SLEEP
RECOVERY

OPEN
24 HRS

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


28 OLYMPIANS


SPORT CANADA
TEAM USA
Getty


NFL


NHL


NBA

HUMAN
PERFORMANCE
PROJECT

CANADA
BRAZIL
ROMANIA
FINLAND
JAPAN
PUERTO RICO
CHINA
SOUTH AFRICA
AUSTRIA


HUMAN PERFORMANCE PROJECT

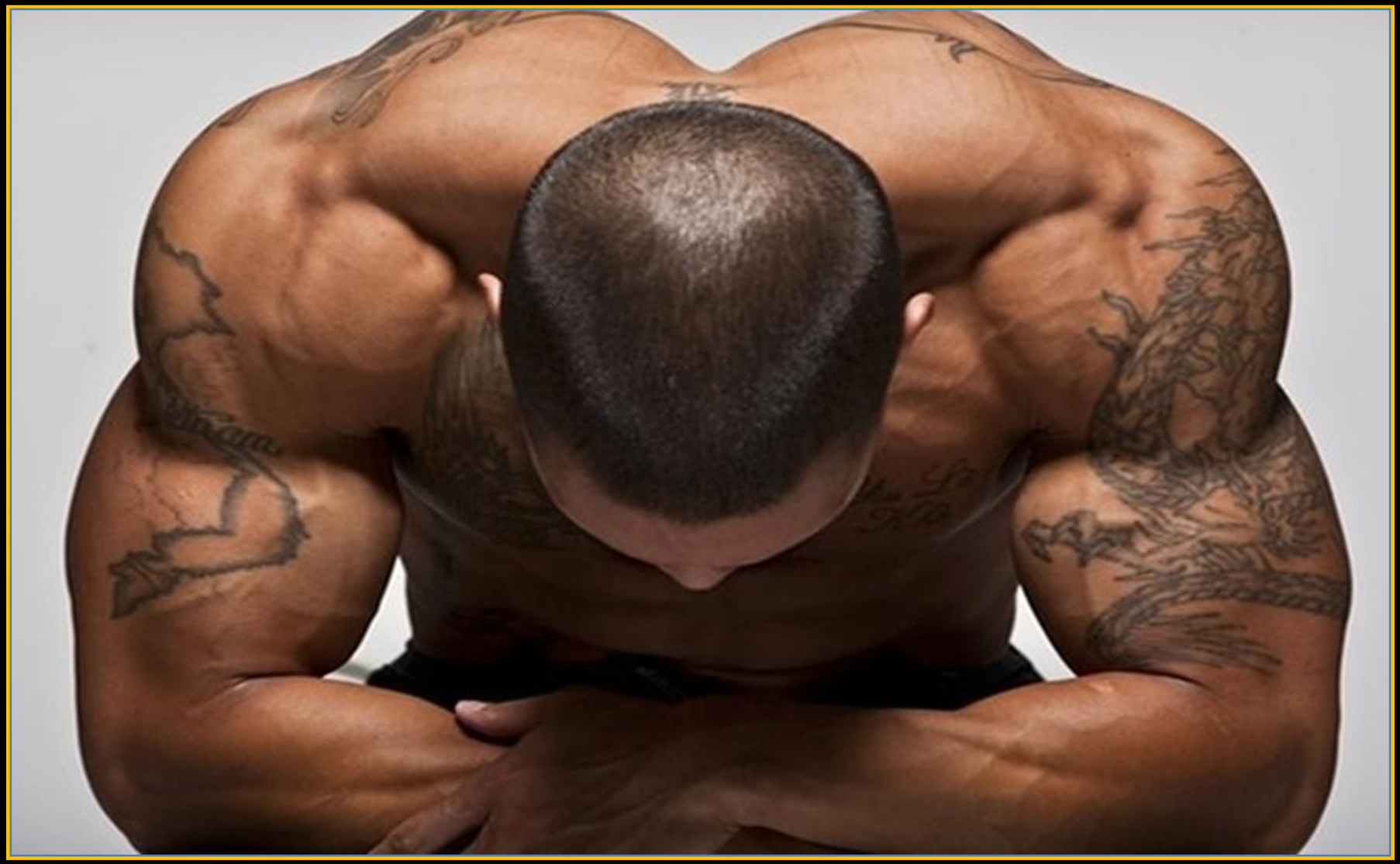
U.S. Navy SEALS

Naval Special Warfare

The SEALS met Underwood, who had studied in Finland for three years, at the U.S. Olympic Training Center in Lake Placid, N.Y., and asked for his help in changing the way SEALs trained.

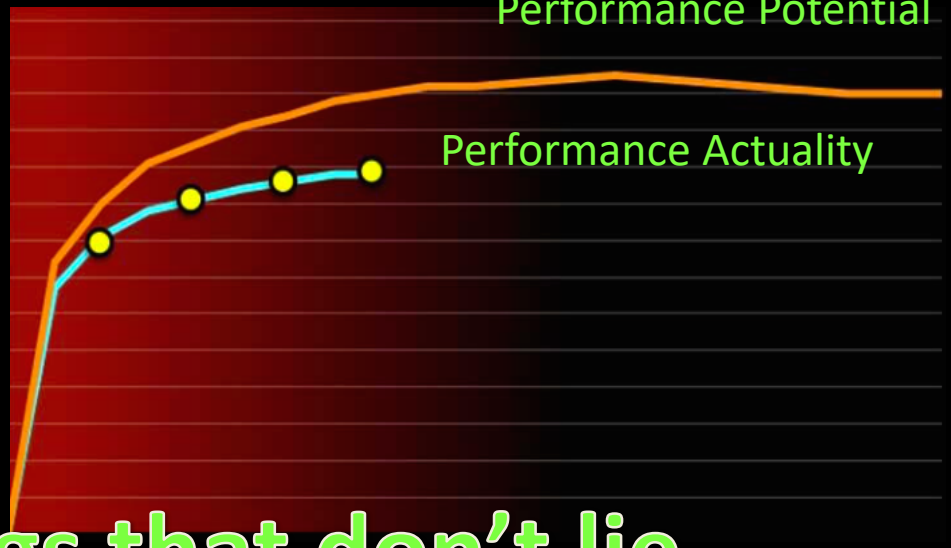
Sports Illustrated

NSWG2 Laboratory



Naval Special Warfare

108-0



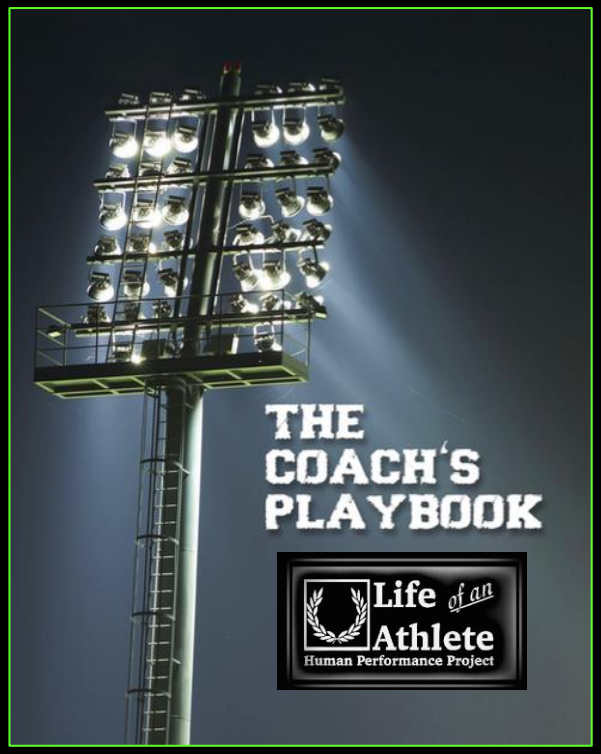
The only things that don't lie

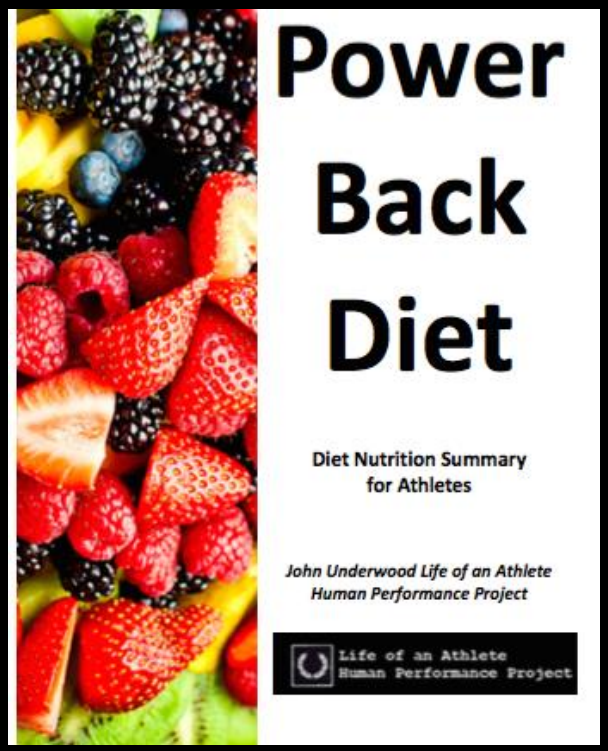
Science and results

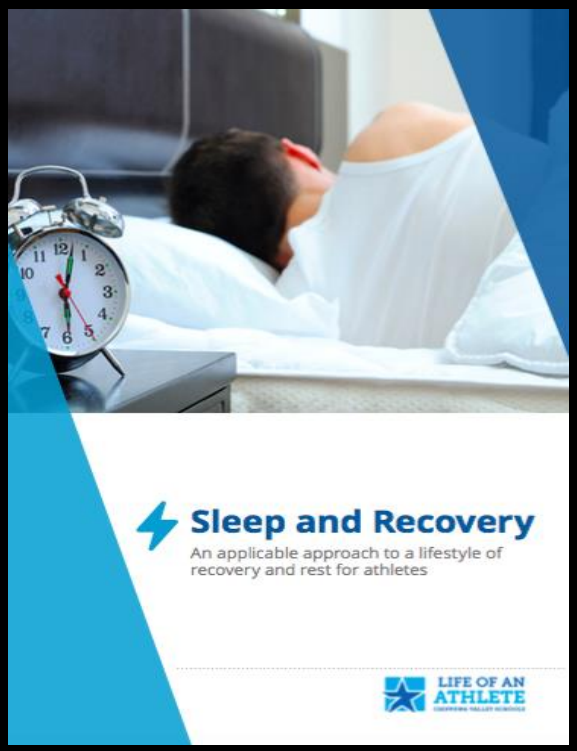
This ain't no guessing game…

Human Performance Project

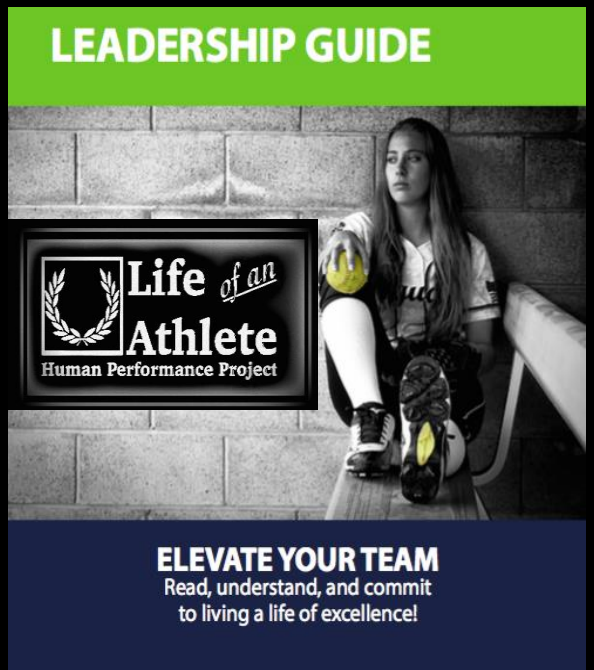
A science based approach to performance


THE COACH'S PLAYBOOK
Life of an Athlete
Human Performance Project


Power Back Diet
Diet Nutrition Summary for Athletes
John Underwood Life of an Athlete Human Performance Project
Life of an Athlete Human Performance Project

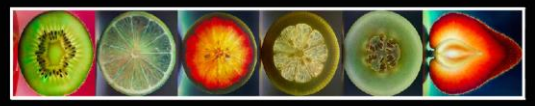

Sleep and Recovery
An applicable approach to a lifestyle of recovery and rest for athletes
LIFE OF AN ATHLETE


Coaches Super Clinic
Life of an Athlete
Human Performance Project


LEADERSHIP GUIDE
Life of an Athlete
Human Performance Project
ELEVATE YOUR TEAM
Read, understand, and commit to living a life of excellence!


HELP
STRESS IS
KILLING YOU
Mental Wellness for Top Performance
High Expectations Bring High Stress
We expect so much from our youth today academically, athletically, in activities and in the jam packed schedules they keep during their waking hours. One in four of them will develop mental health related issues during their teen years. We are asking them to perform at high levels without even giving them the tools to make it happen. This guide is to help them understand a healthy outlook to high level performance and skills to deal with the stress and stressors they face today in their daily lifestyle.

Athletes and Nutrition



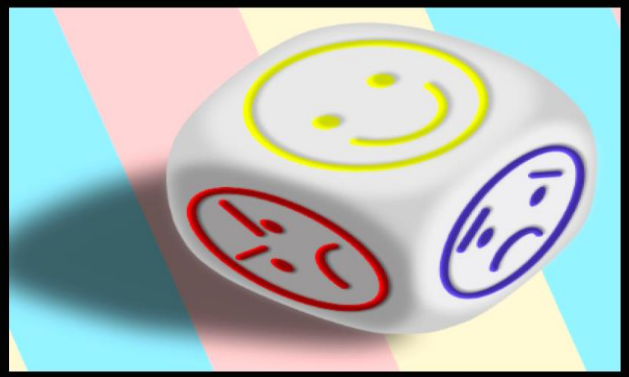
Power Back Diet

Life of an Athlete
Human Performance Project

Athletes and Recovery

Athletes and Marijuana

Athletes and MOOD



Athletes and Training

Athletes and Alcohol

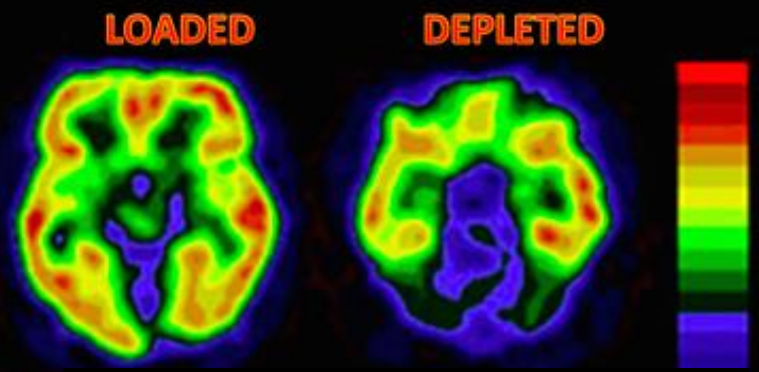
LIFE OF AN ATHLETE
Human Performance Project

Athletes and Stress

Life of an Athlete
Human Performance Project

Athletes and Technology

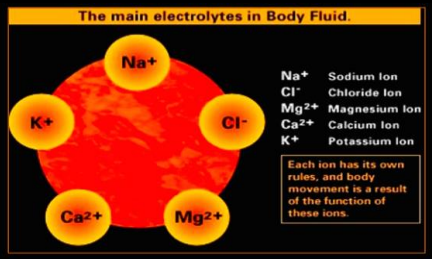
Athletes and Sleep



Athletes and Neurotransmitters

Athletes and Blue Light

ATHLETE LEADERSHIP



ATHLETES AND ELECTROLYTES

ATHLETES AND FATIGUE

Fatigue status changes over minutes hours and days...
There are no patterns that are predictable...
Every stress and stressor contributes to levels of fatigue...

FATIGUE STATUS

RECOVERY AND LIFESTYLE

The Human Performance Project

JOHN UNDERWOOD

USE EVERY ASSET

1% FACTOR

THE 100m FINAL OLYMPIC STADIUM, LONDON, AUG 5 2012

WIND SPEED +1.5m/s

LANE 9	LANE 8	LANE 7	LANE 6	LANE 5	LANE 4	LANE 3	LANE 2
Churandy Martina HOL	**Ryan Bailey** USA	**Usain Bolt** JAM	**Justin Gatlin** USA	**Yohan Blake** JAM	**Tyson Gay** USA	**Asfa Powell** JAM	**Richard Thompson** TRI
TIME 9.94sec	**TIME** 9.88	**TIME** 9.63 (OR)	**TIME** 9.79	**TIME** 9.75	**TIME** 9.80	**TIME** 11.99	**TIME** 9.98
POSITION 6th	**POSITION** 5th	**POSITION** 1st	**POSITION** 3rd	**POSITION** 2nd	**POSITION** 4th	**POSITION** 8th	**POSITION** 7th
REACTION TIME 0.139sec	**REACTION TIME** 0.176sec	**REACTION TIME** 0.165sec	**REACTION TIME** 0.178sec	**REACTION TIME** 0.179sec	**REACTION TIME** 0.145sec	**REACTION TIME** 0.155sec	**REACTION TIME** 0.160sec
PERSONAL BEST 9.91sec	**PERSONAL BEST** 9.88sec	**PERSONAL BEST** 9.58	**PERSONAL BEST** 9.79	**PERSONAL BEST** 9.75	**PERSONAL BEST** 9.69	**PERSONAL BEST** 9.72	**PERSONAL BEST** 9.85

9.63

9.98

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.


SPIRIG
SUI
NORDÉN
SWE

Gold and Silver

0.001

1 GBR PENDLETON
2 AUS MEARES +0.001

OMEGA

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

REST.

(it's part of the program!)

Life of an Athlete
Human Performance Project

REPAIR
RESTORE
REBOOT
RELOAD
REFUEL
REINFORCE

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

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

John Underwood Human Performance Project

How fast you can recover!

QUALITY OF TRAINING

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

The first hour

70 20 10 Rule

Turn around time

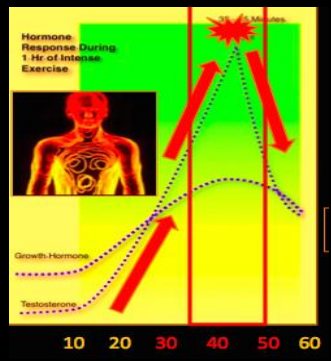
METABOLIC →

Metabolism Changes
Ex. Fuels Thermal NTs
Alertness Focus

STRUCTURAL →

Primary failure/ Core/
Skeletal/ Postural

ENDOCRINE →

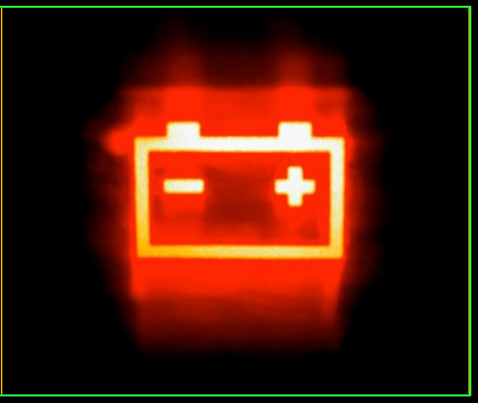


Hormonal
Decline

NEURO-MUSCULAR

Signal / Neural Drive/ Misfires
NT's /Neural Fatigue

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

Life of an Athlete Human Performance Project

PERFORMANCE

TRAIN

RECOVER

ADAPT

The Human Performance Project

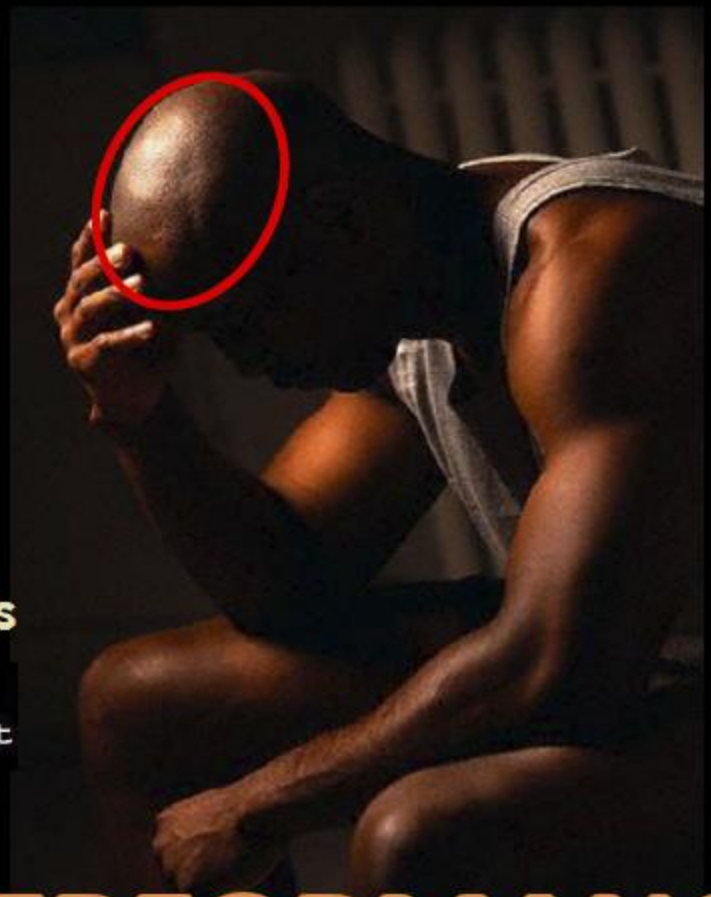
JOHN UNDERWOOD

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.

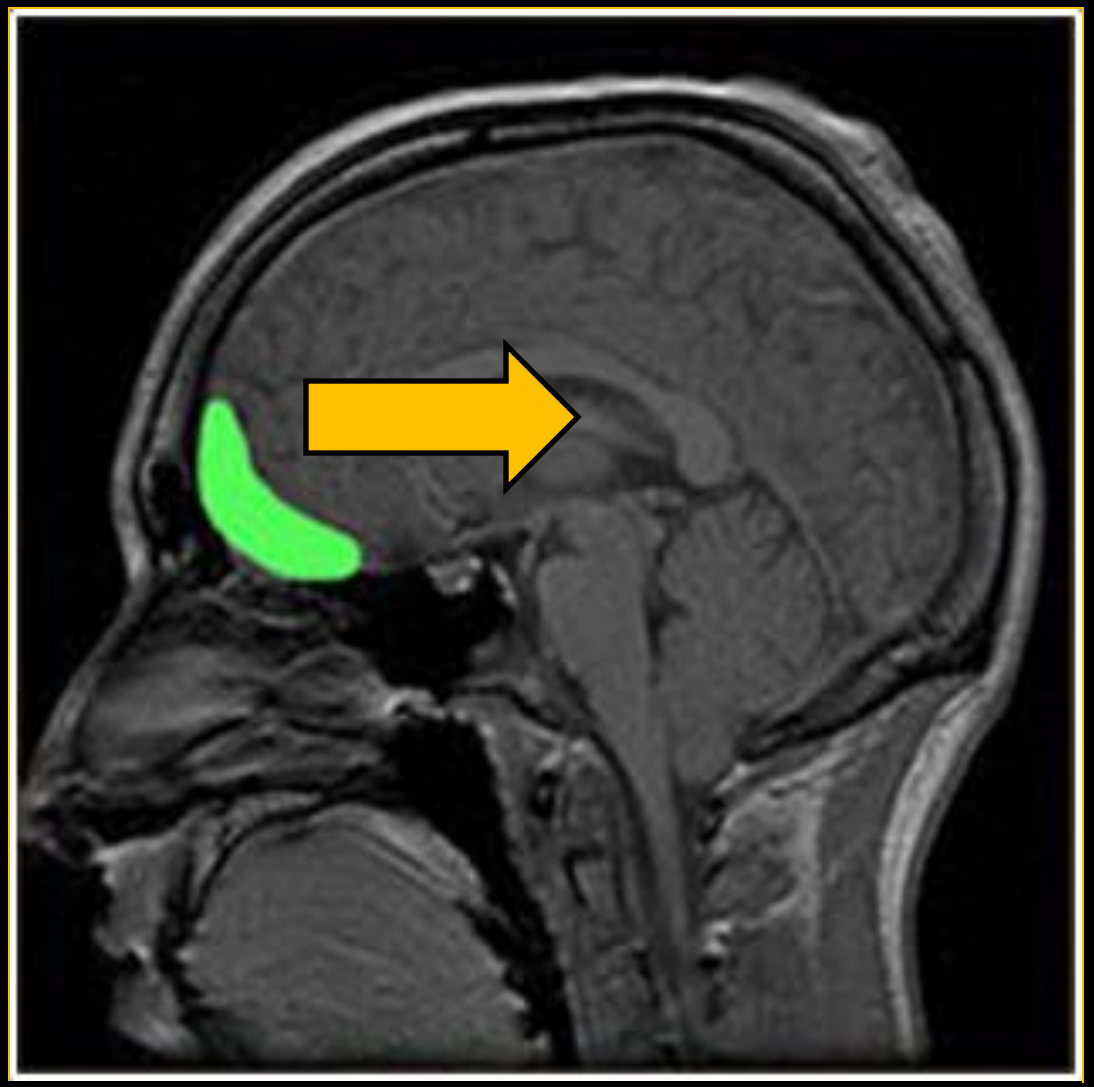


Pay Attention to Recovery Details

Life of an Athlete
Human Performance Project

INCONSISTANT PERFORMANCE #1 SUSPECT

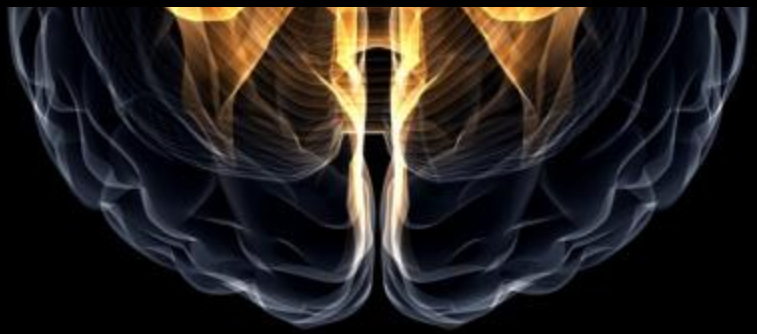
TIRED BRAIN



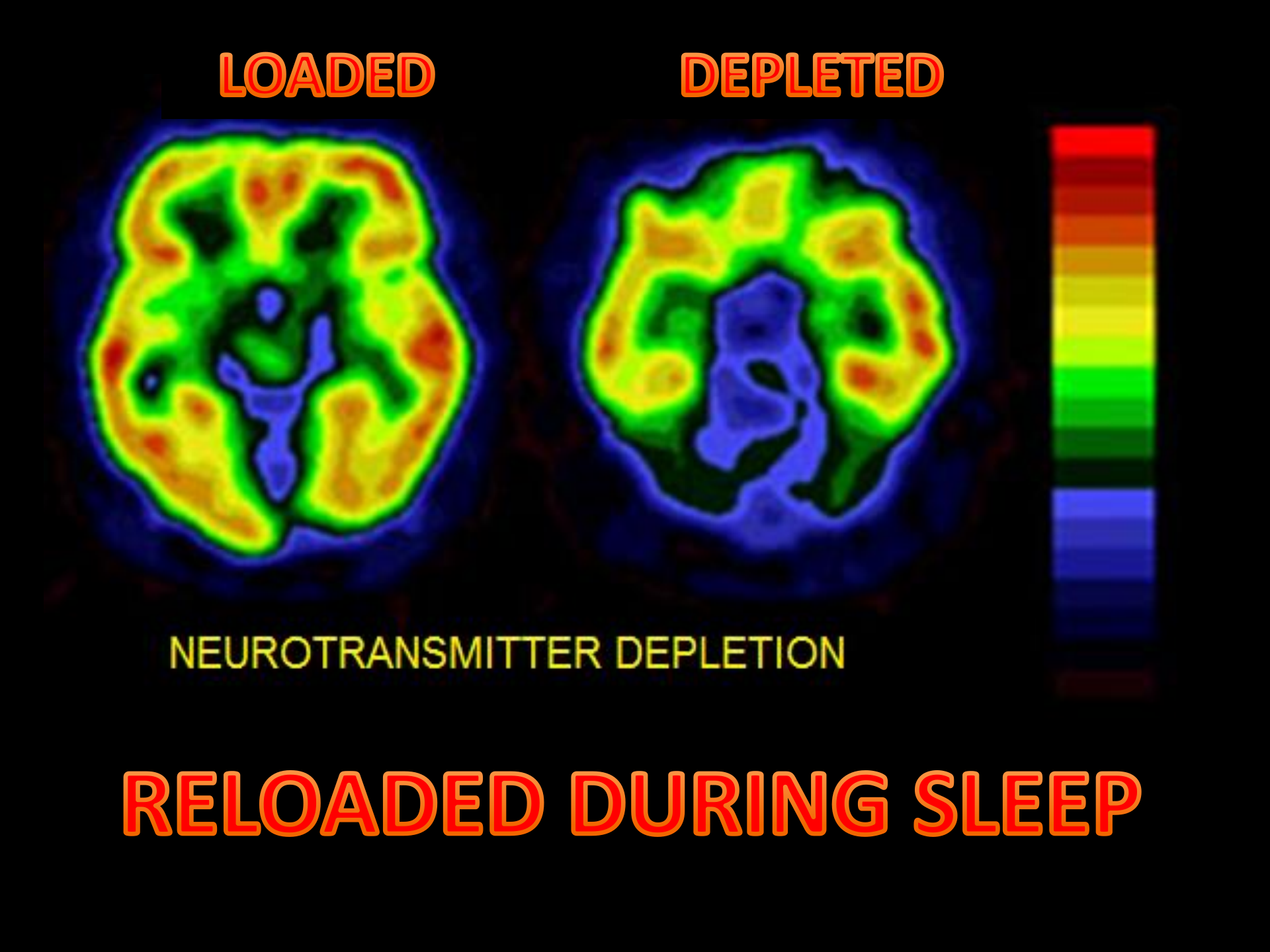
Neural fatigue in processing (FRONTAL CORTEX) fatigues other regions of brain function…

NEURAL FATIGUE

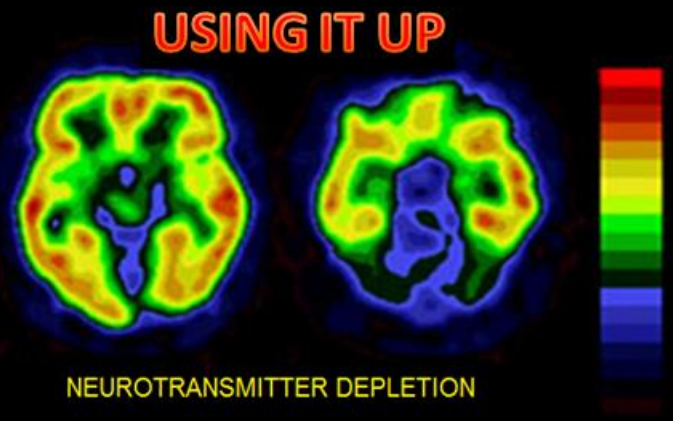
TOTAL QUALITY MOVEMENTS



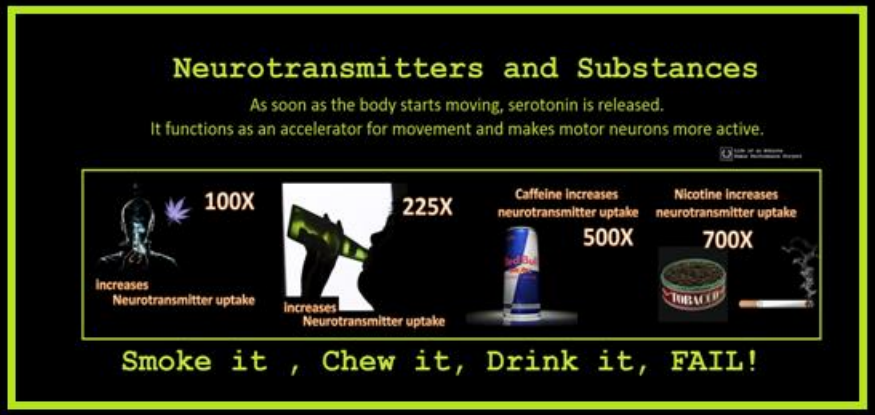
Life of an Athlete
Human Performance Project


LOADED
DEPLETED
NEUROTRANSMITTER DEPLETION
RELOADED DURING SLEEP

ACCELERANTS



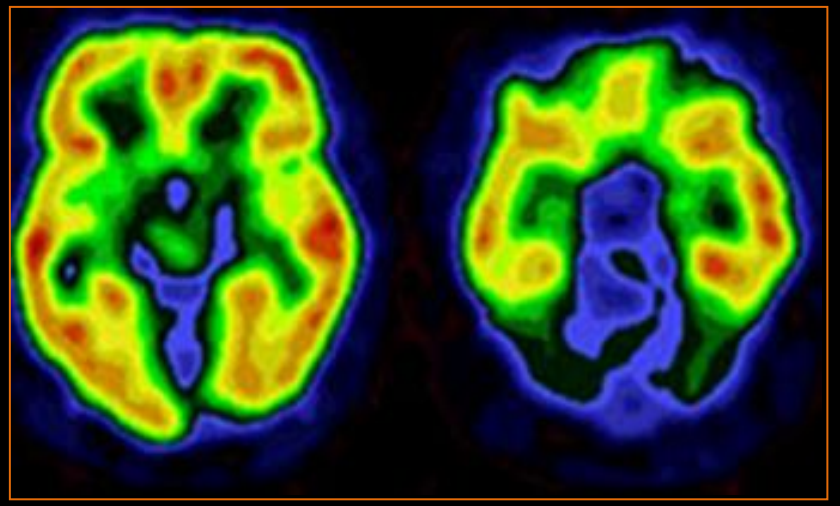
The importance of the connection between serotonin and dopamine stems from the balance that must be maintained within the body for brain /body function



Using substances, uses up the chemicals your brain needs for high level mental and physical performance!

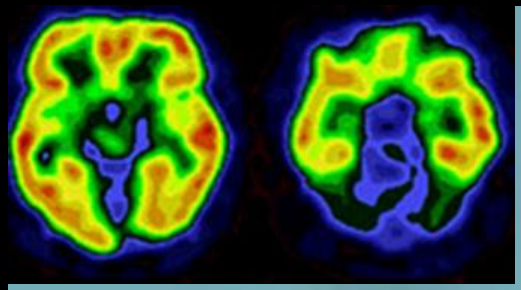
Life of an Athlete
Human Performance Project

DEPLETED DOPAMINE



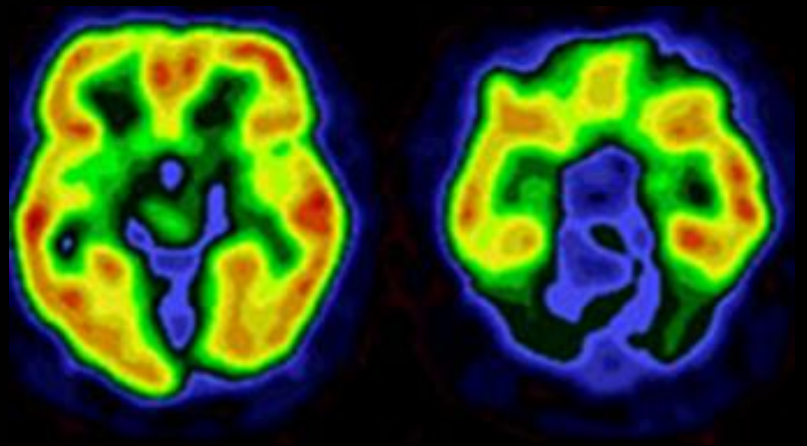
DECREASED MOTIVATION

350X



Caffeine increases neurotransmitter uptake

500X



Stimulant Users have high level CNS trauma when they come off effects…

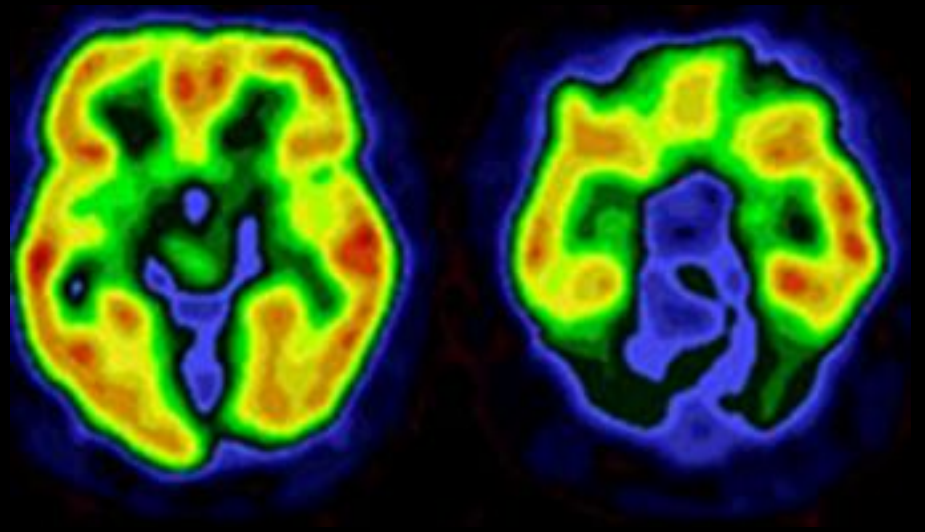
AFTER EFFECTS:

CNS Neural Fatigue
Sensitivity to Light
Irritability Anxiety
Weakness Fatigue
<Sleep Quality /Quantity
Moodiness Negative Mood
Decreased Appetite
>DOMS and Muscle Soreness.

NEURAL FATIGUE INFLAMMATION

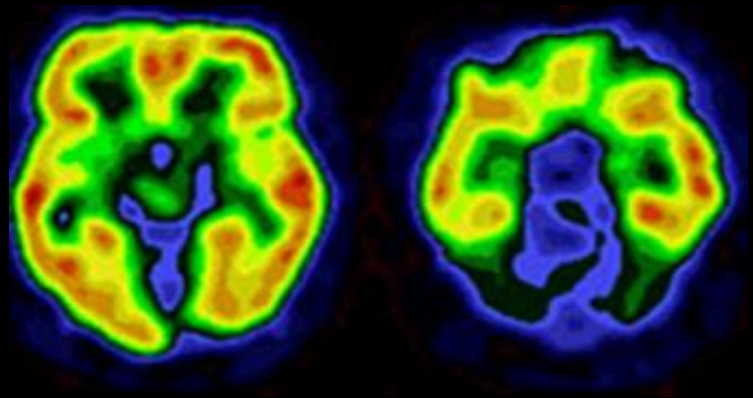
Nicotine increases neurotransmitter uptake

700X

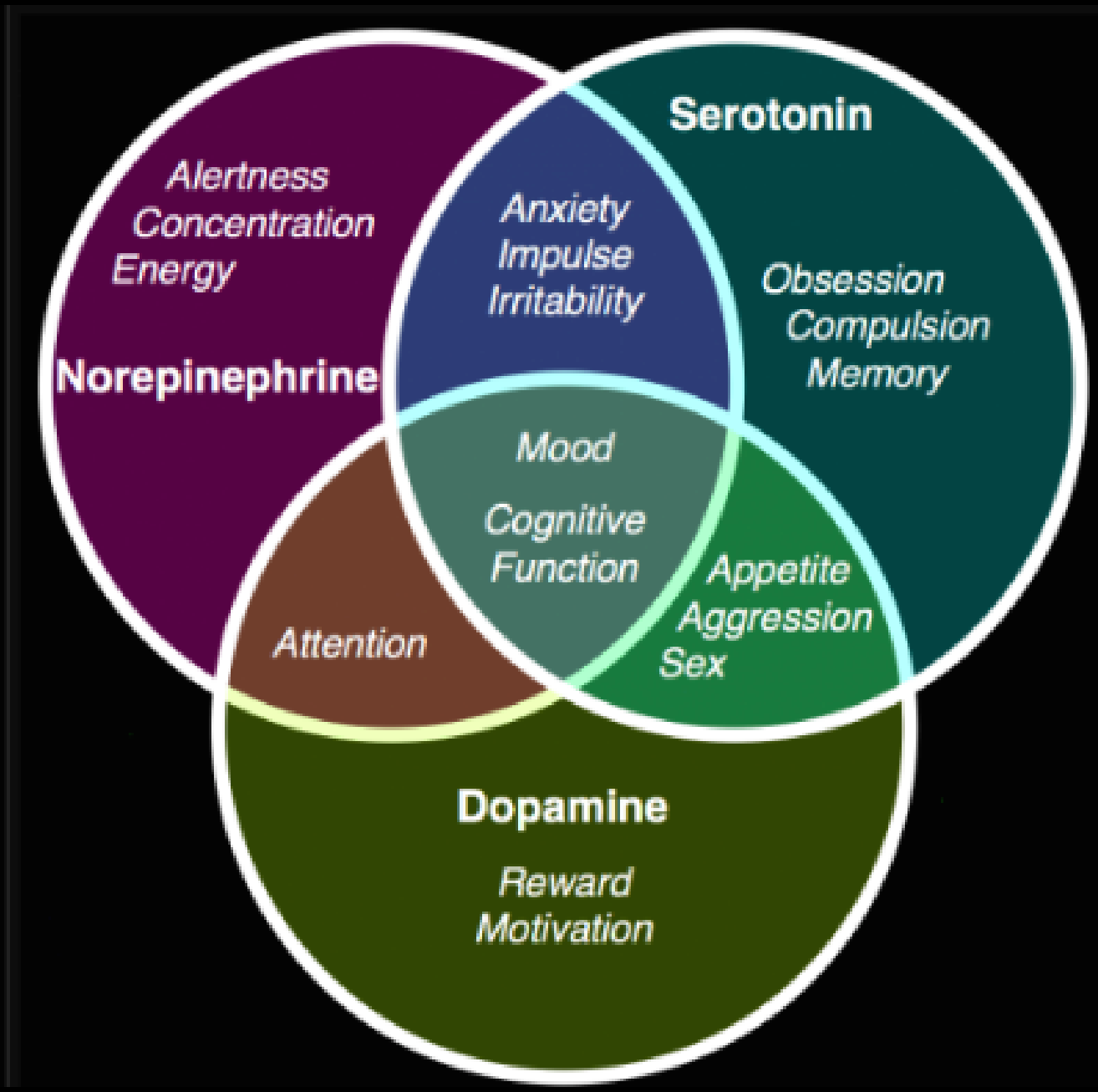


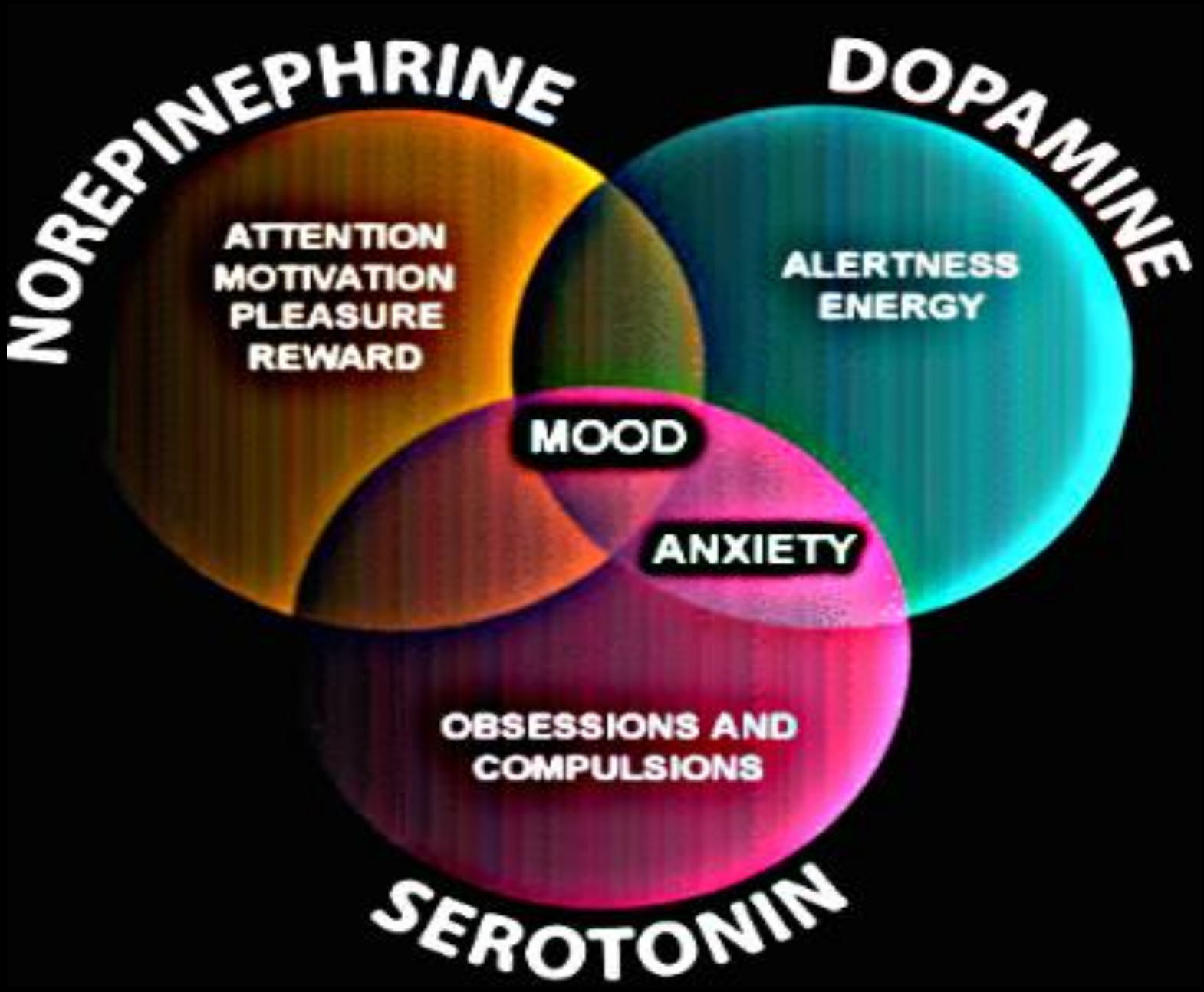

225X
Neurotransmitter uptake

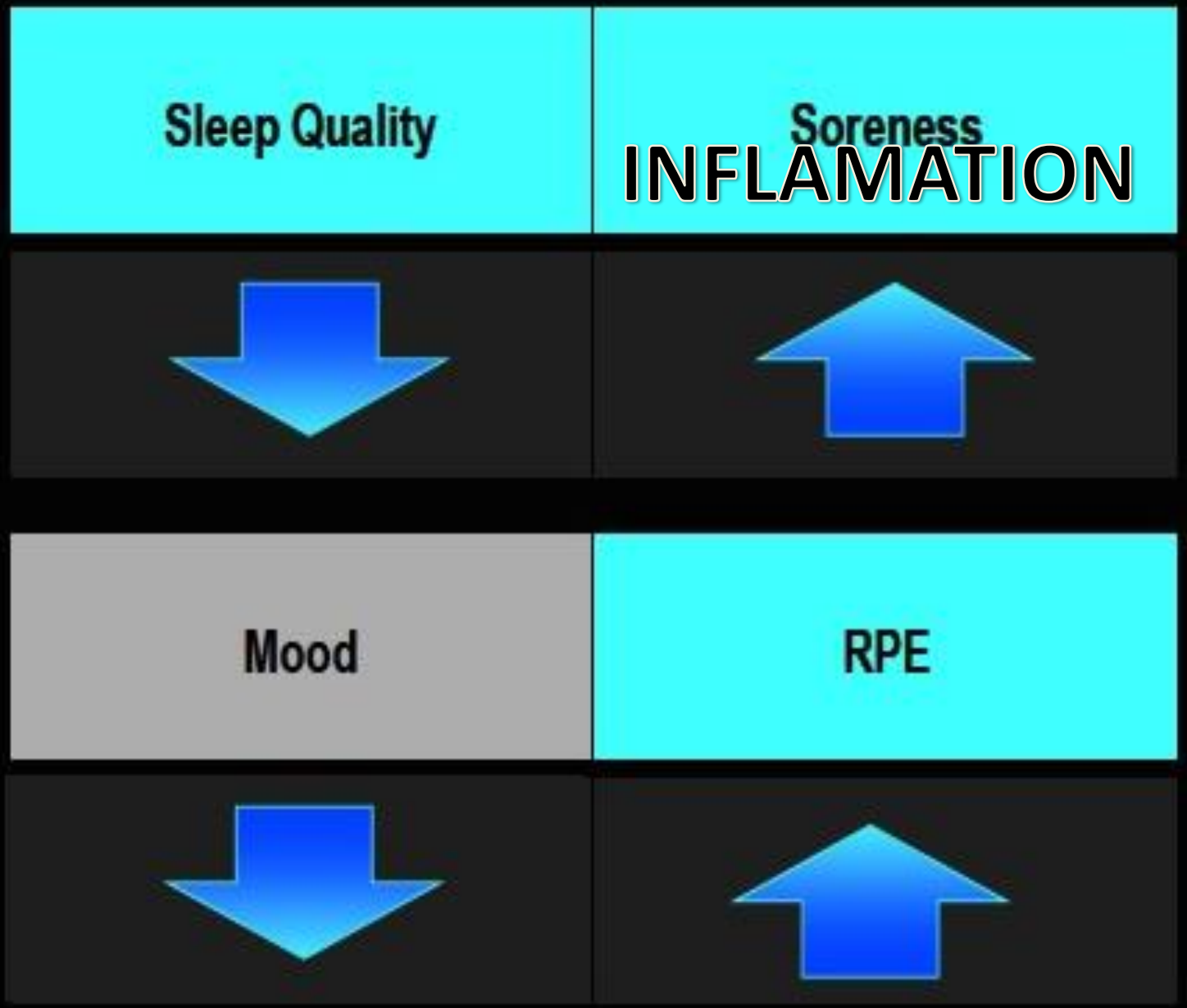
100X



Neurotransmitter uptake

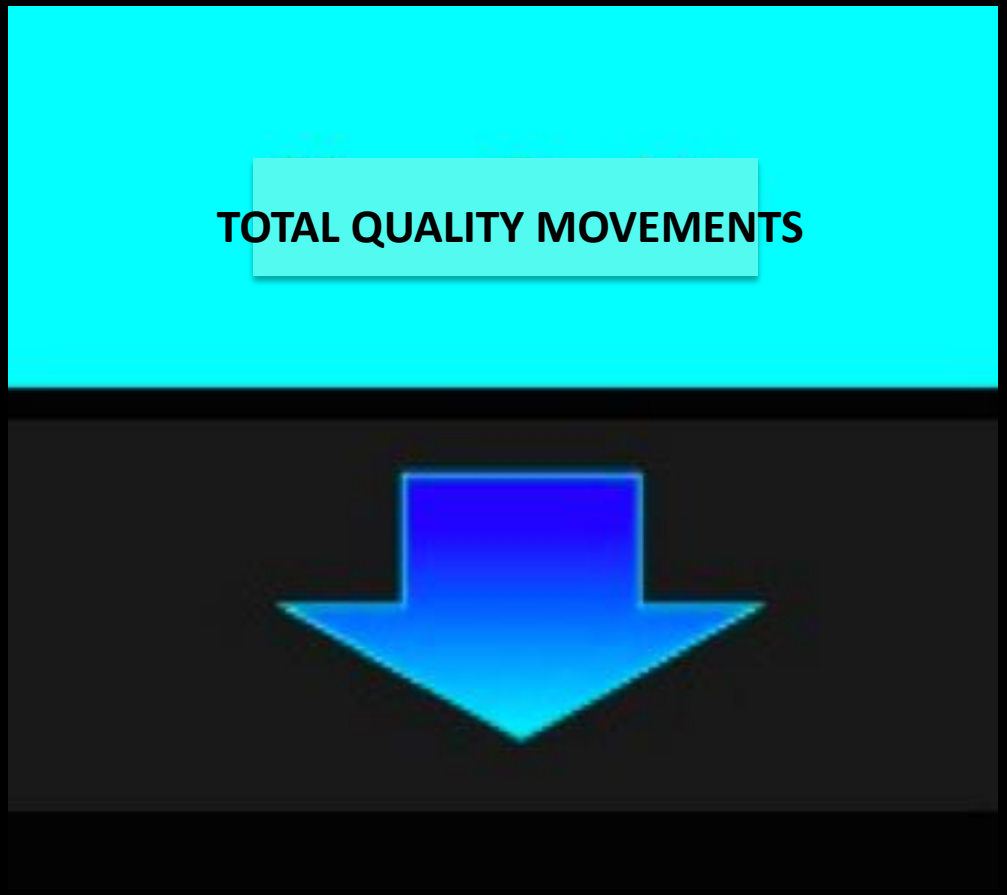

Alertness
Concentration
Energy
Norepinephrine
Serotonin
Anxiety
Impulse
Irritability
Obsession
Compulsion
Memory
Mood
Cognitive
Function
Attention
Appetite
Aggression
Sex
Dopamine
Reward
Motivation


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



Baylor AP 2016

TOTAL QUALITY MOVEMENTS



8.0 HOURS

6.5 HOURS

ALERTNESS

SLEEP

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

Life of an Athlete

30% <


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

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

Life of an Athlete
Human Performance Project


Sleep

SLEEP QUALITY SLEEP QUANTITY

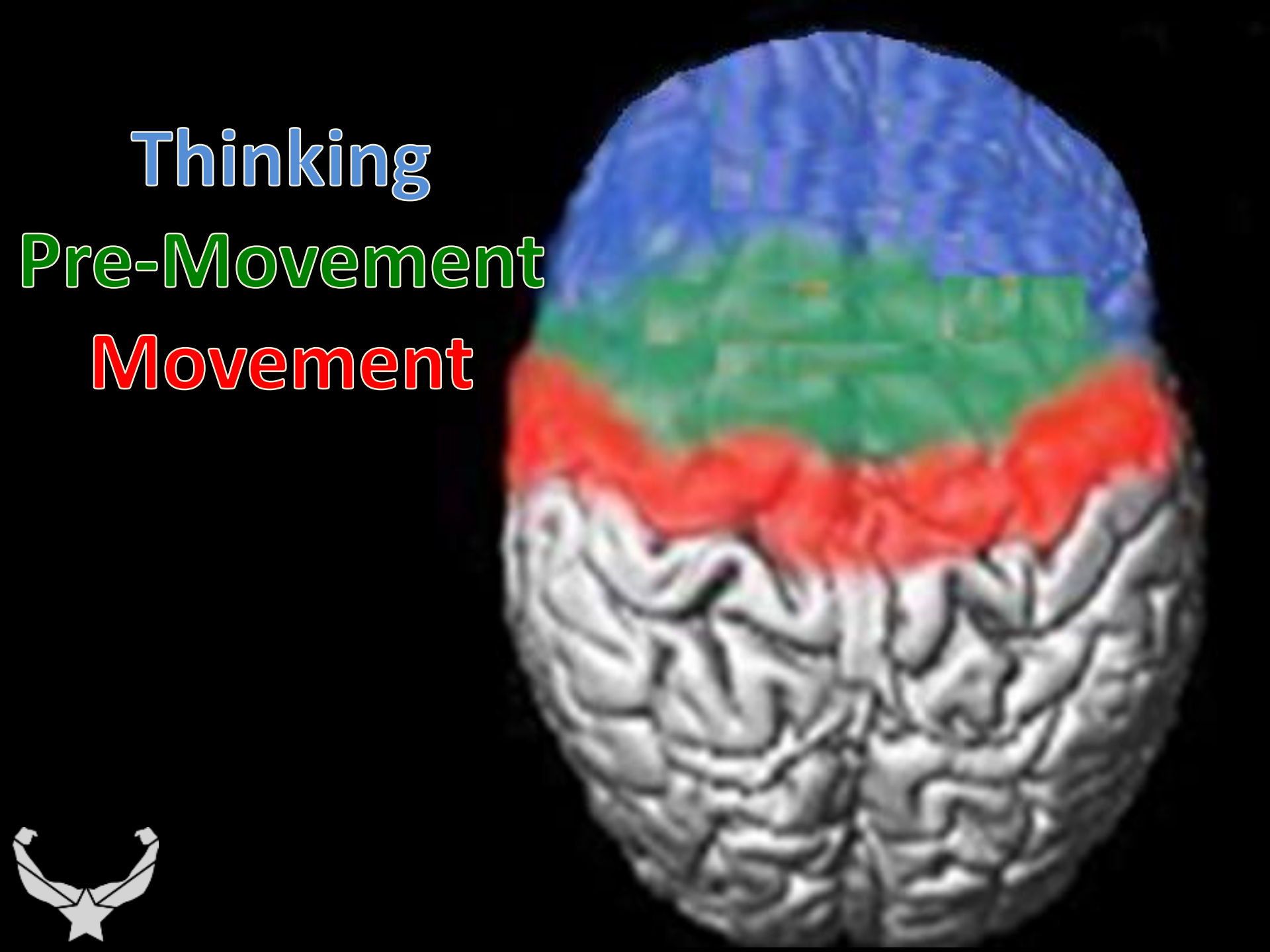
You have to have sufficient SLEEP QUANTITY
to accumulate enough SLEEP QUALITY

Life of an Athlete
Human Performance Project

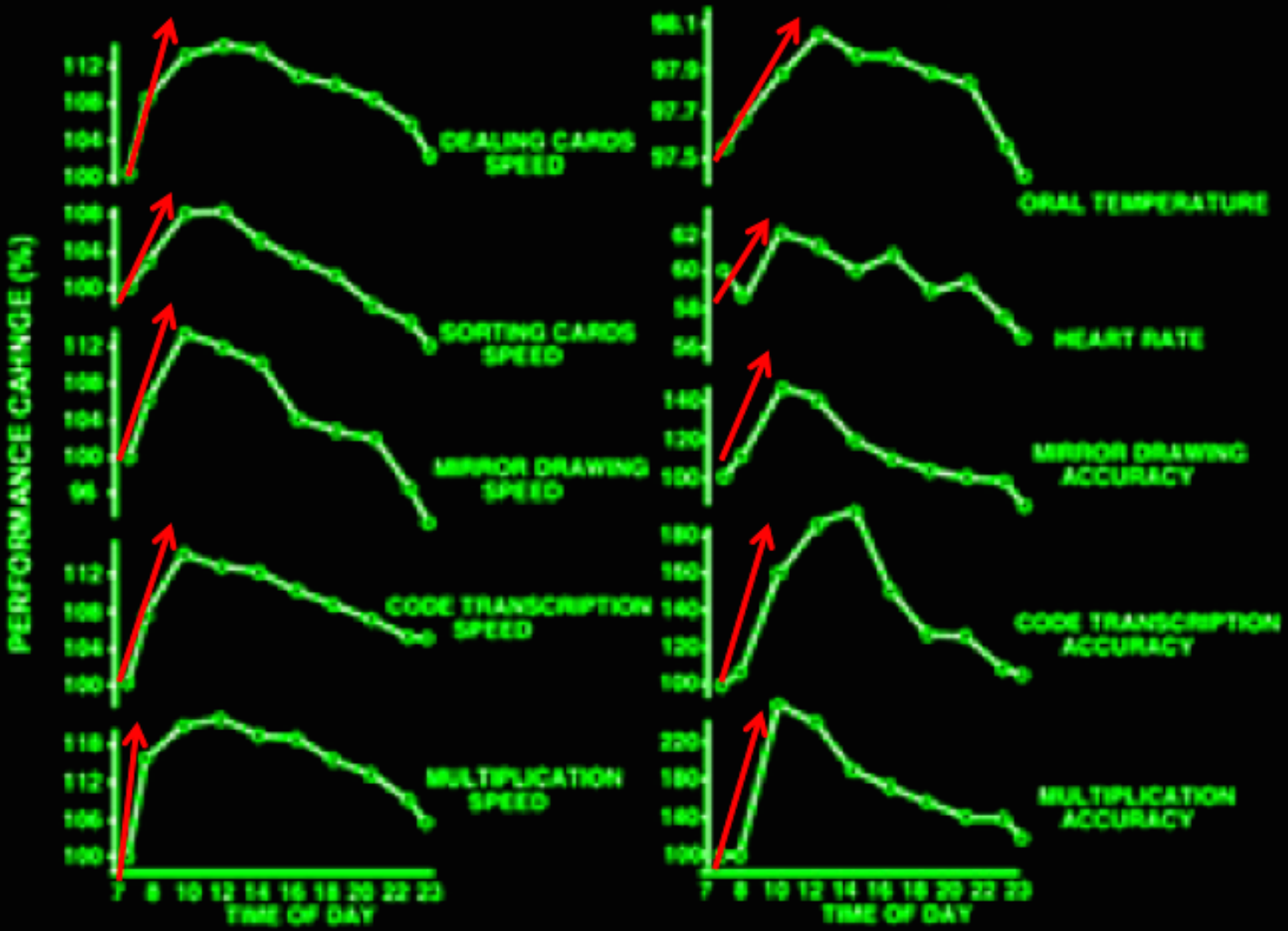
Thinking

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

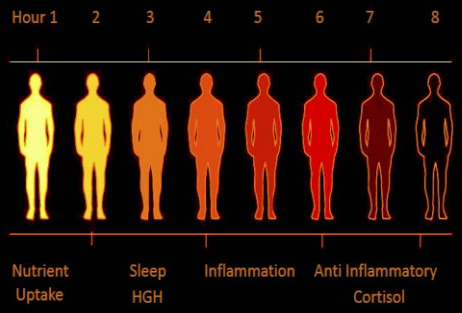

90% OF MAX

CNS TAKES A HUGE HIT

MAY TAKE UP TO 48 HRS TO COME BACK

CHEMICAL MESSENGERS

Athletes need timelines



LIFE OF AN ATHLETE
Human Performance Project

Even Elite Athletes

LIFE OF AN ATHLETE
Human Performance Project

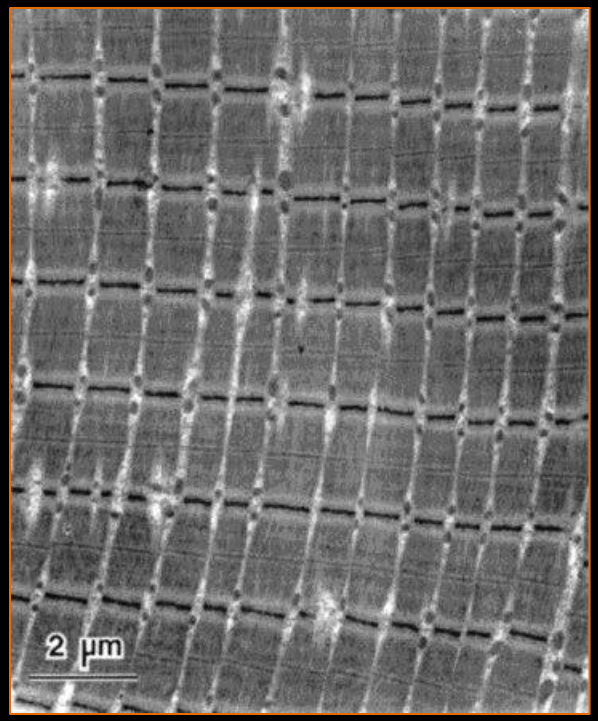
DAMAGE REPORT

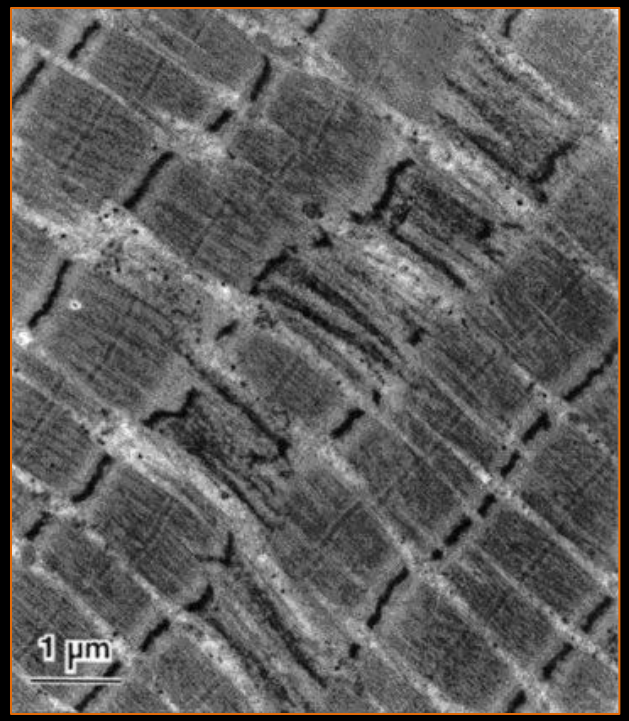
MUSCLE DAMAGE
BLEEDS
OVERSTRETCHED
MICROTEARS
FLUID ACCUMULATION
RESIDUE
MYOKINES
PH DAMAGE
HYPOXIC DAMAGE
BRUISING
SWELLING
FRICTION HEAT DAMAGE
COMPRESSION DAMAGE
PERCUSSION DAMAGE
COMPARTMENT DAMAGE
GRAVITATIONAL DAMAGE

DAMAGE REPAIR

SLEEP HAS BIGGEST IMPACT

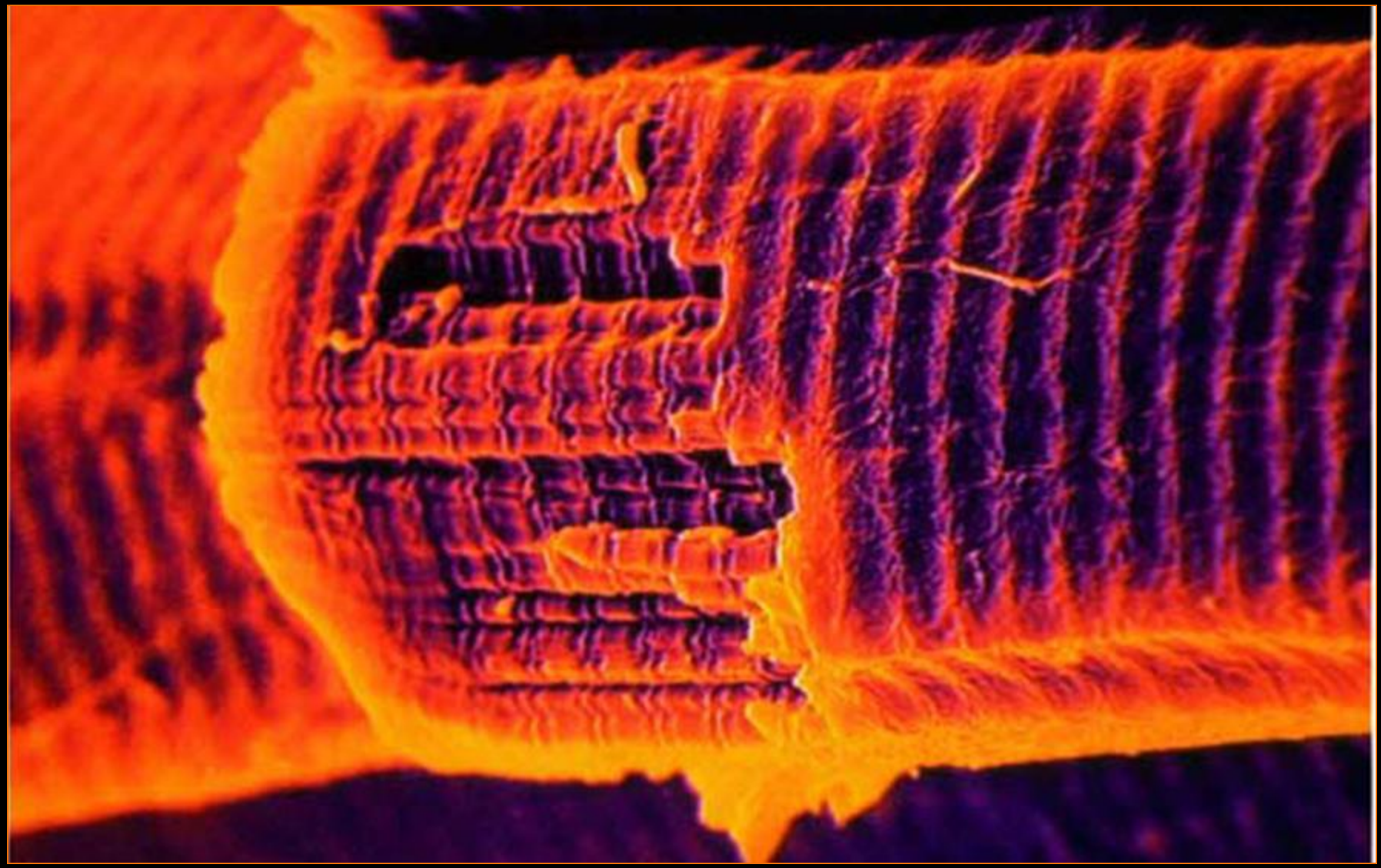
REPAIR REBUILD REFUEL



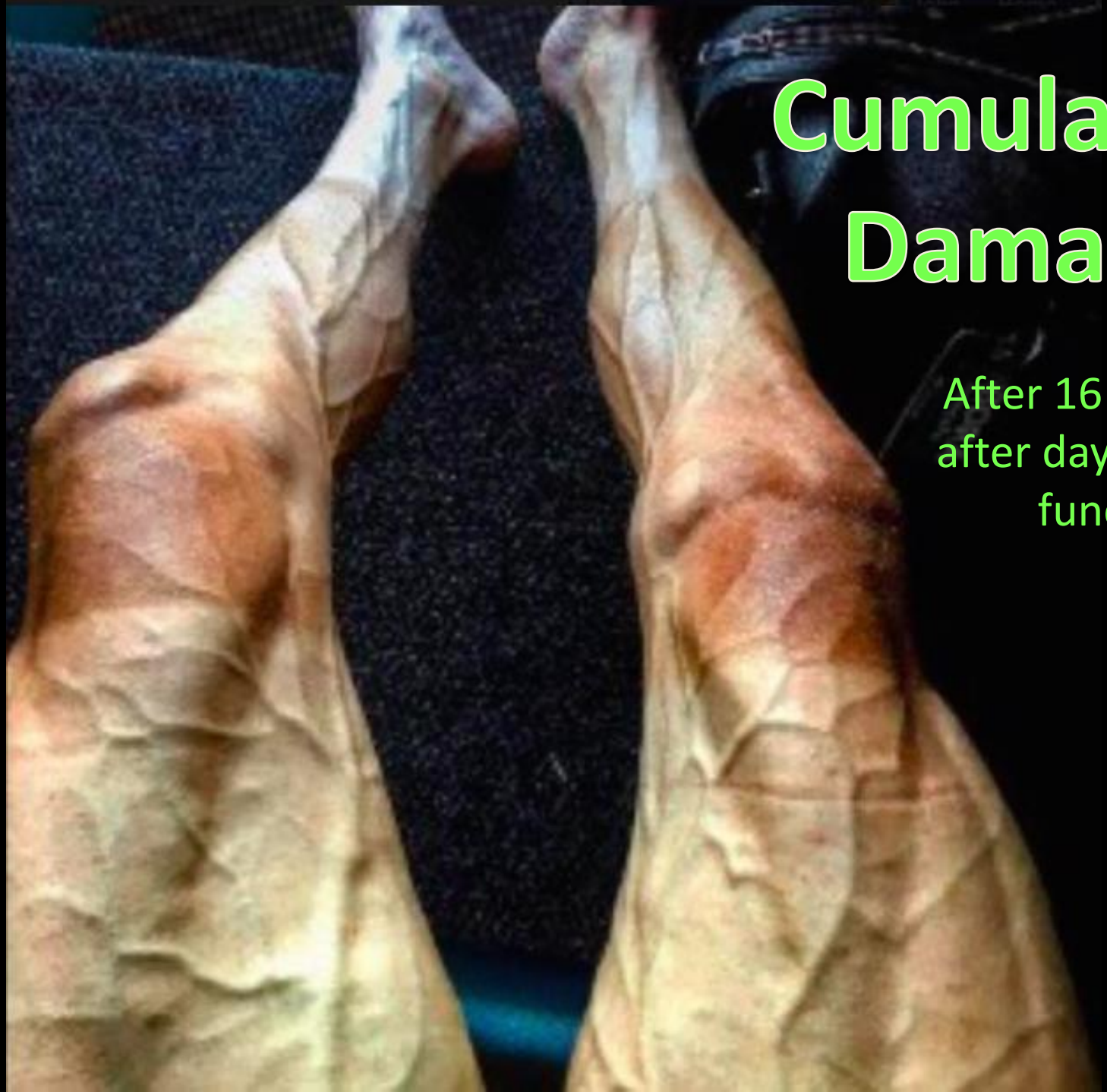


RESTED MEDIUM EXTREME

MUSCLE DAMAGE ON GOING



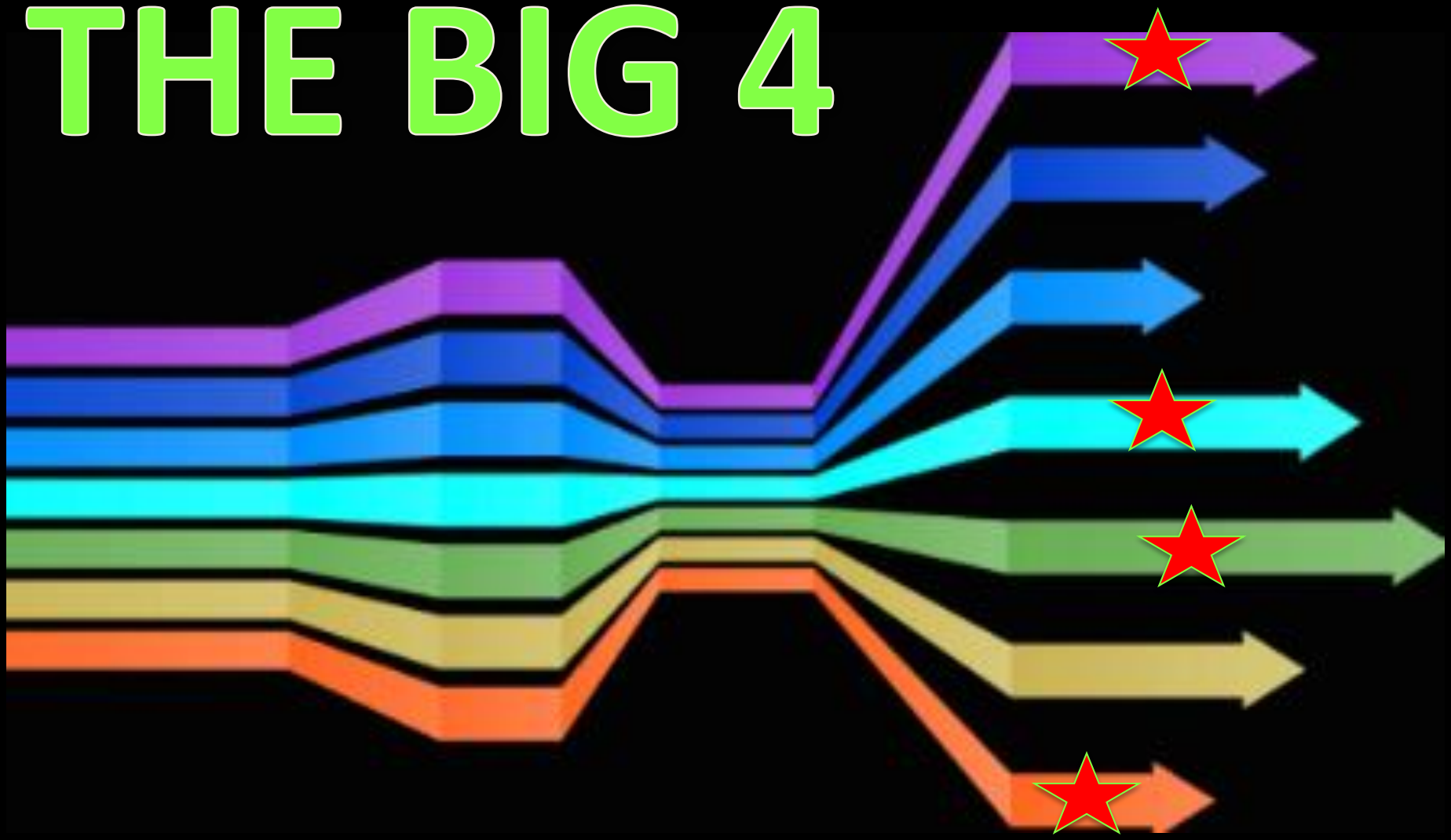
REPAIR NEW MASS



Cumulative Damage

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

RECOVERY
THE BIG 4



Turn around time

LOWER BODY TEMP VAGAL TONE

#1

#1

LOWER YOUR CORE TEMP

RESET CENTRAL SYSTEM

In conclusion, drinking water at different temperatures evoked distinct cardiovascular and metabolic changes in young and healthy humans. Drinking cold water increased cardiac vagal tone and decreased substantially the workload to the heart and lungs.

COLD RESET

Table I Baseline data recorded 30 min prior ingesting each of the drinks (data are presented as means ± SE)

Drink temperature	Cold [3 °C]	Room [22 °C]	Body [37 °C]
Systolic blood pressure, mmHg			
Diastolic blood pressure, mmHg			
Heart rate, beats min^{-1}			
Stroke volume, mL			
Double product, mmHg beat min^{-1}			
Cardiac output, L min^{-1}			
Total peripheral resistance, mmHg L^{-1} min			
Baroreflex sensitivity, ms $mmHg^{-1}$			
Resting energy expenditure, kJ min^{-1}			
Resting oxygen consumption, mL min^{-1}			
Respiratory exchange ratio			
Skin blood flux, arbitrary units			

Drinking cold water at 3C degrees decreased :
Heart Rate
Blood Pressure
Core Temperature
Skin Temperature
RPE
CO SV
RER

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

There is more to training than the workout…

When the workout is over the recovery timeline begins. If all you care about is rushing to the next activity in your life, you will reduce the quality of training impact.

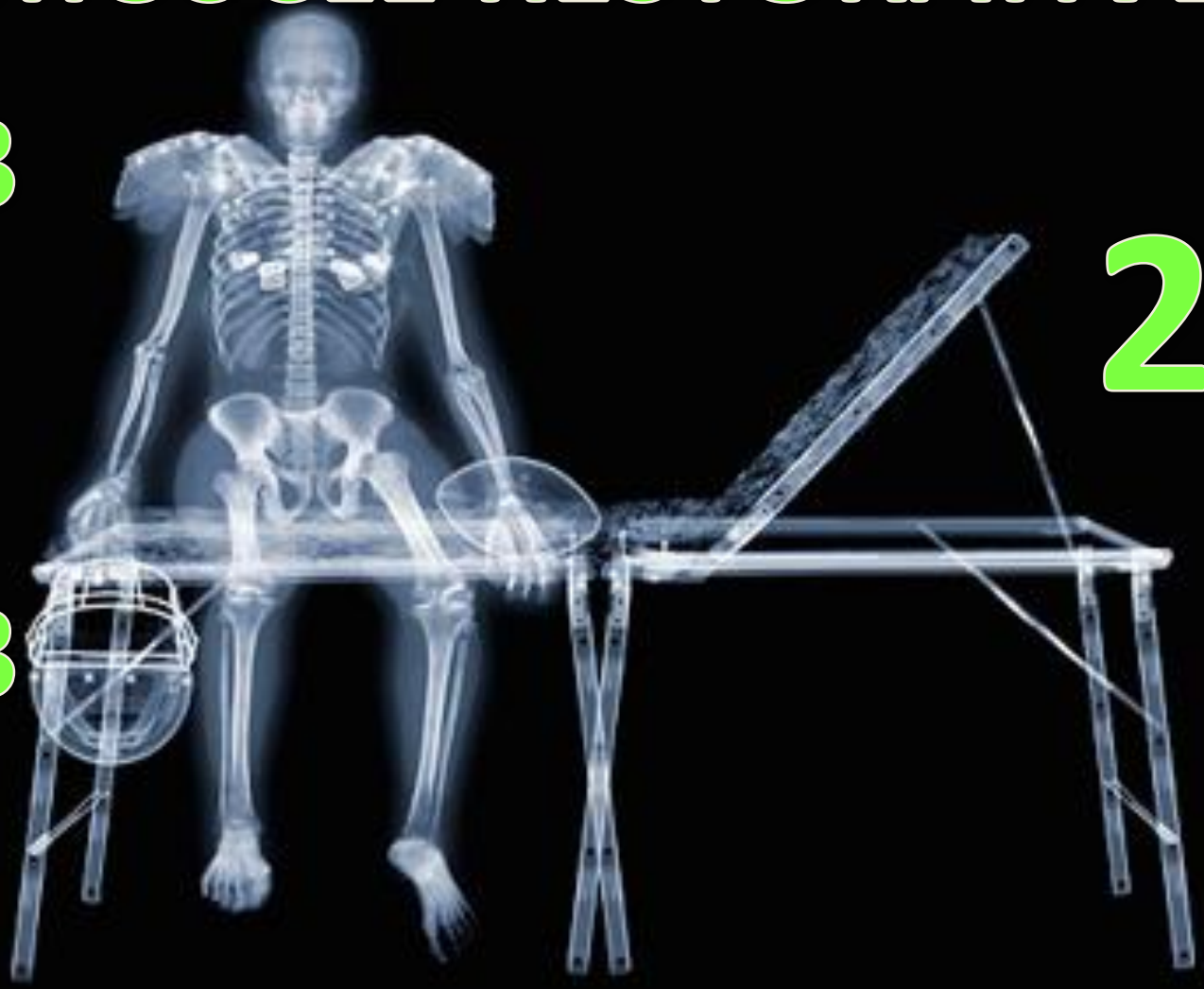
TRAIN RECOVER ADAPT

FEEDBACK = RESULTS

INCREASED POST TRAINING MUSCLE RESTORATIVE TIME

53

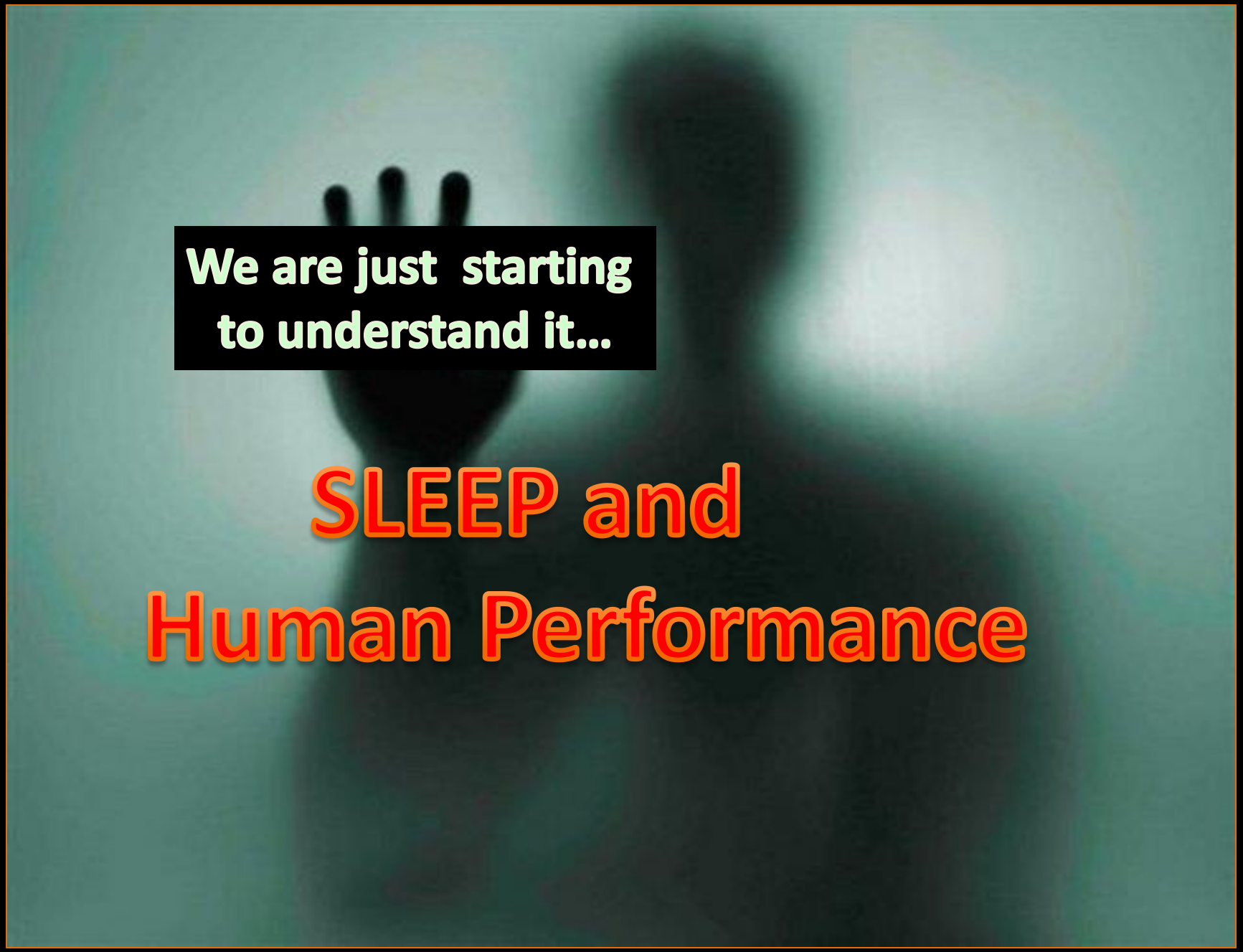
13



213%

#4 SLEEP

Athletes and Sleep


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.

John Underwood
Human Performance Project

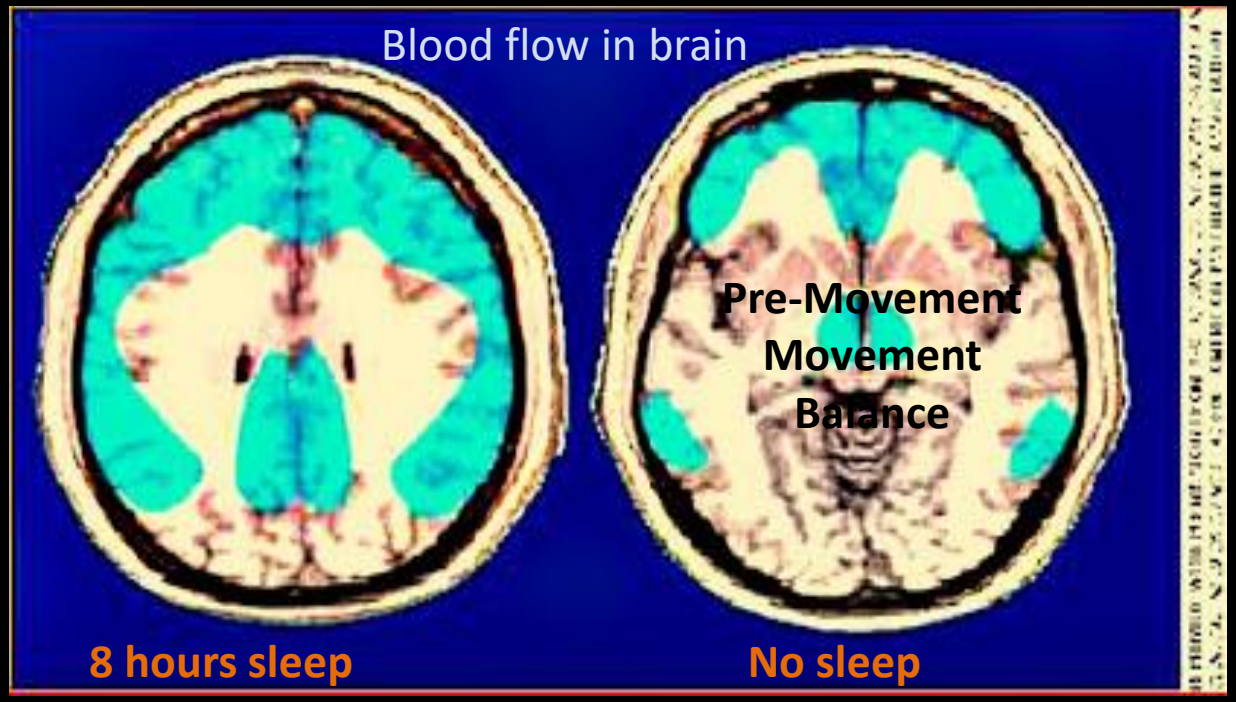
WORLDWIDE SLEEP STUDIES

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

Life of an Athlete
Human Performance Project

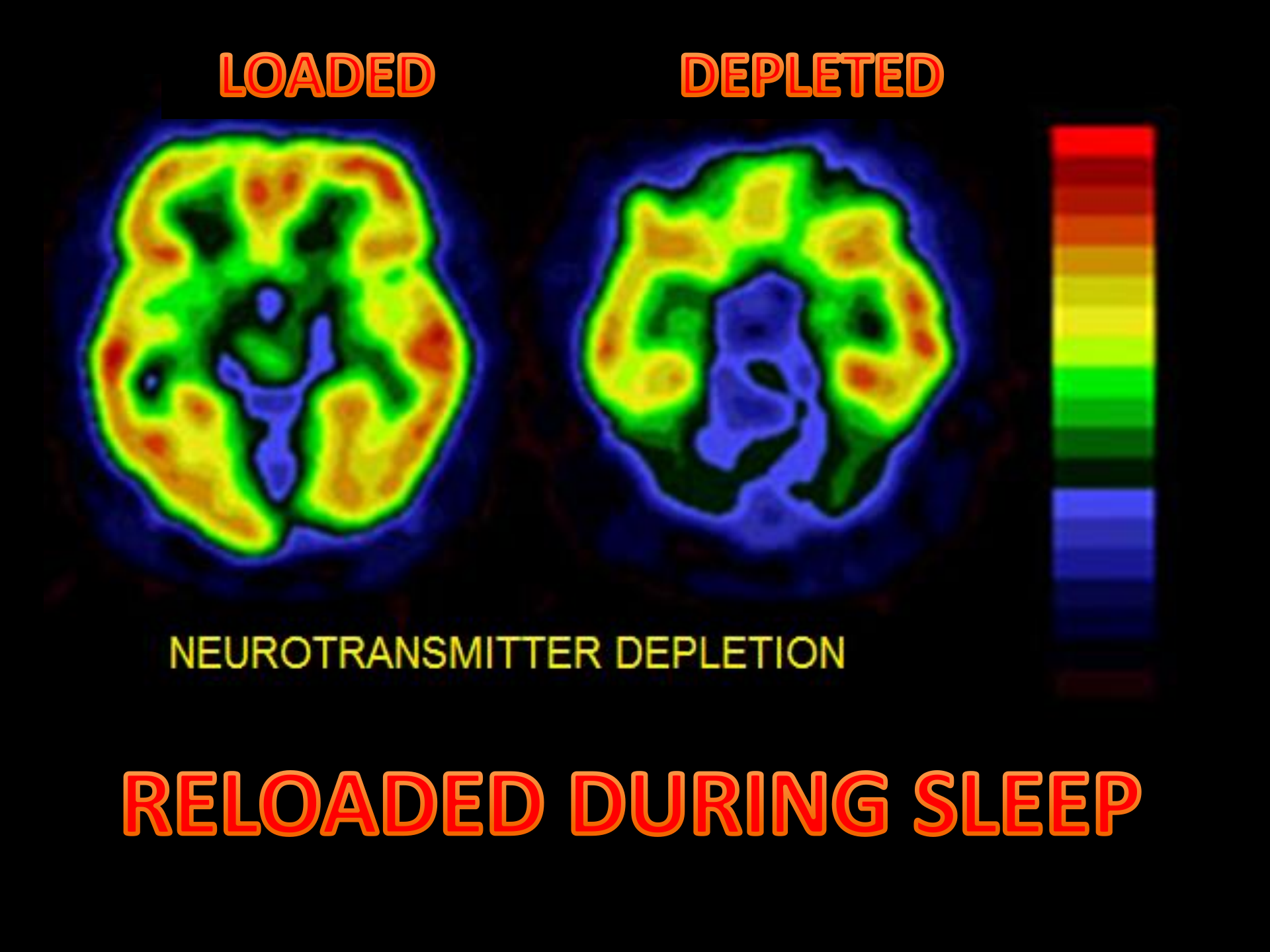
Recently, researchers have also found that our need for sleep is largely determined by our genes. So if you need eight hours of sleep to feel well-rested, it's impossible to train yourself to get by with less and still operate at peak capacity. (Though that doesn't stop people from trying — surveys have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

Sleep No Sleep



Blood Flow in Brain

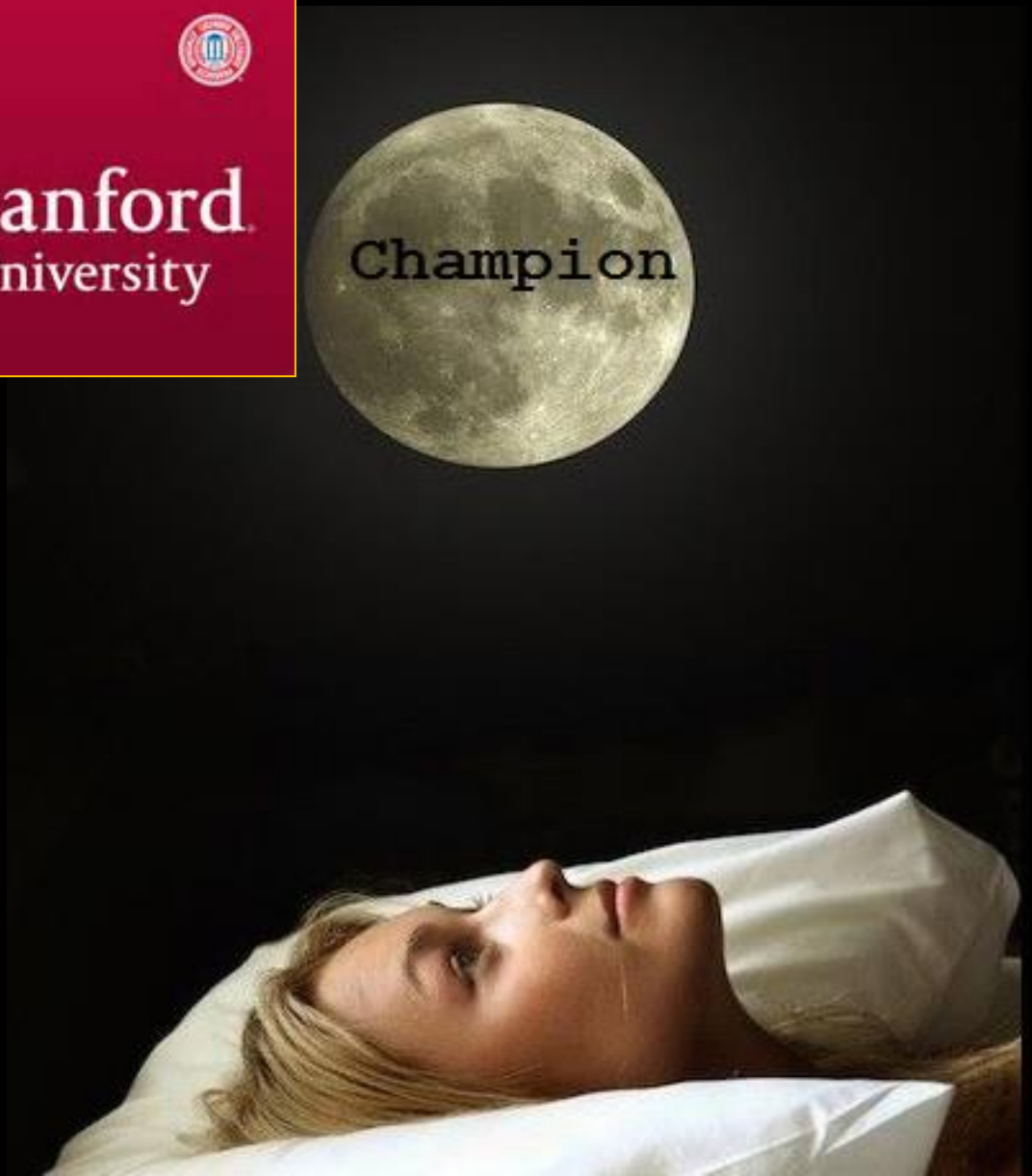
Optimal not possible


LOADED
DEPLETED
NEUROTRANSMITTER DEPLETION
RELOADED DURING SLEEP

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.

Life of an Athlete
Human Performance Project

Muscle Restorative
Organ Restorative
CNS Restorative

Deep in the NIGHT

LIFE OF AN ATHLETE
Human Performance Project

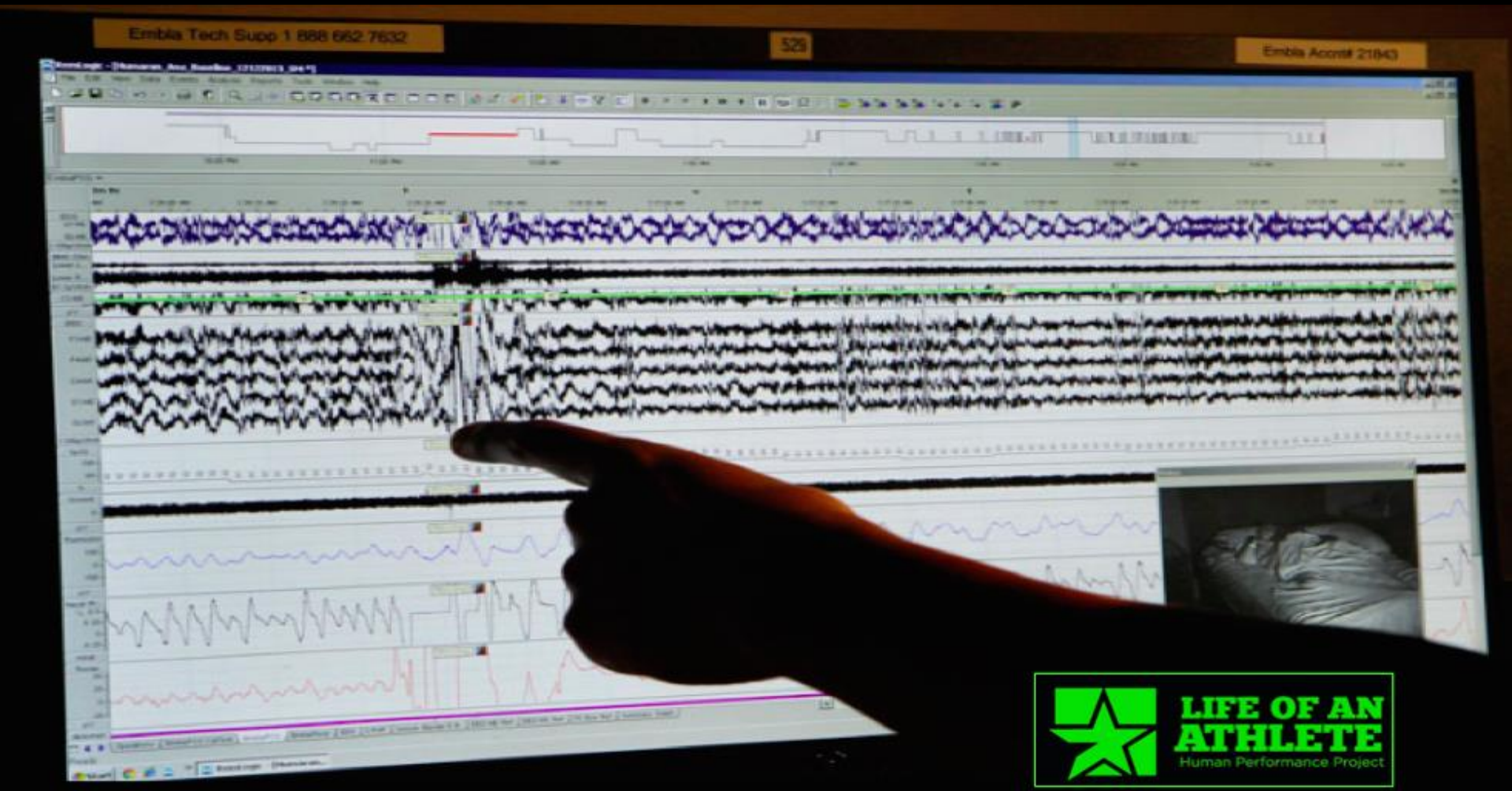
It is during sleep that you repair the damage your body systems accumulate during your waking hours. GROWTH REPAIR RESTORATION RECOVERY AND TRAINING EFFECT TAKE PLACE DURING SLEEP.

SLEEP SLEEP SLEEP

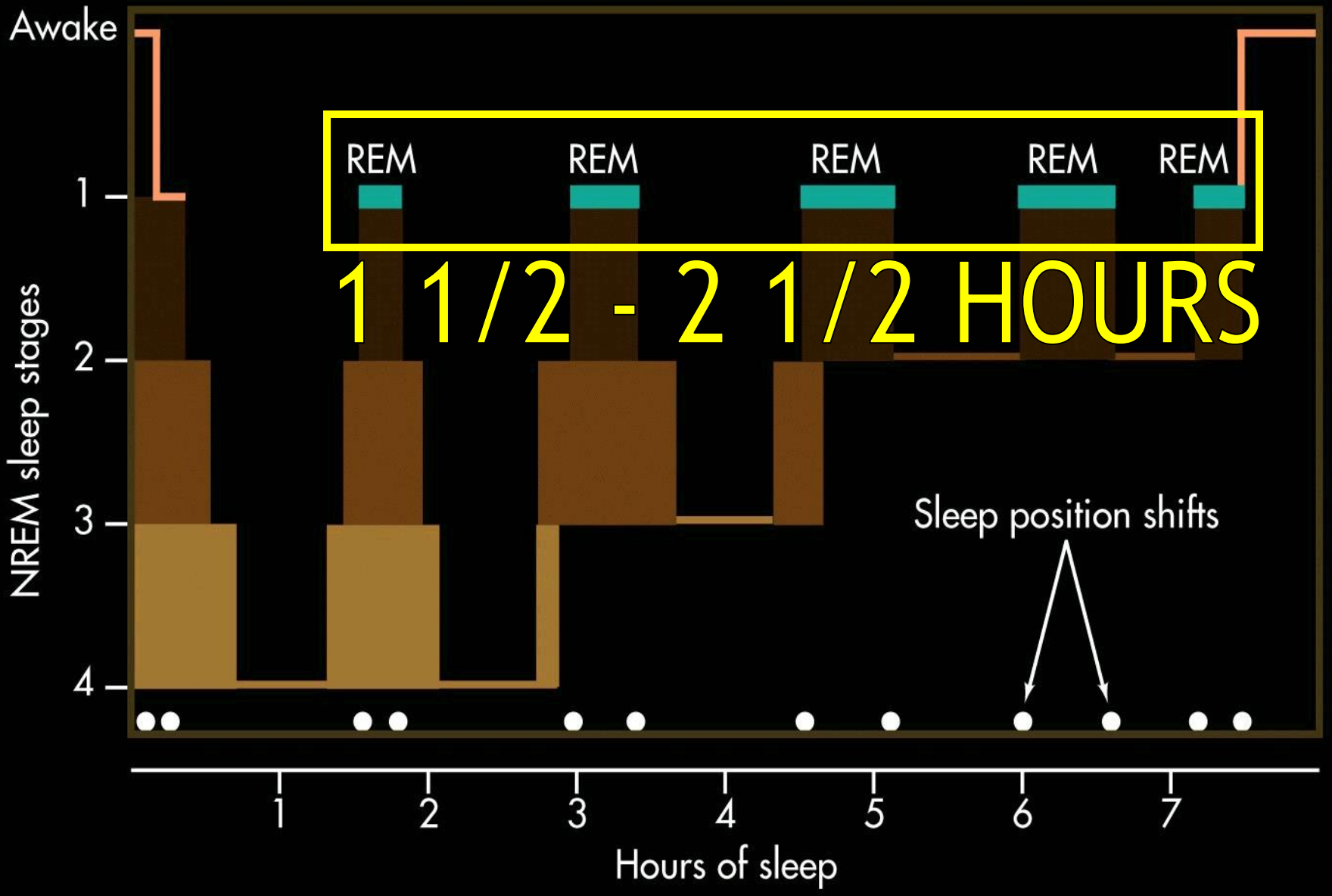
LIFE OF AN ATHLETE
Human Performance Project

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

REM SLEEP CRITICAL

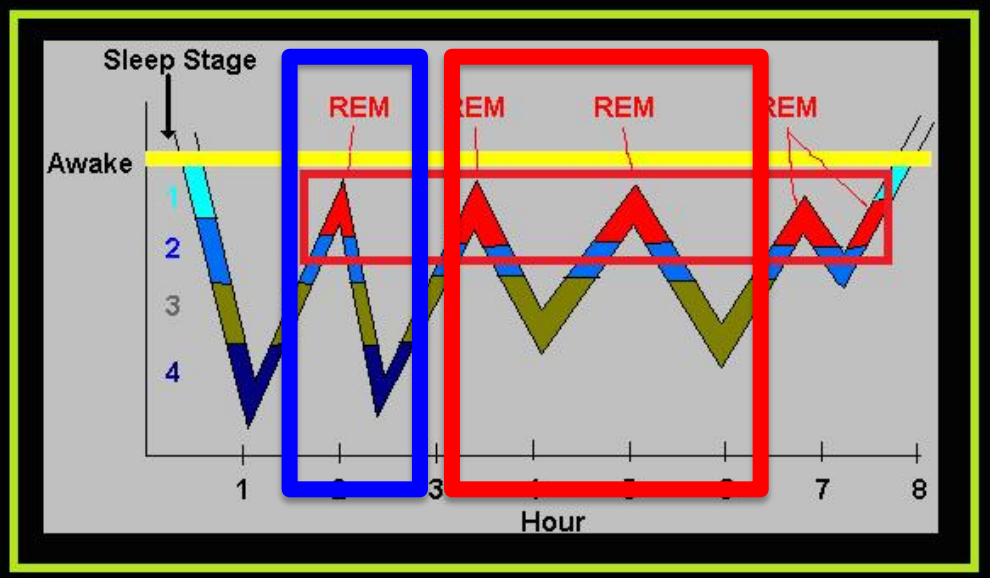


Restore Repair Rejuvenate Reload Reboot



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!

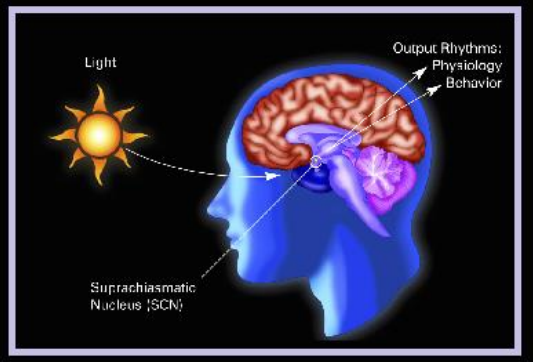
Life of an Athlete
Human Performance Project

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.



Life of an Athlete
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

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
- NCAA Average Sleep per night was 6 hours 14 minutes

SLEEP SURVEYS

RECHARGING THE BRAIN

1-3 days

The brain builds up energy deficits or energy reserves over several days and will function at that level.

CNS READINESS


M T W R F S S

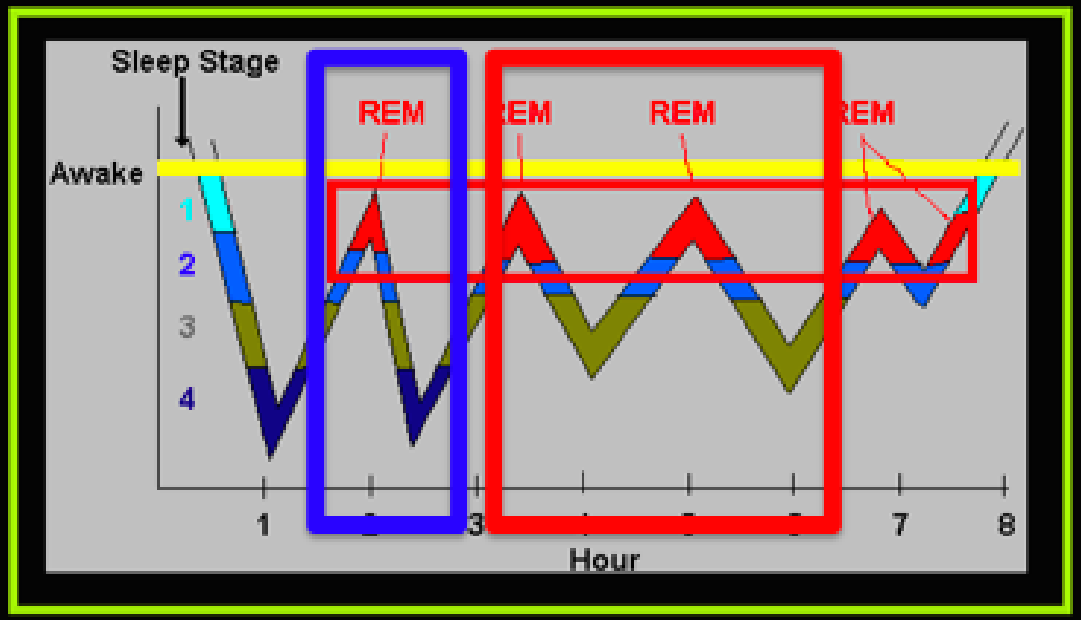
Life of an Athlete
Human Performance Project

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.

ACCURACY STATS

SKILL REINFORCEMENT



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.

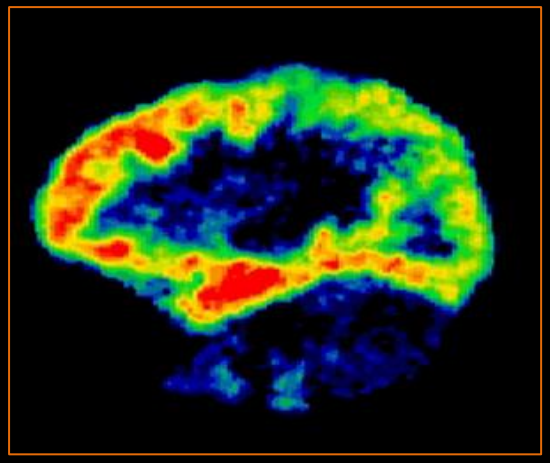
Spatial Reasoning

Life of an Athlete
Human Performance Project

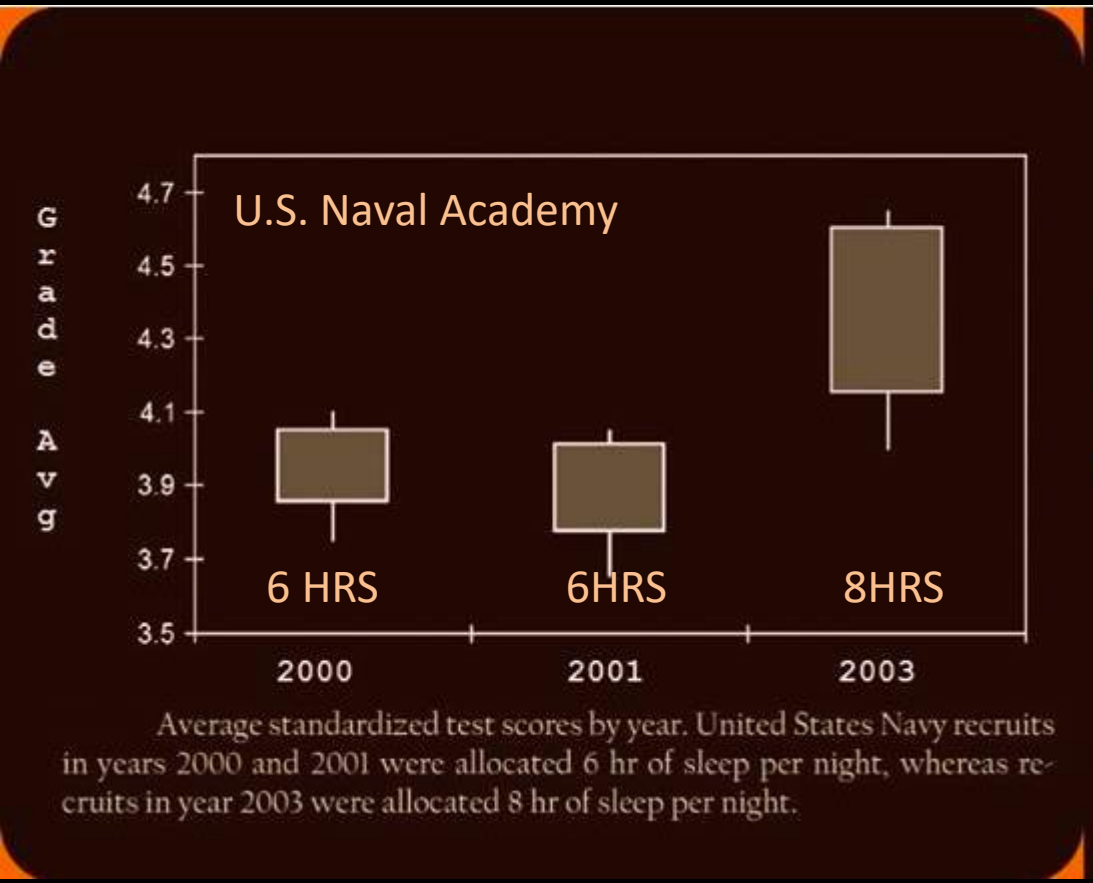
Anticipation

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!

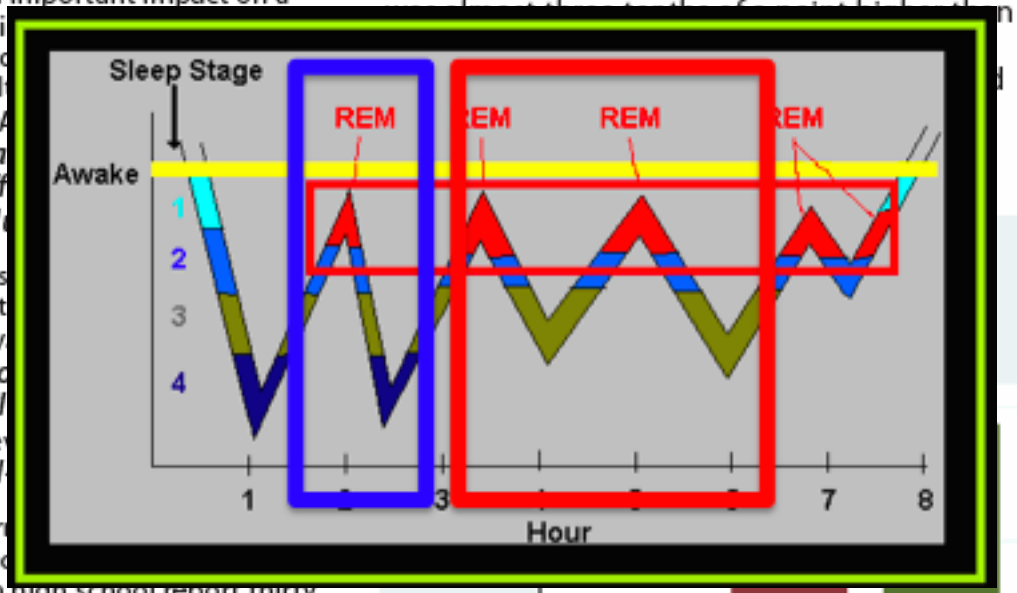
Sleep has an important impact on a student's abi
a test. Accord
College Heal
lege Health A
quarter of a
negative eff
formance d

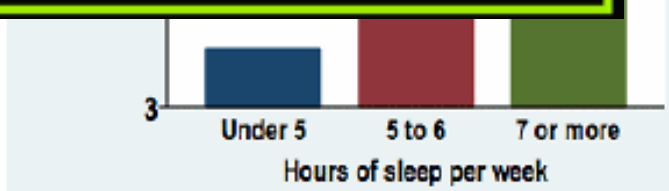
Nevertheless
continue to t
in the library
60 percent o
pulled an al
found, howe
between all-

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...

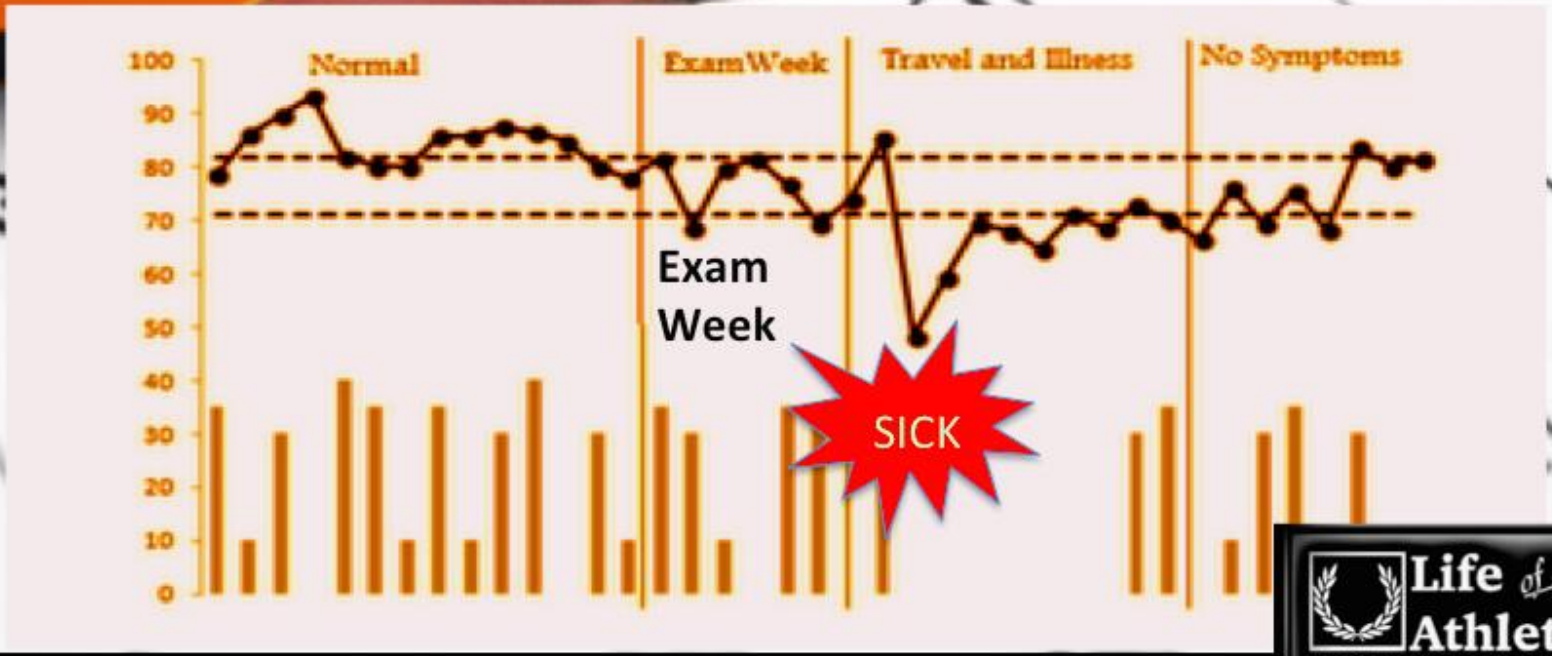
DROWSINESS IS RED ALERT!

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!

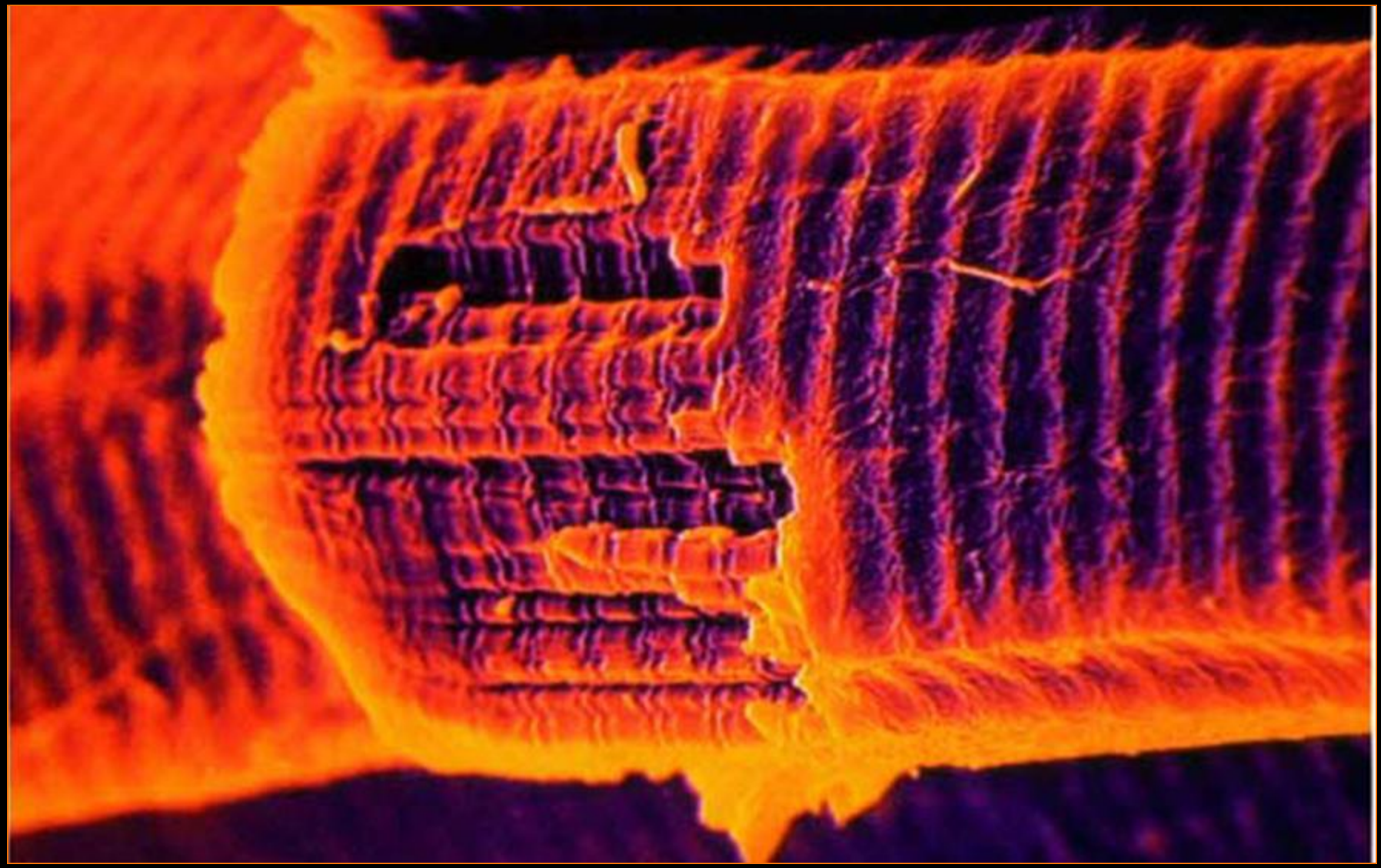
WWW.DROWSINESSISREDALERT.COM

HRV EXAM WEEK

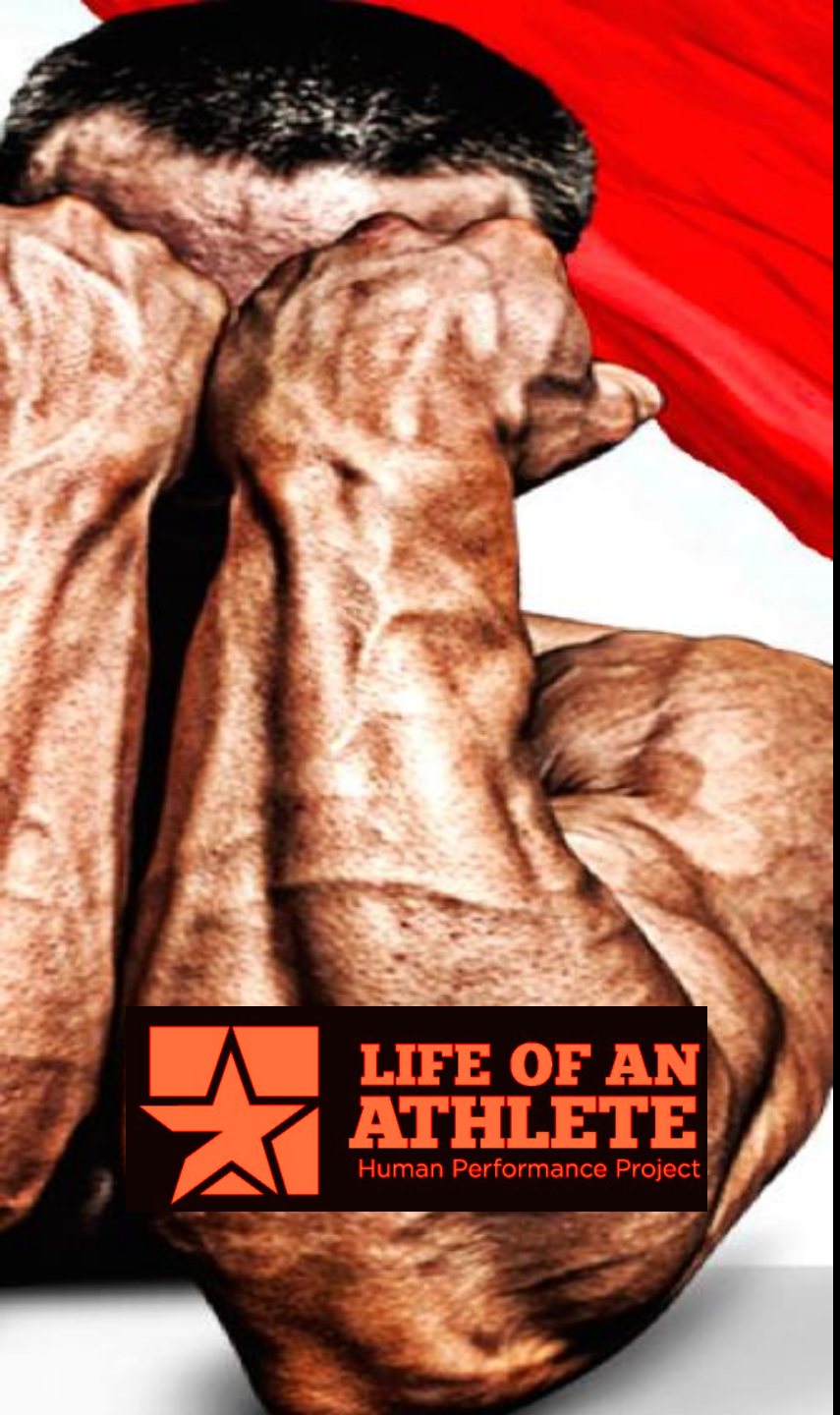
CNS TAKES HUGE HIT



Life of an Athlete
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).

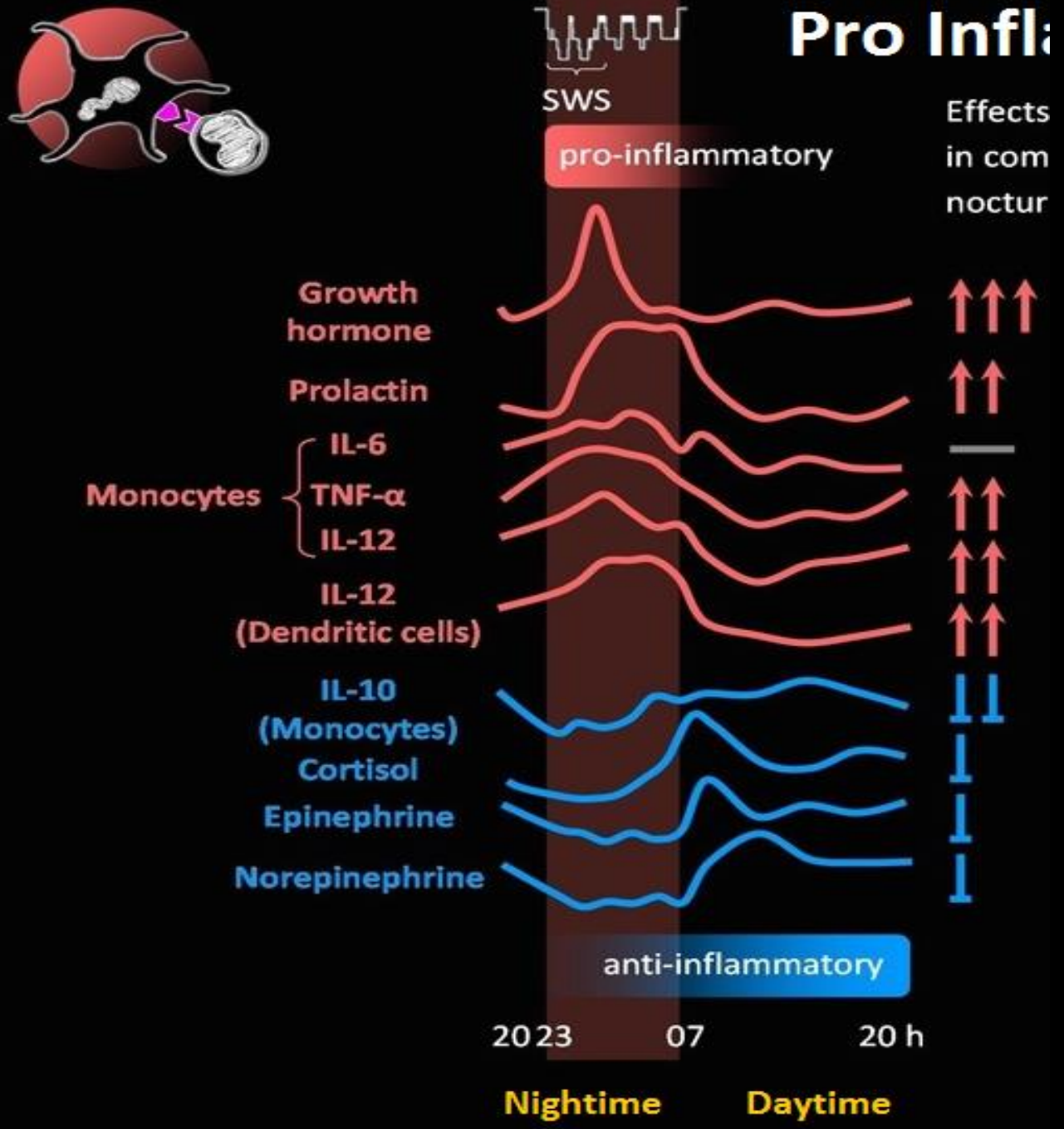
One form is known as the pro-inflammatory polypeptide regulators. These types of cytokines are created primarily by immune cells that are engaged in the process of amplifying inflammatory reactions as a means of dealing with some sort of health threat to the body. By relaying messages between the cells,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

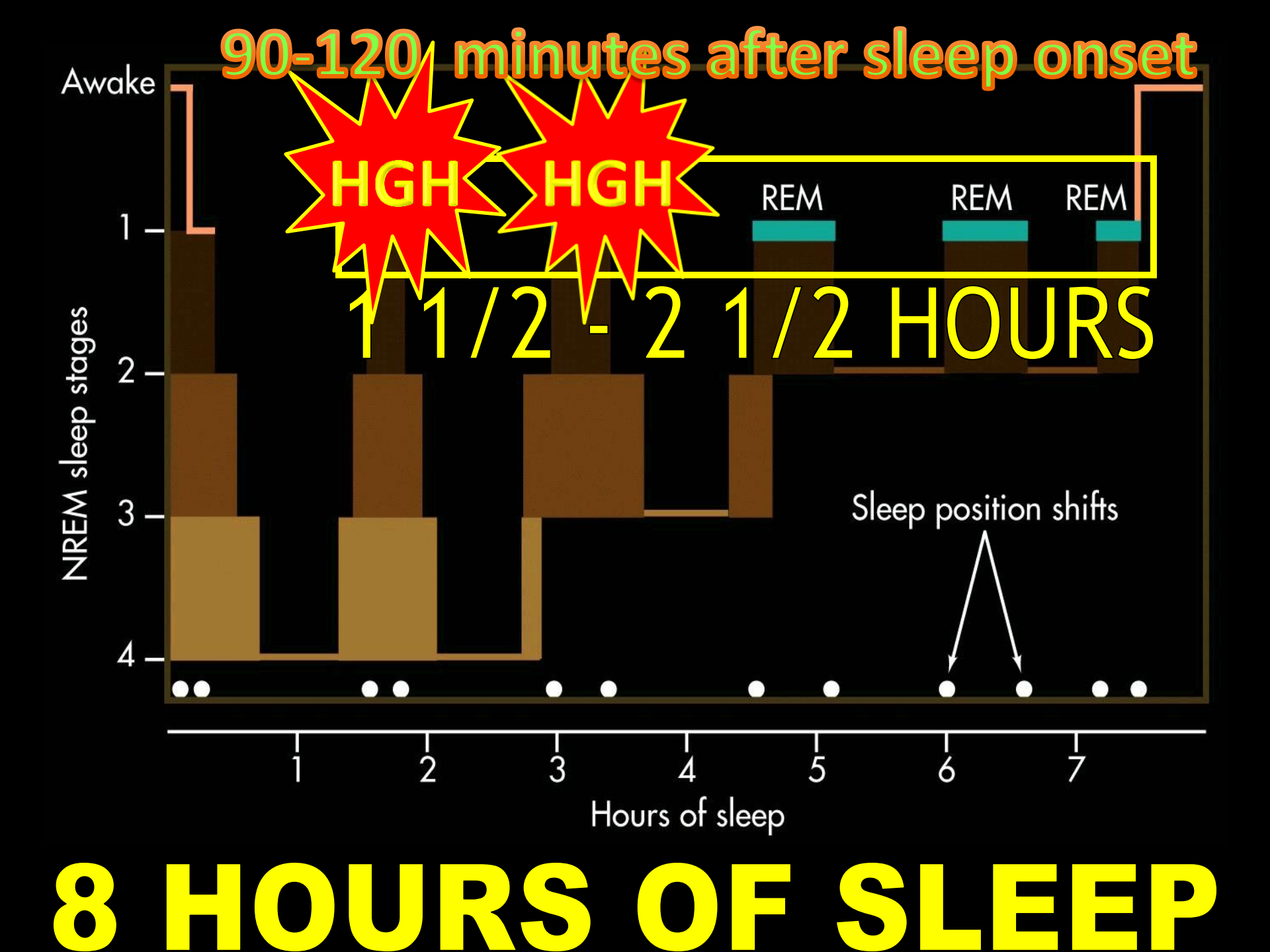

Pro Infl
SWS
pro-inflammatory
Effects
in com
noctur
Growth hormone
Prolactin
IL-6
Monocytes
TNF-α
IL-12
IL-12 (Dendritic cells)
IL-10 (Monocytes)
Cortisol
Epinephrine
Norepinephrine
anti-inflammatory
20 23
07
20 h
Nightime
Daytime

GROWTH HORMONE

New muscle mass

Repair muscle mass

Maintain muscle mass


90-120 minutes after sleep onset
Awake
1
2
3
4
NREM sleep stages
HGH
HGH
REM
REM
REM
1 1/2 - 2 1/2 HOURS
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.

LIFE OF AN ATHLETE
Human Performance Project

TRAINING EFFECT

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!

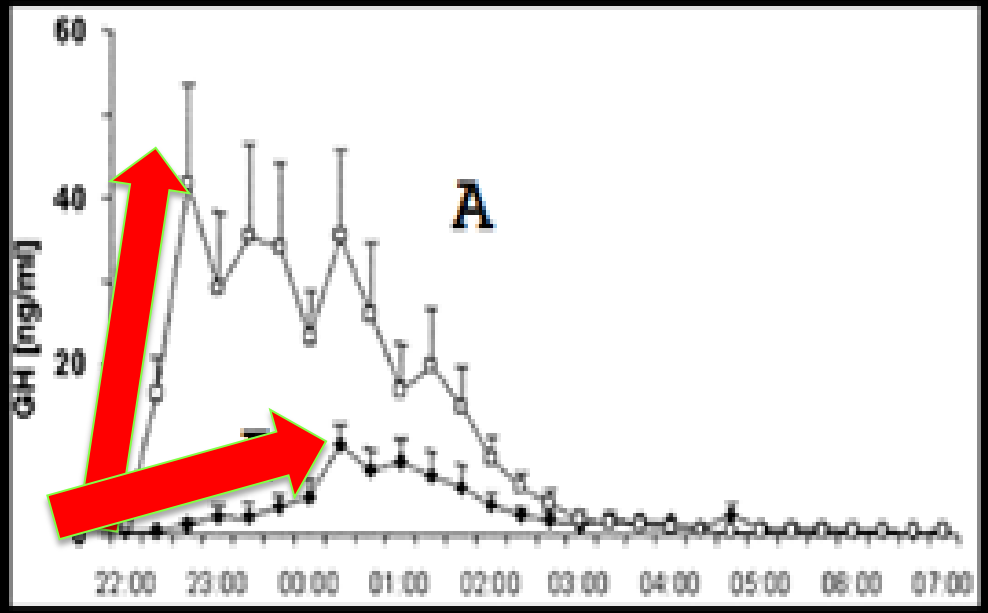
I'm going to take a wild guess that you already know that sleep affects how well you perform. You're also probably aware that sleep quality is part of the equation (not just quantity).

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!

Life of an Athlete
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.

Life of an Athlete
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!

Life of an Athlete
Human Performance Project

DARK?

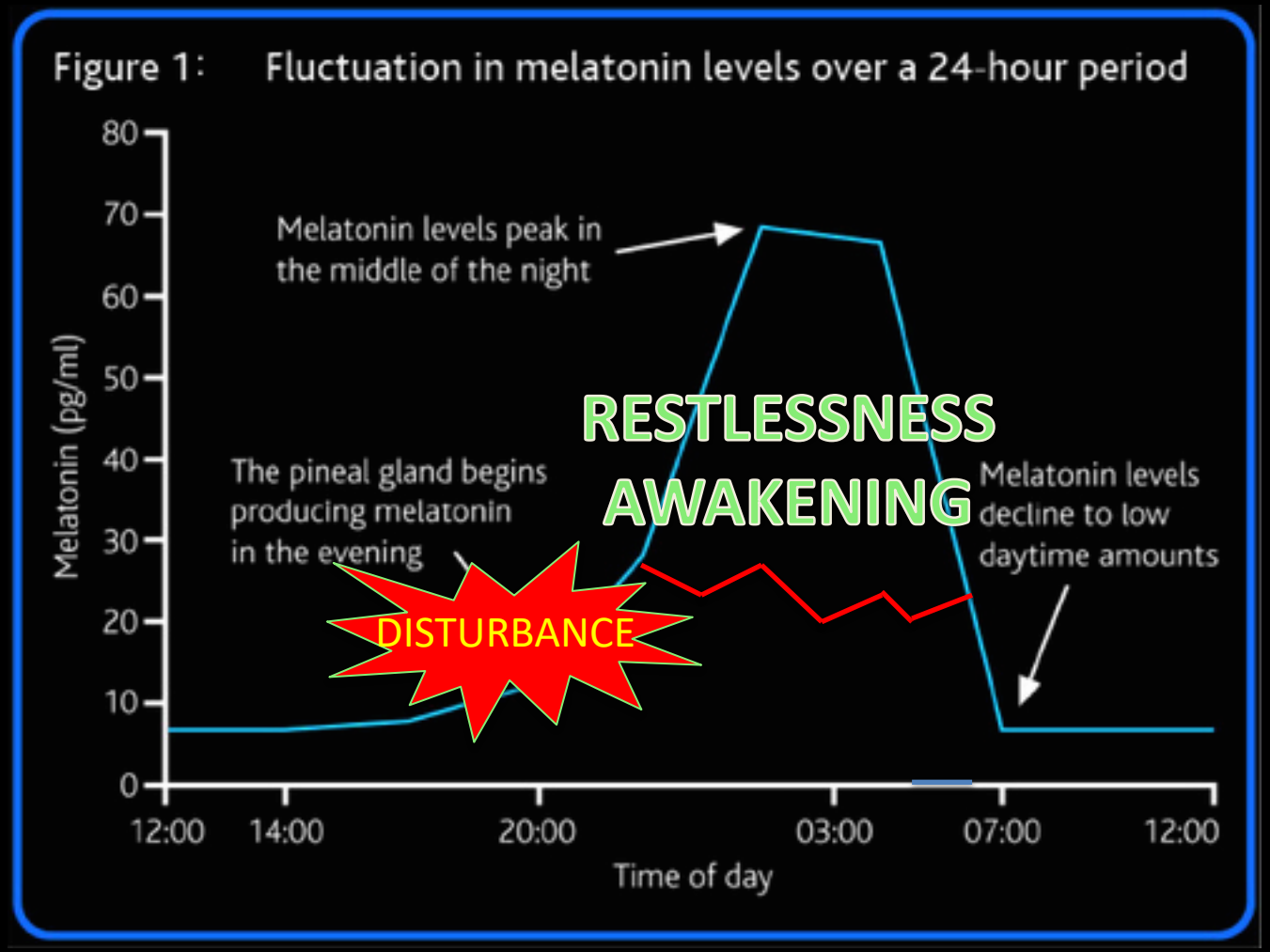
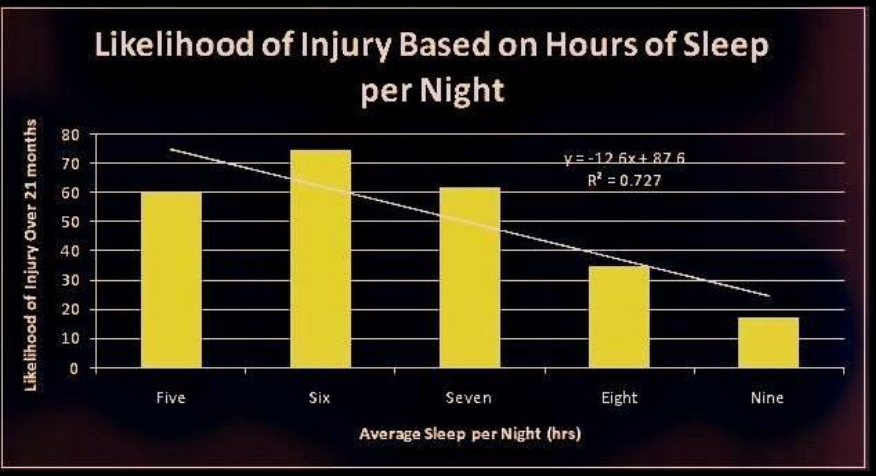


Figure 1: Fluctuation in melatonin levels over a 24-hour period
Melatonin (pg/ml)
80
70
60
50
40
30
20
10
0
Melatonin levels peak in the middle of the night
RESTLESSNESS
AWAKENING
The pineal gland begins producing melatonin in the evening
DISTURBANCE
Melatonin levels decline to low daytime amounts
12:00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

SLEEP EXTRA SLIDES JU

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!

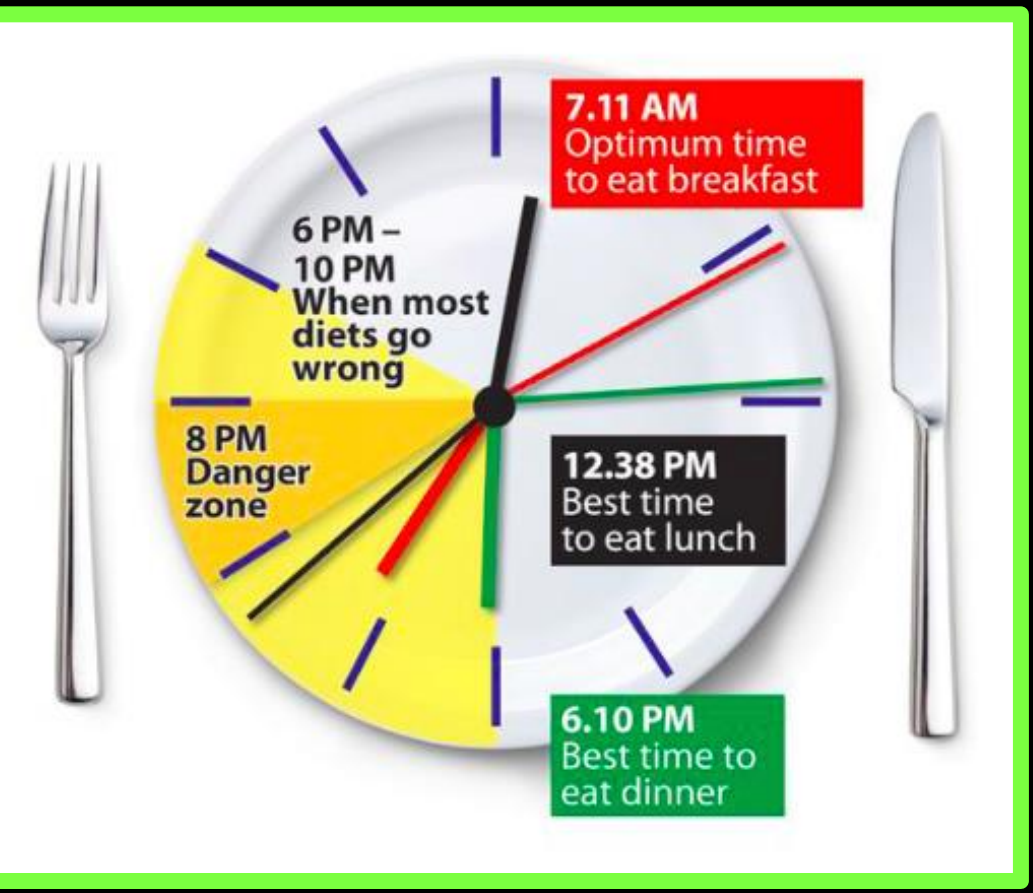
Too Late Too Much

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

Human Performance Project

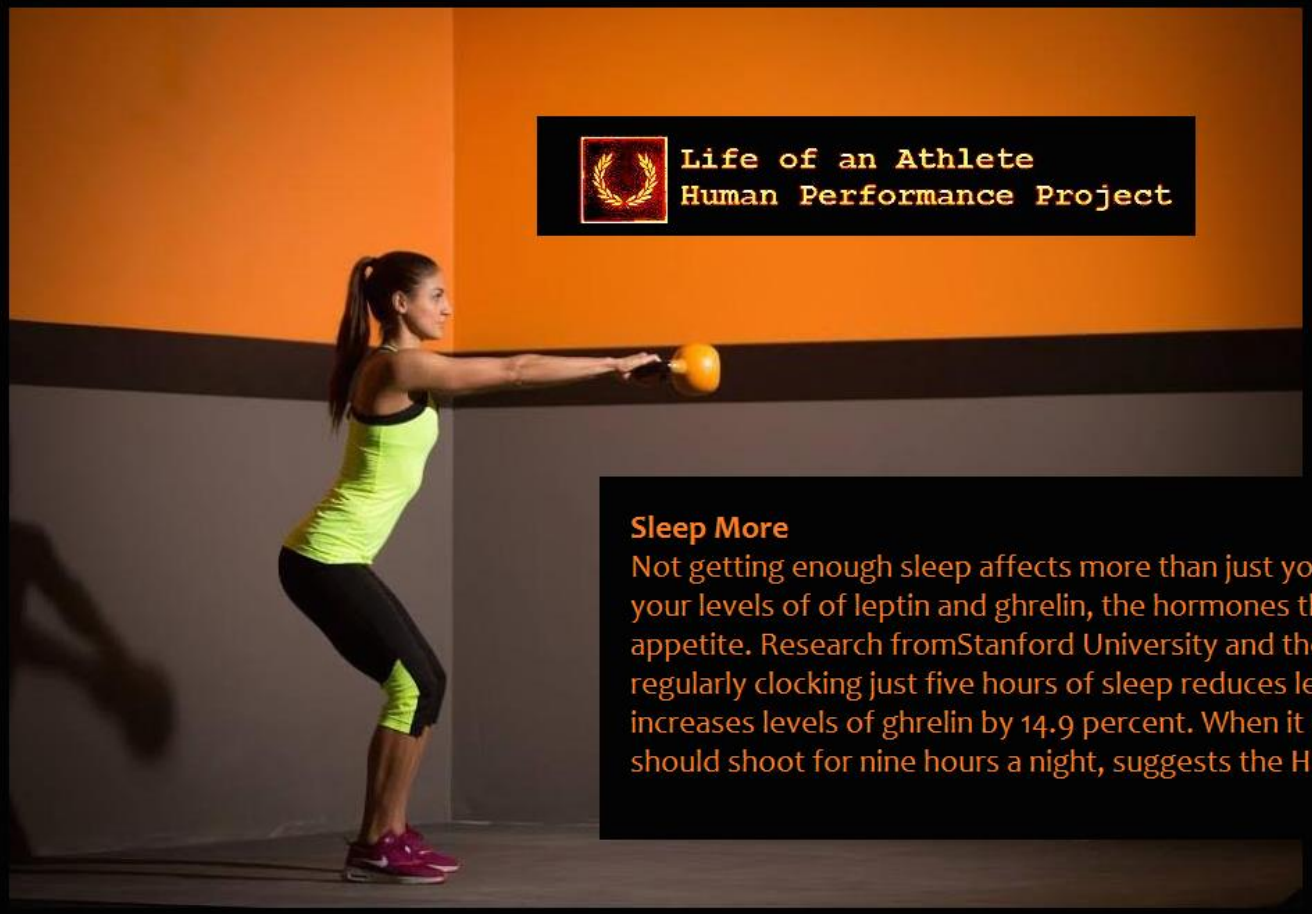
TIMING OF MEALS AND SLEEP

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

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

Sleep Manual

Optimal Sleep Temperature

68°-72° F

Life of an Athlete
Human Performance Project

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.

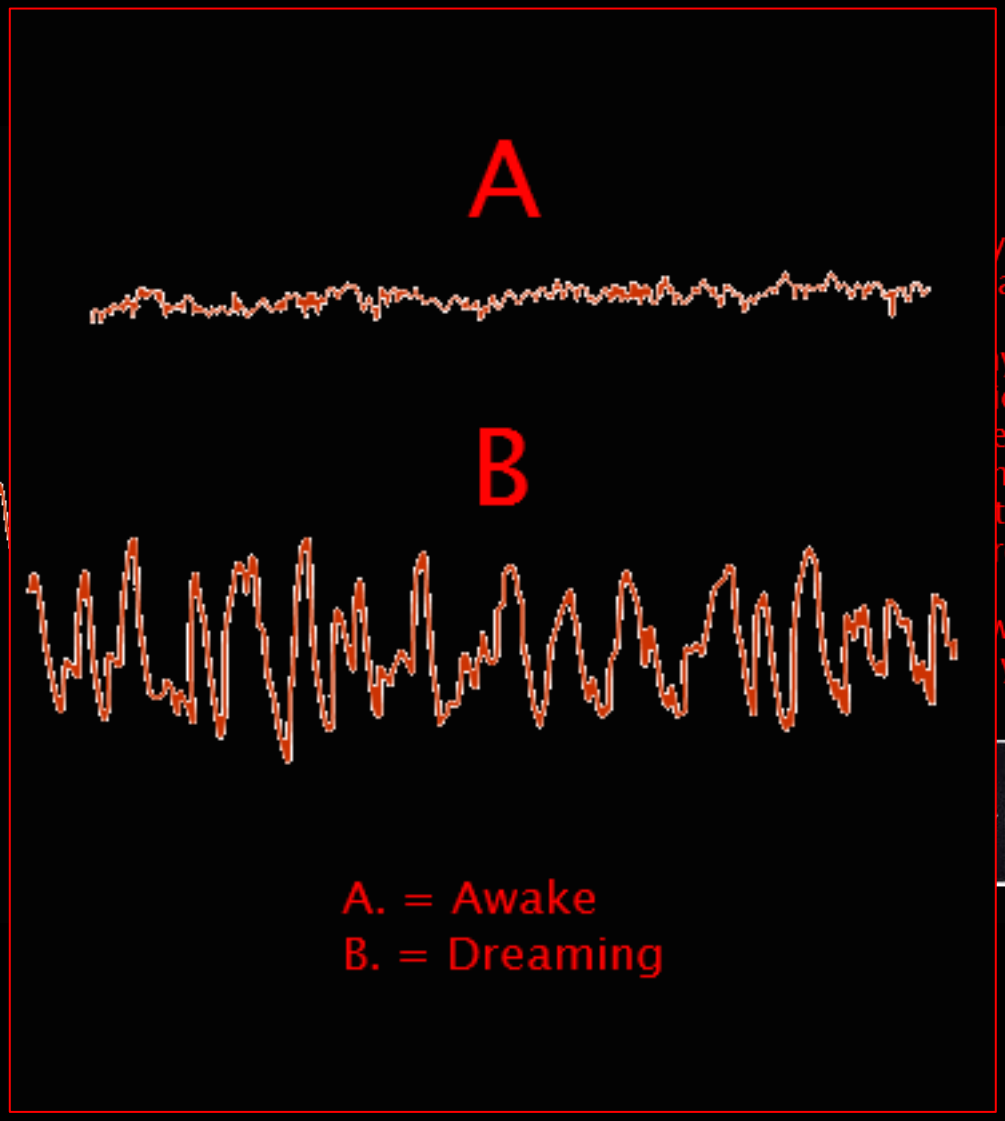
Life of an Athlete
Human Performance Project

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

ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ



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?

Life of an Athlete
Human Performance Project

Gotta game tomorrow?

Life of an Athlete
Human Performance Project

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

Life of an Athlete
Human Performance Project

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.

Life of an Athlete
Human Performance Project

No sleep,No gains
More damage,More pains

Life of an Athlete
Human Performance Project

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

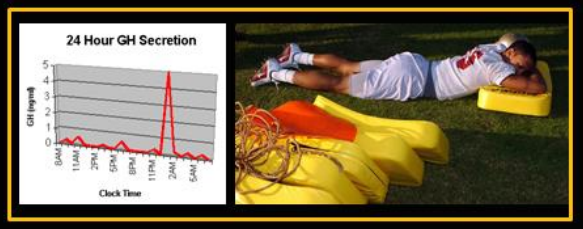
HGH

New muscle mass
Repair muscle mass
Maintain muscle mass

HGH 24 Hours

NIGHT EARLY SLEEP

90-120 MINUTES> SLEEP

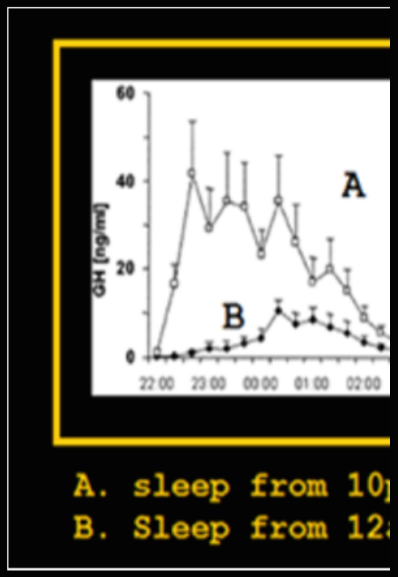


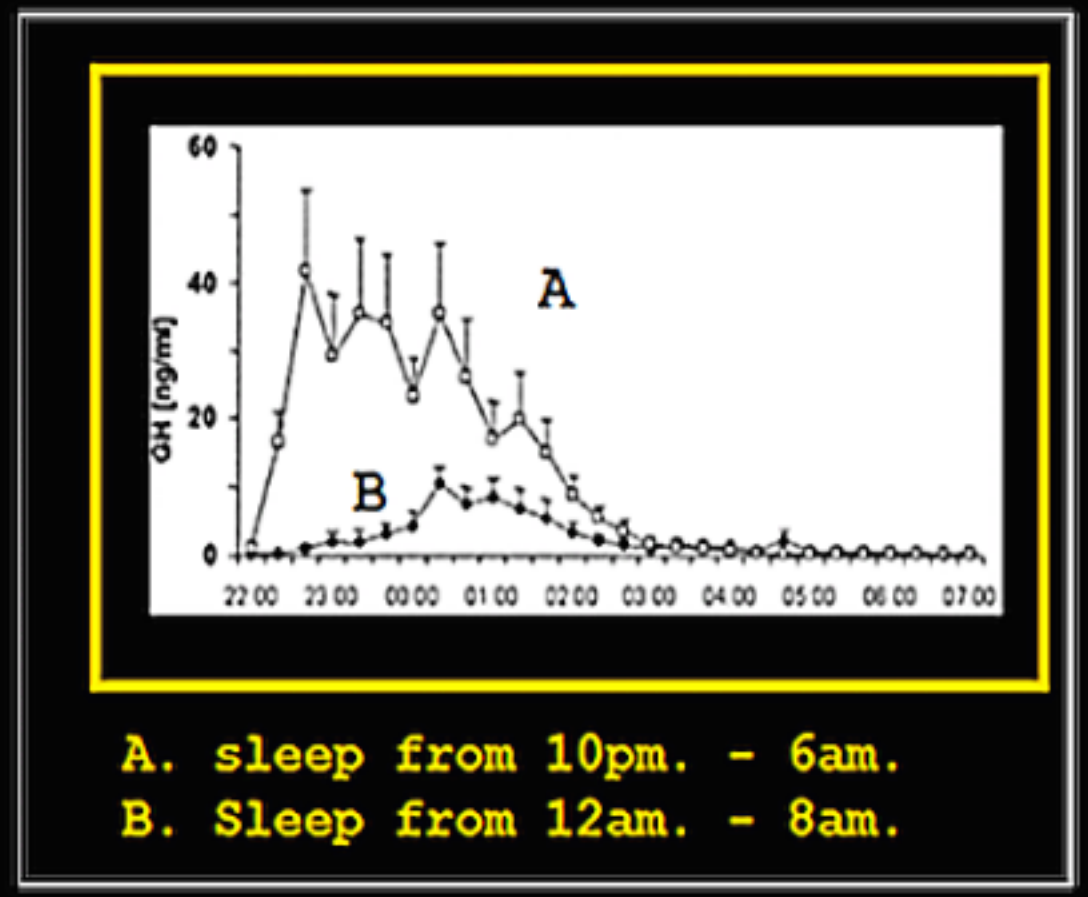
Early sleep at night HGH

When it all happens

Life of an Athlete
Human Performance Project

Life of an Athlete
Human Performance Project





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

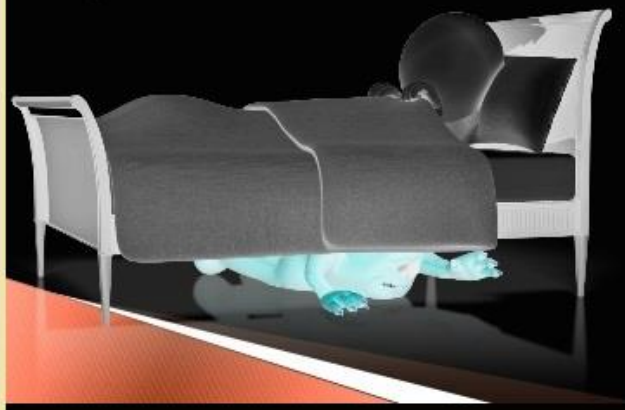
Sports Med
DOI 10.1007/s40279-014-0260-0

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!

Life of an Athlete
Human Performance Project

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.

Life of an Athlete
Human Performance Project

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.

Life of an Athlete
Human Performance Project

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!

Life of an Athlete
Human Performance Project

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!

p durations are
with levels of
ng fatigue or
nsity workouts!

may
th the
as

oject

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.

LIFE OF AN ATHLETE
Human Performance Project

Using Caffiene When you are Trashed

Life of an Athlete
Human Performance Project

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.

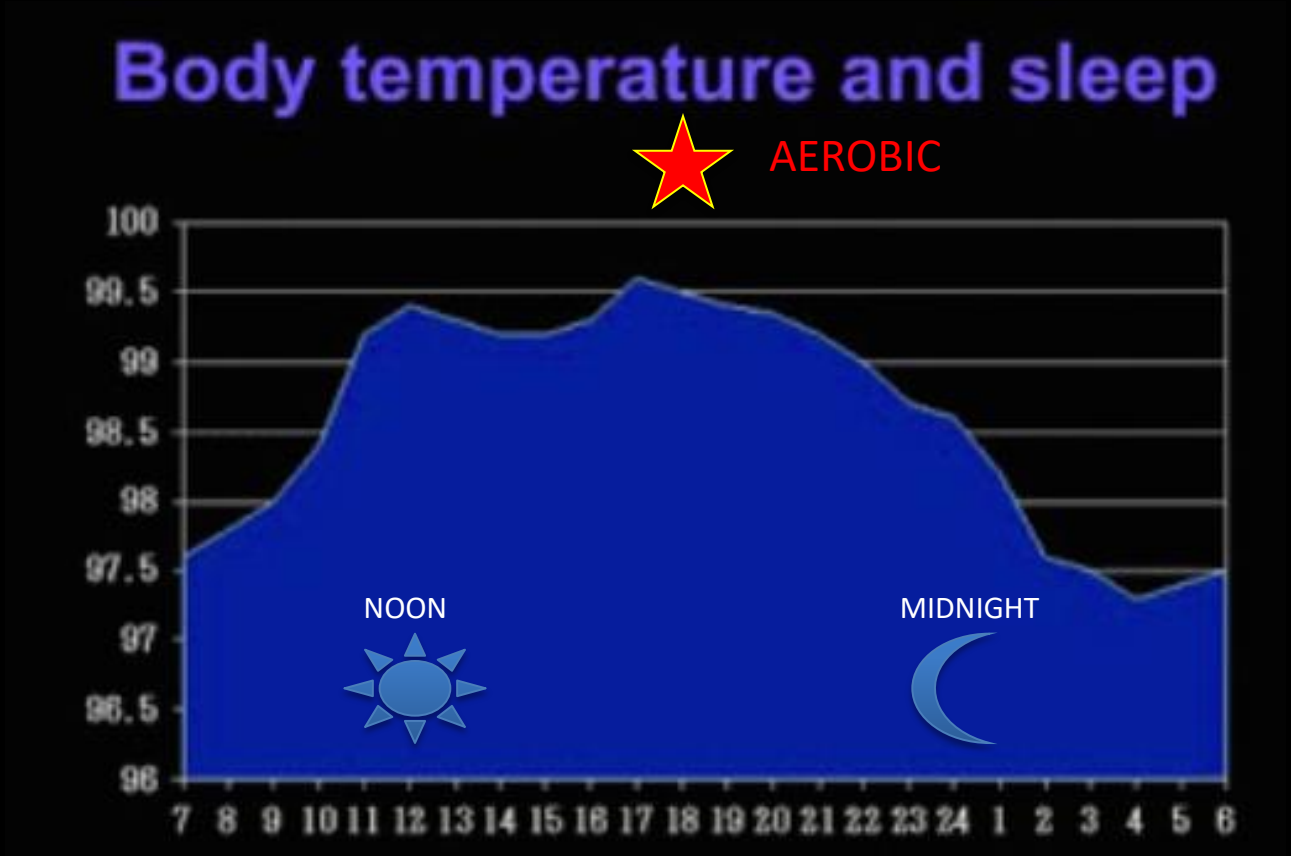
The Use of Stimulants to Modify Performance During Sleep Loss: A Review by the Sleep Deprivation and Stimulant Task Force of the American Academy of Sleep Medicine

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

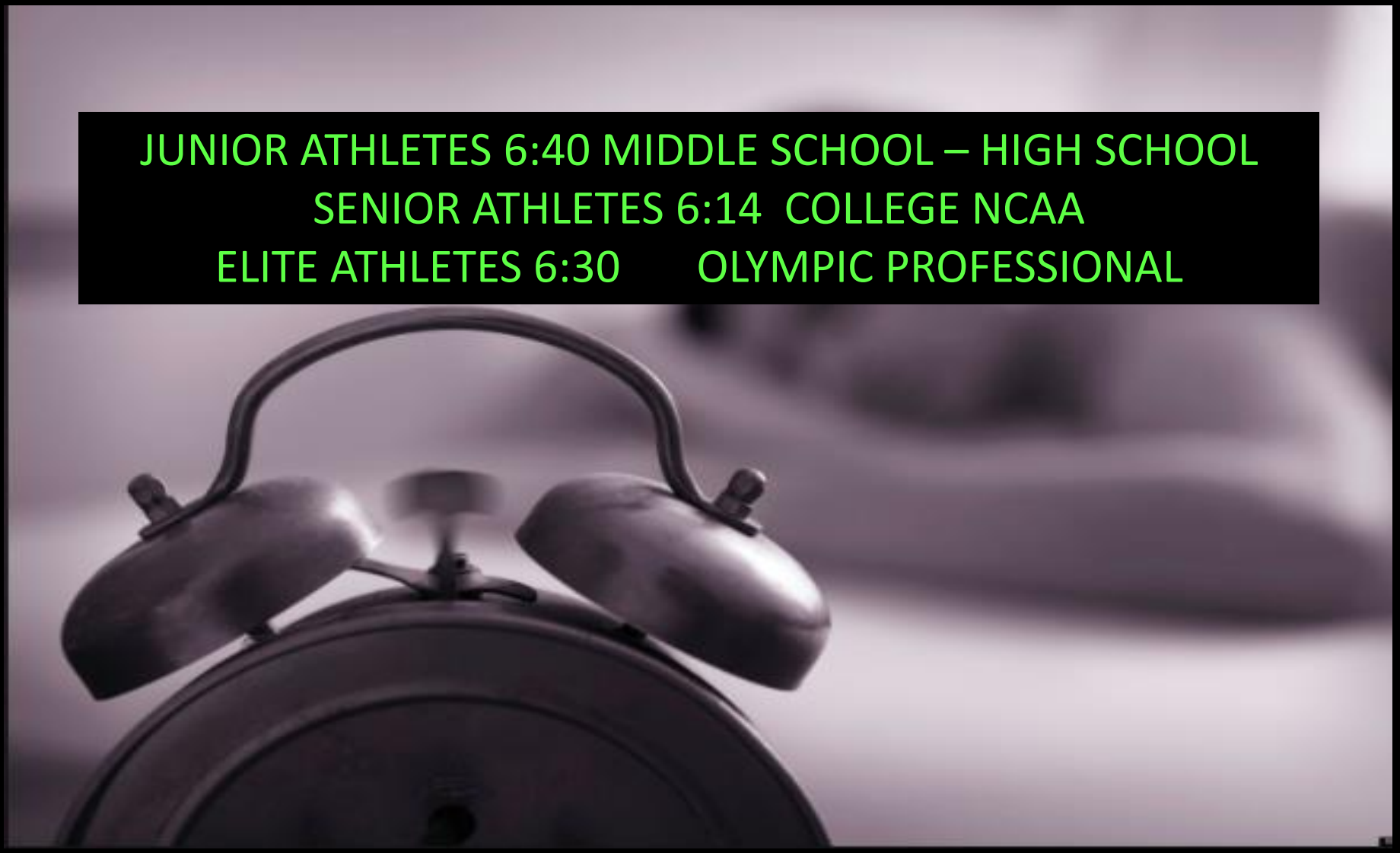
- *Heavy cell phone use showed an increase in sleep disorders in men and an increase in depressive symptoms in both men and women.*
- *Those constantly accessible via cell phones were the most likely to report mental health issues.*
- *Men who use computers intensively were more likely to develop sleeping 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

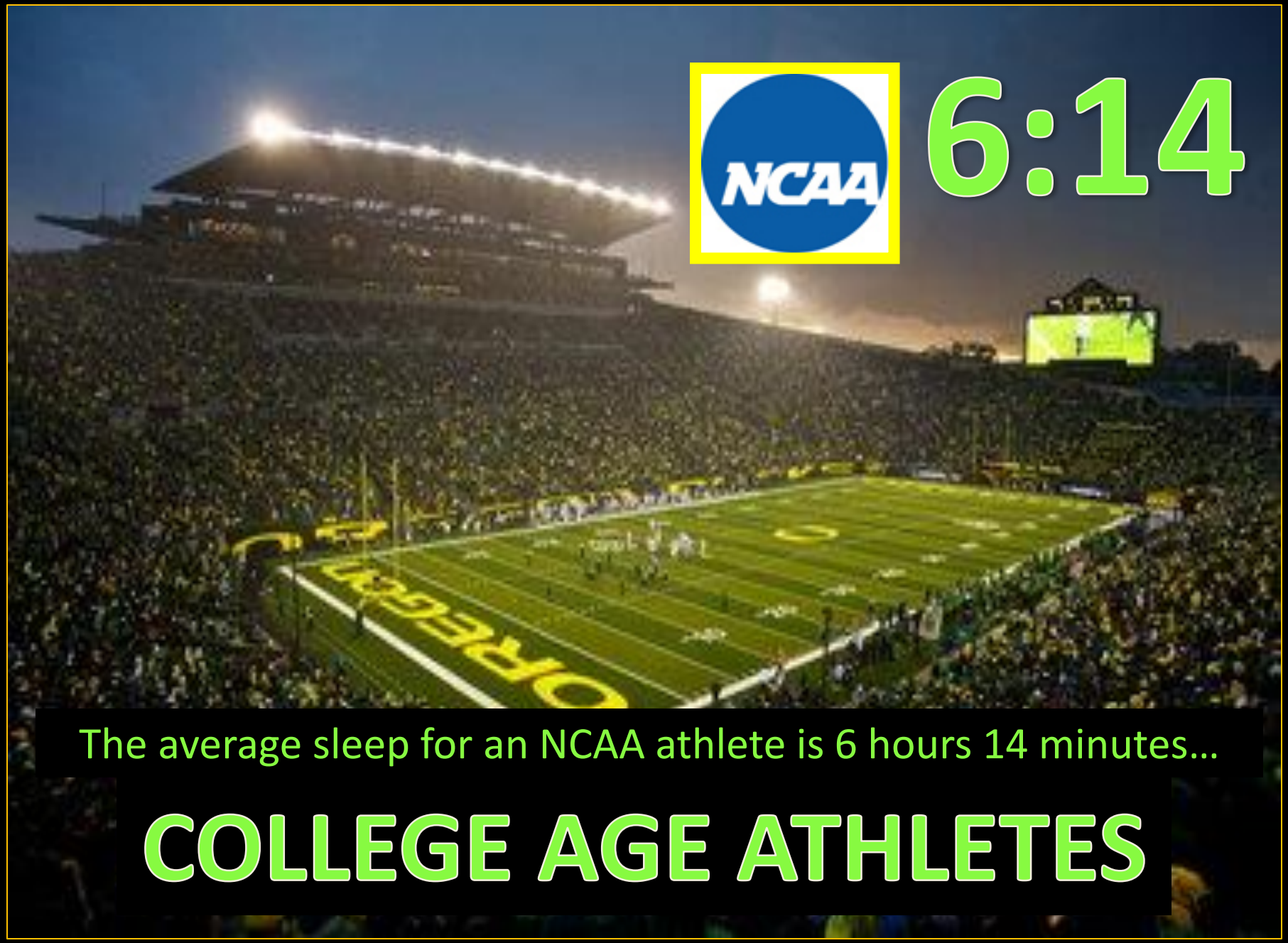
Life of an Athlete
Human Performance Project

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

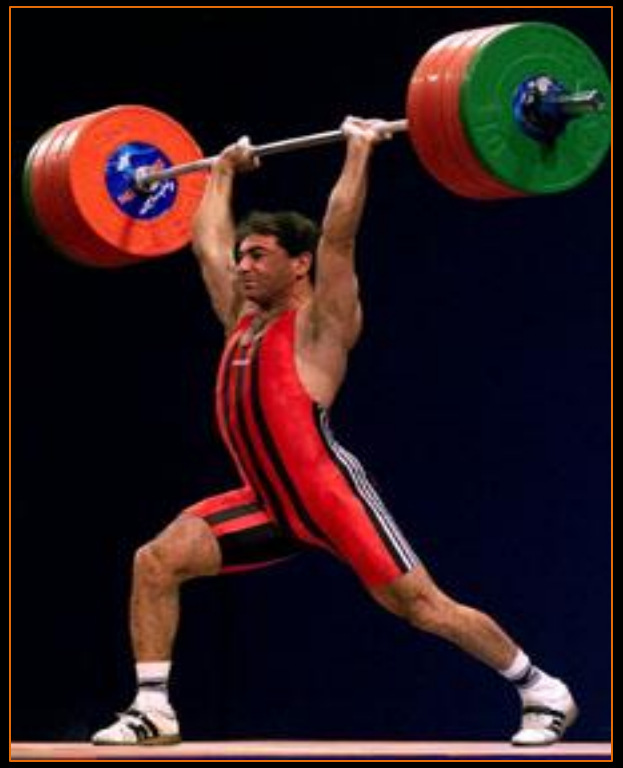
High Levels of Fatigue

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
Life of an Athlete
Human Performance Project

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.

Human Performance Project

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

Life of an Athlete
Human Performance Project