED DOPAMINE



DECREASED MOTIVATION



MOOD

is the net sum of all scientific feedback for status of recovery!

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RECOVERY

TRAINING EFFECT

PERFORMANCE

SLEEP MODULATES MOOD

SLEEP AND MOOD

MOOD DISORDERS

Sleep and mood are intimately linked and it is important to recognize this relationship in situations where an athlete is complaining of non-restorative or disturbed sleep. The mood disorders that are common are depression and anxiety disorder. It is important to recognize that what is believed to be chronic training fatigue or overtraining may in fact be depression and may be associated with sleep disturbance. Sleep disturbance, if longstanding and chronic, can ultimately lead to low mood and/or increased anxiety. Additionally, an athlete who may be predisposed to a mood disorder or currently treated for a mood disorder might experience worsening of the disorder if there sleep is disturbed. Alternatively, the mood disorder may cause sleep disturbance and this can present as either insomnia or excessive need for sleep. In both situations this can significantly affect the athlete's ability to train, recovery and compete.

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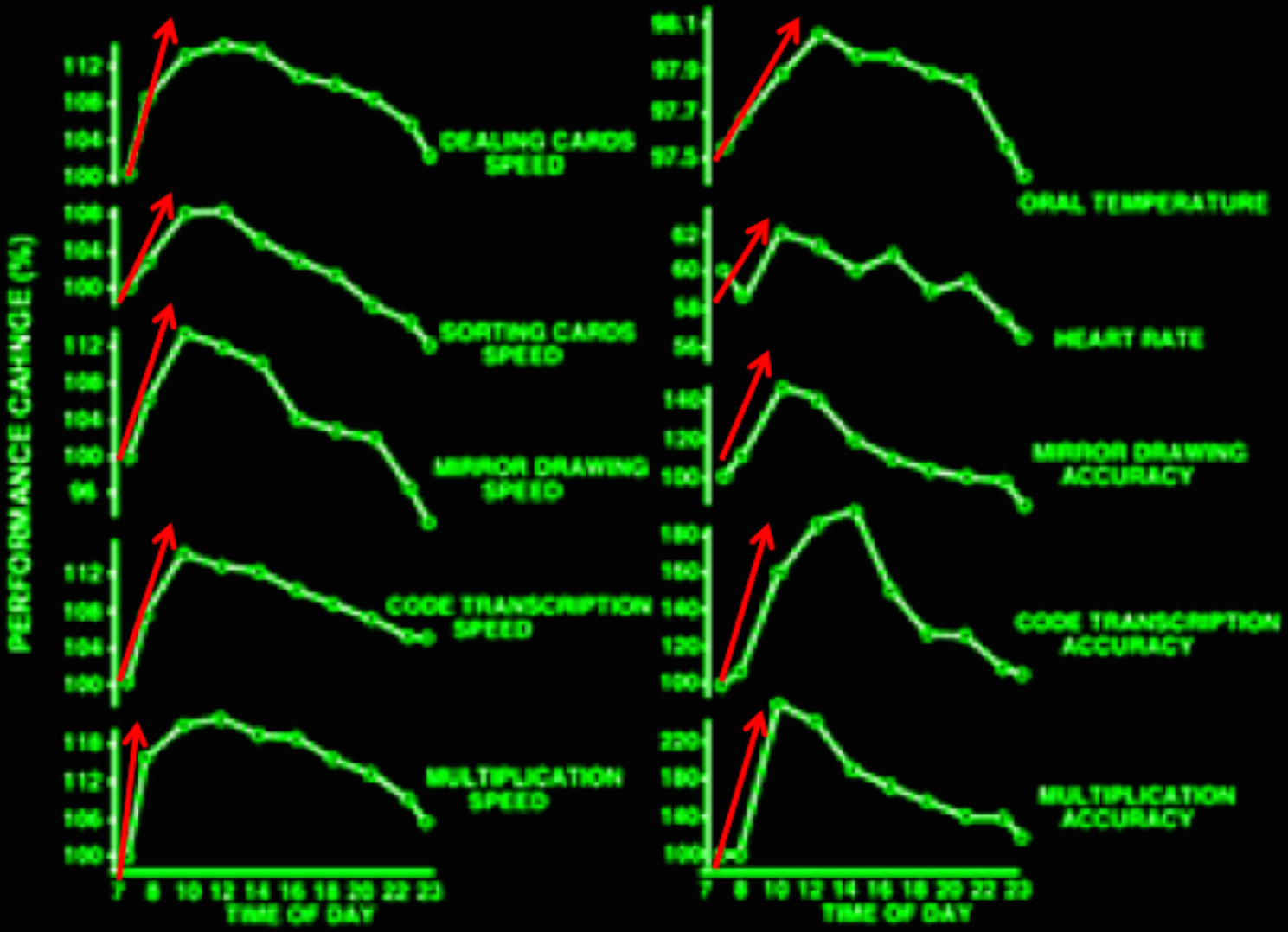
SLEEP IS A HUGE MODULATOR OF MOOD AND MOOD IS THE BEST INDICATIVE FACTOR IN RECOVERY TRAINABILITY AND PERFORMANCE

Thinking

Pre-Movement

Movement

Circadian rhythm of performance



Blatter et al., Physiol & Behav 2007

Once in a state of fatigue the more you struggle to close the gap between what you can do and what you think you can do, the further down the performance curve you move and the more compromised you are! *John Underwood Human Performance Project*

90%

SPEED


90% OF MAX

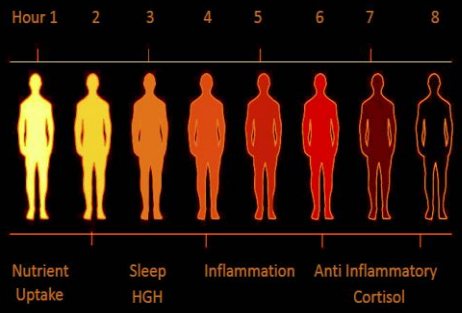
CNS TAKES A HUGE HIT

MAY TAKE UP TO 48 HRS TO COME BACK

CHEMICAL MESSENGERS

DAMAGE REPORT

Athletes need timelines



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Even Elite Athletes

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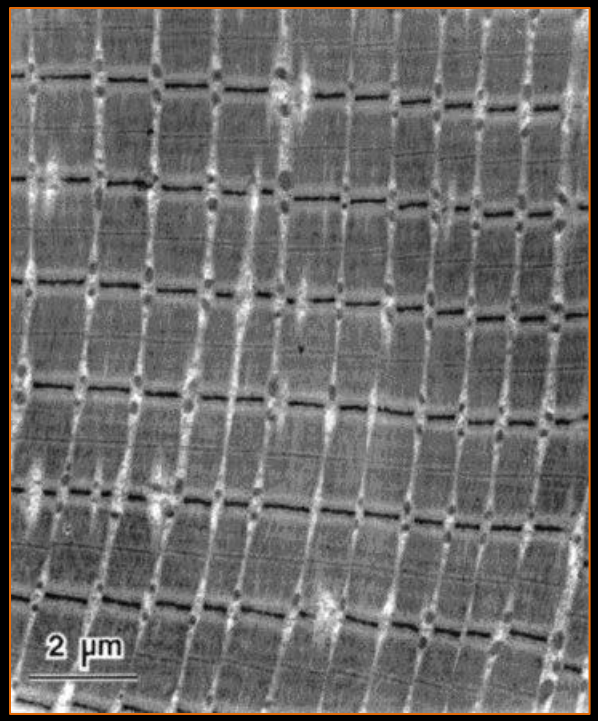
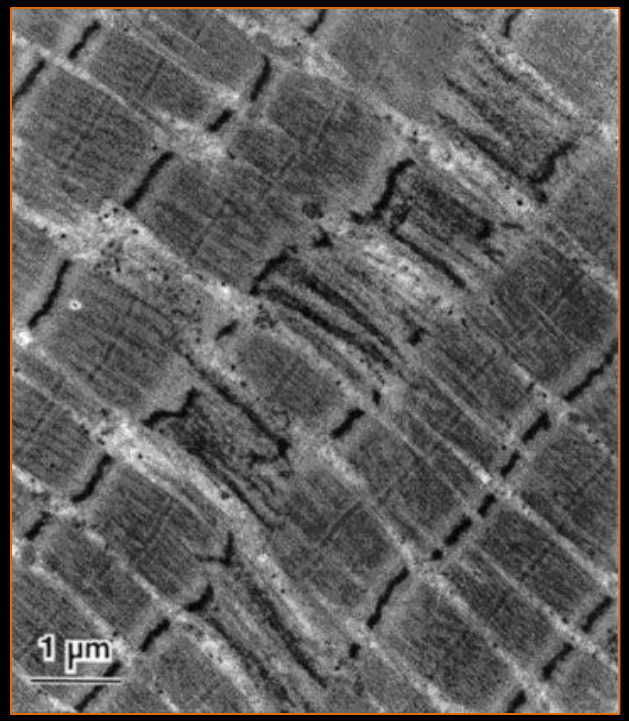
MUSCLE DAMAGE
BLEEDS
OVERSTRETCHED
MICROTEARS
FLUID ACCUMULATION
RESIDUE
MYOKINES
PH DAMAGE
HYPOXIC DAMAGE
BRUISING
SWELLING
FRICTION HEAT DAMAGE
COMPRESSION DAMAGE
PERCUSSION DAMAGE
COMPARTMENT DAMAGE
GRAVITATIONAL DAMAGE

DAMAGE REPAIR

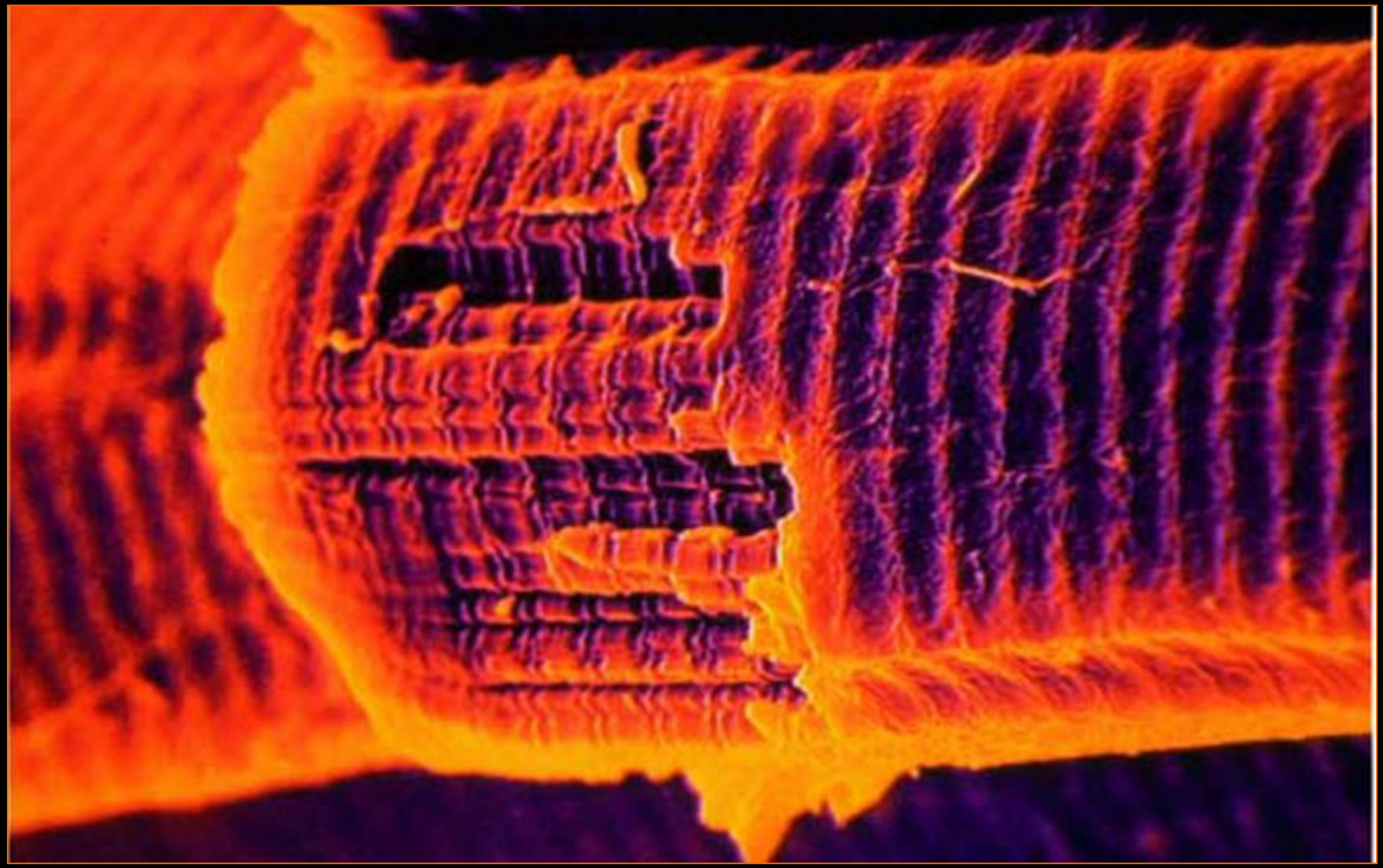
SLEEP HAS BIGGEST IMPACT



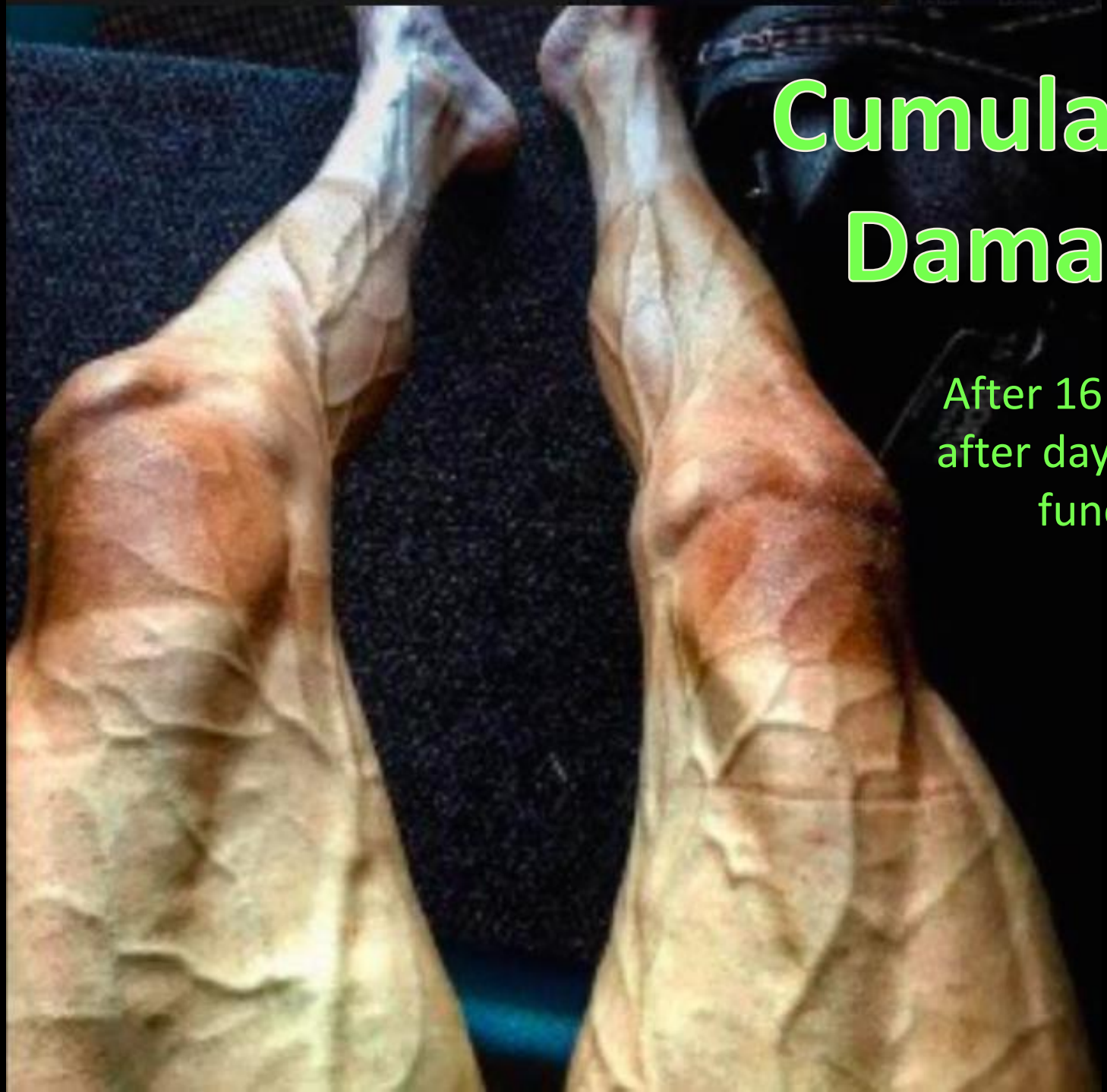


RESTED MEDIUM EXTREME

MUSCLE DAMAGE ON GOING



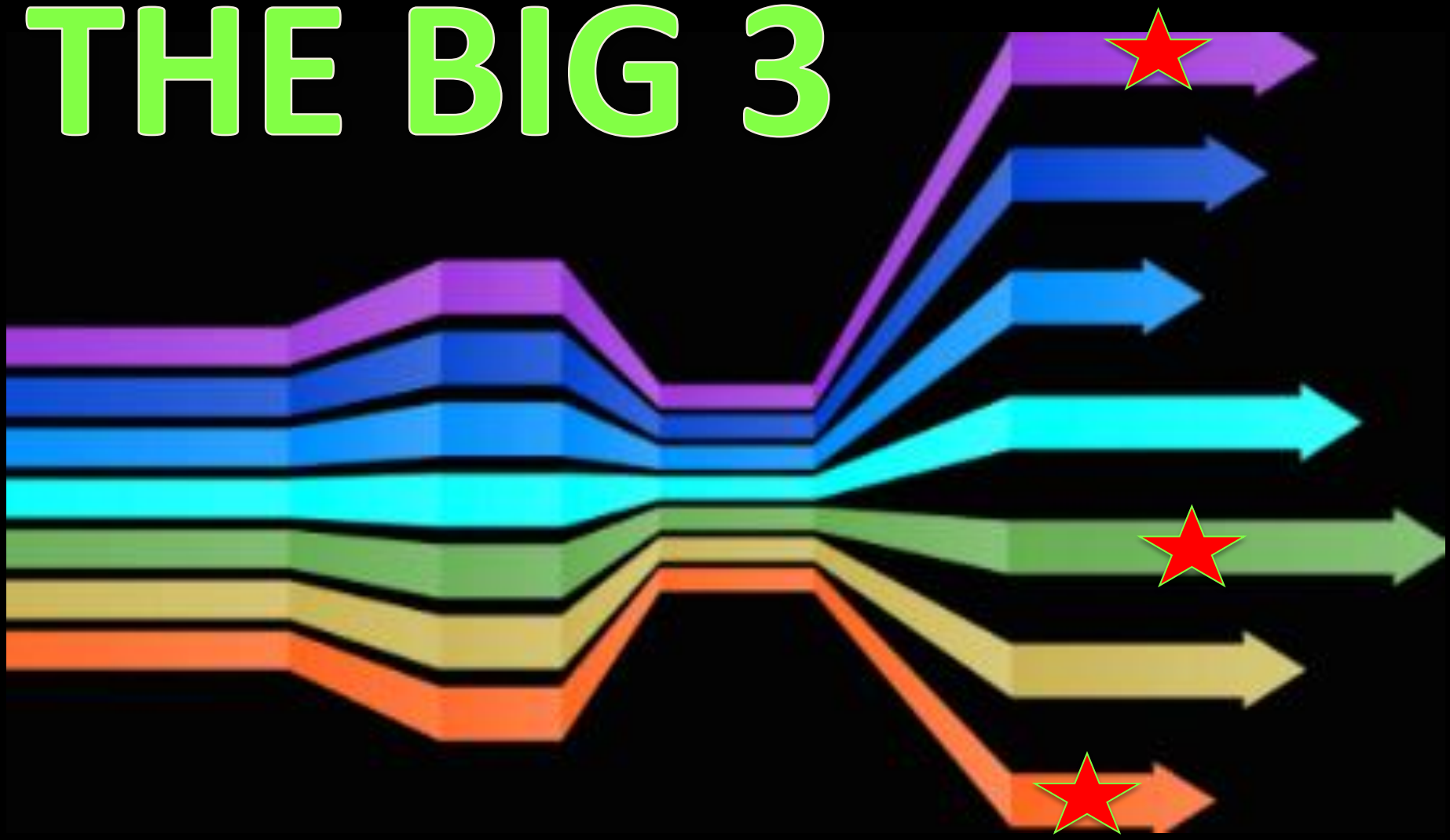
REPAIR NEW MASS



Cumulative Damage

After 16 stages and day after day damage repair functions fail!

RECOVERY
THE BIG 3



REPAIR REBUILD REFUEL

Turn around time

WHEY PROTEIN

#2 RECOVERY FACTOR

BIGGEST FACTOR IN RECOVERY

JUMP STARTS RECOVERY BY 70%

BLUNTS DAMAGE BY 83%

DOUBLES GAINS IN MASS

What this is for?

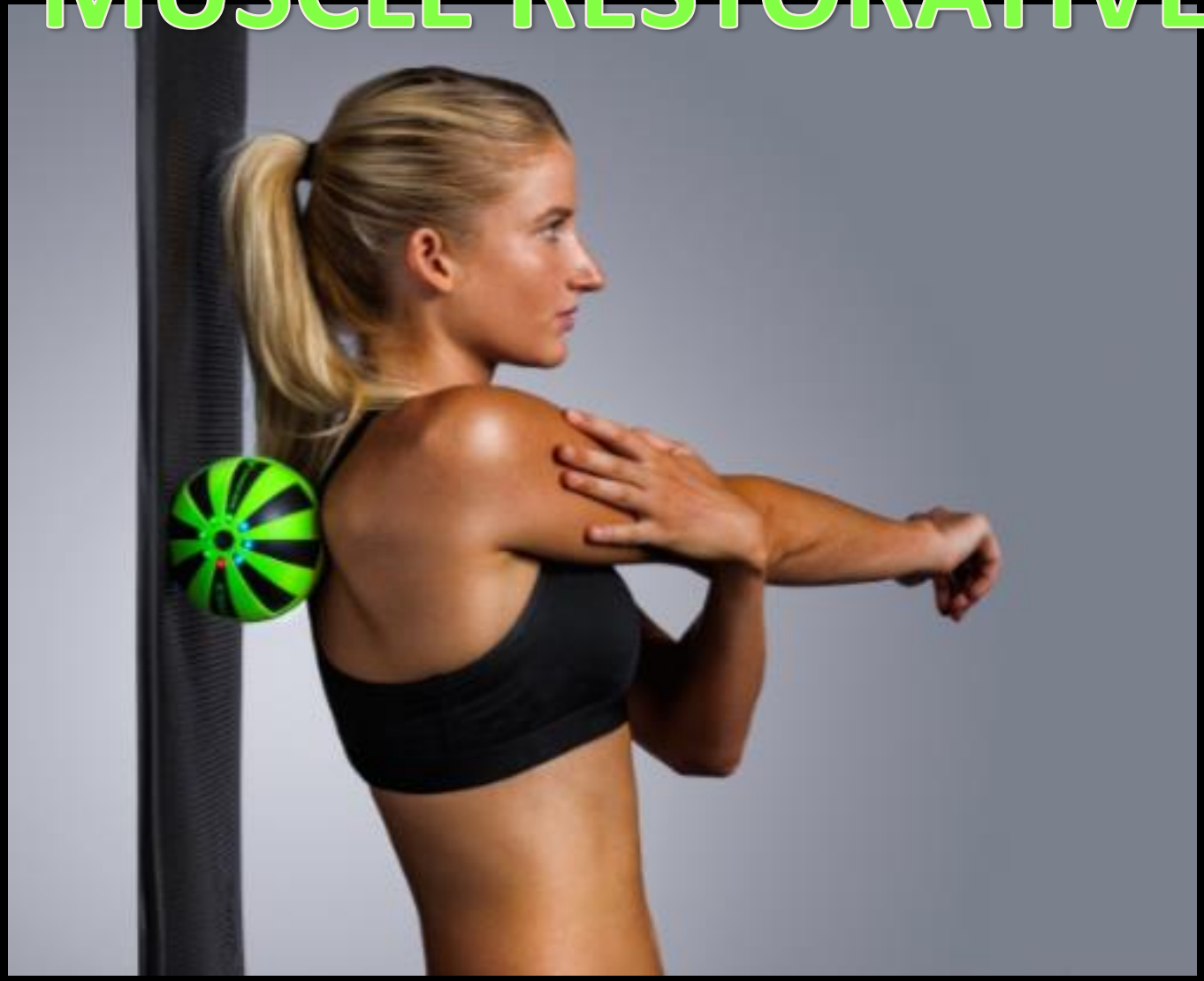
36 DON’T CARE?

HOW FAST?

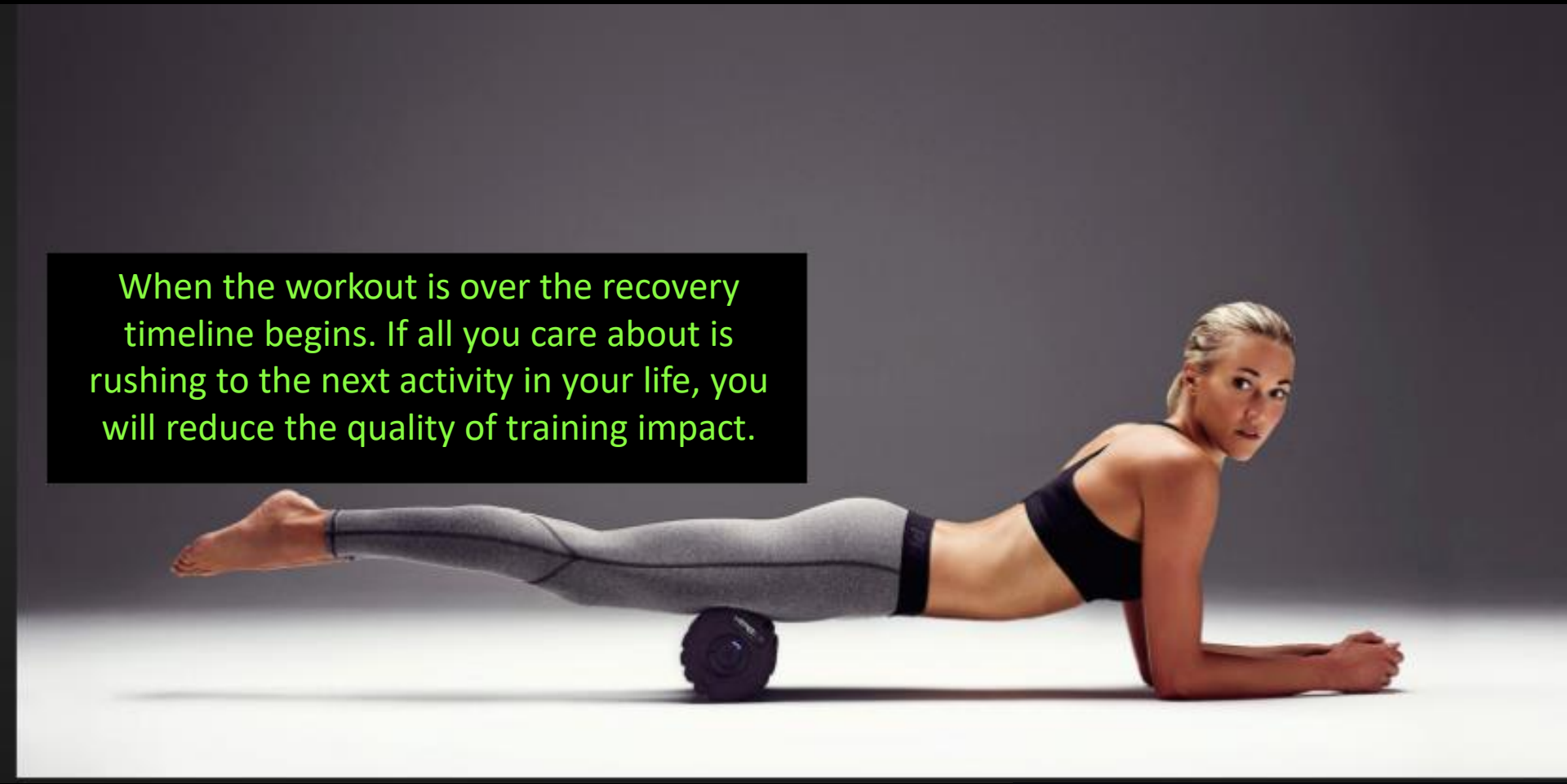
THE QUICKER THE BETTER

#3 MUSCLE RESTORATIVE ACTIONS

POST TRAINING MUSCLE RESTORATIVE



There is more to training than the workout…



TRAIN RECOVER ADAPT

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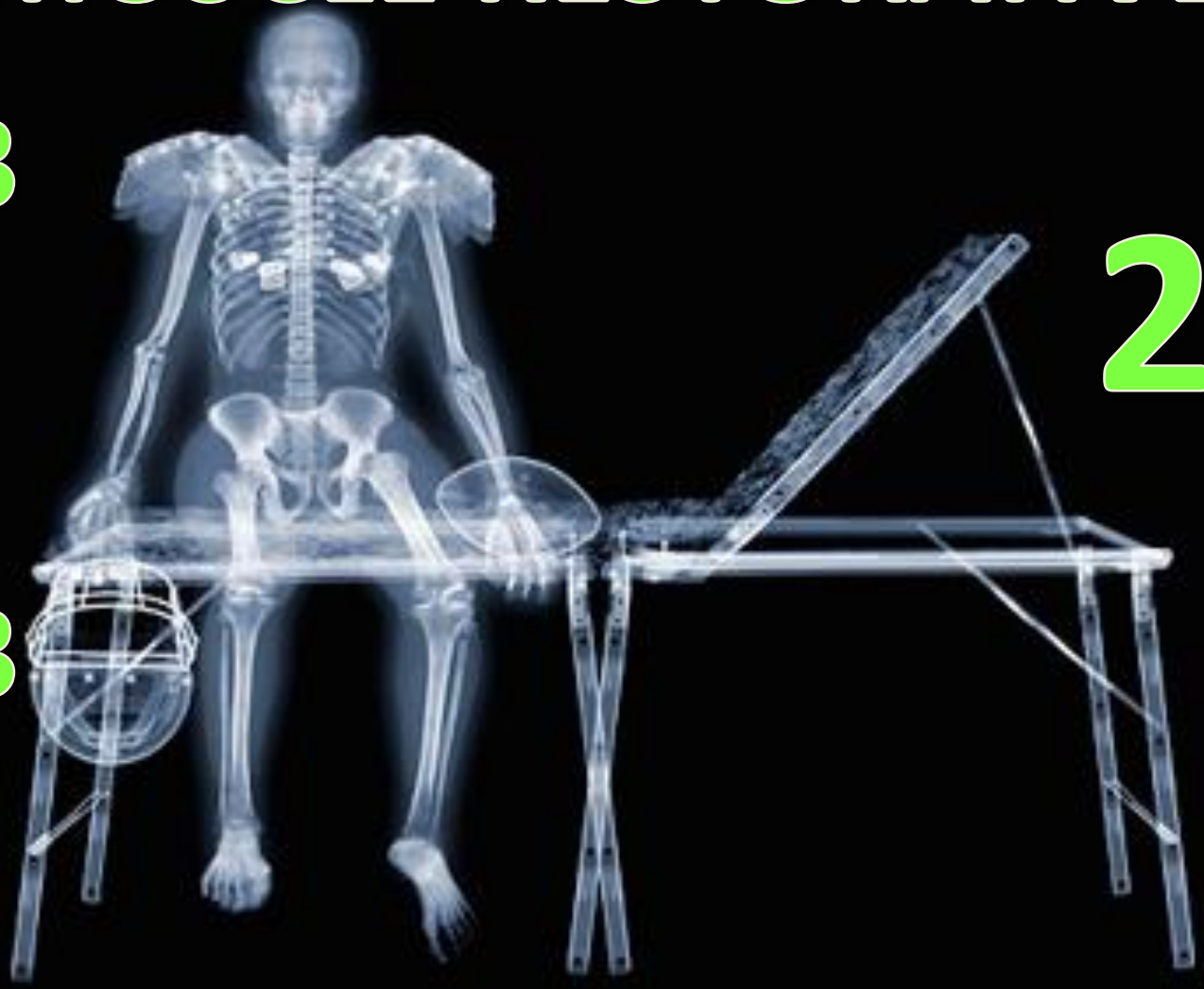
FEEDBACK = RESULTS

INCREASED POST TRAINING MUSCLE RESTORATIVE TIME

53

13



213%

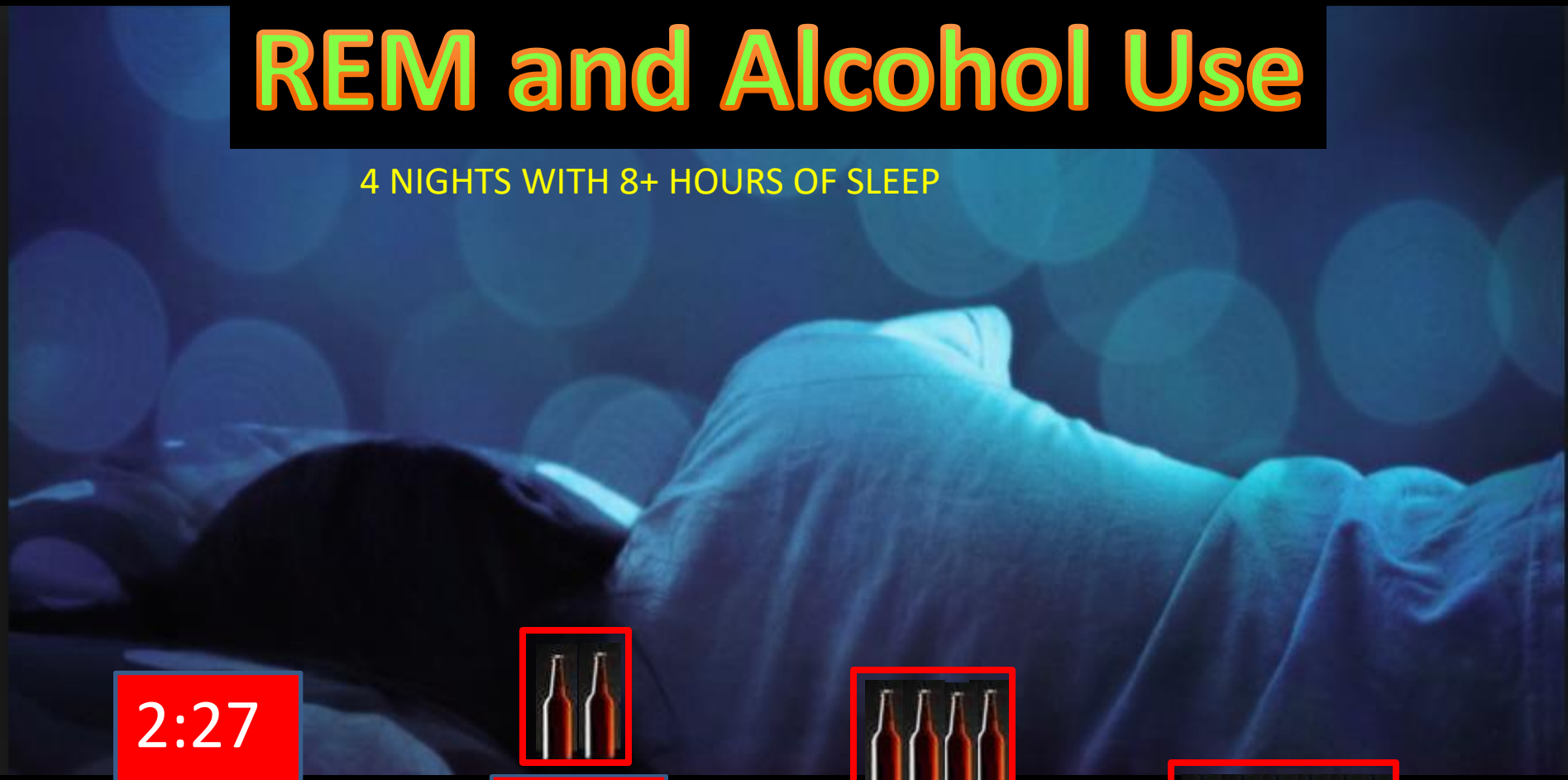
#4 SLEEP

Sleep Studies Athletes

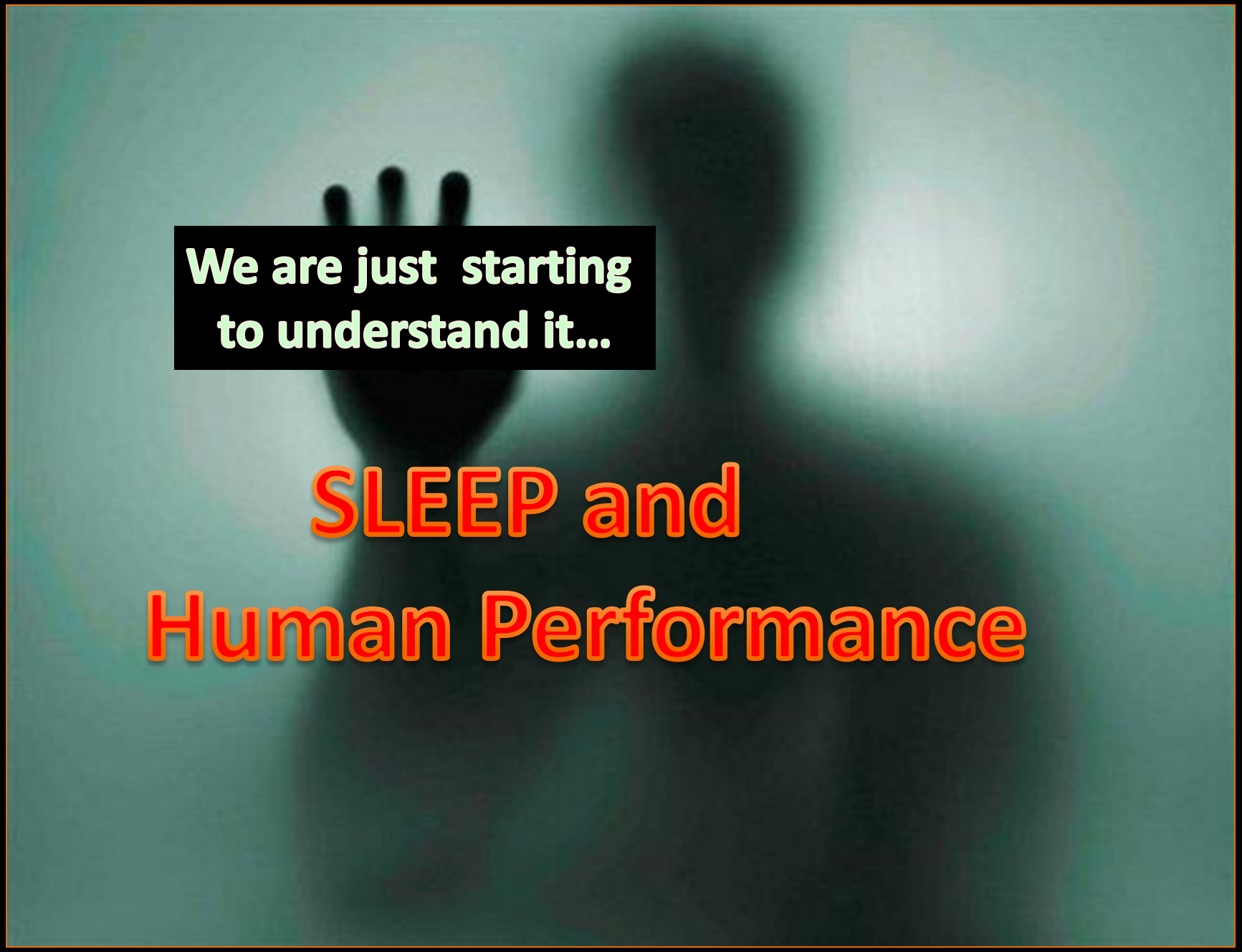
Athletes and Sleep

REM and Alcohol Use

4 NIGHTS WITH 8+ HOURS OF SLEEP



None	2	4	6
2:27 REM	1:31 REM	:58 REM	:31 REM


We are just starting to understand it...
SLEEP and Human Performance

You could not begin to imagine how important sleep is to your performance capacities. Sleep is the single most significant factor in trainability, recovery and performance.

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WORLDWIDE SLEEP STUDIES

Don't try to fight it: Your need to sleep is 80 percent genetic!

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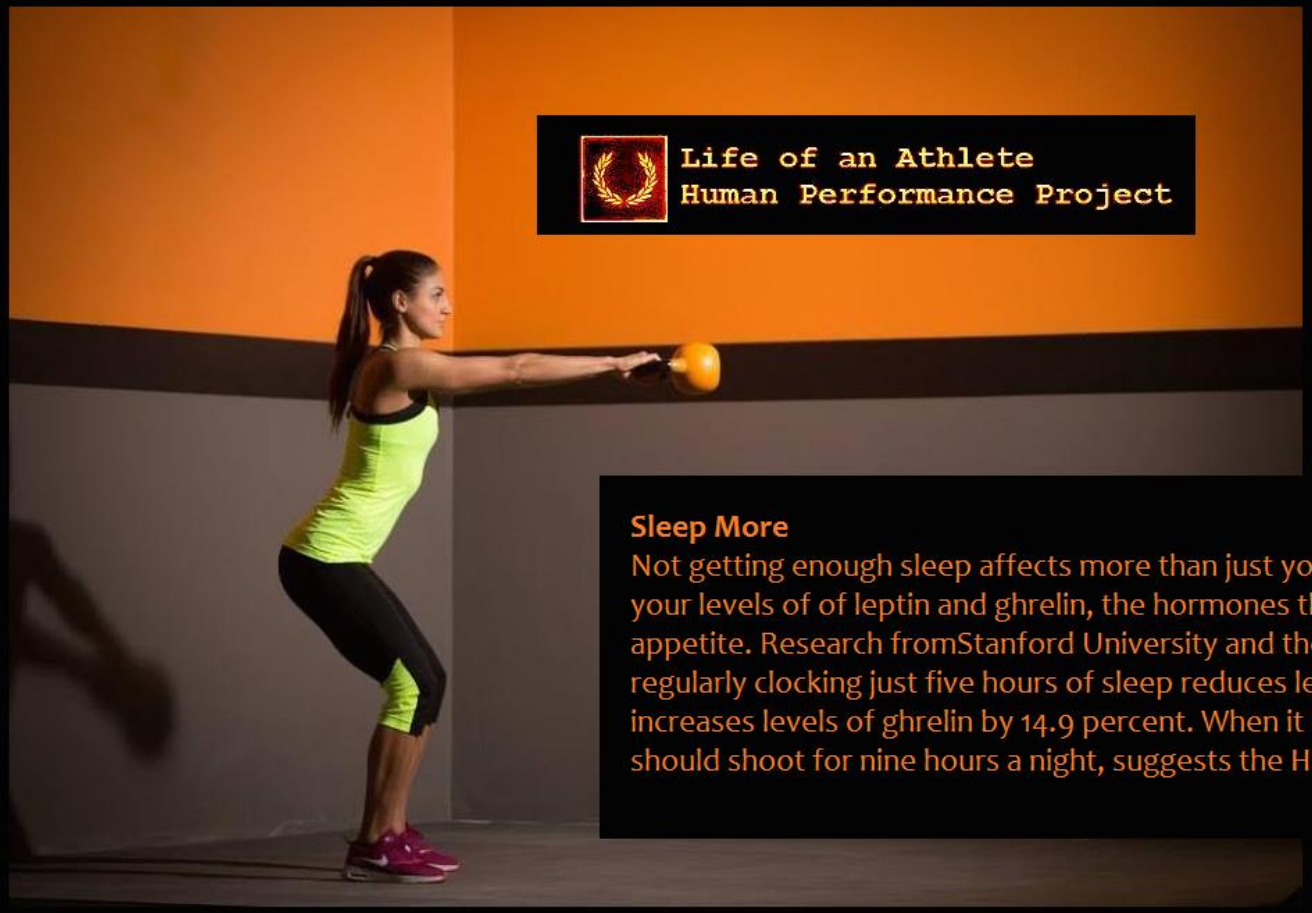
Recently, researchers have also found that our need for sleep is largely determined by our genes. So if you need eight hours of sleep to feel well-rested, it's impossible to train yourself to get by with less and still operate at peak capacity. (Though that doesn't stop people from trying — surveys have found that about 40 percent of Americans get six hours or less each night.) Athletes are no exception!

A longitudinal study of 1,101 Australian high school students aged between 13 and 16 found poor-quality sleep associated with late-night texting or calling was linked to a decline in mental health, such as depressed moods and declines in self-esteem and coping ability.

WORLDWIDE RESEARCH

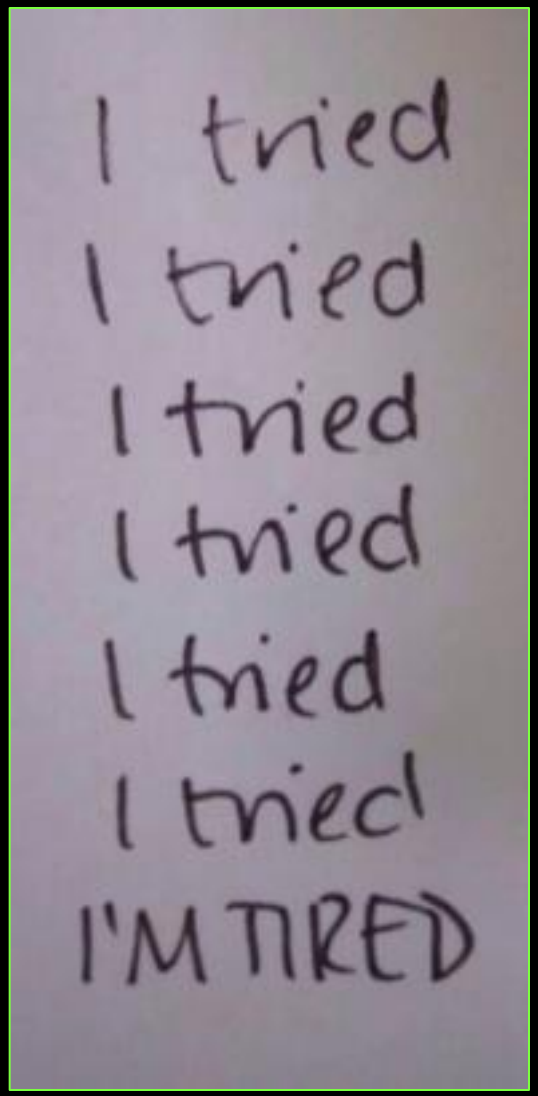


Sleep More

Not getting enough sleep affects more than just your energy the next day; it throws off your levels of of leptin and ghrelin, the hormones that help regulate energy use and appetite. Research fromStanford University and the University of Wisconsin shows that regularly clocking just five hours of sleep reduces levels of leptin by 15.5 percent and increases levels of ghrelin by 14.9 percent. When it comes to a healthy metabolism, athletes should shoot for nine hours a night, suggests the Human Performance Project!

Energy Levels Energy Use and Appetite Regulated by SLEEP

SLEEP IS THE REGULATOR



MENTAL PHYSICAL EMOTIONAL

Sleep is an absolute predictor of performance…
The more you sleep, the better you play…

Life of an Athlete Human Performance Project

Human Performance Project

SLEEP PREPARATION

CREATING YOUR HEALTHY SLEEP SCHEDULE

7:00 am	**Wake up:** set a consistant time to wake each morning so your body's clock will begin to naturally wake you up.
2:30 pm	**Nap:** If you're feeling sleep deprived, a 30 minute afternoon nap is a great way to overcome sleep debt. (Set your alarm so you don't transition into deep sleep.)
6:00 pm	**No more sugar:** Eliminating sugar after dinner aids in the body's ability to fall asleep. In addition, avoid caffeine or spicy foods
8:30 pm	**Technology sunset:** Shut off/ put away all electronics 90 minutes before bed (including laptop, cell phone and TV) to avoid blue light.
9:00 pm	**Eat a banana:** Foods like bananas, cherries and walnuts help induce sleepiness.
9:00 pm	**Avoid physical activity:** Physical activity stimulates the body and mind making sleep more difficult
9:30 pm	**Pre-sleep protein:** Drink 8-10 oz. of liquid, caseine protein before sleep to promote muscle repair and to build muscle during sleep: the best time to build muscle!
10:00 pm	**Get to sleep:** In a completely dark room, with a temperature between 68-72 degrees

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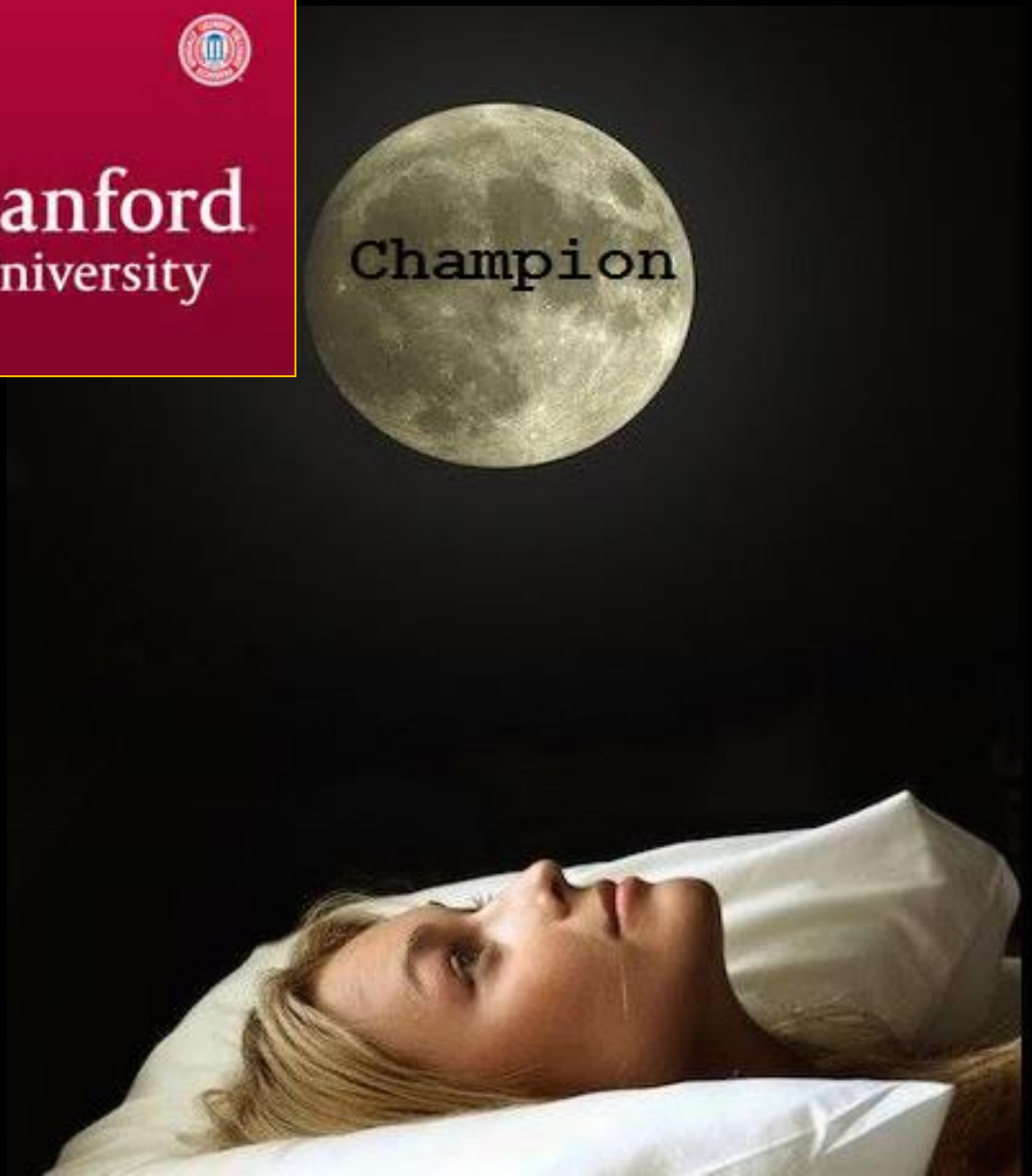
Human Performance Project

Sleep Studies Athletes

Stanford University

CHERI MAH



STANFORD SLEEP STUDIES CHERI MAH

Extended sleep beyond one's habitual nightly sleep contributes to improved athletic performance, reaction time, < daytime sleepiness, and - mood. Improvements in all stats percentage, sprint times, reaction time, mood, fatigue, and vigor were all observed with increased total sleep time.

EFFECTS OF SLEEP EXTENSION ON ATHLETIC PERFORMANCE

The Effects of Sleep Extension on the Athletic Performance of Collegiate Basketball Playershttp://dx.doi.org/10.5665/sleep.1132

Cheri D. Mah, MS[1]; Kenneth E. Mah, MD, MS[1]; Eric J. Kezirian, MD, MPH[2]; William C. Dement, MD, PhD[1]

[1]Stanford Sleep Disorders Clinic and Research Laboratory, Department of Psychiatry and Behavioral Sciences, School of Medicine, Stanford University, Stanford, CA; [2]Department of Otolaryngology—Head and Neck Surgery, University of California, San Francisco, CA

Universal effect

All performance improved

Stats improved

Less fatigue

GAINS HAPPEN DURING SLEEP

Most of the intra-muscular chemistry and synthesis takes place at night when you are sleeping. It is also well known that during early sleep (90-120 minutes after falling asleep) there is a huge release of human growth hormone (HGH). This is one of the most critical factors in muscle growth. You also need protein available in your system during this timeframe. Casein protein, a protein isolate of milk is a very good choice for this critical nutrient intake. It goes into your system very slowly all night and makes protein uptake available for repair and new mass.

LIFE OF AN ATHLETE
Human Performance Project

TRAINING EFFECT

Don't fight it... SLEEP

To train and compete at a high level you need regular sleep cycles. That means you need to go to bed at wake at the same time every day... Even on weekends. Your body gets used to many physiological responses during sleep and they happen at critical times during the night. Sleep includes muscle restorative phases, organ restorative phases and brain and CNS restorative phases. If you have random sleep patterns, these responses will be random. Critical recovery and adaptation occurs based on these cycles. In the recent Stanford Sleep Studies it was proved that the more you sleep the better you perform.

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Muscle Restorative
Organ Restorative
CNS Restorative

Deep in the NIGHT

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It is during sleep that you repair the damage your body systems accumulate during your waking hours. GROWTH REPAIR RESTORATION RECOVERY AND TRAINING EFFECT TAKE PLACE DURING SLEEP.

SLEEP SLEEP SLEEP

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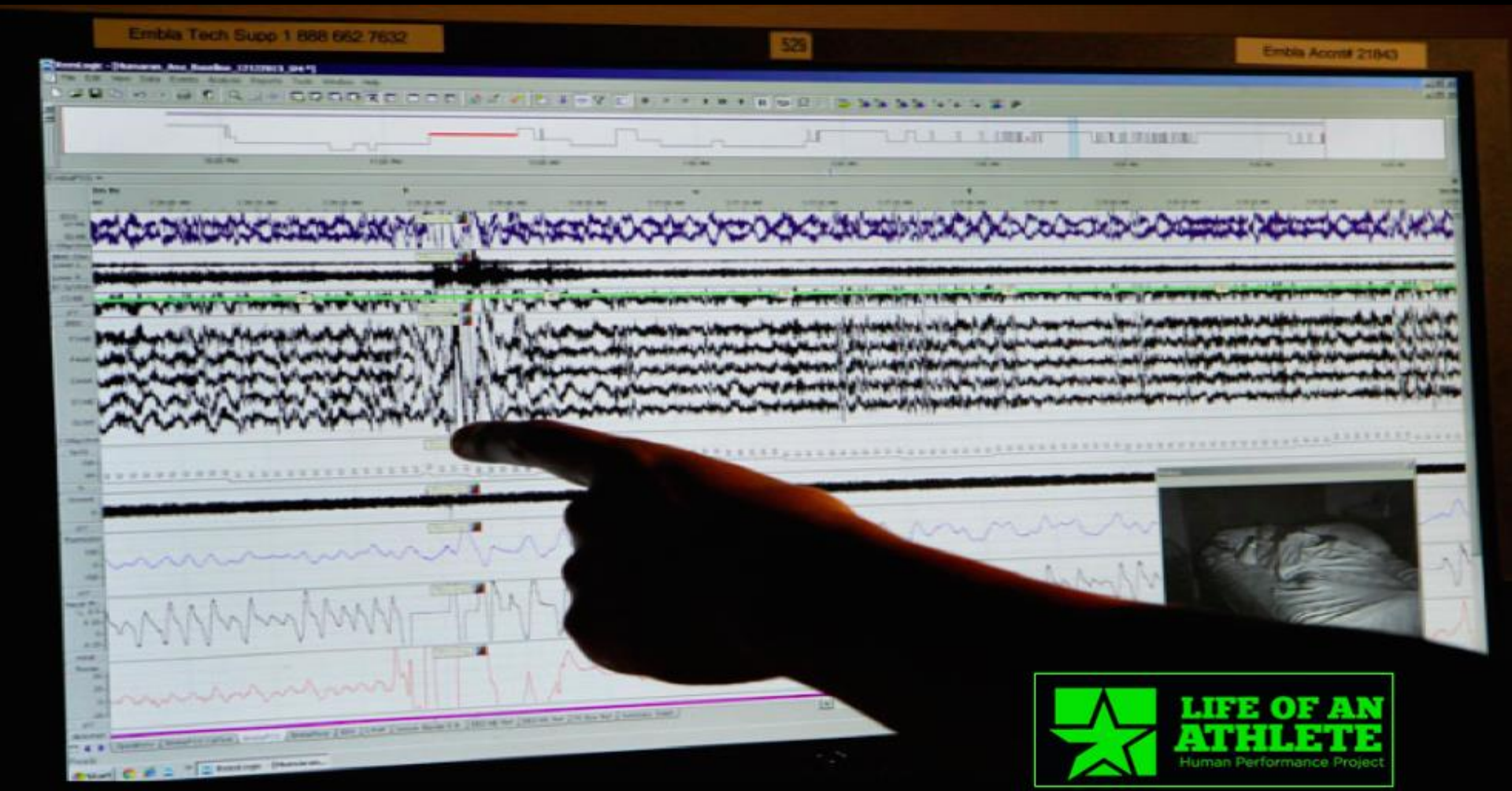
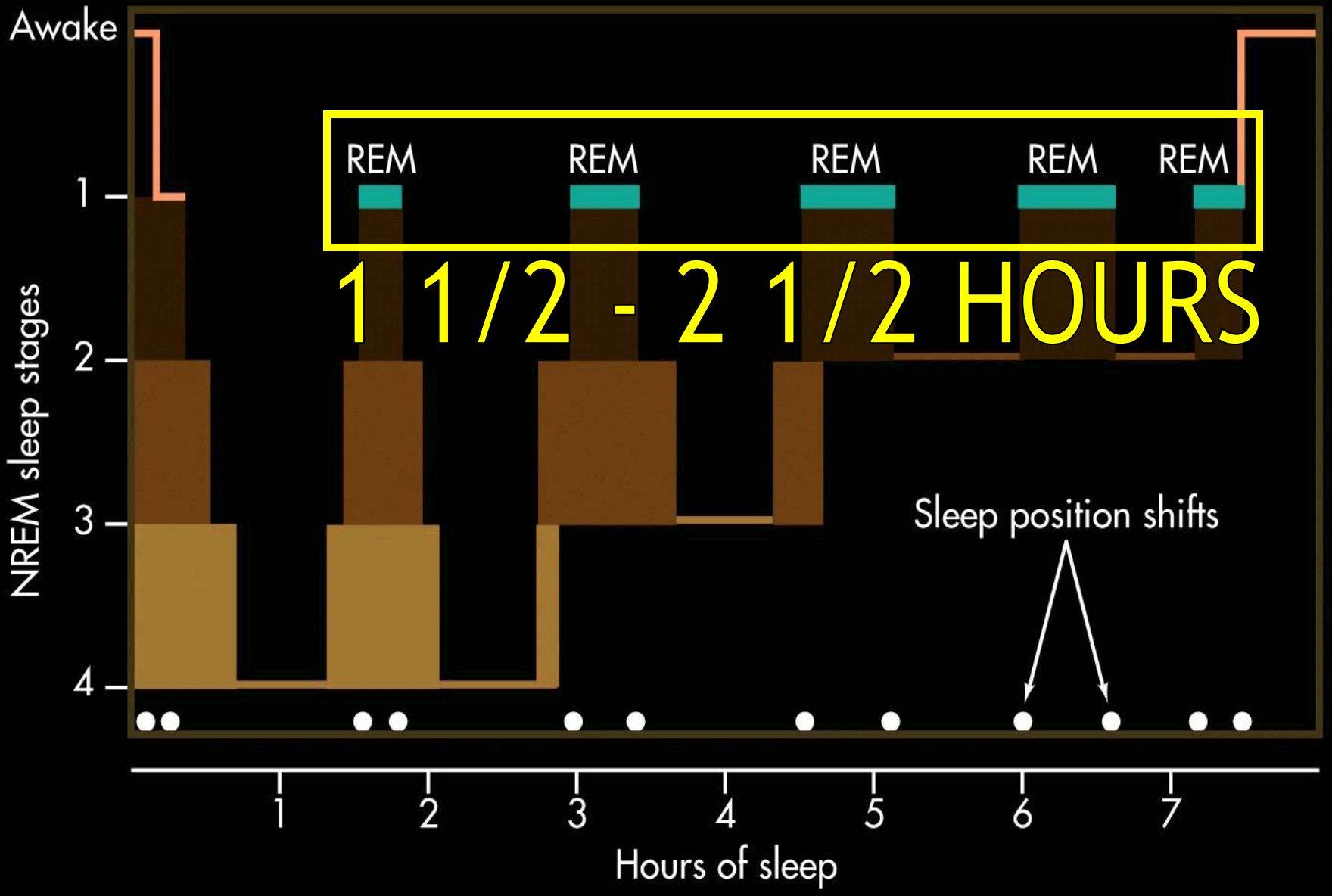
Human Performance Project

The more you train
The harder you train
The more you need sleep

REM SLEEP CRITICAL

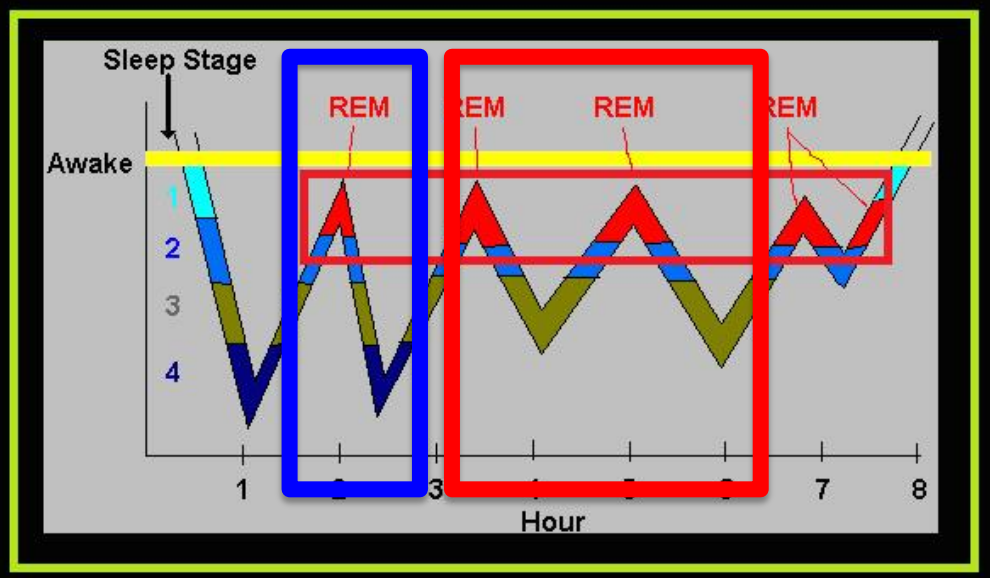


Restore Repair Rejuvenate Reload Reboot



8 HOURS OF SLEEP

Body Repair Neural Repair



1 1/2 - 2 HOURS OF REM PER NIGHT ACCUMULATES DURING 8 HOURS OF TOTAL SLEEP

THAT IS WHAT YOU NEED TO RECOVER AND RESTORE!

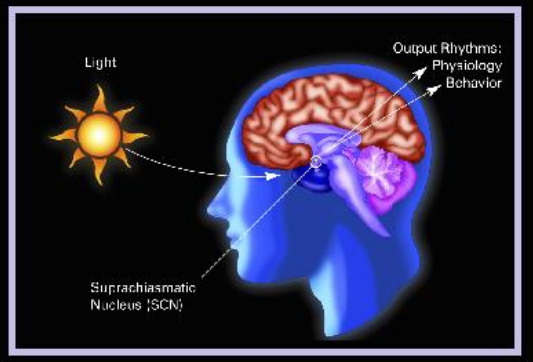
Life of an Athlete
Human Performance Project

Review of 40 years of games

The Impact of Circadian Misalignment on Athletic Performance in Professional Football Players

Roger S. Smith, DO[1]; Bradley Efron, PhD[2]; Cheri D. Mah, MS[3]; Atul Malhotra, MD[4]
[1]Brigham and Women's Hospital Sleep Disorders Program, Harvard Medical School, Boston MA; [2]Department of Statistics, Stanford University, Stanford CA; [3]Stanford Sleep Disorders Clinic and Research Laboratory, Stanford University, Stanford CA; [4]Department of Medicine, University of California San Diego, La Jolla, CA

Objective: We hypothesized that professional football teams would perform better than anticipated during games occurring close to their circadian peak in performance.
Design: We reviewed the past 40 years of evening and daytime professional football games between west coast and east coast United States teams. In order to account for known factors influencing football game outcomes we compared the results to the point spread which addresses all significant differences between opposing teams for sports betting purposes. One sample t-tests, Wilcoxon signed ranked tests, and linear regression were performed. Comparison to day game data was included as a control.
Results: The results were strongly in favor of the west coast teams during evening games against east coast teams, with the west coast teams beating the point spread about twice as often ($t = 3.95$, $P < 0.0001$) as east coast teams. For similar daytime game match-ups, we observed no such advantage.
Conclusions: Sleep and circadian physiology have profound effects on human function including the performance of elite athletes. Professional football players playing close to the circadian peak in performance demonstrate a significant athletic advantage over those who are playing at other times. Application of this knowledge is likely to enhance human performance.



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Human Performance Project

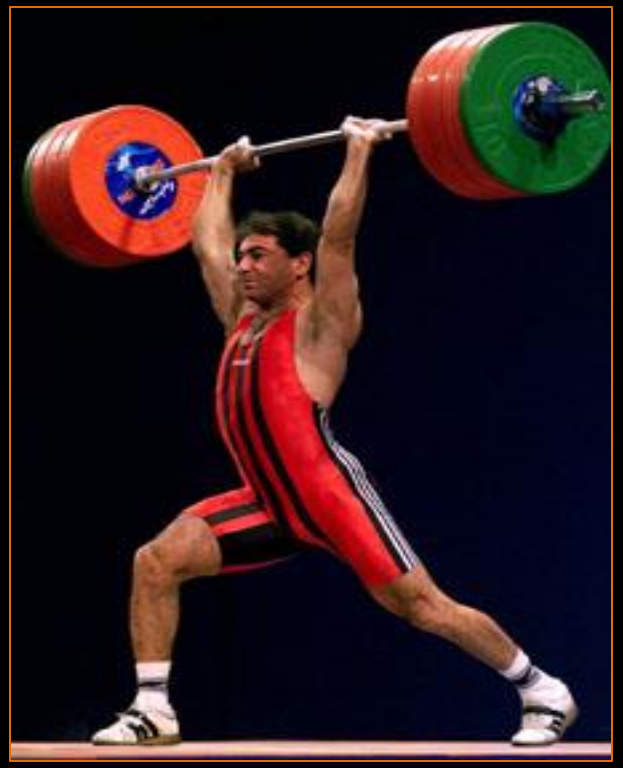
East teams lost during West games 75% of the time…
3 hour time difference

6 Hours 14 Minutes

4-6 Hours

Average sleep for most NCAA athletes

RECHARGING THE BRAIN



The brain seems to be able to build up energy deficits or energy reserves over several days and will function at that level.

CNS READINESS

How many days does it take to gain energy reserves in CNS?

Perform Saturday

CNS Readiness begins Wednesday

M T W R F S S

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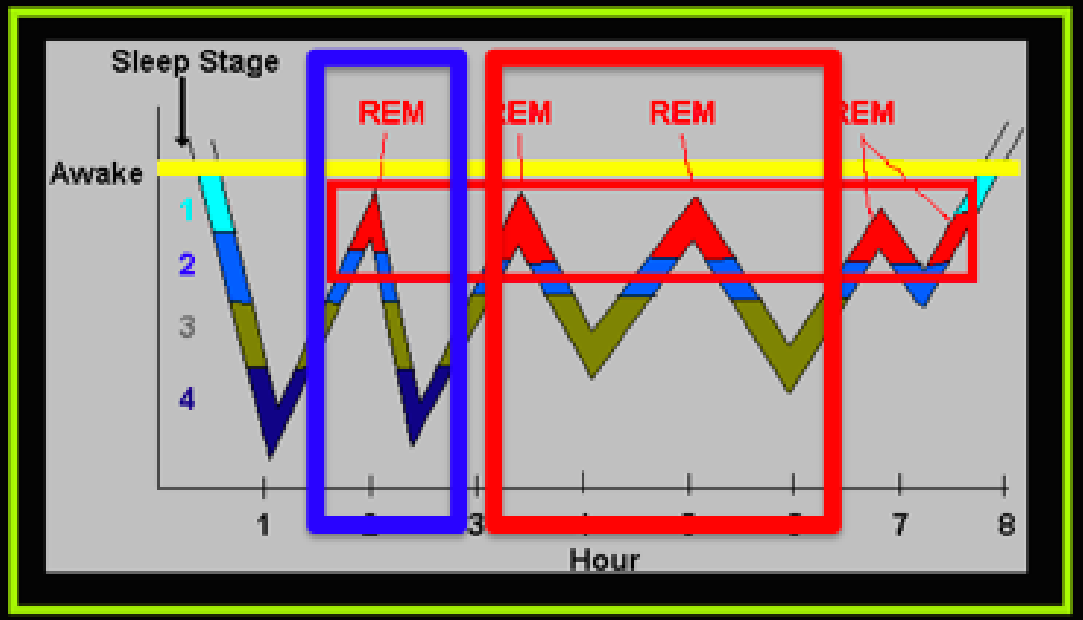
The brain/body builds up reserves or deficits over 1-3 days...

When a person is taught a new skill his or her performance does not improve until he or she receives at least eight hours of sleep.

SKILL REINFORCEMENT

ACCURACY STATS



MOVEMENT MEMORY

ADVANCED BRAIN COMMUNICATION

Pattern Recognition Reaction

ATHLETE BRAIN

Emotional Regulation

The energy expenditures of the brain and CNS during high level performance is very demanding. Besides teh mental processing functions of competition, the brain must also use huge energy reserves to send myographic impulses to muscles via the nervous system. If you want to perform, make sure your CNS is rested. This is quite different than the rest requirements for heart, lungs and muscles.

Spatial Reasoning

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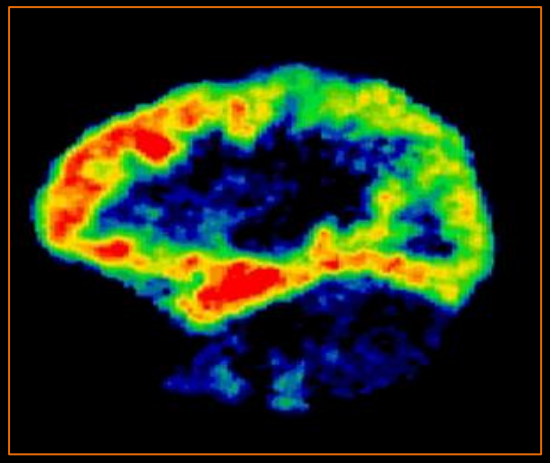
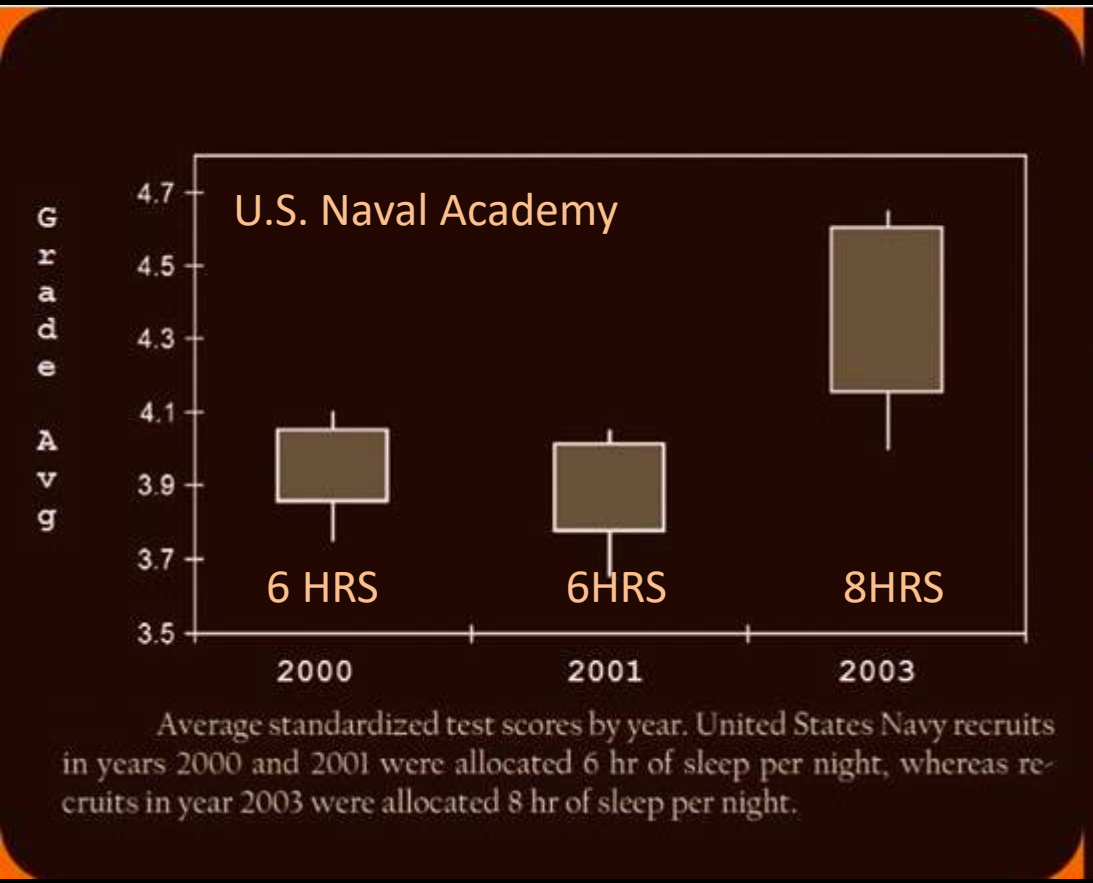
Anticipation

FOCUS CONCENTRATION

High Speed Decision Making



SLEEP
makes you smarter!



Average standardized test scores by year. United States Navy recruits in years 2000 and 2001 were allocated 6 hr of sleep per night, whereas recruits in year 2003 were allocated 8 hr of sleep per night.

Wanna be smarter?
Try sleep!

Life of an Athlete
Human Performance Project

The effect of sleep debt on...

ACADEMIC PERFORMANCE

Your mother probably told you to get a good night sleep before a test. Well, she was right!

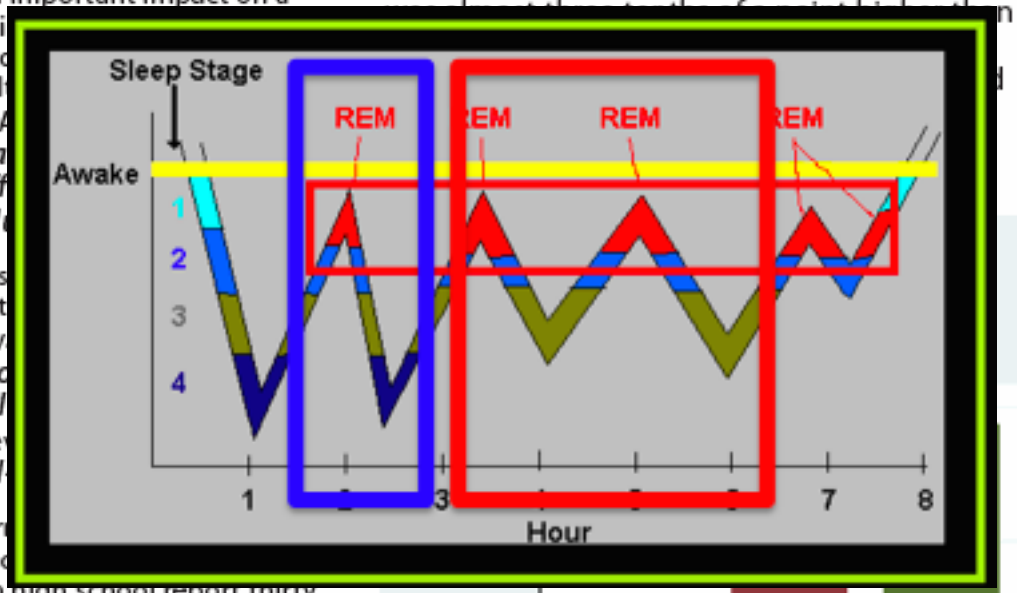
Sleep has an important impact on a student's abi
a test. Accord
College Heal
lege Health A
quarter of a
negative eff
formance d

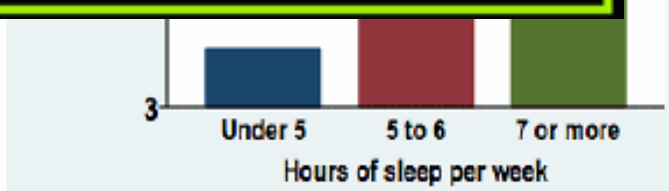
Neverthless
continue to t
in the library
60 percent o
pulled an al
found, howe
between all-

These patter
exist before
A's and B's in high school report thirty minutes more sleep than those who stuggle or fail.

Additionally, students who are sleep deprived are more likely to procrastinate studying and more likely to be motivated strictly to obtain a passing grade, rather than the intrinsic value of learning.

Numerous studies have linked poor sleep habits with poor academic performance. One study (below) found that students who average seven hours of sleep or more had an average GPA that





UC-Berkeley students who slept more than seven hours per night reported significantly higher GPA's than those who slept less.

GOOD SLEEP HABITS

1. Develop a standard sleep schedule and stick to it.
2. Sleep in a dark, quiet place and in comfortable clothes.
3. Regular exercise can help sleep
4. Avoid caffeine, nicotine and alcohol prior to sleep.
5. Develop a relaxing bedtime routine.
6. Remember...

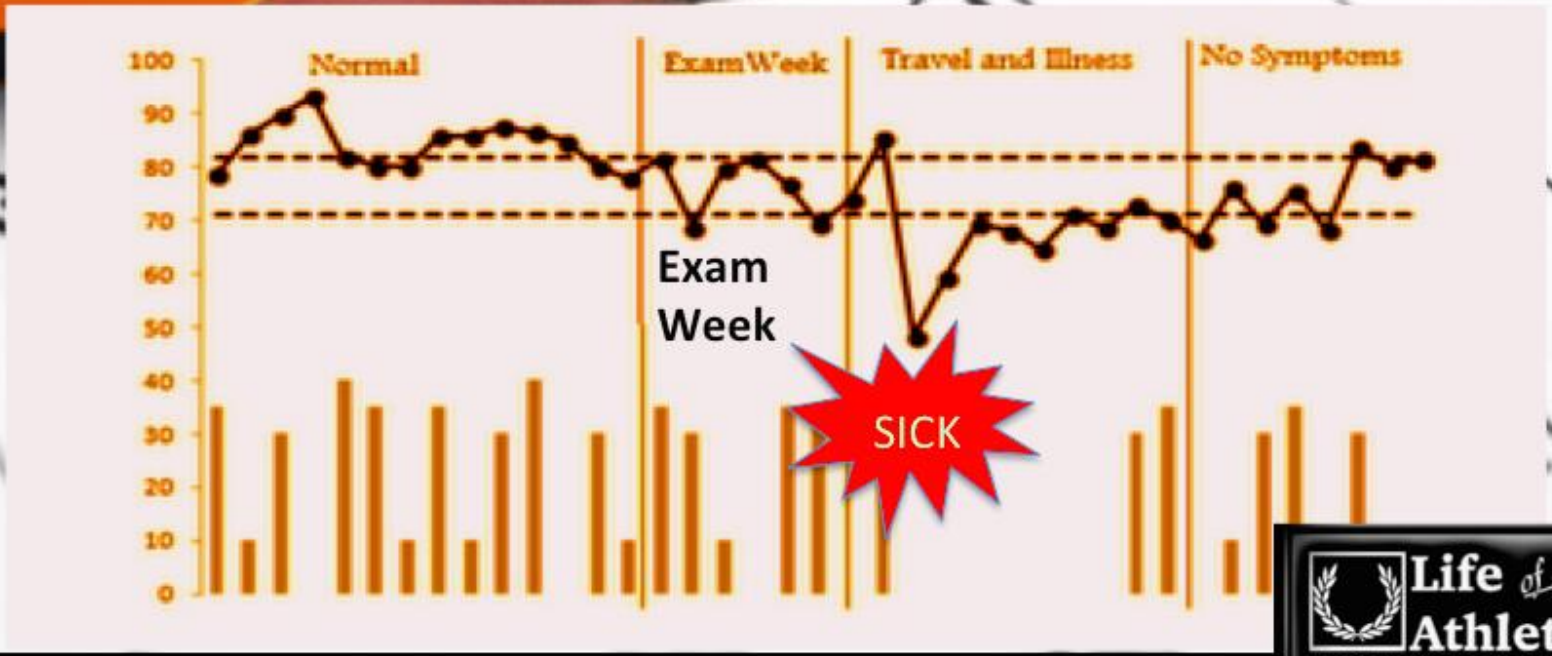
DROWSINESS IS RED ALERT!

Sadly, most students still lack basic sleep knowledge. At one major state institution, seven in ten students said that if they knew the impact of sleep on their grades, they would change their sleep habits. So, get out and spread the word!

WWW.DROWSINESSISREDALERT.COM

HRV EXAM WEEK

CNS TAKES HUGE HIT



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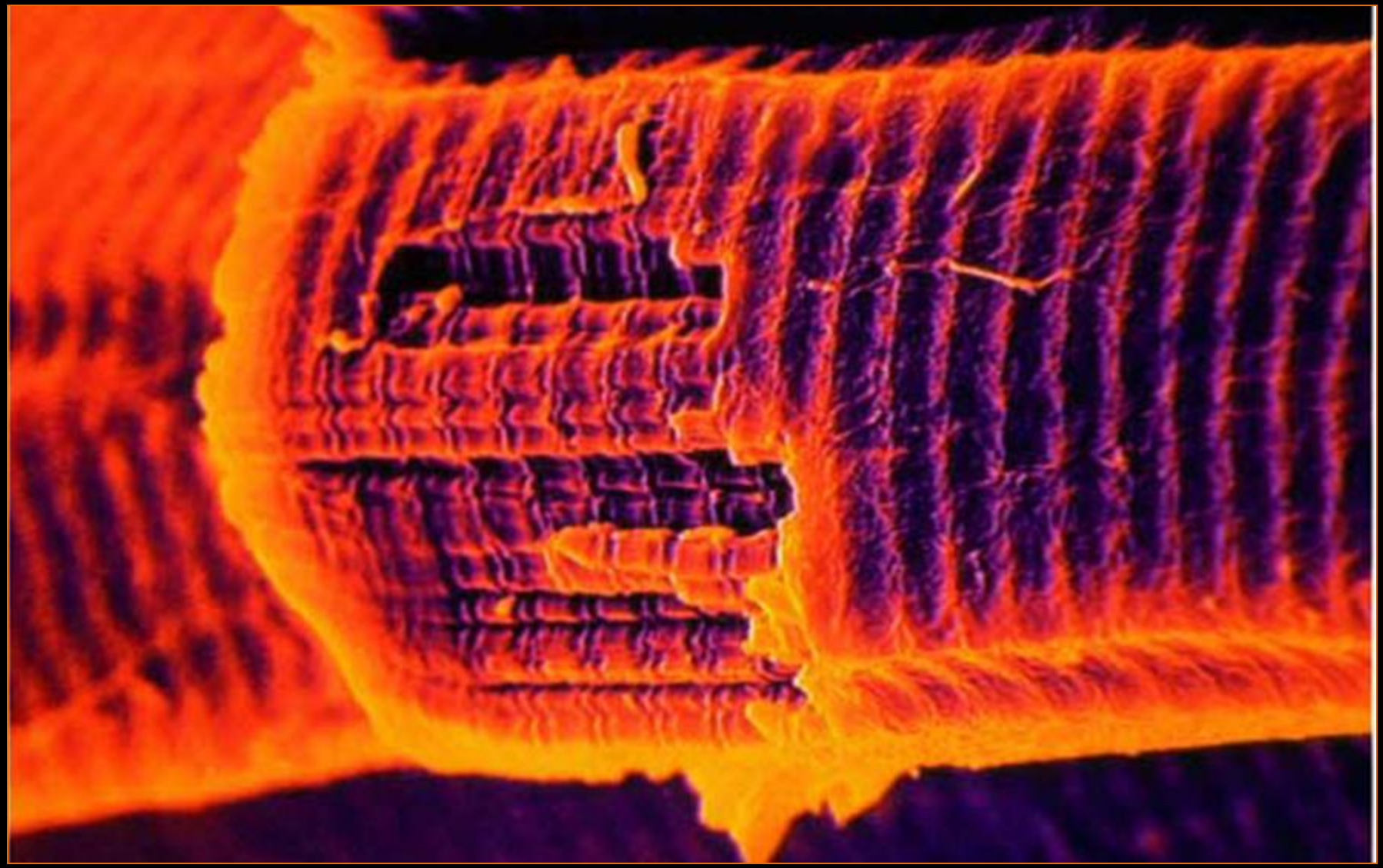
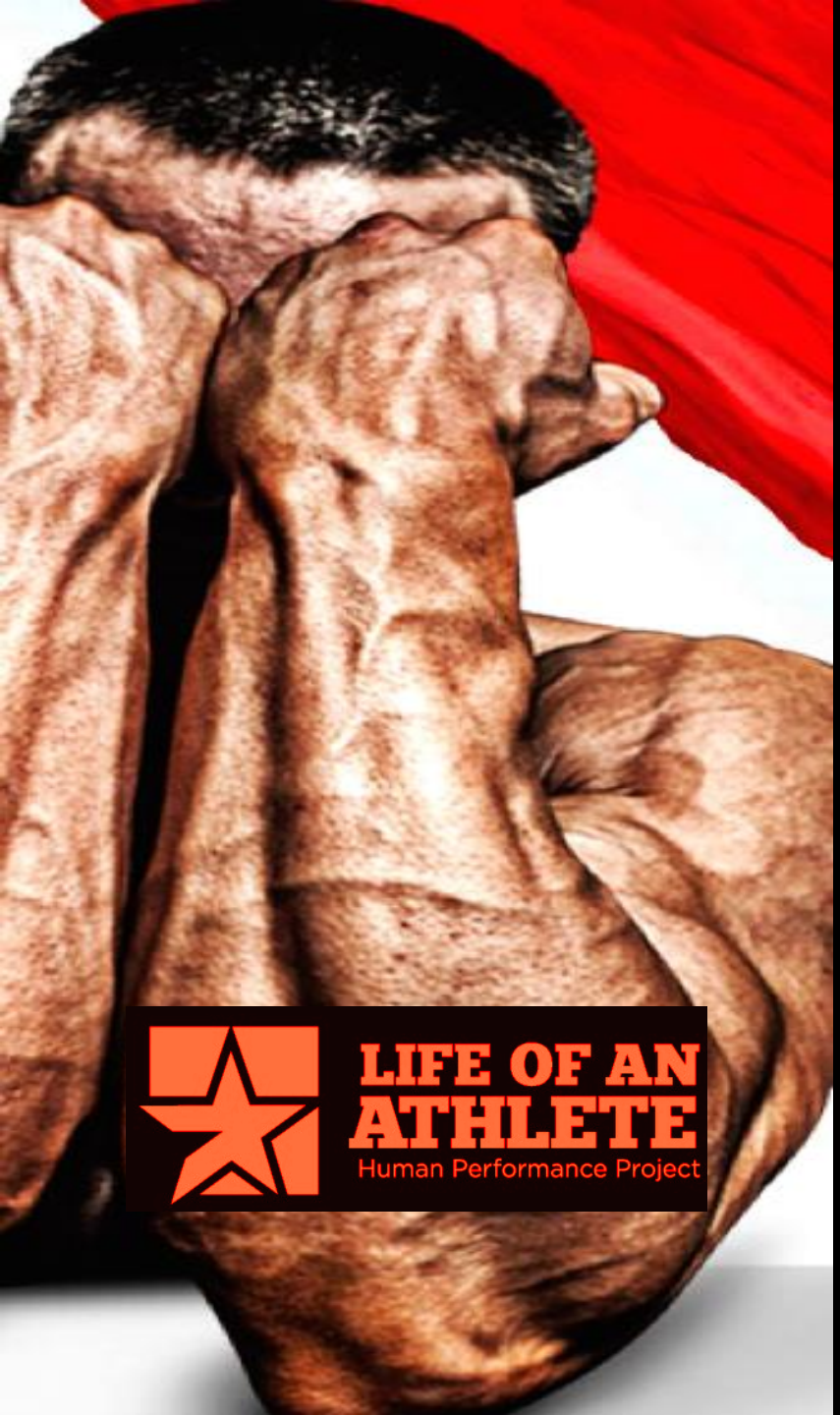
Human Performance Project



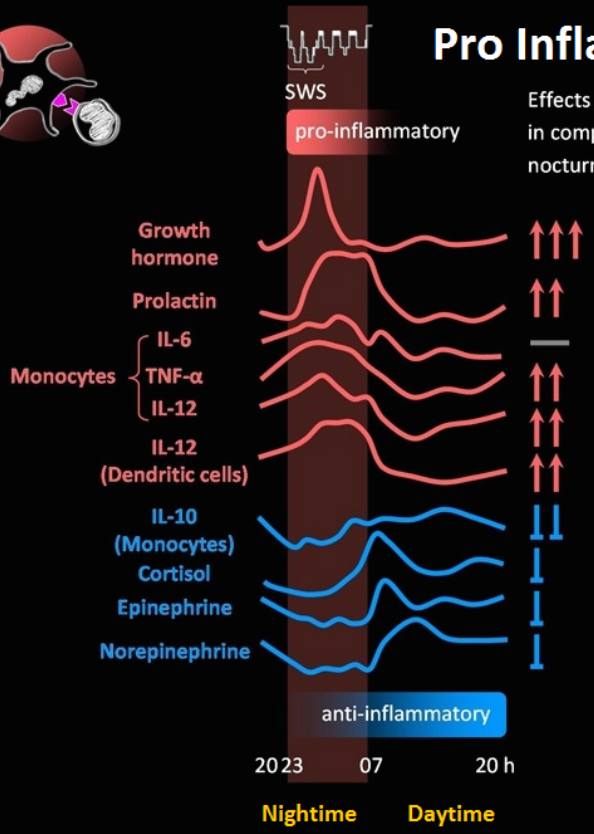
REPAIR NEW MASS



DAMAGE REPORT

MUSCLE DAMAGE
BLEEDS
OVERSTRETCHED
MICROTEARS
FLUID ACCUMULATION
RESIDUE
MYOKINES
PH DAMAGE
HYPOXIC DAMAGE
BRUISING
SWELLING
FRICTION HEAT DAMAGE
COMPRESSION DAMAGE
PERCUSSION DAMAGE
COMPARTMENT DAMAGE
GRAVITATIONAL DAMAGE

Pro Inflammatory Activation during early (SWS Slow Wave Sleep)
Anti-Inflammatory Activation during Daytime Hours



Rhythms of blood hormone levels and cytokine production Blood levels of growth hormone (GH), prolactin, cortisol, epinephrine and norepinephrine, as well as production of interleukin (IL)-6, tumor necrosis factor (TNF)-alpha, IL-12 and IL-10 by stimulated monocytes and of IL-12 by stimulated myeloid dendritic cell precursors show characteristic changes during a 24-hour period including regular sleep between 2300 h and 0700 h (maroon area).

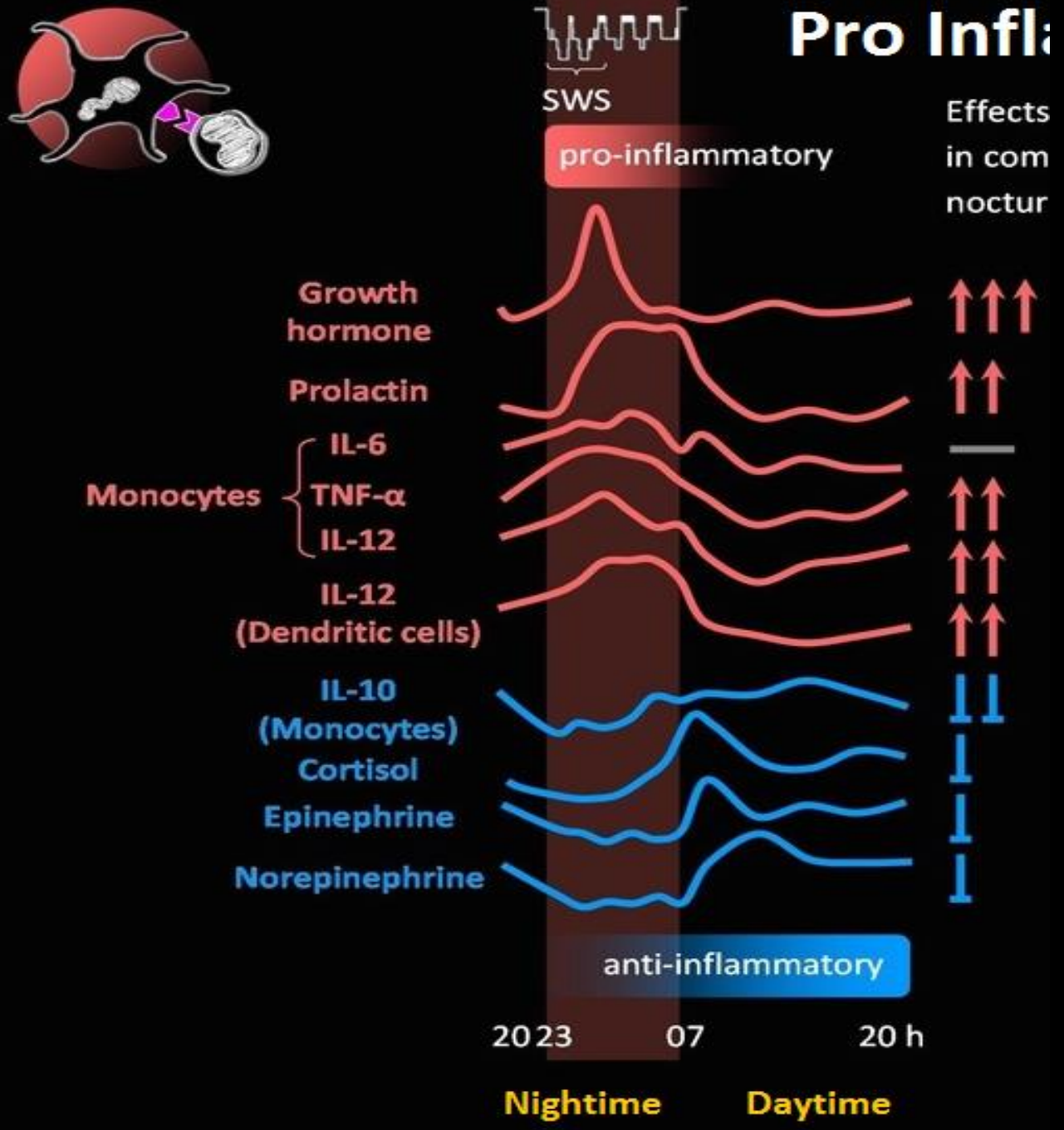
One form is known as the pro-inflammatory polypeptide regulators. These types of cytokines are created primarily by immune cells that are engaged in the process of amplifying inflammatory reactions as a means of dealing with some sort of health threat to the body. By relaying messages between the cells, these cytokines help to trigger the immune system's rate of response to whatever threat is present.

During Sleep

Along with the pro-inflammatory cytokines, there is also anti-inflammatory cytokines. These have the opposite effect, in that they help to limit of inflammation . This counters the stress response from night time normal inflammation and resets this reactive response system.

During Daytime

Life of an Athlete
Human Performance Project

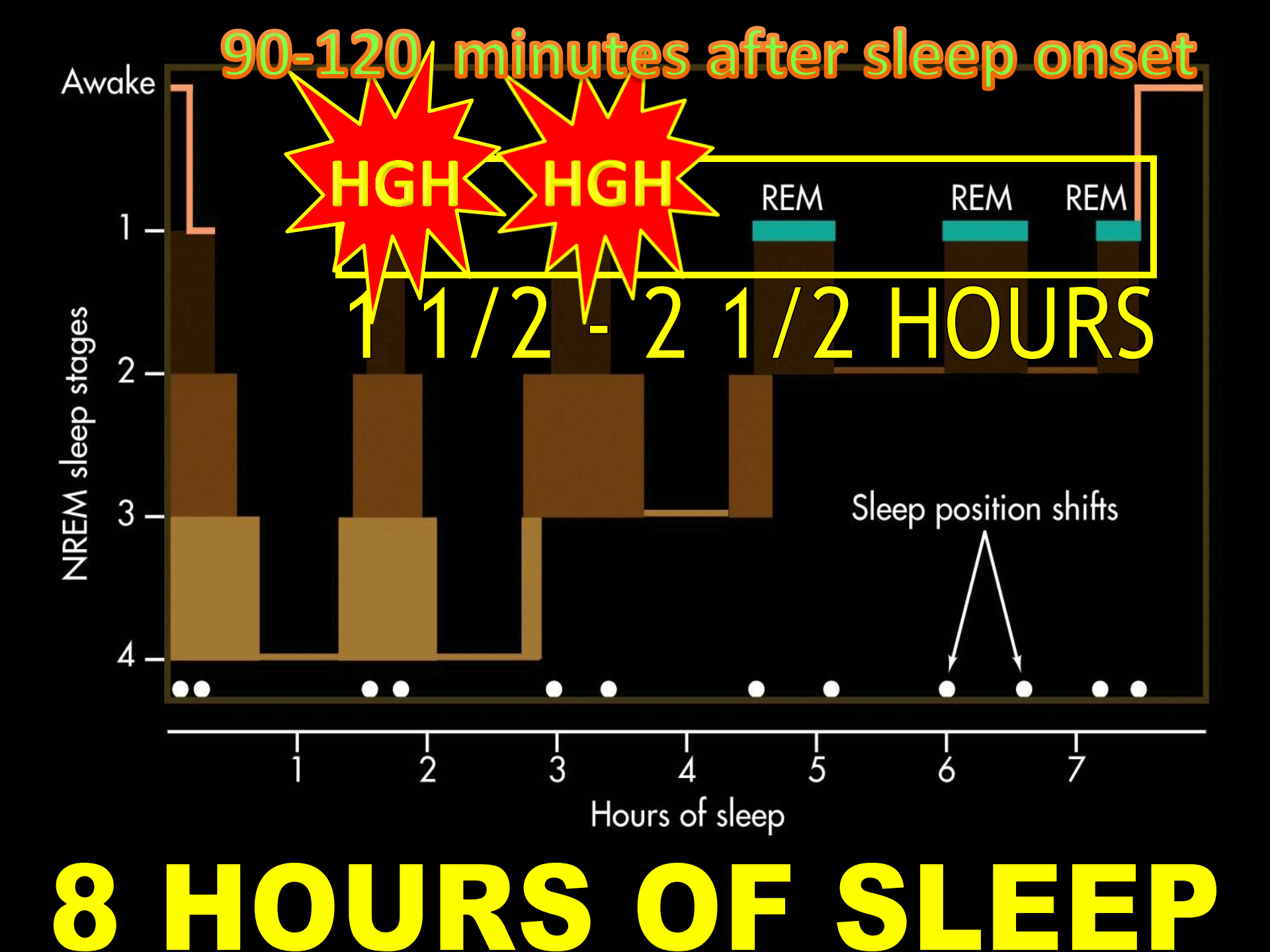

Pro Infl
SWS
pro-inflammatory
Effects
in com
noctur
Growth hormone
Prolactin
IL-6
Monocytes
TNF-α
IL-12
IL-12 (Dendritic cells)
IL-10 (Monocytes)
Cortisol
Epinephrine
Norepinephrine
anti-inflammatory
20 23
07
20 h
Nightime
Daytime

GROWTH HORMONE

New muscle mass

Repair muscle mass

Maintain muscle mass


90-120 minutes after sleep onset
HGH
HGH
REM
REM
REM
1 1/2 - 2 1/2 HOURS
Awake
1
2
3
4
NREM sleep stages
Sleep position shifts
1
2
3
4
5
6
7
Hours of sleep
8 HOURS OF SLEEP

HGH 24 Hours

NIGHT EARLY SLEER

90-120 MINUTES> SLEEP

GAINS HAPPEN DURING SLEEP

Most of the intra-muscular chemistry and synthesis takes place at night when you are sleeping. It is also well known that during early sleep (90-120 minutes after falling asleep) there is a huge release of human growth hormone (HGH). This is one of the most critical factors in muscle growth. You also need protein available in your system during this timeframe. Casein protein, a protein isolate of milk is a very good choice for this critical nutrient intake. It goes into your system very slowly all night and makes protein uptake available for repair and new mass.

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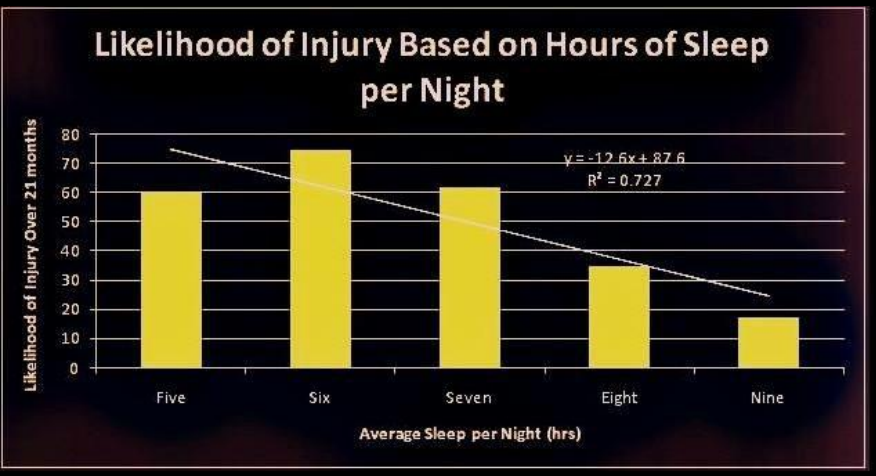
Human Performance Project

TRAINING EFFECT

Injuries and hours of SLEEP



Researchers in Los Angeles surveyed athletes about their sleep and training habits and tracked them for 21 months...

WAKE UP CALL

The best predictor of injury was the number of hours the athletes slept each night.

WHY?

The most essential event in athletic recovery is the night time release of Human growth hormone, which happens during sleep!

Life of an Athlete
Human Performance Project

The more you sleep the less chance that you will be injured!

The single biggest event in 24 hours

Why 10 P.M. Is The Perfect Bedtime

Early to bed early to rise
make you ready to kick butt!

I'm going to take a wild guess that you already know that sleep affects how well you perform. You're also probably aware that sleep quality is part of the equation (not just quantity).

But the truth is, the time you go to bed, what you do in the hours before going to bed, and what you do when you wake up ALL have a big impact on your total benefits of sleep. Studies on athletes and sleep have shown that training athletes have many sleep disturbance syndromes. You could for instance sleep 8 hours but only attain 5 hours of quality sleep, which leaves you fatigued and unready to train and compete the next day. We also know that you can build up energy reserves or deficits over 1-3 days.

Is there is a golden bedtime for everyone? Everyone's body IS different, so it's most important to listen to what works best for you. But if you haven't tried going to bed before midnight, give it a chance. Sleep patterns are light sensitive. We are biological beings affected by the sun's patterns, so if we go to bed with the sun and wake up with it, we're working with our natural circadian rhythm. In fact, the closer we can get to the sun's patterns, the better our energy is. We recommned a 10 p.m. to 6 a.m. sleep schedule for athletes. In early sleep (90-120 minutes after falling sleep) much of our muscle repair takes place! Based on a 10pm bedtime that happens at 11:30-midnight. From 2-6 am much of our neurological processes of repair and restoration and rebooting energy levels and reloading neurotransmitters takes place. That is the deal! Then you get up, wake up, fuel up and go train! An athlete's life! A creature of habit! A champion!

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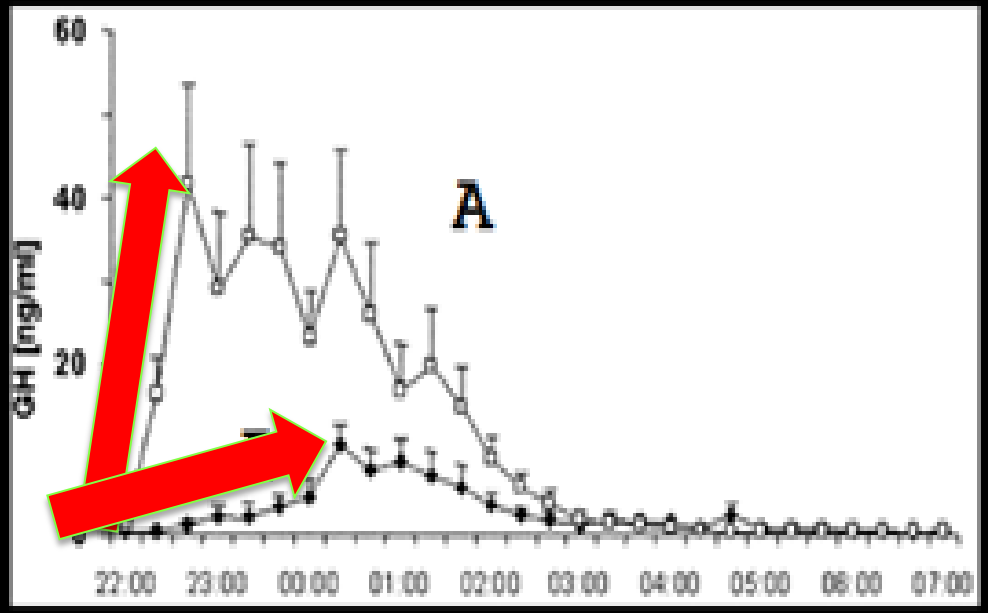
Human Performance Project

Athlete Sleep and HGH Release



10 11 12 1 2 3 4 5 6 7 8

A Normal Bedtime 10:00 PM

B Late Sleep 12:00PM

REST NAPS DOWN TIME SLEEP

30 MINUTE NAPS

POWER UP POWER NAPS

Napping reduces the stress hormone cortisol and promotes muscle-building growth hormone . Taking a nap, even for just 20-30 minutes, creates an environment in your body that builds muscle and burns fat. It also re-energizes the brain and CNS, increasing alertness and arousal levels!

Try naps prior to training and between workouts if you train more than once per day! You will notice increased quality to your workouts.

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Human Performance Project

Life of an Athlete
Human Performance Project

The amazing 26-minute NASA power nap

A 1995 NASA study that found a 26-minute nap improved performance 34% and alertness 54%.

The best time to nap is usually in the early afternoon, between the hours of 1 and 3 p.m., for those who keep regular hours. This falls just after lunch, when our bodies naturally get tired anyway. For those who sleep odd hours, prime nap time is about seven hours after waking up.

- Increased stamina
- Lowered stress hormones
- Improved mood
- Increased learning ability
- Improved memory
- Improved decision making
- Greater creativity
- Reduced risk of heart disease
- Increased ability to stay asleep through the night
- Increased motivation to exercise
- Increased cell repair
- Increased hormone balance

Sleep in a dark room!

In the absense of light, your brain's pineal gland starts to release melatonin (sleep hormone) which after about 30 minutes transitions you from wake state to sleep state. If you have light in the room the release is decreased. Complete darkness is best!

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Human Performance Project

DARK?

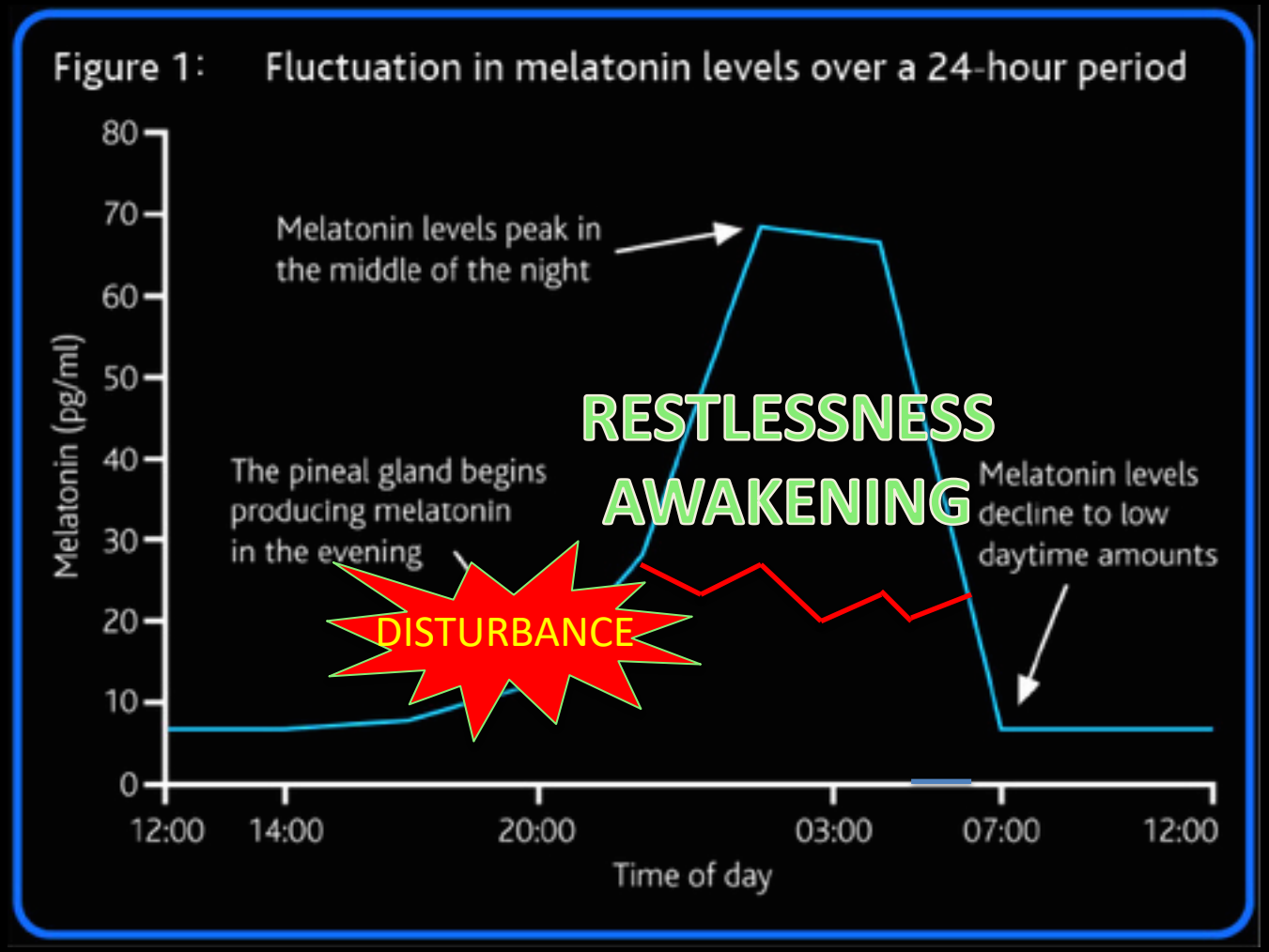


Figure 1: Fluctuation in melatonin levels over a 24-hour period
Melatonin (pg/ml)
80
70
60
50
40
30
20
10
0
Melatonin levels peak in the middle of the night
RESTLESSNESS
AWAKENING
The pineal gland begins producing melatonin in the evening
DISTURBANCE
Melatonin levels decline to low daytime amounts
12:00
14:00
20:00
03:00
07:00
12:00
Time of day

SLEEP EXTRA SLIDES JU

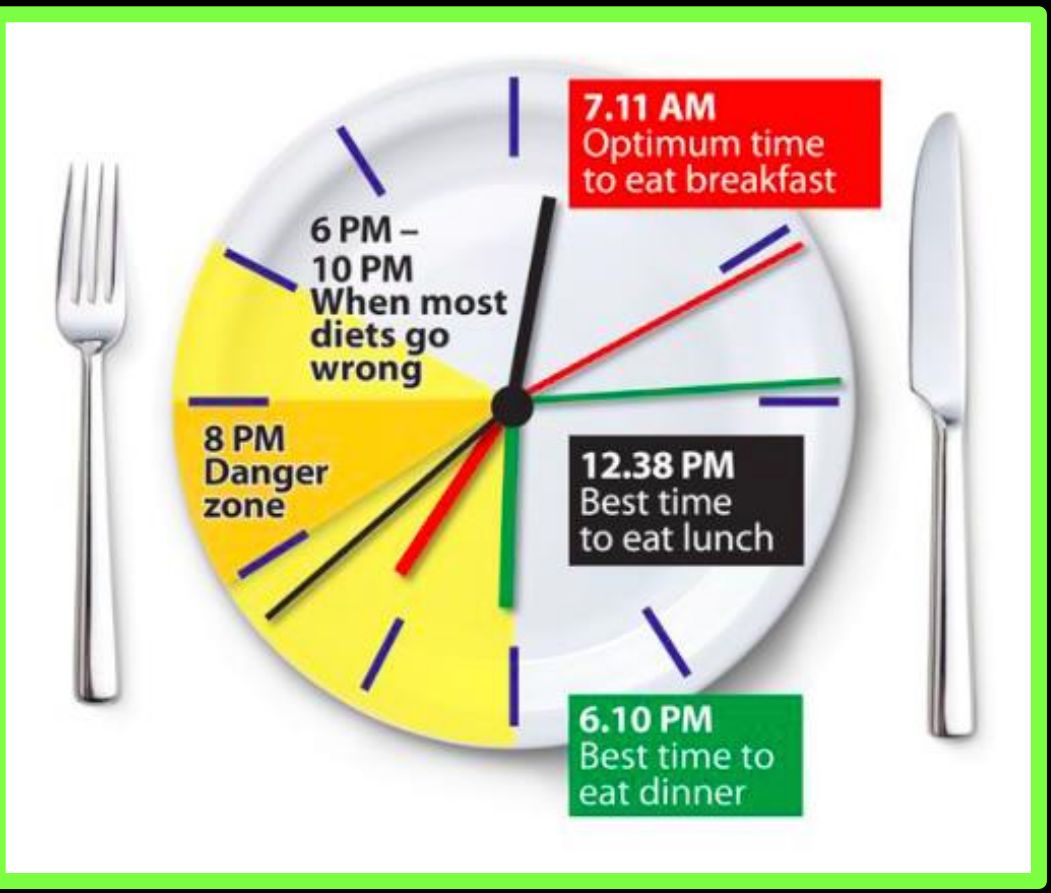
Too Late Too Much

Late night eating causes disturbances to hormonal systems that create disturbances to sleep cycles.

Human Performance Project

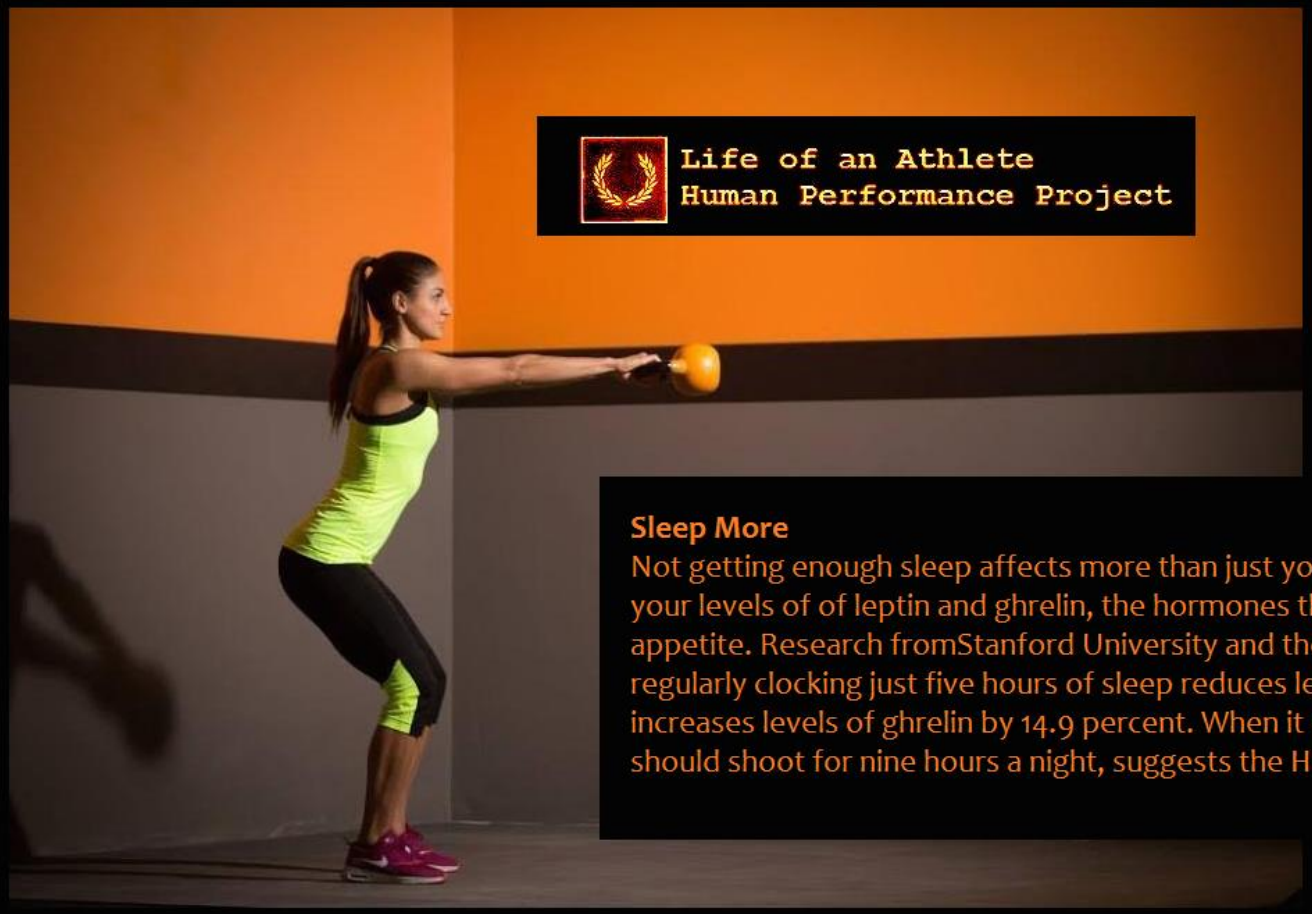
TIMING OF MEALS AND SLEEP

The meal hours influence the brain through hormones that have been discovered quite recently like the hypocretin/orexin (which has a common action in the food intake behaviors and the circuits of sleep).



Try as best you can to stick to a time schedule for the intake of nutrients. Your body will establish set points for responding to hormonal changes associated with digestion and blood glucose levels.

Human Performance Project



Sleep More

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Energy Levels Energy Use and Appetite Regulated by SLEEP

SLEEP IS THE REGULATOR

Sleep Manual

Optimal Sleep Temperature

68°-72° F

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Night is for Repair

Pro-Inflamatory response occurs at night when your body uses body systems to counteract the damage from physical stressos. Your body releases hormones to repair and restore cells that are broken down from physical trauma.

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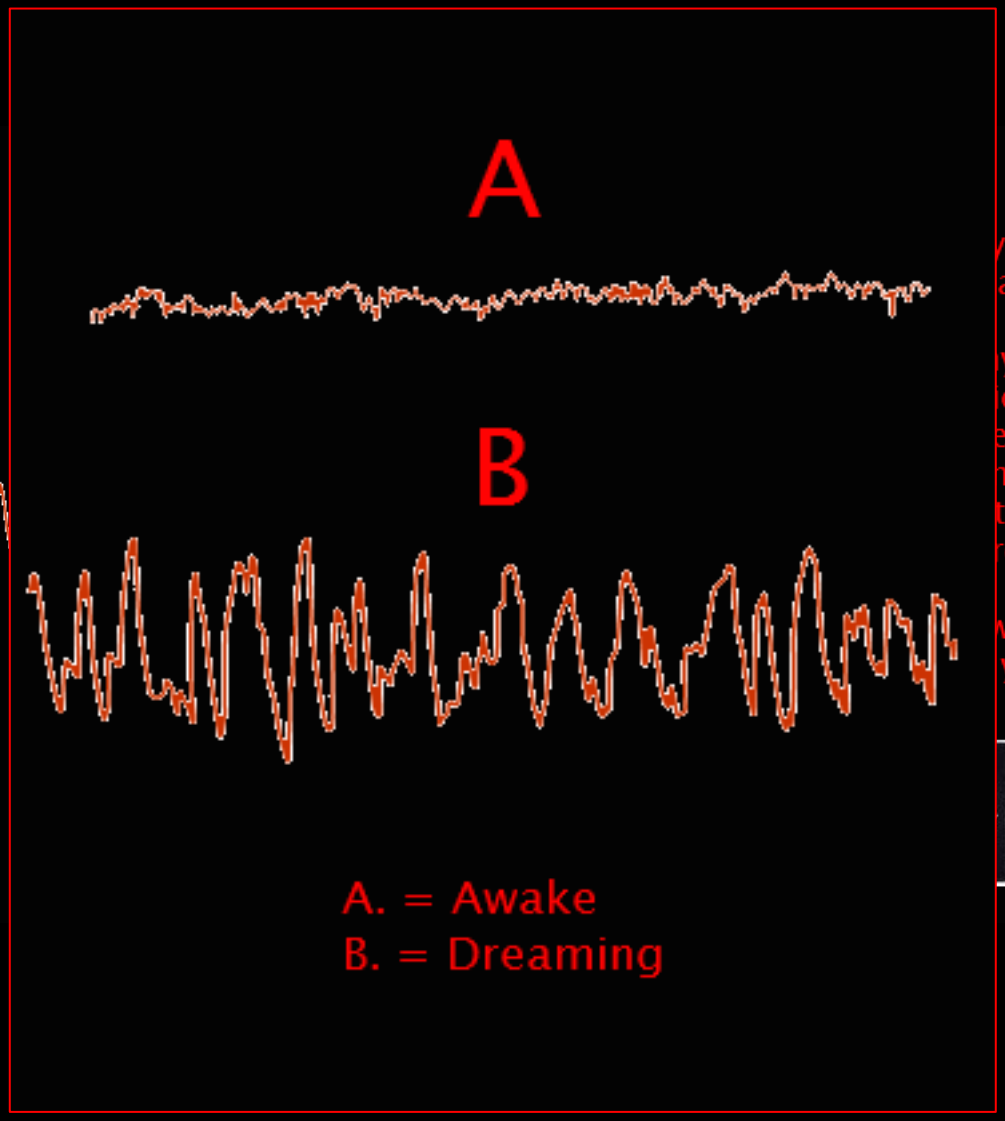
Human Performance Project

You need 1 1/2 - 2 hours of total accumulated REM sleep at night for your brain and CNS to recover and repair and recharge. It takes a minimum of 8 hours of total sleep time to get the REM you need. If you want to perform...SLEEP!

Get your REM!

Life of an Athlete
Human Performance Project

ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ



your brain is still very active. When you dream your
as it is when you are awake.

y we need sleep. Without it we can't think logically,
ion and lose co-ordination and muscle function.
e brain and body time to recover and sort out the day's
muscles recover, lets your organs rest and downloads
t patterns to your circuitry and catalogs them in the
re-movement sectors of your brain

v a person's brain activity while they are awake and
you think is which?

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Gotta game tomorrow?

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Key to success for any athlete is how much you sleep!

The Sandman Hormone

Athletes need to sleep to recover and restore

Melatonin is absent from the system or undetectably low during daytime. Its onset in dim or decreasing light, dim-light melatonin onset (DLMO), at about 21:00 (9 p.m.) can be measured in the blood or the saliva. Its major metabolite can also be measured in morning urine. Both DLMO and the midpoint (in time) of the presence of the hormone in the blood or saliva have been used as circadian markers

After studying sleep research for many years our recommendations for athletes training and competing at a high level are for

9 hours and 15 minutes of sleep

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HGH Release related to SLEEP

Growth Hormone and Sleep
A major pulse of growth hormone occurs shortly after falling asleep (90-120 minutes after transition to deep sleep) in relation to slow wave sleep and delta waves (0.5-3.5Hz). This spike accounts for approximately 50% of the daily overall exposure of growth hormone in otherwise healthy young men. This is your muscle building,repair and maintainer. No HGH no gains... No performance.

"You grow while you sleep," is perfectly true, and we could all do better to pay more heed to this bit of age old wisdom.

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No sleep,No gains
More damage,More pains

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Growth Hormone and Sleep
A major pulse of growth hormone occurs shortly after falling asleep (90-120 minutes after

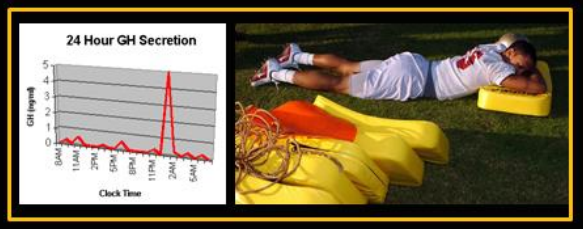
HGH

New muscle mass
Repair muscle mass
Maintain muscle mass

HGH 24 Hours

NIGHT EARLY SLEEP

90-120 MINUTES> SLEEP



Early sleep at night HGH

When it all happens

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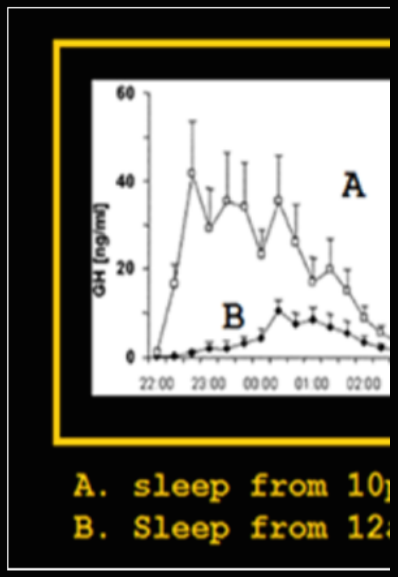
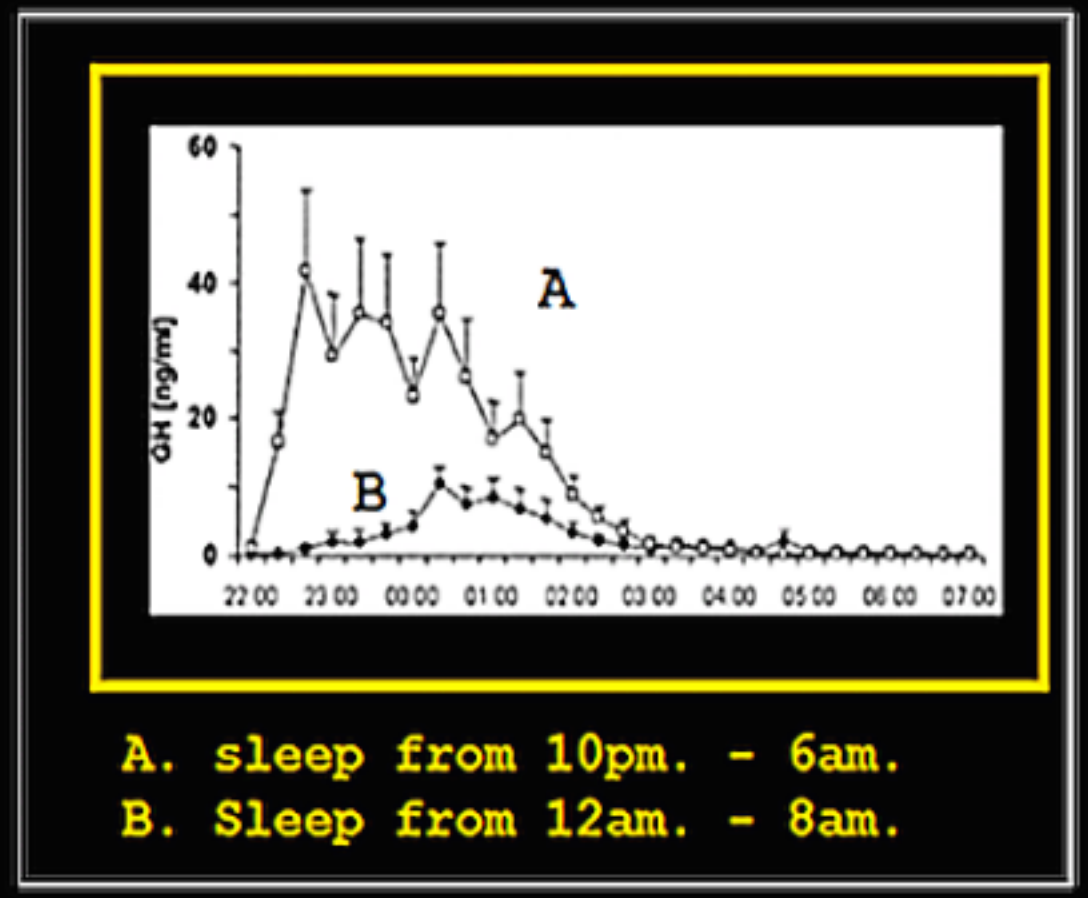




ease and

leep and go into REM
is is an example of how
every night. A. is an
he huge release of HGH!

at 8 am. Note the minimal
nights, he lost the optimal
me. This shows the critical
clock to function for hormonal
some!

Project

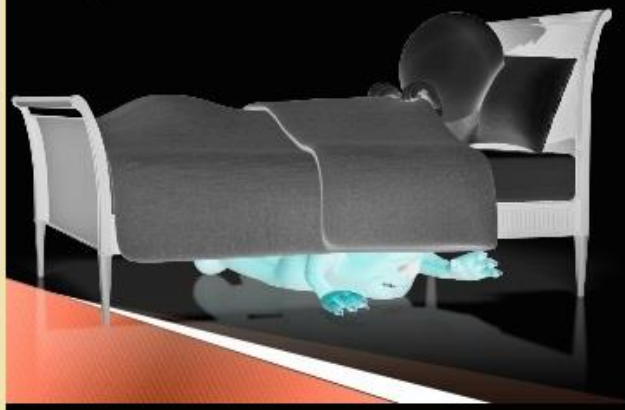
Sports Med
DOI 10.1007/s40279-014-0260-0

SLEEP

REVIEW ARTICLE

Sleep and Athletic Performance: The Effects of Sleep Loss on Exercise Performance, and Physiological and Cognitive Responses to Exercise

Hugh H. K. Fullagar · Sabrina Skorski · Rob Duffield · Daniel Hammes · Aaron J. Coutts · Tim Meyer



Sleep restriction is generally associated with:

- ↘ Cognitive Performance
- ↘ Alertness
- ↗ Reaction Time
- ↘ Memory
- ↘ Decision Making
- ↗ Sleepiness
- ↘ Overall Mood States

All capacities are diminished!

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Create An Electronic Sundown.

The smallest amount of light can impact your Melatonin levels (the sleep hormone). About ninety minutes before bed, turn off all electronic devices in your bedroom.

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70 million Americans have persistent trouble falling or staying asleep.

New Sleep Aid

Most sleep aids have a residual and you awake and feel groggy and unresponsive. They are habit forming and you can become dependent on them!

Don't mess with your own sleep hormone levels!

Your body outputs melatonin the sleep hormone! In the absense of daylight or dimness of light melatonin starts to release in waves and you get drowsy and then usally within thirty minutes you transition to deep sleep. If you have problems in this transition from wake state to sleep state it is likely one of many sleep disturbances. Certain acid based foods, sugar, stimulants, spicy foods, stress (emotional and physical), exposure to blue light or LCD light, use of alcohol of marijuana may be the cause. Before you use a sleep aid, consider that if you take melatonin from and out of body source ex. pill, your body may reduce your own natural output, making you dependent on using the sleep aid all the time. Start with identifying the sleep issue!

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The quality
get enough
stress and
much as 9

Athletes have sleep disturbances most of the time!

Shorter sleep durations are associated with levels of pre-training fatigue or maximal intensity workouts!

sturbances
ne!

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with levels of
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SLEEP AND COGNITION

Cognitive Output and Sleep

Restriction of sleep produces a neural sleep wave pattern that is sometimes observed in depression. A reduction in sleep reduces higher levels of cognition such as problem solving, high speed decision making, processing and reaction. Much of your sport depends on how you think and quickly react. Sleep and you will see more functional mental performance.

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Using Caffiene When you are Trashed

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In most situations that involve limited sleep loss, caffeine, can provide significantly improved alertness and performance starting with doses as low as 75 mg. Normal dosage of 100-200mg (equal to 2 standard cups of coffee) (SEAL Study).

In situations involving extended sleep loss (more than 2 nights), available data indicate that caffeine administered as a single dose of 600 mg is roughly comparable to (but not as long lasting as) a single 20-mg dose of d-amphetamine or a single 400-mg dose of modafinil. However, all of these doses and medications may be associated with side effects that could limit use under certain operational conditions.

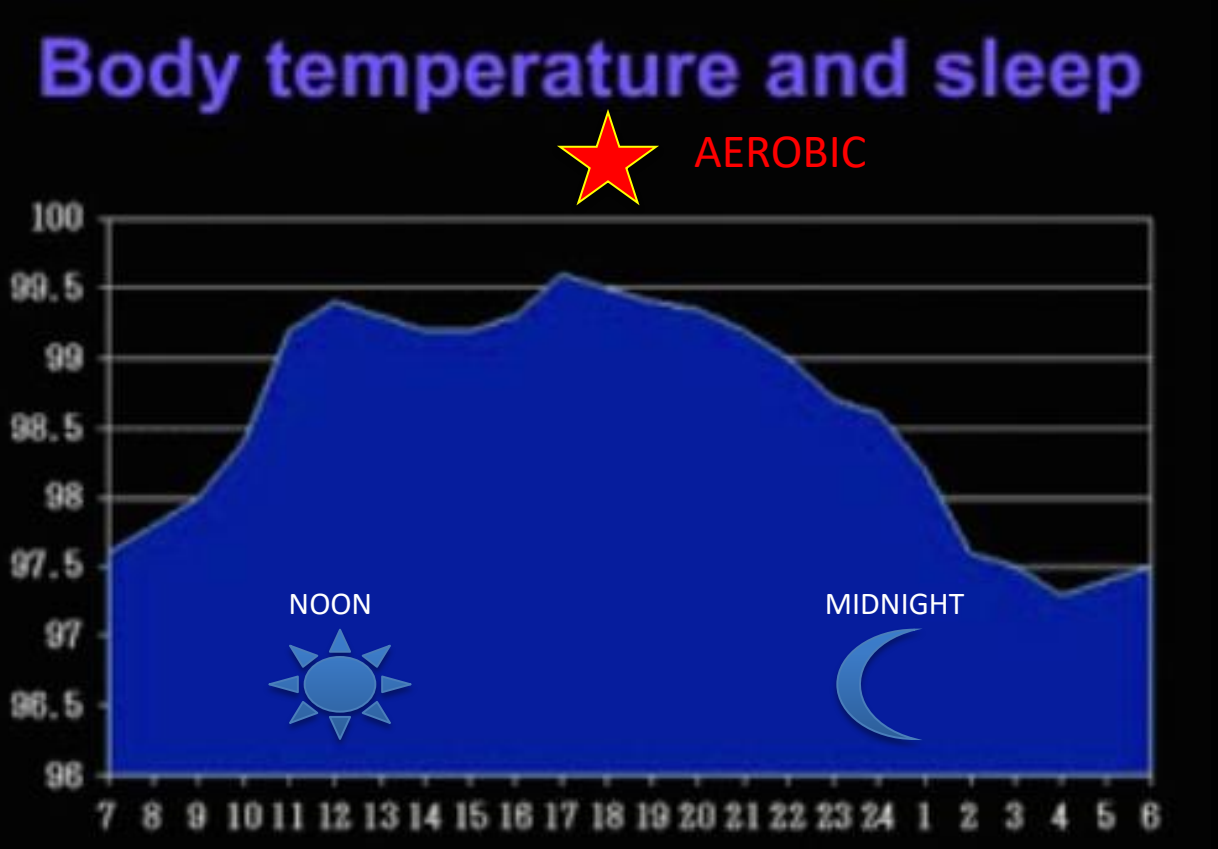
The Use of Stimulants to Modify Performance During Sleep Loss: A Review by the Sleep Deprivation and Stimulant Task Force of the American Academy of Sleep Medicine

Stimulants and Sleep Loss—Bonnet et al

Michael H. Bonnet, PhD (151N), Dayton Department of Veterans Affairs Medical Center, 4100 W. Third Street, Dayton, OH

Physical activity has a significant influence on the body temperature. The warmer the organism is during the day, the stronger becomes the action of sleep hormone (melatonin) on the fall of body temperature in the evening.

ANAEROBIC



During high intensity exercise your body's system for regulating temperature is kicked up into high gear. Heat production by the body can cause your internal temperature to rise up to as high as 104 degrees Fahrenheit

Aerobic activities are traditionally associated with a deeper sleep.

We spend one-third of our lives asleep.

121 days per year

9,581 days in your lifetime are spent sleeping.

SLEEP RESEARCH WORLDWIDE

- *Heavy cell phone use showed an increase in sleep disorders in men and an increase in depressive symptoms in both men and women.*
- *Those constantly accessible via cell phones were the most likely to report mental health issues.*
- *Men who use computers intensively were more likely to develop sleeping problems.*
- *Regular, late night computer use was associated with sleep disorders, stress and depressive symptoms in both men and women.*
- *Frequently using a computer without breaks further increases the risk of stress, sleeping problems and depressive symptoms in women.*
- *A combination of both heavy computer use and heavy mobile use makes the associations even stronger.*

Modern technology is affecting our sleep. The artificial light from TV and computer screens affects melatonin production and throws off circadian rhythms, preventing deep, restorative sleep.

University of Gothenburg's Sahlgrenska Academy

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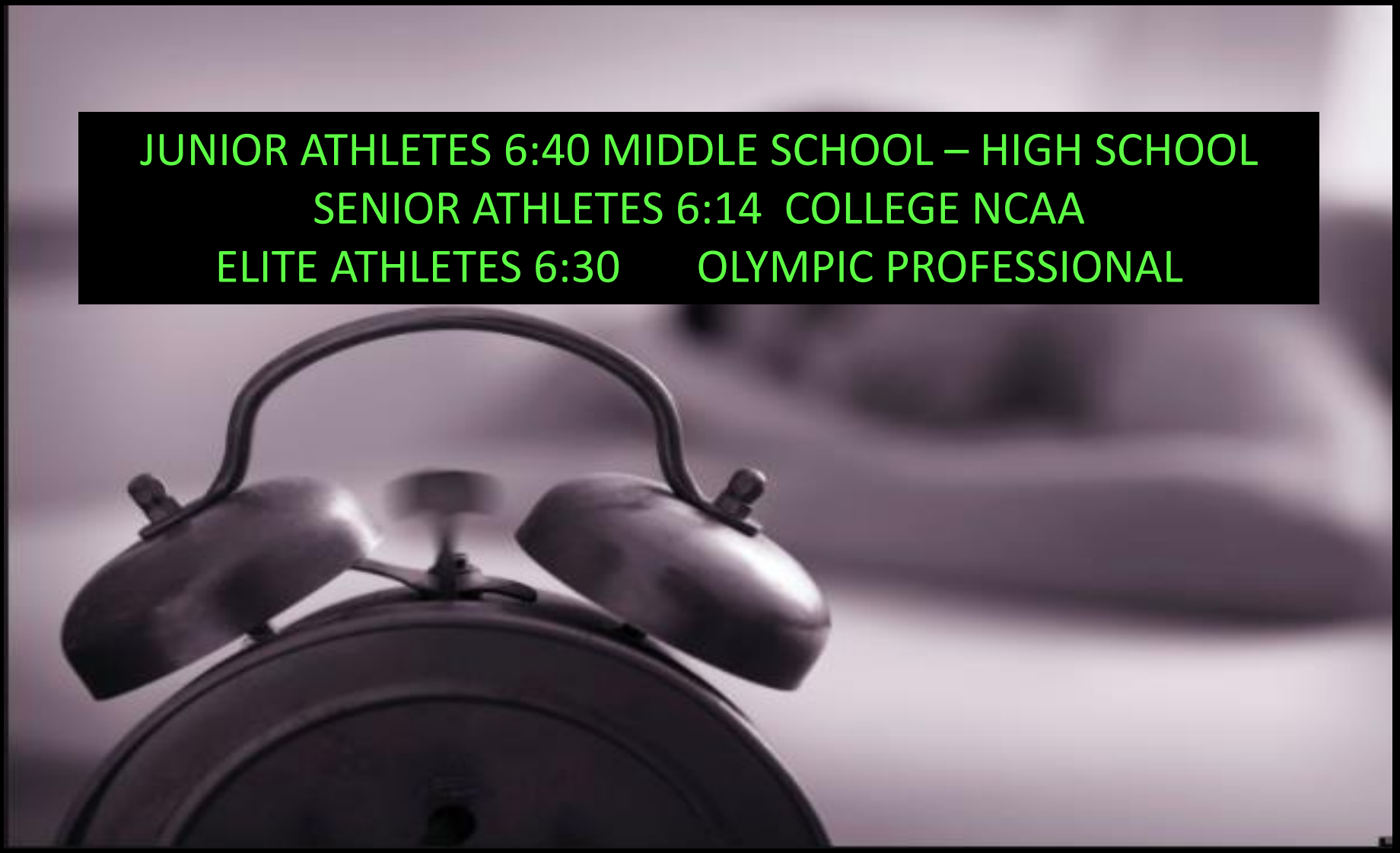
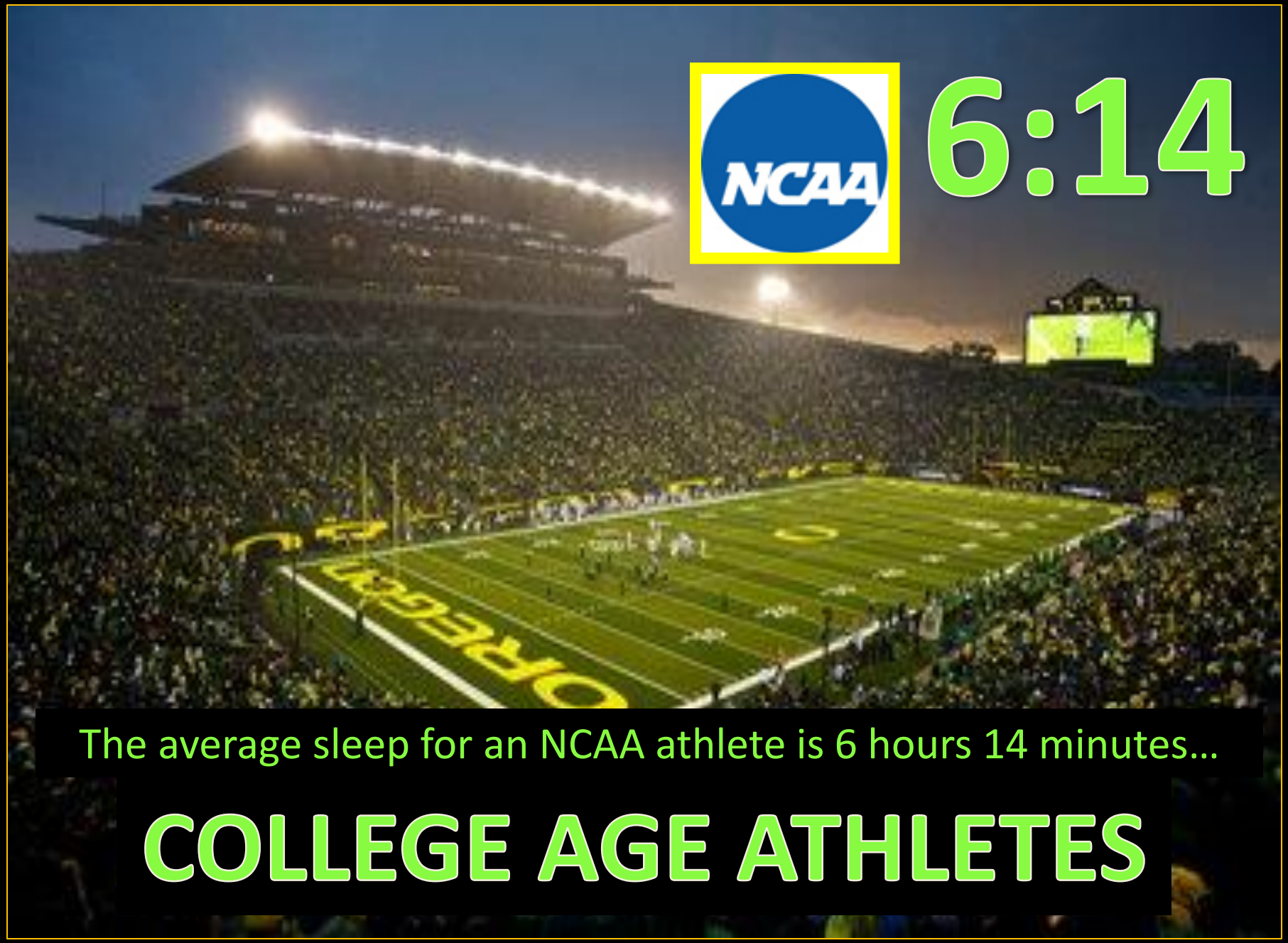
ATHLETE SLEEP SURVEYS

JUNIOR ATHLETES 6:40 MIDDLE SCHOOL – HIGH SCHOOL
SENIOR ATHLETES 6:14 COLLEGE NCAA
ELITE ATHLETES 6:30 OLYMPIC PROFESSIONAL



HIGH SCHOOL AGE ATHLETES


NCAA
6:14
The average sleep for an NCAA athlete is 6 hours 14 minutes…
COLLEGE AGE ATHLETES

TODAY'S ATHLETES

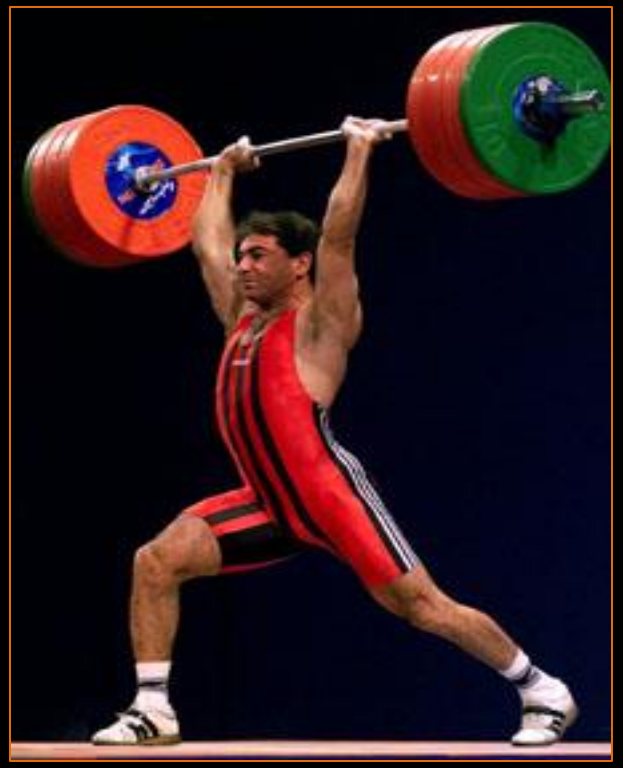
High Levels of Fatigue

Most of the time…

If you are tired most of the time…

You can get used to being tired!

Sleep Studies Athletes



The brain seems to be able to build up energy deficits or energy reserves over several days and will function at that level.

CNS READINESS

Perform Saturday

CNS Readiness begins Wednesday

M T W R F S S

Stanford University


Banged up, beat up, sore, inflamed?
Try understanding the recovery processes and you will greatly increase the quality of your training. Gains in condition and performance are limited without proper recovery methods …
SLEEP
TRAIN RECOVER COMPETE REPEAT
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Sleep and Basketball Performance

EFFECTS OF SLEEP EXTENSION ON ATHLETIC PERFORMANCE
The Effects of Sleep Extension on the Athletic Performance of Collegiate Basketball Players

SLEEP INCREASES PERFORMANCE

STANFORD UNIVERSITY

Subjects demonstrated a faster timed sprint
Shooting accuracy improved
Free throw percentage increasing by 9%
3-point field goal percentage increasing by 9.2%
Psychomotor Vigilance increased
Reaction Time Faster
Mood Elevated
Increased Energy
Decreased Fatigue

Subjects also reported improved overall ratings of physical and mental well-being during practices and games.

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STANFORD SLEEP STUDIES CHERI MAH

Extended sleep beyond one's habitual nightly sleep contributes to improved athletic performance, reaction time, < daytime sleepiness, and - mood. Improvements in all stats percentage, sprint times, reaction time, mood, fatigue, and vigor were all observed with increased total sleep time.

SLEEP PREPARATION

CREATING YOUR HEALTHY SLEEP SCHEDULE

7:00 am	**Wake up:** set a consistant time to wake each morning so your body's clock will begin to naturally wake you up.
2:30 pm	**Nap:** If you're feeling sleep deprived, a 30 minute afternoon nap is a great way to overcome sleep debt. (Set your alarm so you don't transition into deep sleep.)
6:00 pm	**No more sugar:** Eliminating sugar after dinner aids in the body's ability to fall asleep. In addition, avoid caffeine or spicy foods
8:30 pm	**Technology sunset:** Shut off/ put away all electronics 90 minutes before bed (including laptop, cell phone and TV) to avoid blue light.
9:00 pm	**Eat a banana:** Foods like bananas, cherries and walnuts help induce sleepiness.
9:00 pm	**Avoid physical activity:** Physical activity stimulates the body and mind making sleep more difficult
9:30 pm	**Pre-sleep protein:** Drink 8-10 oz. of liquid, caseine protein before sleep to promote muscle repair and to build muscle during sleep: the best time to build muscle!
10:00 pm	**Get to sleep:** In a completely dark room, with a temperature between 68-72 degrees

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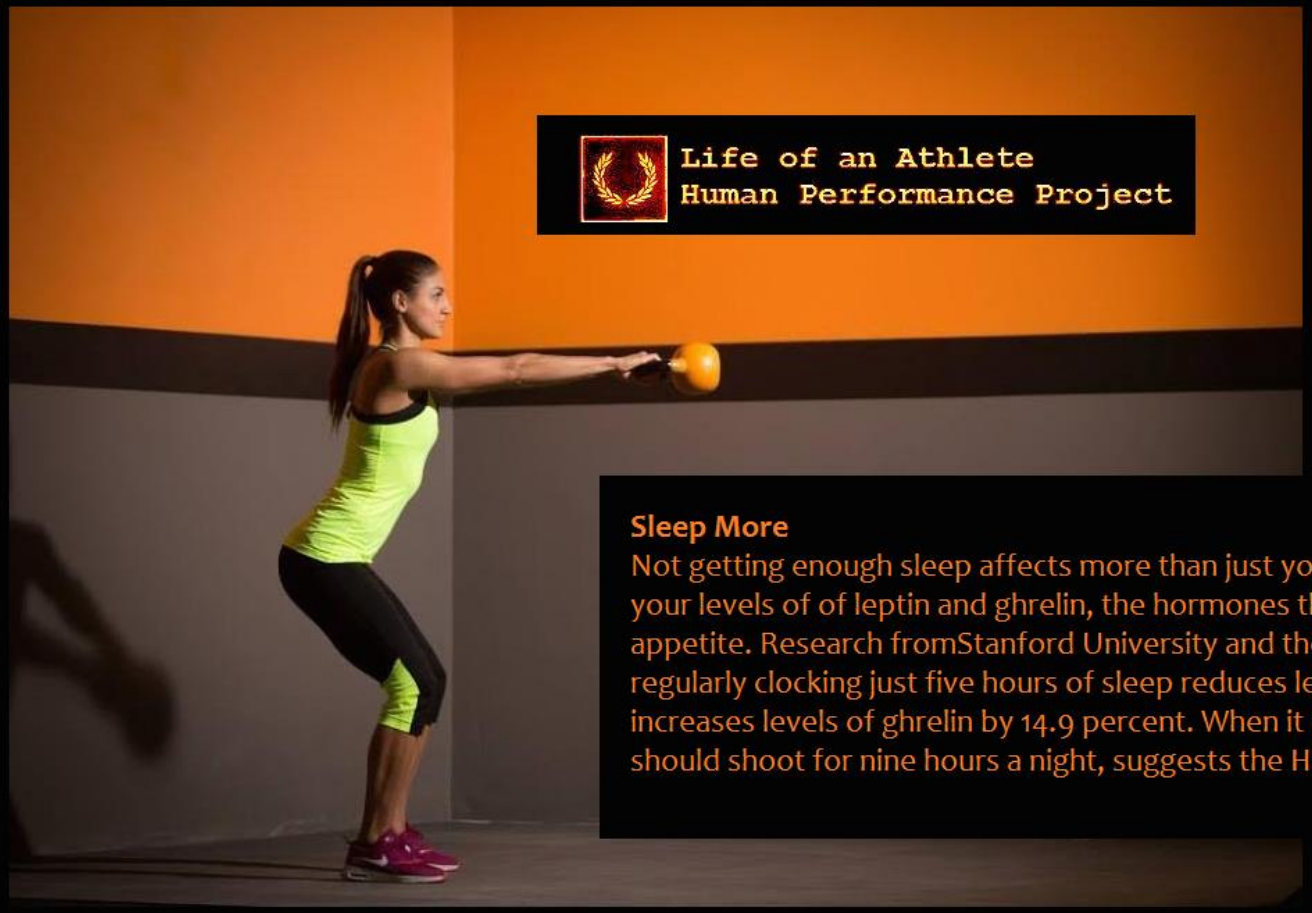
A longitudinal study of 1,101 Australian high school students aged between 13 and 16 found poor-quality sleep associated with late-night texting or calling was linked to a decline in mental health, such as depressed moods and declines in self-esteem and coping ability.

WORLDWIDE RESEARCH

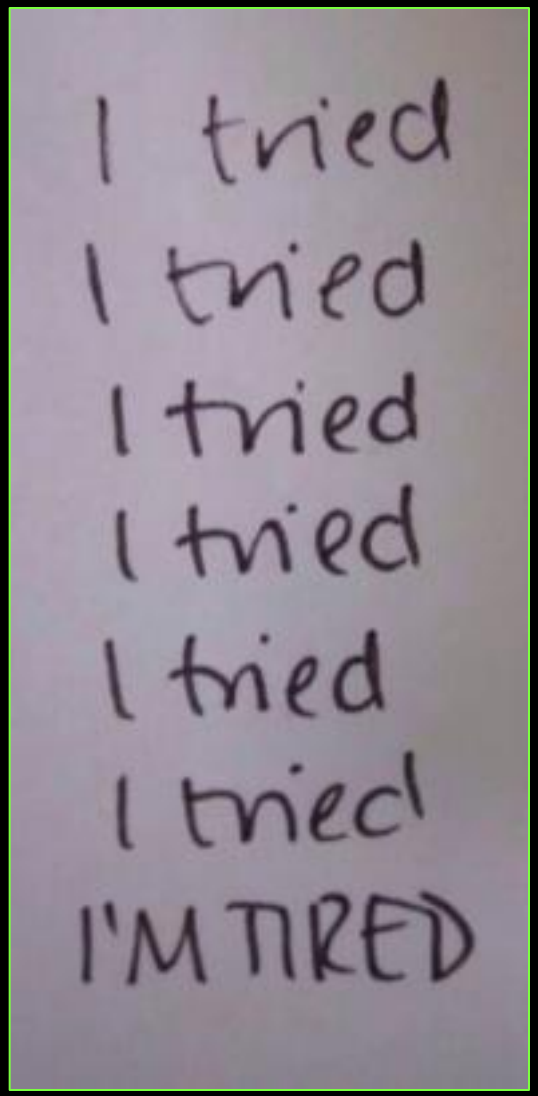


Sleep More

Not getting enough sleep affects more than just your energy the next day; it throws off your levels of of leptin and ghrelin, the hormones that help regulate energy use and appetite. Research fromStanford University and the University of Wisconsin shows that regularly clocking just five hours of sleep reduces levels of leptin by 15.5 percent and increases levels of ghrelin by 14.9 percent. When it comes to a healthy metabolism, athletes should shoot for nine hours a night, suggests the Human Performance Project!

Energy Levels Energy Use and Appetite Regulated by SLEEP

SLEEP IS THE REGULATOR



MENTAL PHYSICAL EMOTIONAL

Sleep is an absolute predictor of performance…
The more you sleep, the better you play…

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Lifestyle Strikes Back

Sleep

Now Clearly a Predictor of Performance

John Underwood, President & Founder, American Athletic Institute

Without any question the brain and central nervous system play the most significant role in optimal physical performance. Every movement emanates from brain CNS impulses. For an elite athlete, the CNS controls every aspect of performance potential, including function of skills, biomechanical exact movements, the firing sequences of muscles during activity, reflexes and reaction and countless interrelated physiological functions, including both the central system (heart and lungs) and the peripheral system (muscles). The most significant factor in the brain and CNS functioning at an optimal level is that it is rested. This has been documented throughout decades of studies on reflexes, reaction and many other variables which measure CNS readiness. Recent studies centering on sleep and rest as a factor in optimal physical performance have proved conclusively that sleep is clearly a predictor of performance in any skill based sport.

SO WE DID SOME SURVEYS…

No wonder you can't perform!

LOA HPP Sleep Surveys Middle and HS Athletes showed:

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27% < 6 HOURS 17% 8 HOURS>
Average sleep was 6:40

NCAA

6 HOURS 14 MINUTES

No wonder you can't perform!

ATHLETE SLEEP SURVEYS

ELITE ATHLETES 6:30 OLYMPIC PROFESSIONAL

SLEEP Connections

- 39% awaken feeling un-refreshed, fatigued or tired.
- 31% said they seldom get a good night sleep.
- 28% reported less than six hours of sleep per night
- 18% reported getting eight hours or more per night
- HS Average Sleep per night was 6 hours 40 minutes