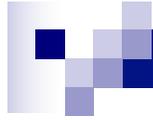


SLEEP and FATIGUE

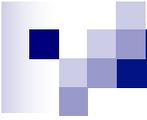


Sleep Quiz



**Sleep is time for the body
in general and the brain
specifically to shutdown
for rest?**

True or False



**Getting just one hour less
sleep per night than
needed will not have any
effect on daytime
functioning.**

True or False



The body adjusts quickly to
different sleep schedules.

True

or

False



People need less sleep as they
grow older.

True

or

False



A “good night’s sleep” can cure
problems with excessive
daytime sleepiness.

True

or

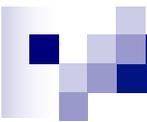
False

Regulation of Sleep

Sleep is regulated by two body systems:

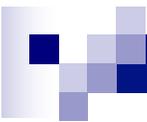
1. Sleep/wake homeostasis
2. Circadian biological clock





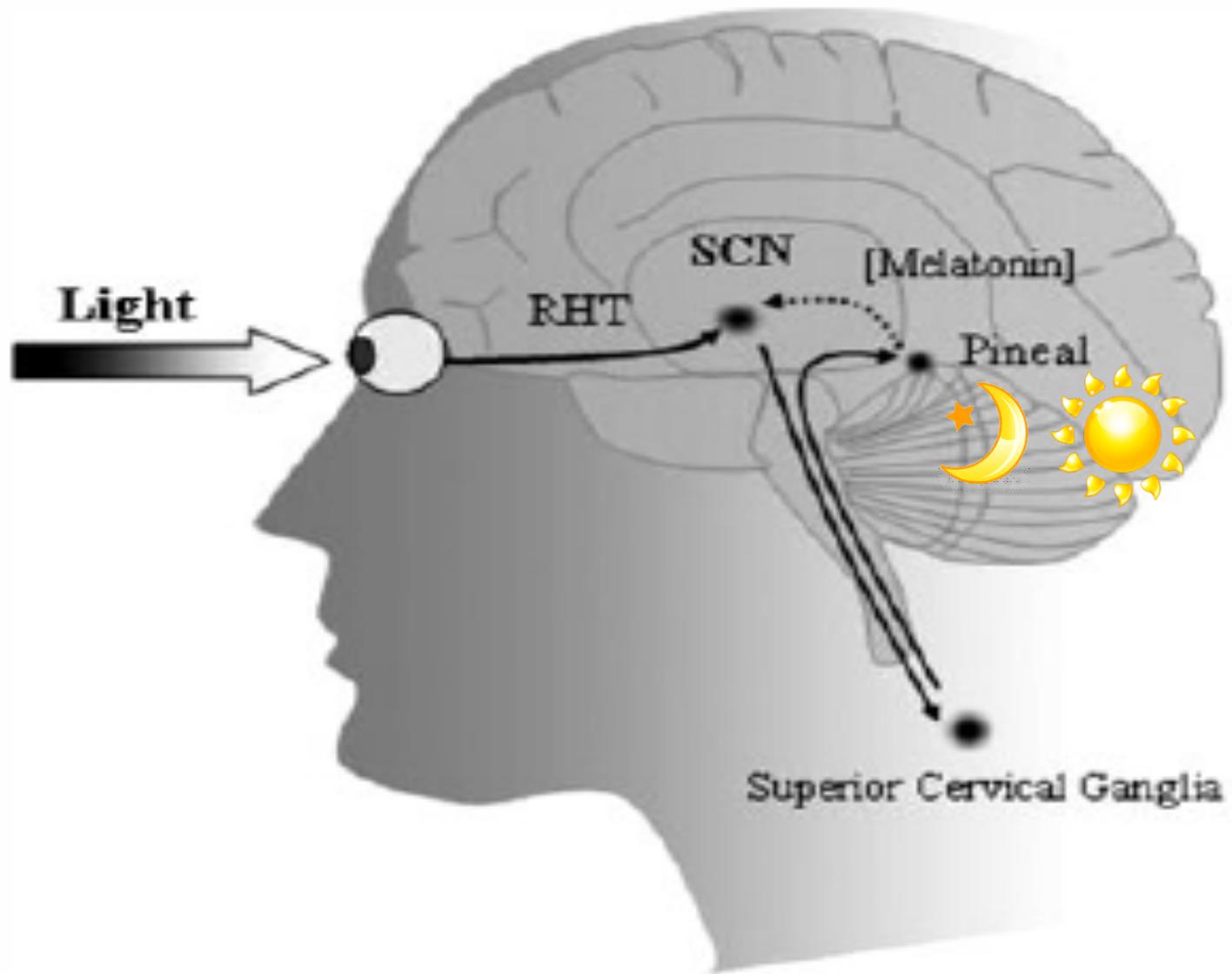
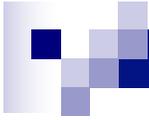
Sleep/Wake Homeostasis

- Tells us that a need for sleep is accumulated and that it is time to sleep.
- Helps us maintain enough sleep t/o the night to make up for the hours of being awake.



Internal Circadian Biological Clock

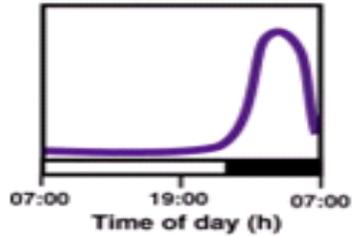
- Regulate the timing of periods of sleepiness and wakefulness t/o the day.
- This rhythm dips and rises at different times of the day.



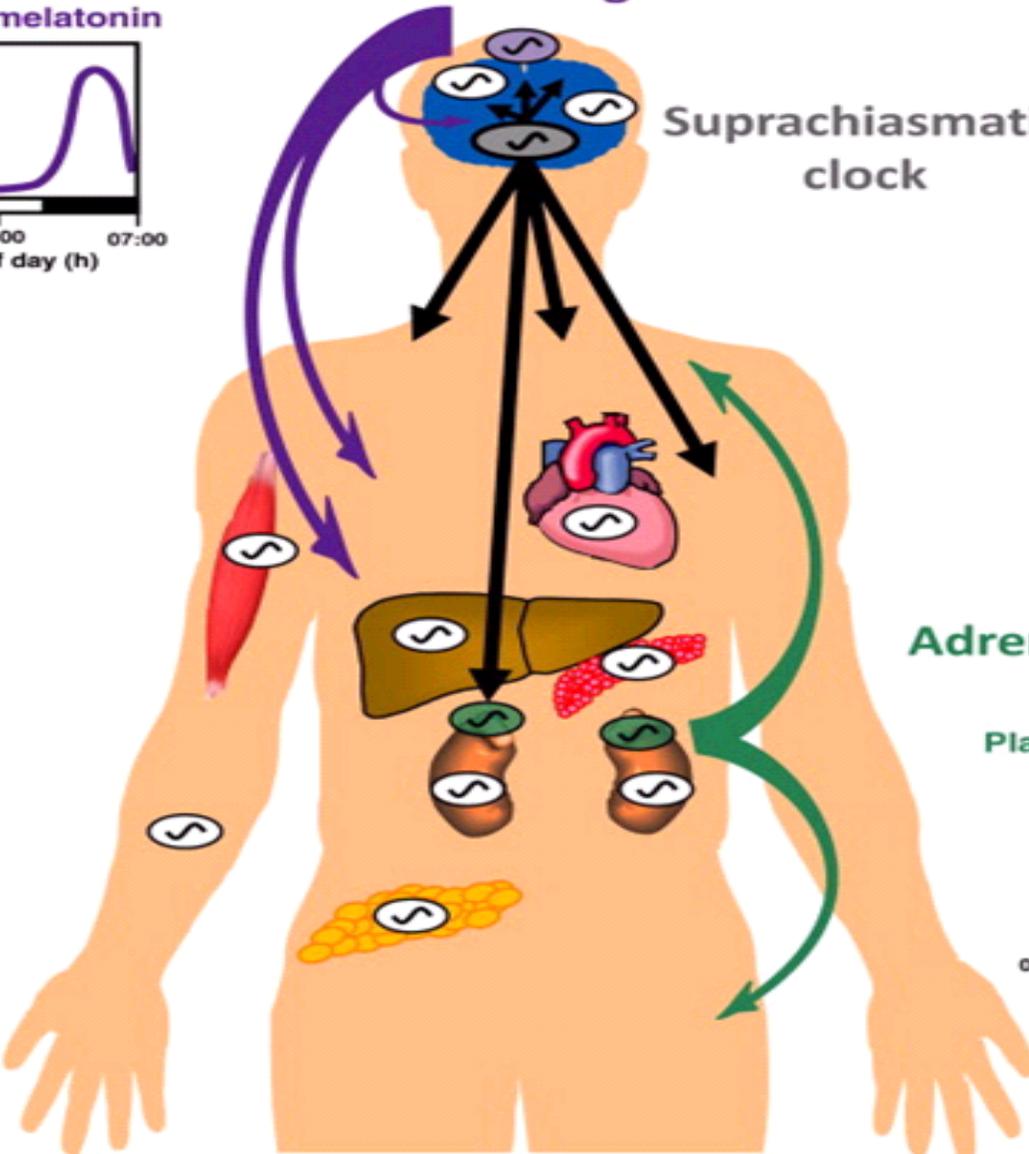
Pineal gland



Plasma melatonin

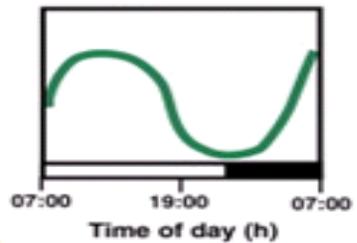


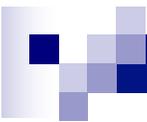
Suprachiasmatic clock



Adrenal glands

Plasma glucocorticoids





Cues to which our body responds to:

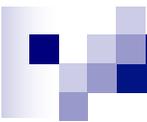
- Light/dark cycle
- Noise, temperature variations
- Sleep
- Meal times



Definition of Sleep

Sleep is a state of natural rest observed in most mammals. It is characterized by:

- ❖ A reduction in voluntary body movement
- ❖ A decrease in reaction to external stimuli
- ❖ Increase rate of the chemical reactions to build muscle mass
- ❖ Decrease rate of breakdown of large molecules to smaller ones producing energy



Why do adults spend 1/3 of our life sleeping?

- The precise functions of sleep is still a mystery but sleep is important for

- Normal motor function

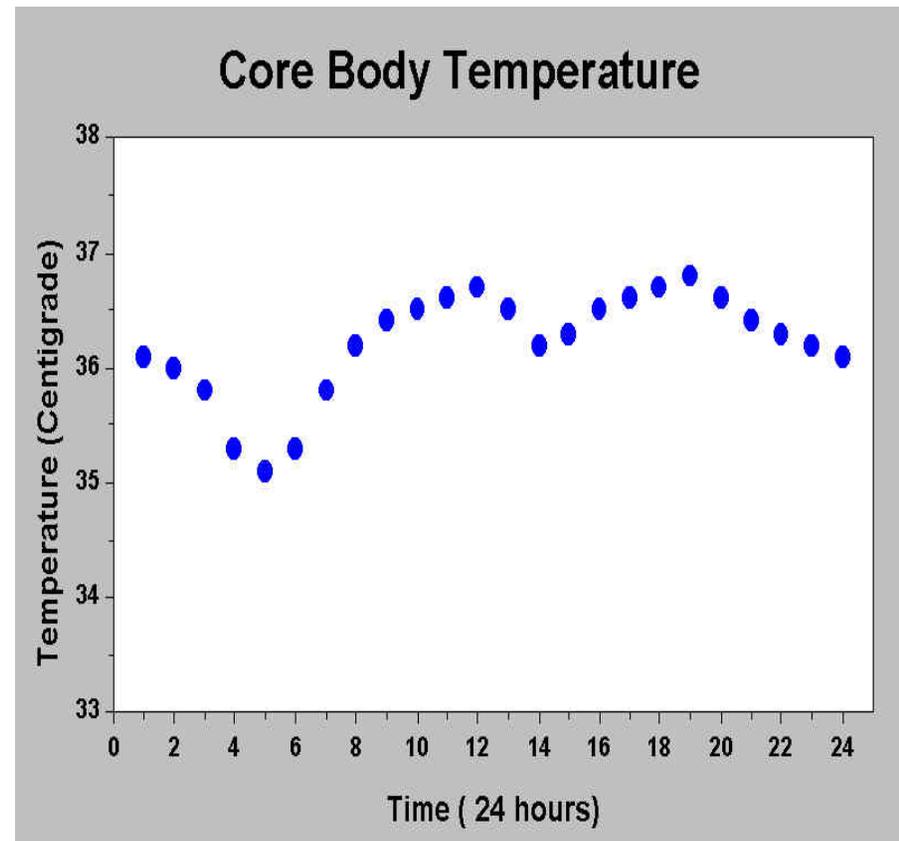
- Normal cognitive function

When we go to sleep....



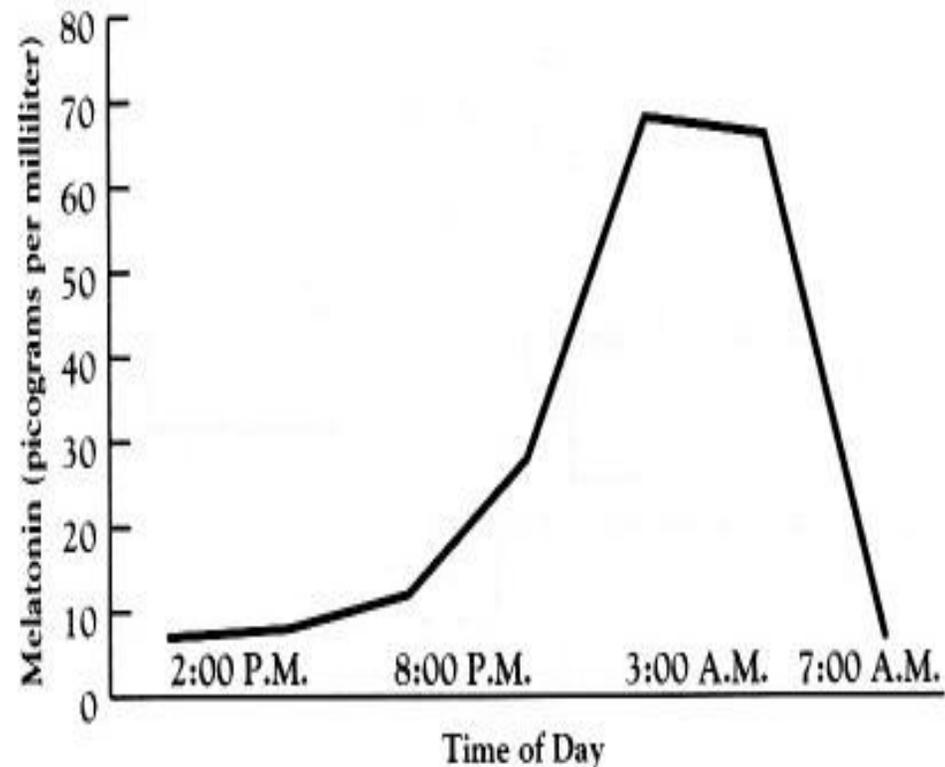
Core Body temperature

- Declines 1 to 2 hours before sleep and reaches a low point between 3-5 a.m. After 6 a.m. it begins to rise again before we wake.
- Three dips in temp
 - 8:00pm-12:00am
 - 3:00-5:00am
 - 1:00-4:00pm

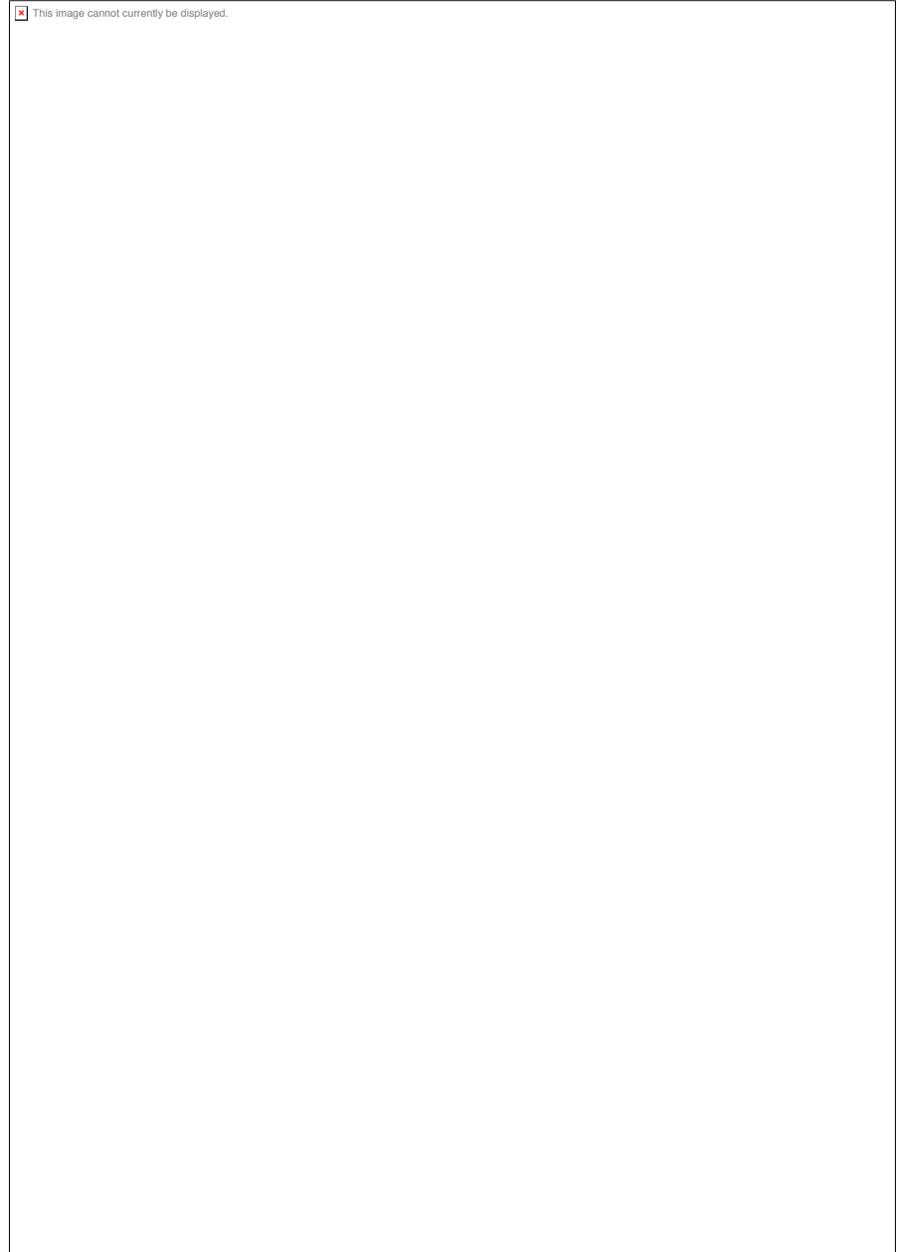


Melatonin Secretion

- Increase in levels around 8:00pm
- Levels peak at approximately 3:00am and begin to decrease
- Lowest levels just before awakening

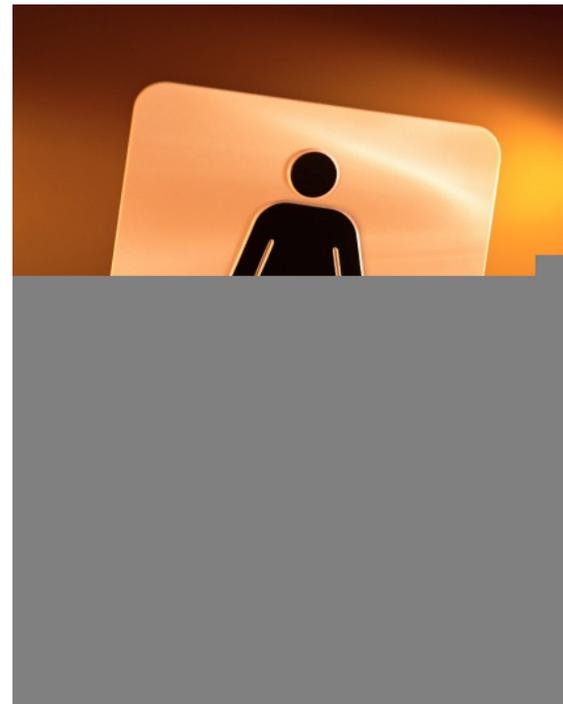


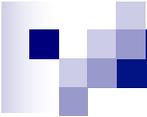
- 
- Hormones important for tissue restoration, such as growth hormone, increase.



- 
- Heart rate and blood pressure decline.
 - Cortisol, adrenaline, and other hormones that help us to maintain wakefulness are suppressed until the end of the night then they begin to increase in order to wake us up.

- Kidney and bowel functions are suppressed so they don't wake us.





Go Team Go!

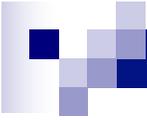
- Biological rhythms change in a co-ordinated way to prepare you for the action of the next working day.

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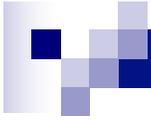
- 
-
- Sleep is highly organized sequence of events that follow a regular, cyclic program each night.





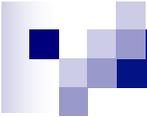
Stages of Sleep

- Non-rapid eye movement (NREM)
 - Stage N1
 - Stage N2
 - Stage N3
- Rapid eye movement (REM)



Wake

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Stage N1

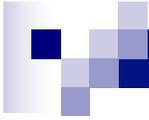
- Stage N1 is a brief stage, lasting no more than 7 – 10 minutes or 2-5% of the Total Sleep Time.
- The individual may not even be aware that he has begun to sleep.
- Still aware of his surroundings
- His thoughts are purposeless and begin to drift – drowsy period

...



Stage N1 cont....

- Thinking is less reality-oriented
- Brain waves are very low.
- The individual is less reactive to outside stimuli, but can still be aroused easily.
- Body temperature and blood pressure start to drop as metabolism slows.



N1

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Stage N2

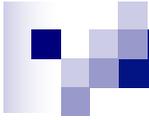
- Stages duration 10 – 25 minutes.
- The most stable and predominant sleep stage in adults.
- 45-55% of Total Sleep Time.
- Slightly deeper sleep than stage N1.
- The individual is no longer aware of his surroundings.

...



Stage N2 cont....

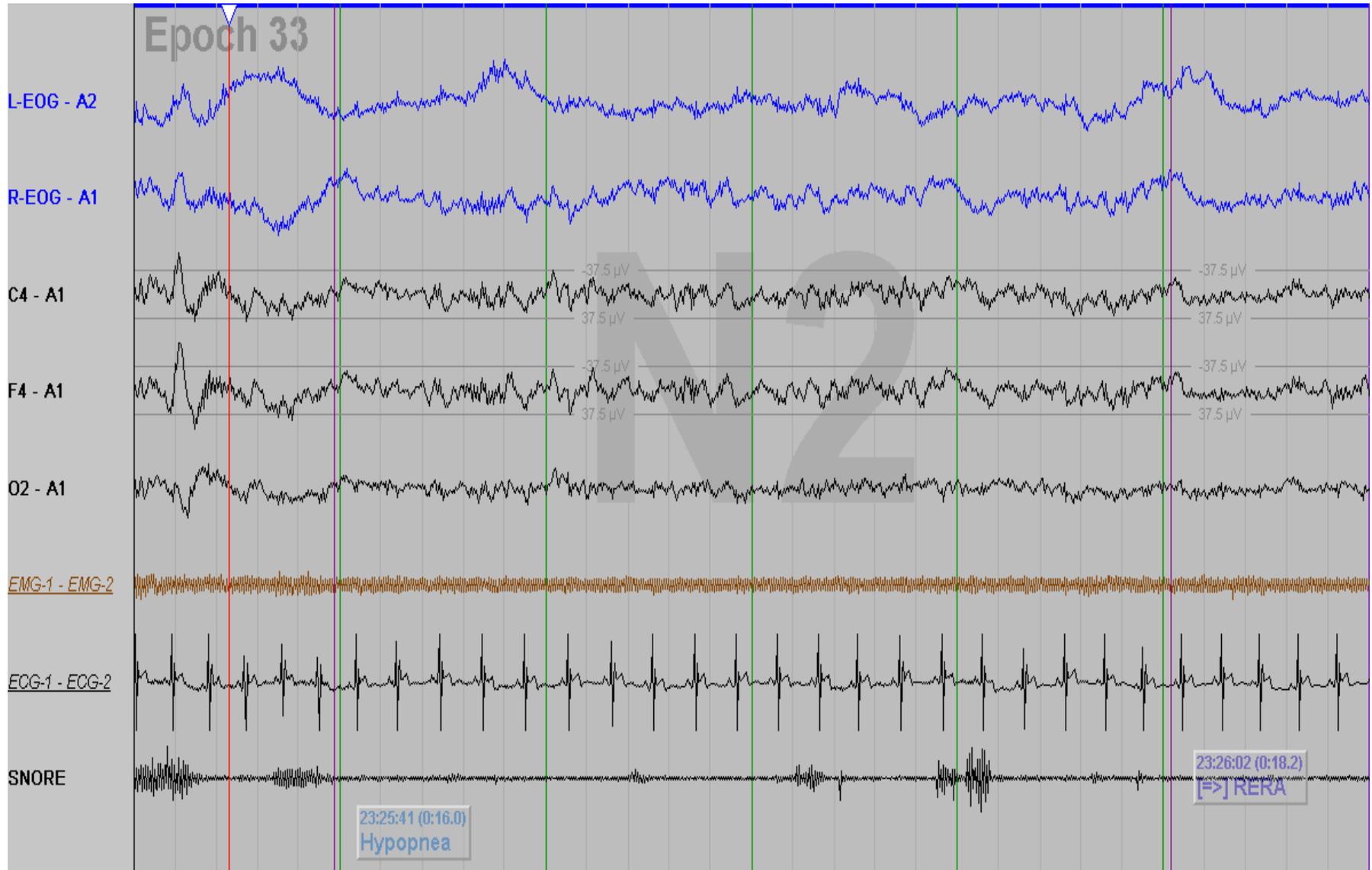
- Need more intense stimulation to wake the individual
- Breathing and heart rate are regular
- Body temperature drops
- Higher amplitude waves



N2

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N2





Stage N3

- Roughly 15 to 20 after falling asleep
- 15 – 25% of Total Sleep Time and decreases with age
- Brain waves are very high
- Deep Sleep
- Need intense stimulation to arouse
- “inactive brain in a movable body”



Stage N3 cont....

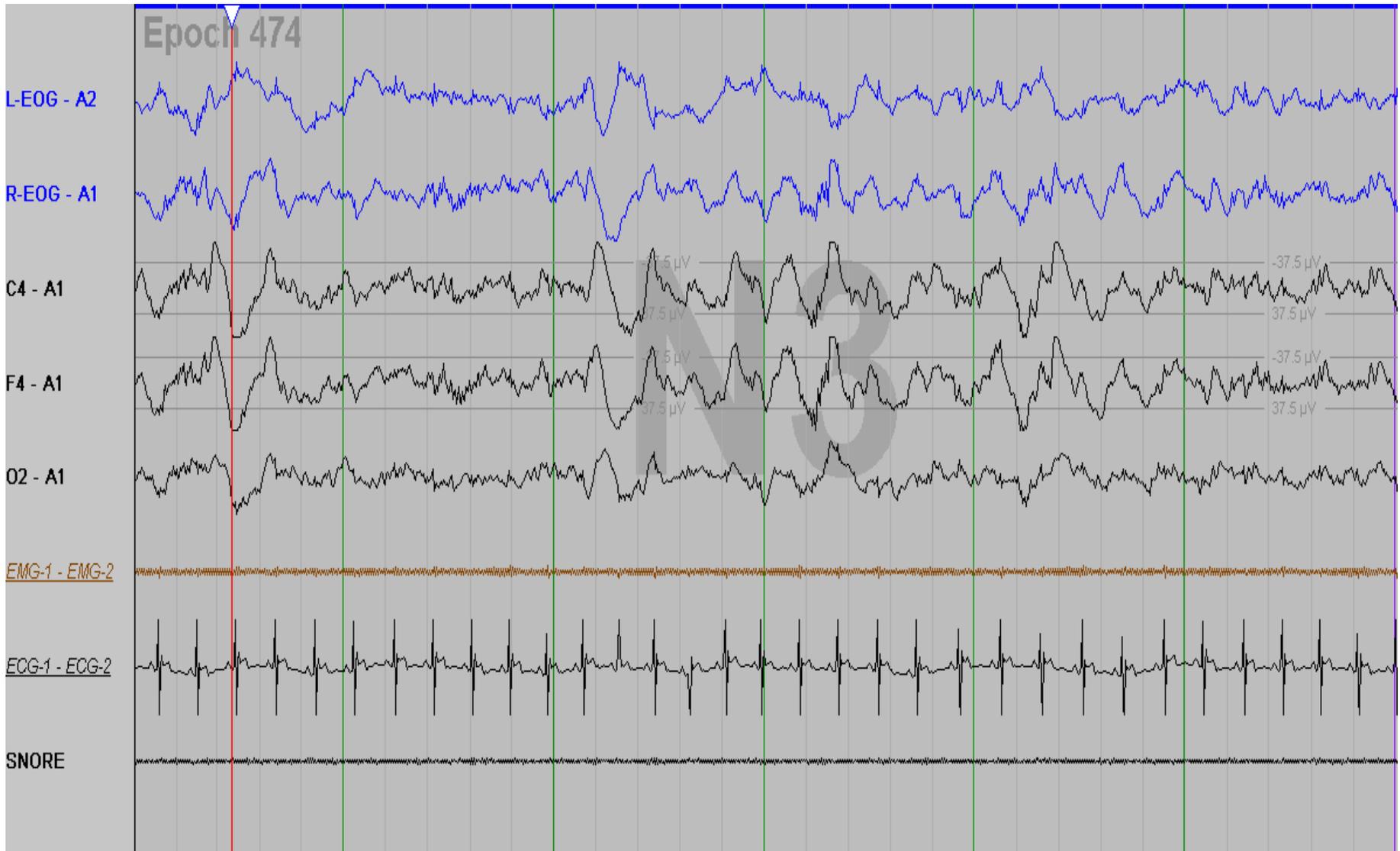
- Deepest and most restorative sleep
- Blood pressure drops
- Breathing becomes slower
- Muscles are relaxed
- Blood supply to muscles increases



Stage N3 cont....

- Tissue growth and repair occurs
- Energy is restored
- Hormones are released, such as:
Growth hormone, essential for growth and development, including muscle development
- Lack of N3 stage – people have more physical pain.

N3 - Delta sleep





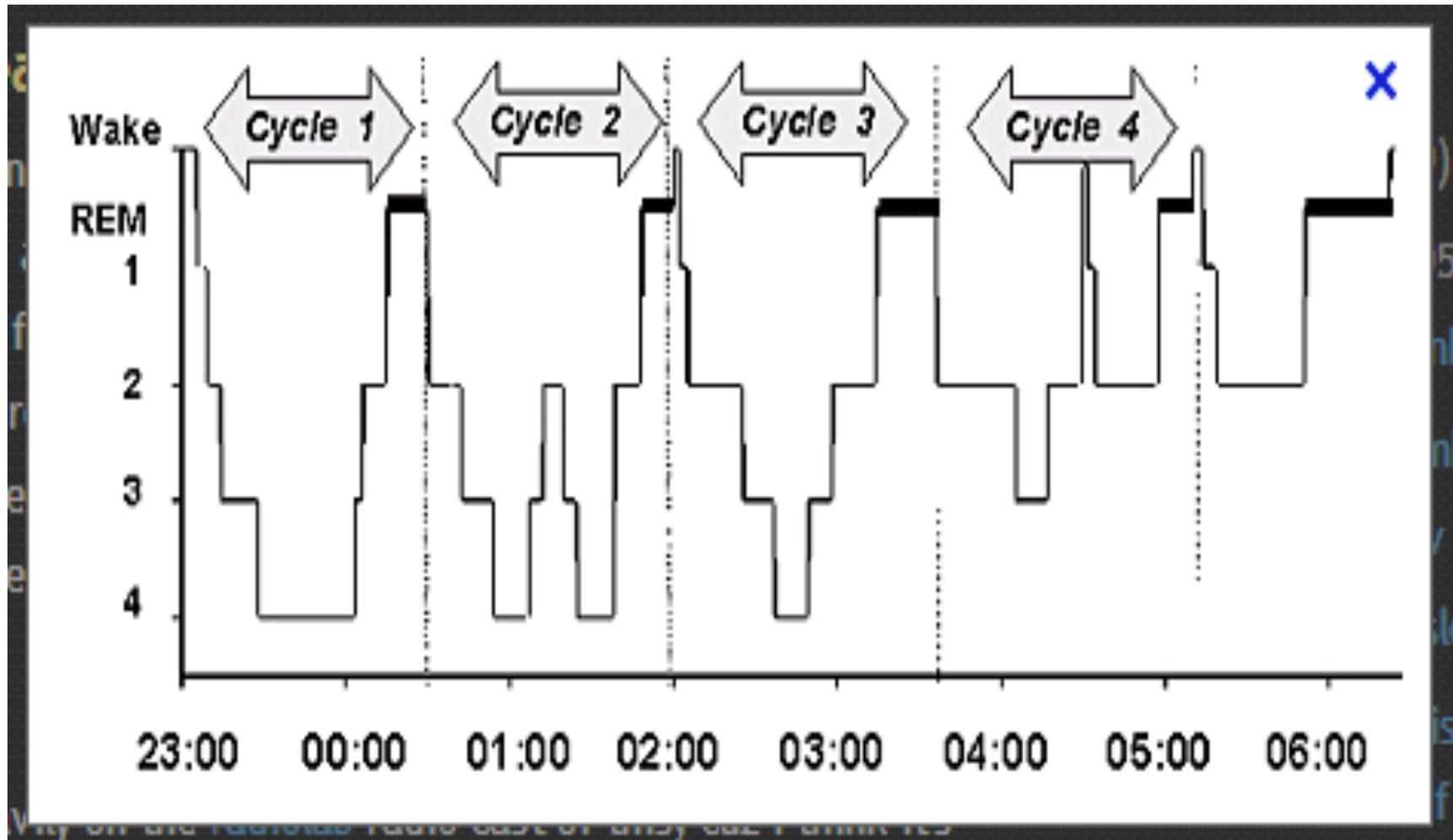
Stage R (REM sleep)

- Occurs within 90 to 120 minutes after lights out.
- Lasts between 5 to 35 minutes
- 20-25% of Total Sleep Time
- “Highly active brain in a paralyzed body”
- Filing system for the brain
- Increased cerebral blood flow

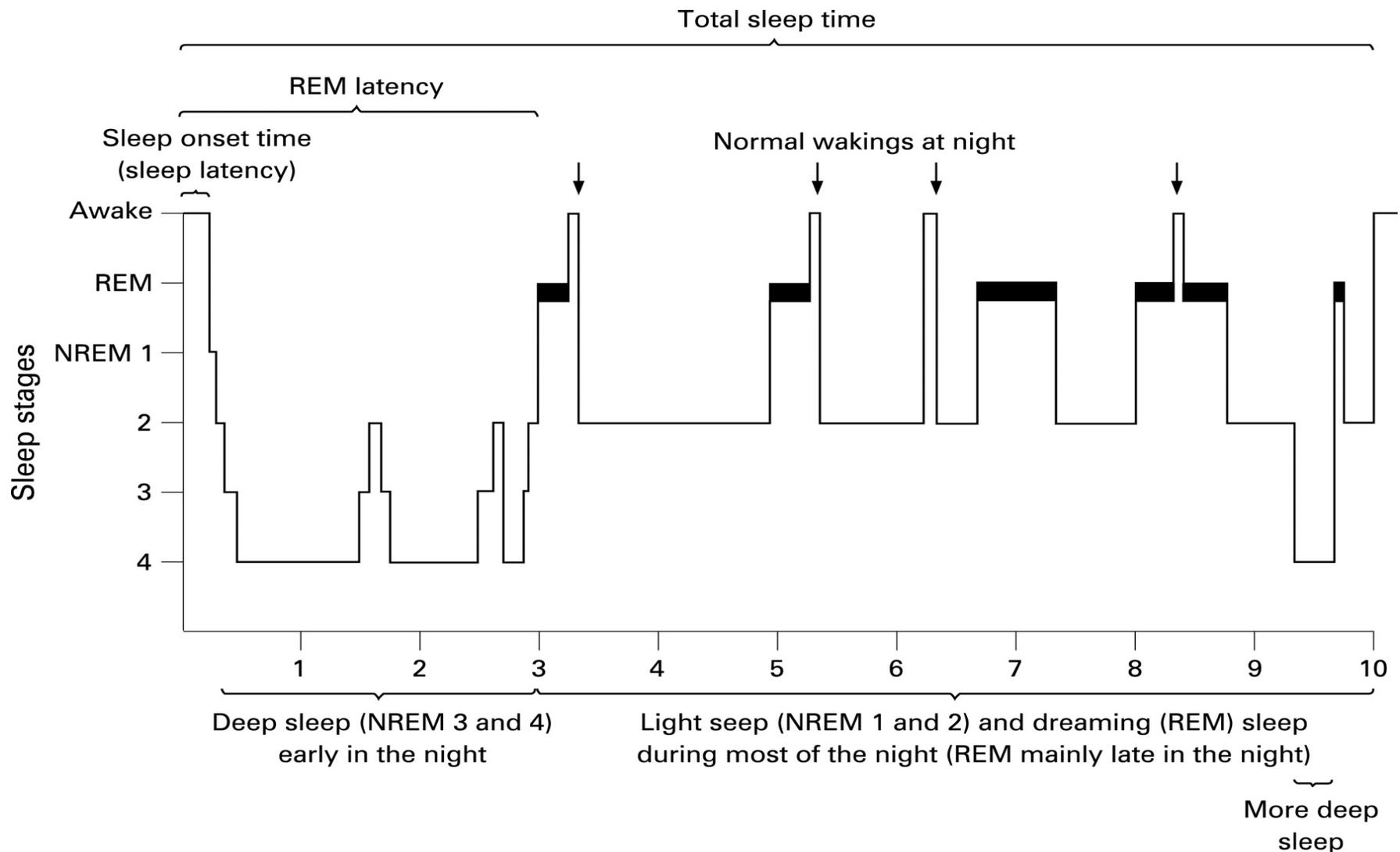
Stage R cont....

- Dreams are only remembered when you wake up in the middle of it.
- Lack of Stage R – people are more anxious and agitated.





Hypnogram – Normal Adult

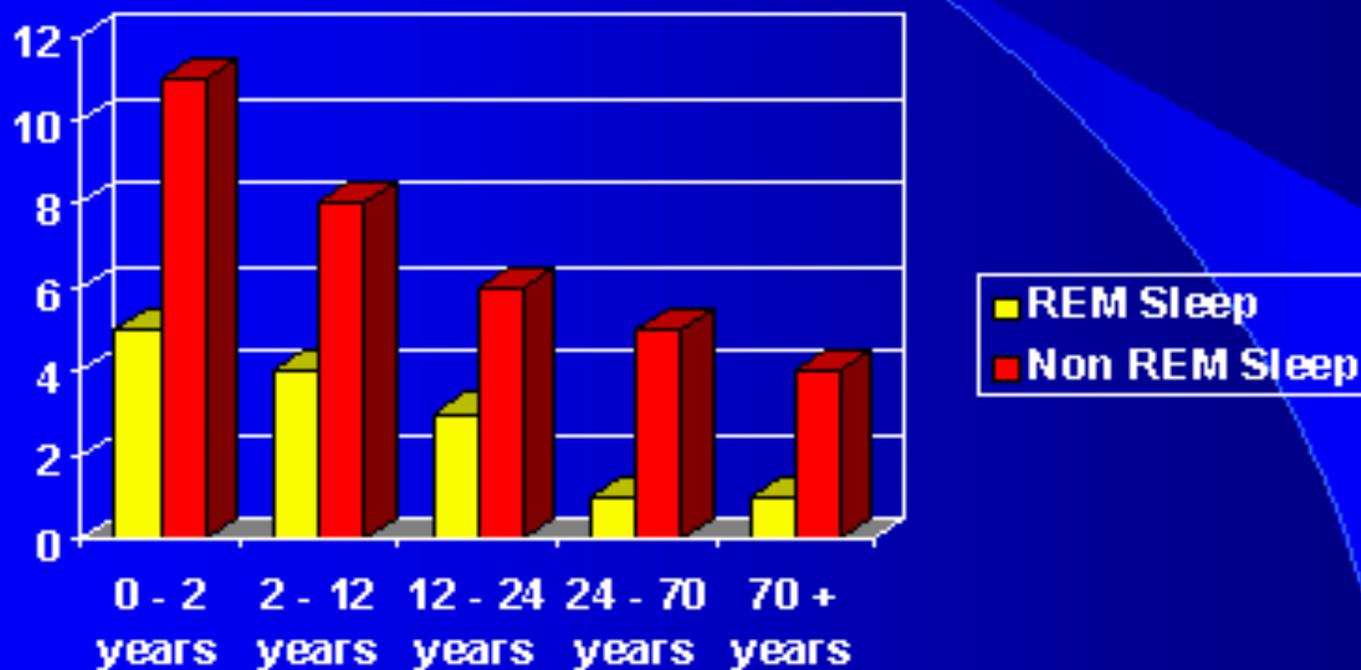




Optimal Amount of Sleep

- Sleep is adequate when:
 - No daytime sleepiness
 - No daytime dysfunction

How Much Sleep Do We Get?

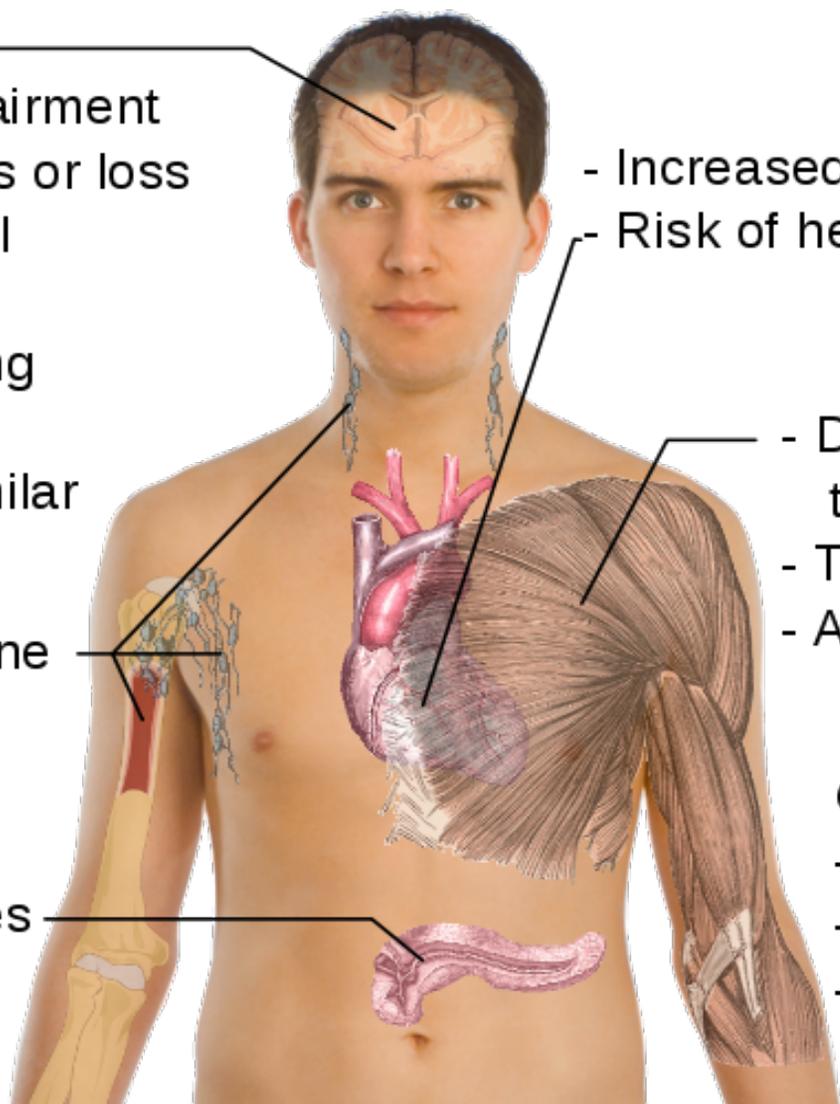




Poor Quality or Quantity =

- Groggy
- Lethargic
- Tired
- Difficulty thinking smoothly
- Poor concentration on tasks
- headaches
- Body aches
- Bad mood
- Easily frustrated, irritable

Effects of Sleep deprivation

- 
- The diagram shows a human male torso with various anatomical features highlighted in different colors and connected to text boxes by lines. The brain is highlighted in light blue, the heart in pink, the lungs in light purple, the stomach in light pink, and the muscles in brown. The callouts are as follows:
- Irritability
 - Cognitive impairment
 - Memory lapses or loss
 - Impaired moral judgement
 - Severe yawning
 - Hallucinations
 - Symptoms similar to ADHD
 - Impaired immune system
 - Risk of diabetes Type 2
 - Increased heart rate variability
 - Risk of heart disease
 - Decreased reaction time and accuracy
 - Tremors
 - Aches
- Other:*
- Growth suppression
 - Risk of obesity
 - Decreased temperature

Circadian rhythm disruptions

Body temperature
Respiratory rate
Hormonal production
Menstrual cycle
Urinary excretion
Cell division

Mental Health

Stress
Anxiety
Depression
Neuroticism
Reduced vigilance
'Burnout syndrome'

Brain effects

Sleep loss
REM sleep reduction
Stage 2 sleep reduction
Fatigue
Reduced brain volume

Cardiovascular disorders

40% increased risk for:
Angina pectoris
Hypertension
Myocardial infarction

Gastrointestinal disorders

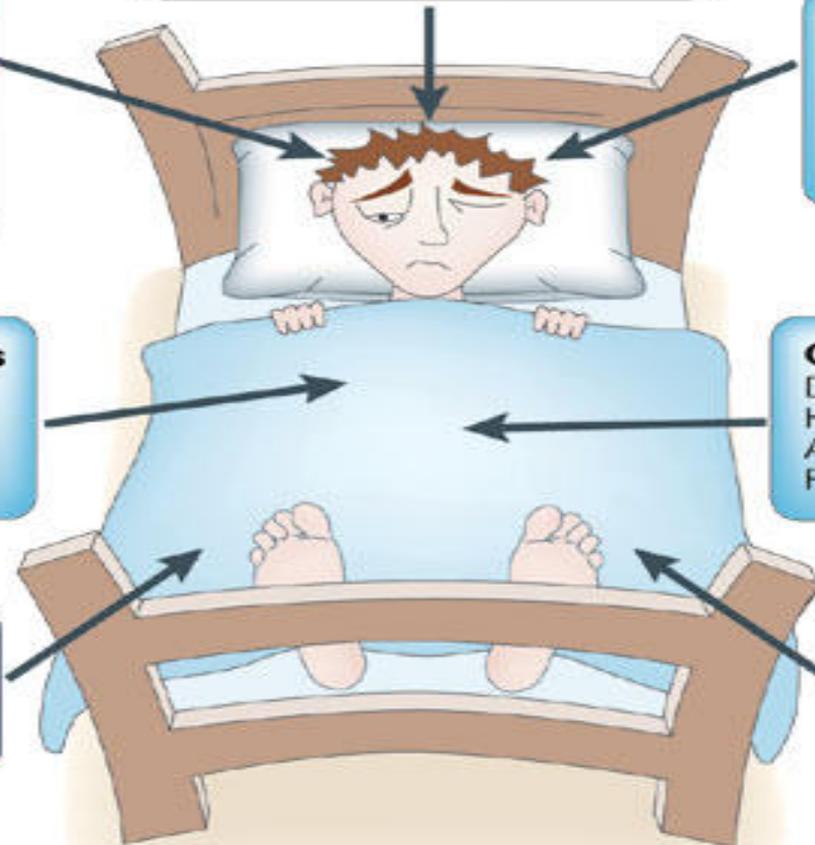
Dyspepsia
Heartburn
Abdominal pains
Flatulence

Reproductive effects

Spontaneous abortion
Low birth weight
Prematurity

Increased cancer

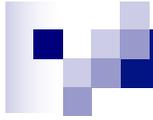
Breast cancer
Colorectal cancer



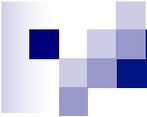


Chronically sleep deprived people

- Suffer from general sense of poor health, and die younger.



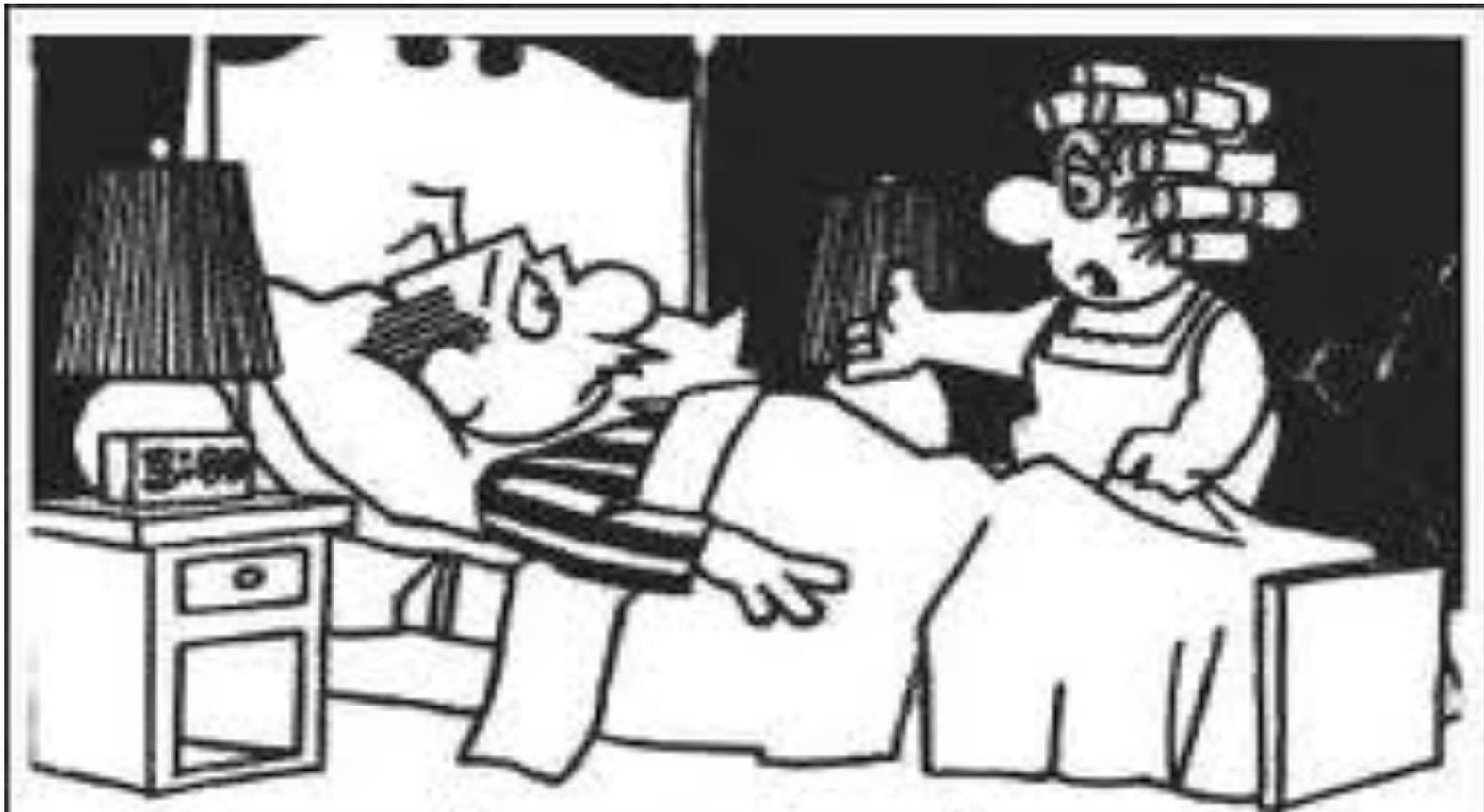
SLEEP DISORDERS



What is the disorder?

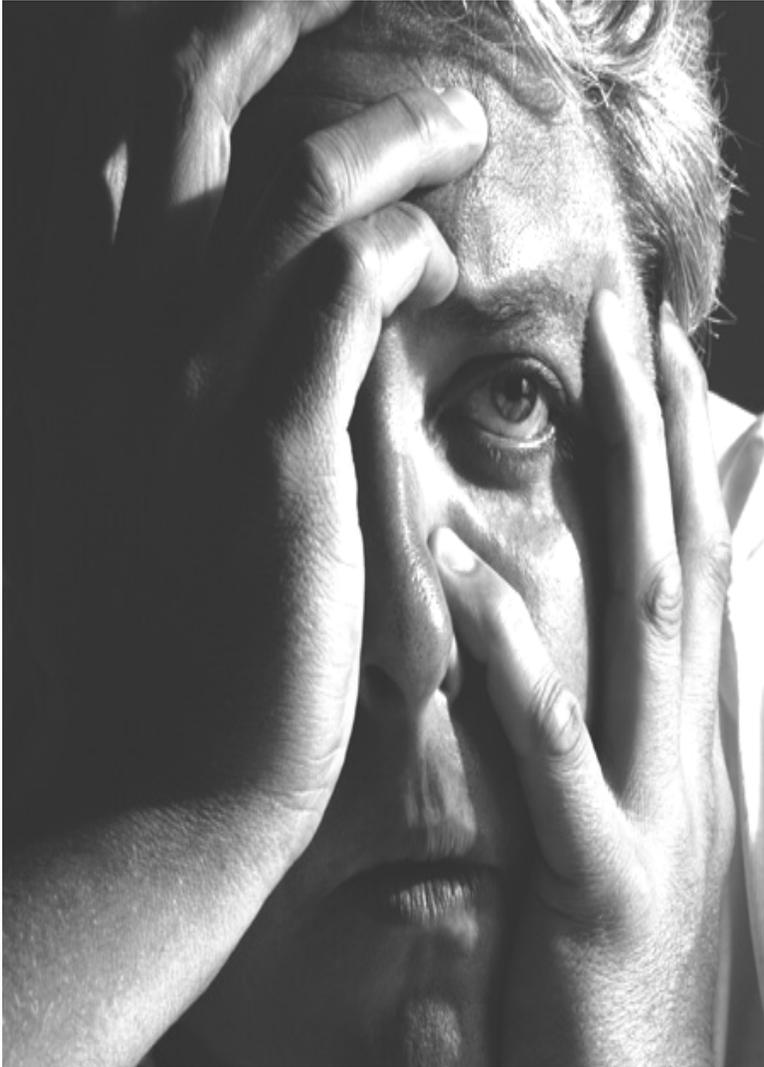
- ***I have difficulty falling asleep.***
- ***Thoughts race through my mind and prevent me from getting to sleep.***
- ***I anticipate a problem with sleep several times a week,***
- ***I often wake up and have trouble going back to sleep.***

- 
- ***I worry about things and have trouble relaxing.***
 - ***I wake up earlier in the morning than I would like to.***
 - ***I lie awake for a half an hour or more before I fall asleep.***
 - ***I often feel sad or depressed because I can't sleep.***



"No wonder you have insomnia . . .
lying there awake all night."

Insomnias



■ Dyssomnias

- Most Common Sleep Disorder**
- Trouble Initiating Sleep**
- Trouble Maintaining Sleep**
- Have Non restorative Sleep**



Causes of Insomnia

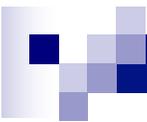
1. Short term or transient insomnia

- Stress
- Emotional or physical discomfort
- Extreme temperatures
- Jet lag
- Side effects or medications



2. Secondary Insomnia

- Combination of physical or mental disorders
- Undiagnosed or uncontrolled sleep disorders



What is the disorder?

- *I have noticed (or others have commented) that parts of my body jerk during sleep.*
- *I have been told that I kick and jerk during sleep.*
- *When trying to go to sleep, I experience an aching or crawling sensation in my legs.*
- *....*



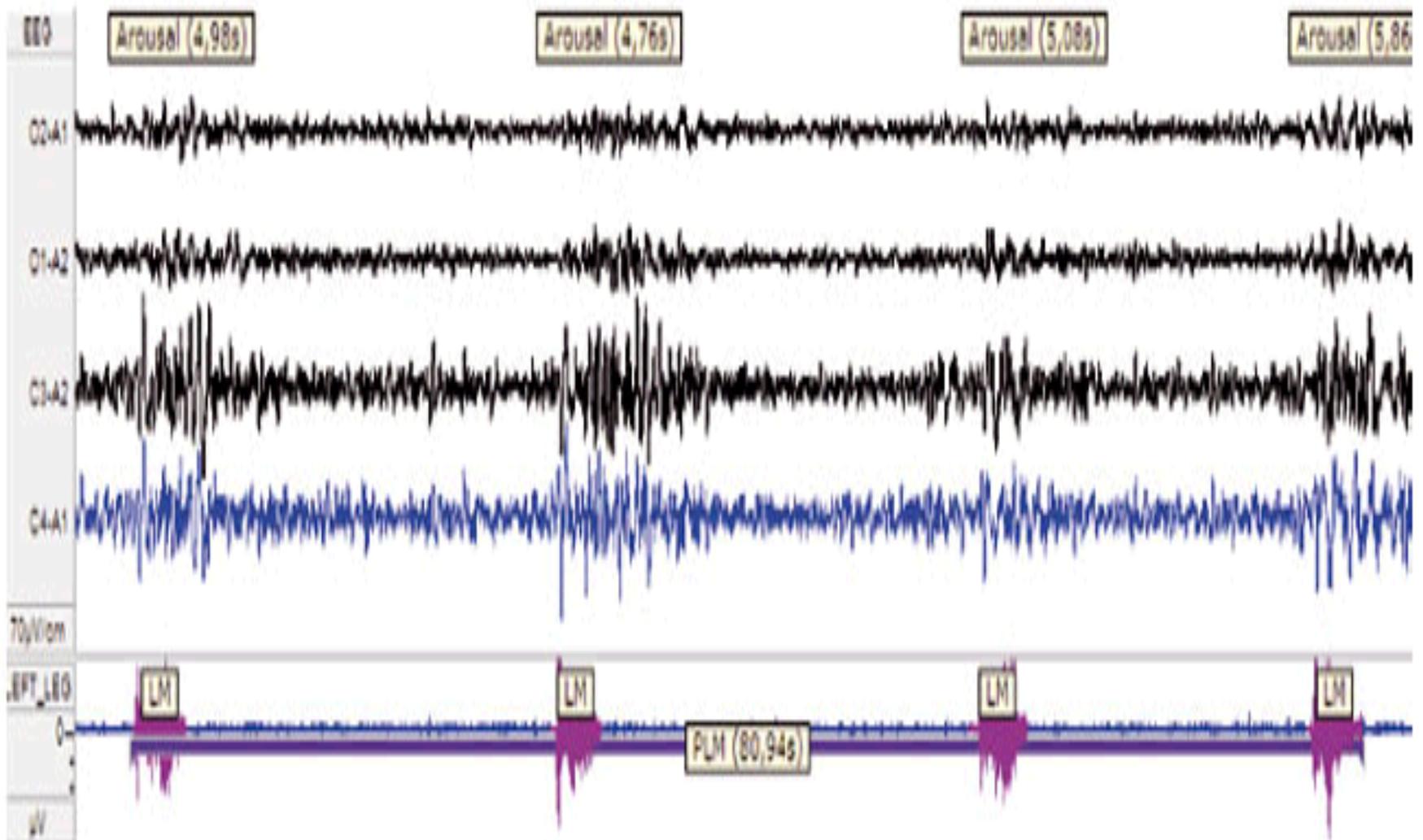
■ *I experience leg pain or cramps at night*

■ *Sometimes I can't keep my legs still at night, I just have to move them to feel comfortable.*

■ *Even though I slept through the night, I feel sleepy during the day.*



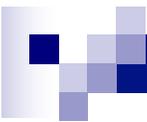
How can patients sleep when their legs are on the move?





Causes of RLS and/or PLMS

- Anemia
- Iron deficiency
- CNS problems
- Kidney Disorders
- Hereditary link



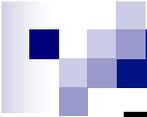
Movement Disorders

- Restless Legs Syndrome (included Sleep-Related Growing Pains)
- Periodic Limb Movement Sleep Disorder
- Sleep-Related Leg Cramps
- Sleep-Related Bruxism
- Sleep-Related Rhythmic Movement Disorder



“You just woke up while in REM,
there’s no monster under the bed.”

By Barbara Ludwig-Cull, RPSGT



Parasomnias

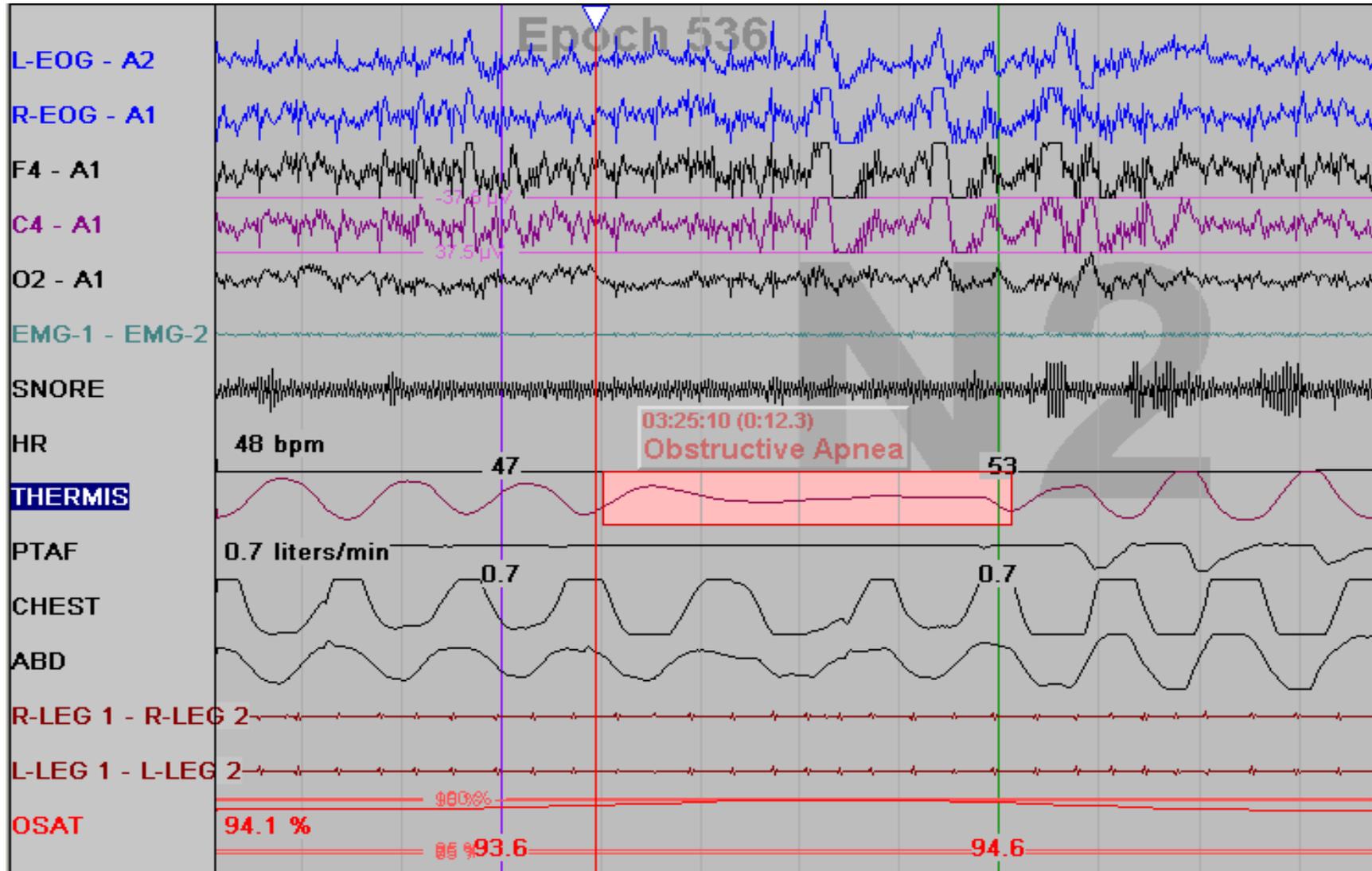
- **Disorder of Arousal (From Non-REM Sleep)**
 - Confusional arousals
 - Sleepwalking
 - Sleep terrors
- **Parasomnias Usually Associated with REM Sleep**
 - REM Sleep Behavior Disorder
 - Recurrent Isolated Sleep Paralysis
 - Nightmare Disorder
- **Other Parasomnias**
 - Sleep-Related Dissociative Disorder
 - Sleep-Related Enuresis
 - Sleep-Related Groaning
 - Exploding Head Syndrome
 - Sleep-Related Hallucinations
 - Sleep-Related Eating Disorder
 - Parasomnia, unspecified
 - Parasomnia due to drug or substance
 - Parasomnia due to a medical condition



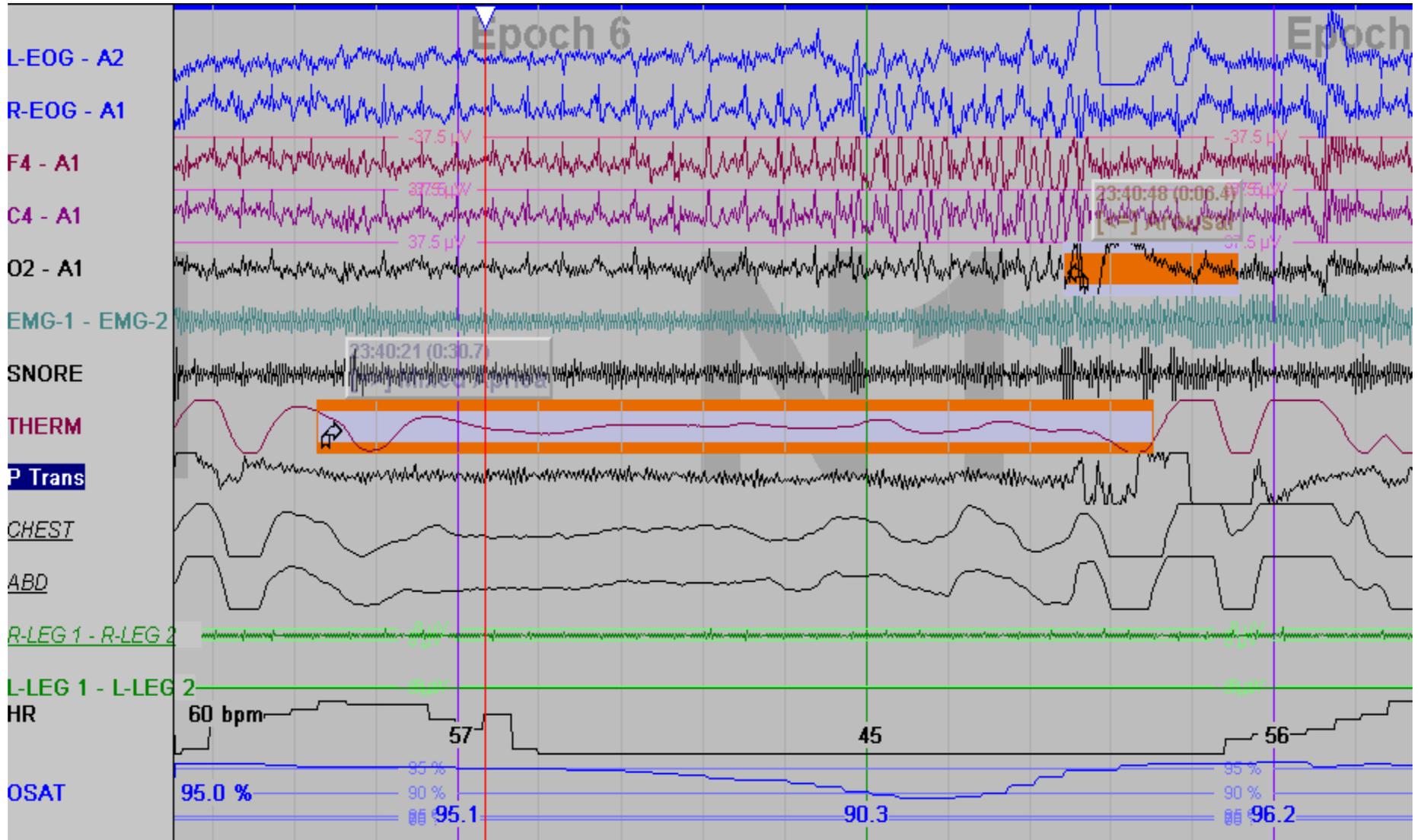
Narcolepsy

- Neurological disorder cause by the brain's inability to regulate sleep-wake cycles normally.
- Sudden sleep attacks, insomnia, dream-like hallucinations and sleep paralysis.
- Cataplexy – sudden muscle weakness often triggered by emotions such as anger, surprise and laughter.

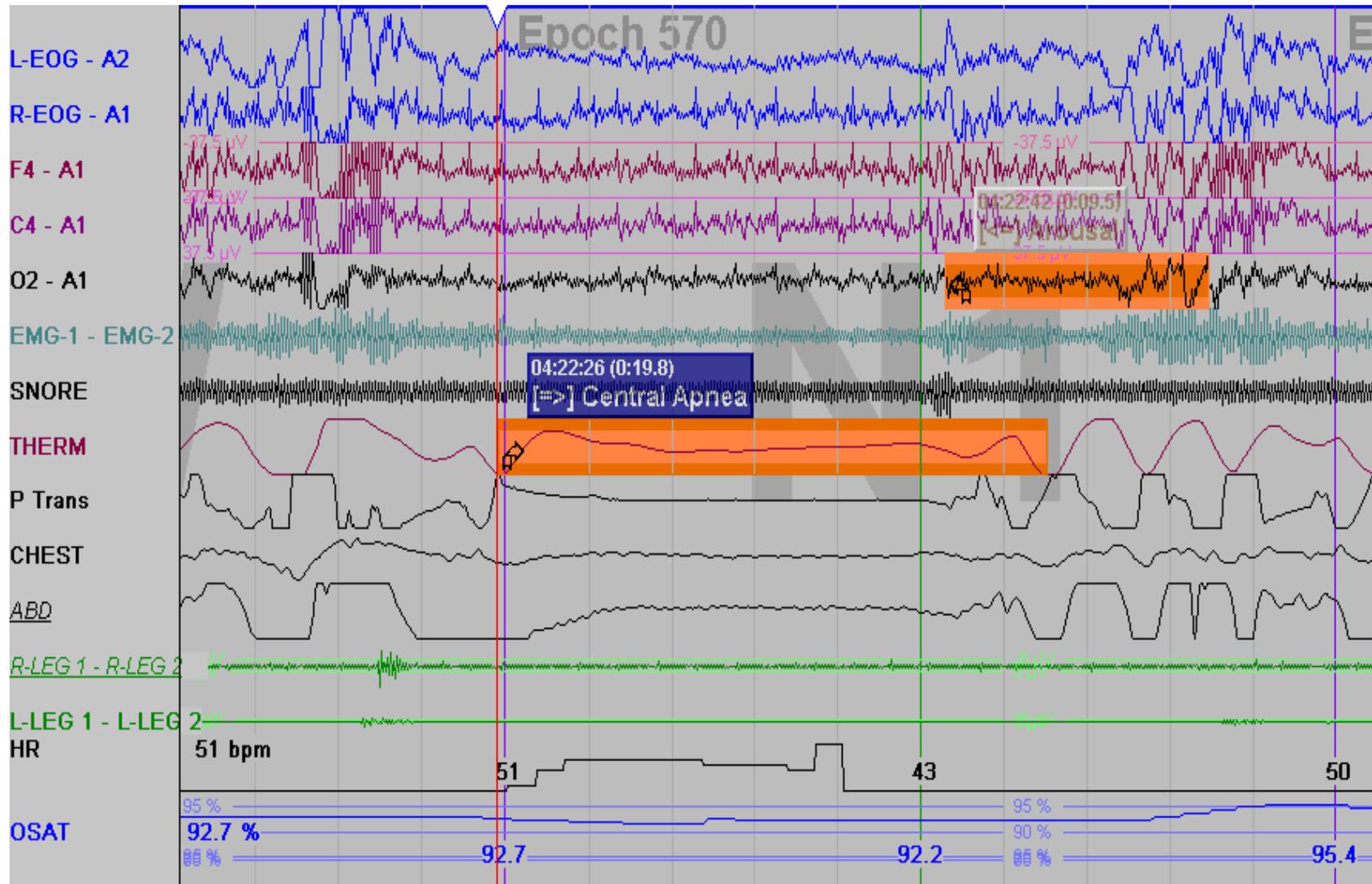
Obstructive apneas

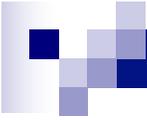


Mixed Apneas

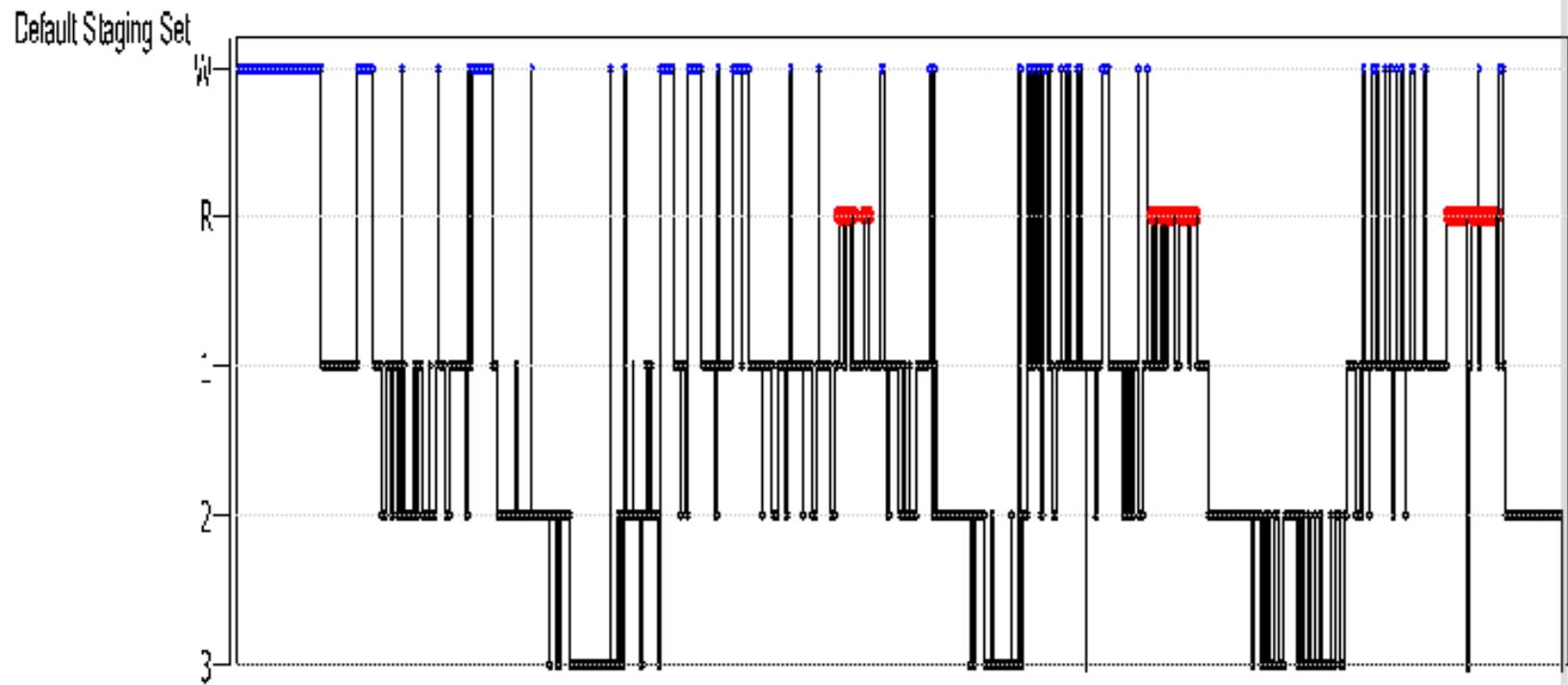


Central Apneas





Severe OSA





Cost of the CPAP machine

- ADP funds 75% if OSA diagnosis
- Patient pays 25% - approx. \$500
- Special units may be 100% funded by VEP program.



©LUDWIG

"Sure, I'll try CPAP - YOU go first."

Barbara Ludwig Cull, RPSGT



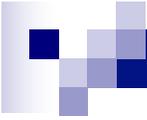
Most common cause of excessive sleepiness

- Self-imposed sleep deprivation.

Testing for Sleep Disorders



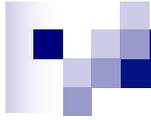
SITUATION	0 WOULD NEVER DOZE	1 <i>SLIGHT</i> CHANCE OF DOZING	2 <i>MODERATE</i> CHANCE OF DOZING	3 <i>HIGH</i> CHANCE OF DOZING
Sitting and reading				
Watching TV				
Sitting inactive in a public place (i.e. – in a theatre or meeting)				
As a passenger in a car for an hour without a break				
Lying down to rest in the afternoon when circumstances permit				
Sitting and talking to someone				
Sitting quietly after a lunch without alcohol				
In a car, while stopped for a few minutes in traffic				
TOTAL				



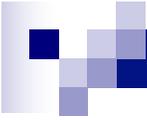
Epworth Sleepiness Scale

Scoring

- 7 or less – normal sleep function
- 8-9 – moderate sleepiness
- 16-20 – severe sleepiness
- 21-24 – excessively sleepy



Home Testing



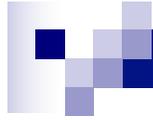
Gold Standard Testing

Nocturnal
Polysomnography

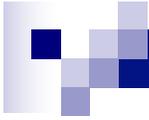


Referrals

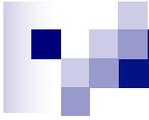
- Snoring
- Snoring with witnessed apneas
- Gasping or choking during sleep
- Hypersomnia (excessive daytime sleepiness)
- Suspected narcolepsy (sleep attacks, cataplexy)
- Non-refreshing sleep
- Restless legs/cramps
- Morning headaches
- Frequent awakenings
- Insomnia
- Hypertension
- Congested heart failure
- Obesity
- Parasomnias (sleep walking, night terror, confusional arousals...)



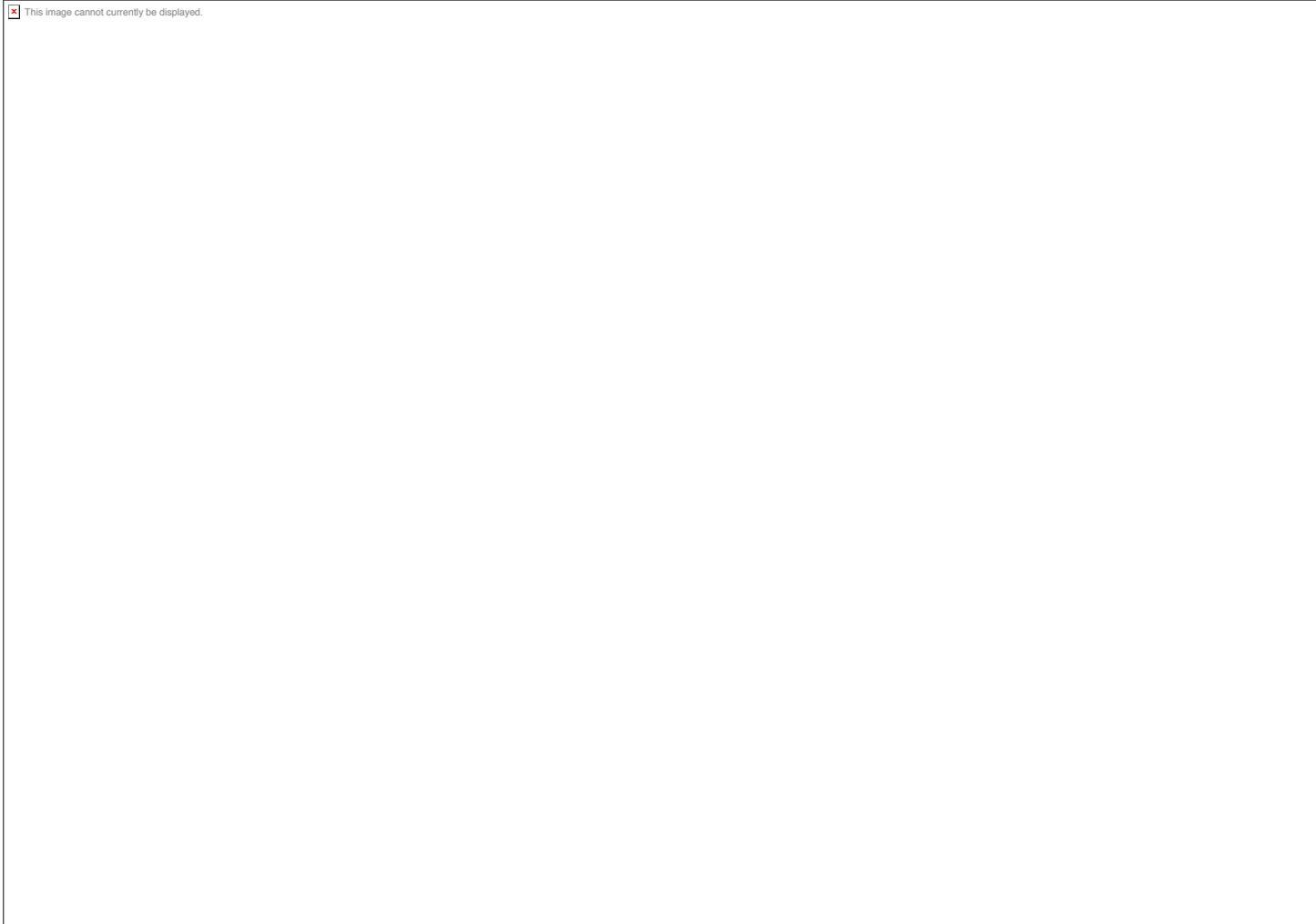
Polysomnographic Testing



- **Electroencephalogram (EEG)**
- **Electrooculogram (EOG)**
- **Electromyogram (EMG)**

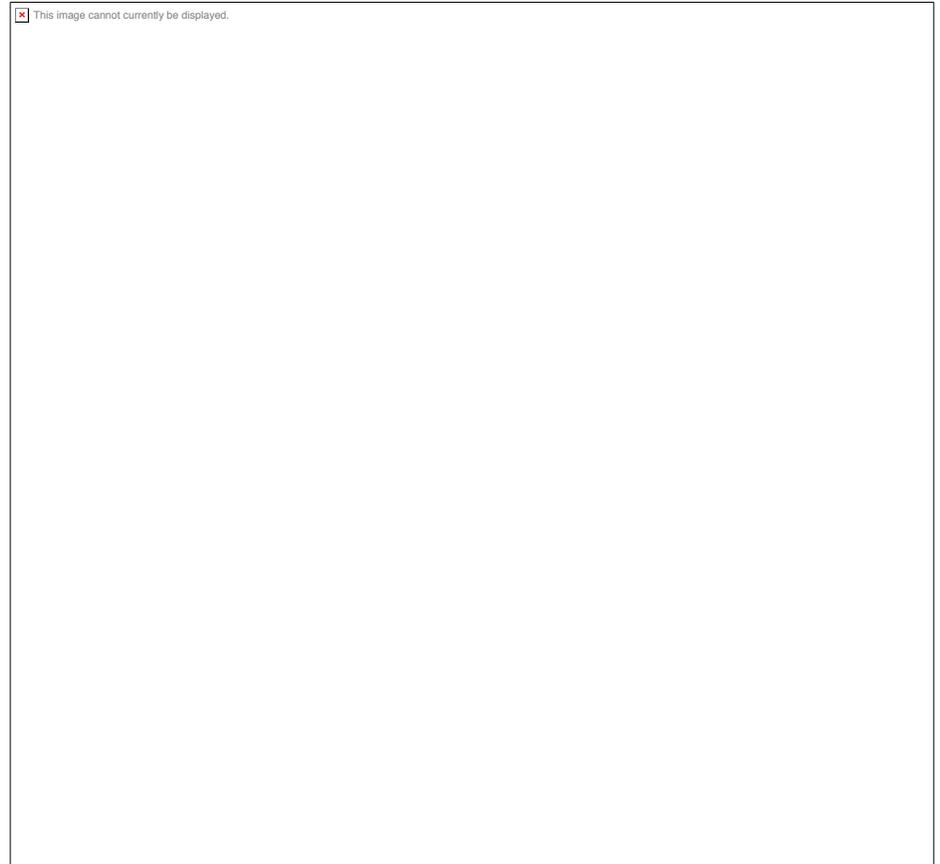


International 10-20 System



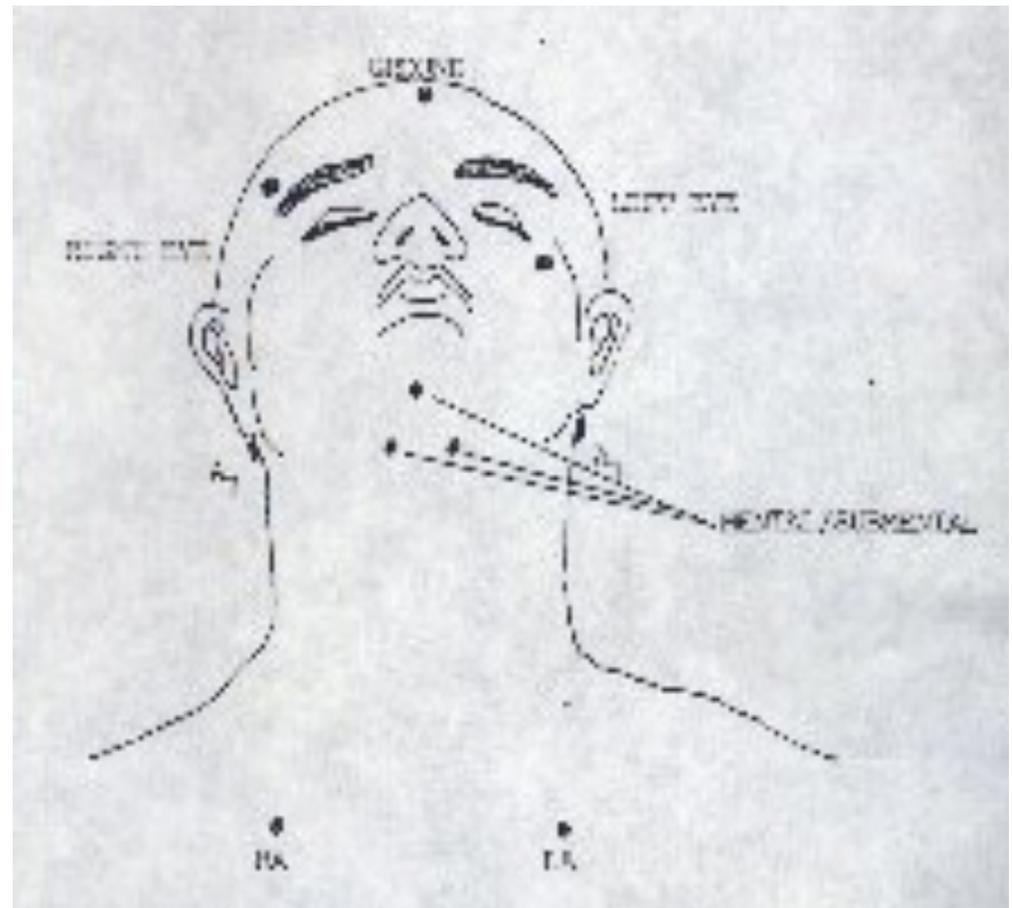
EOG ELECTRODE PLACEMENT

- L-EOG is placed 1 cm below the left outer canthus
- R-EOG is placed 1 cm above the right outer canthus



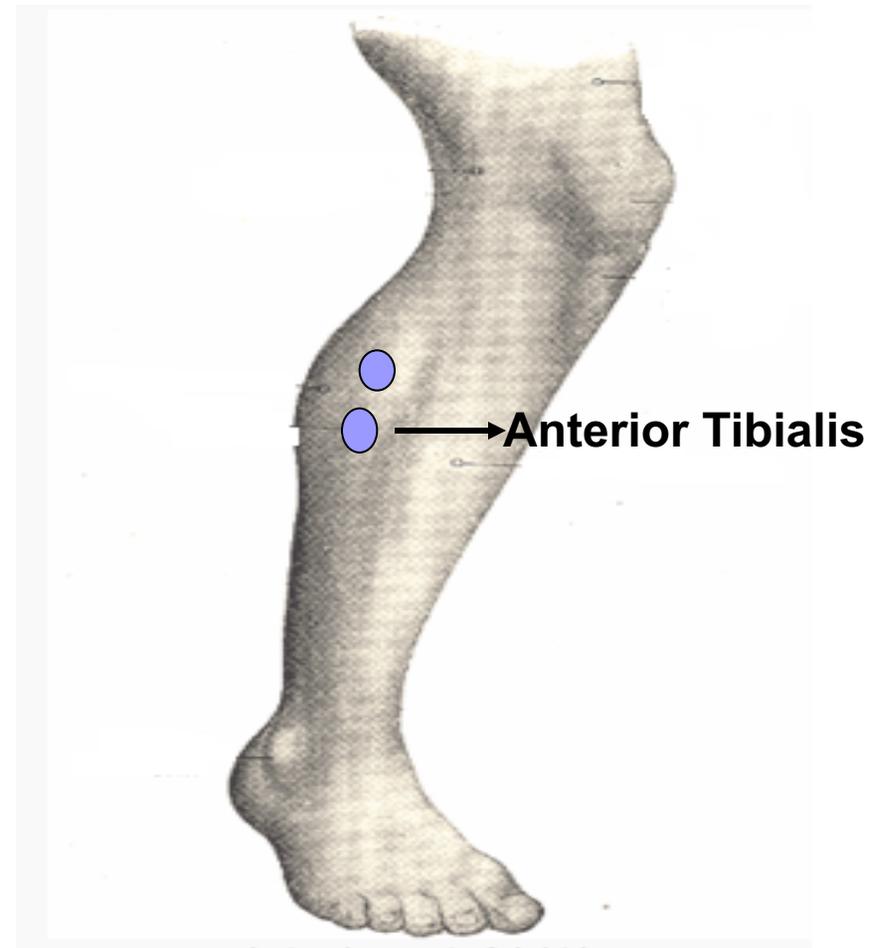
EMG ELECTRODE PLACEMENT

The Chin EMG electrode is placed on the mentalis and submental muscle



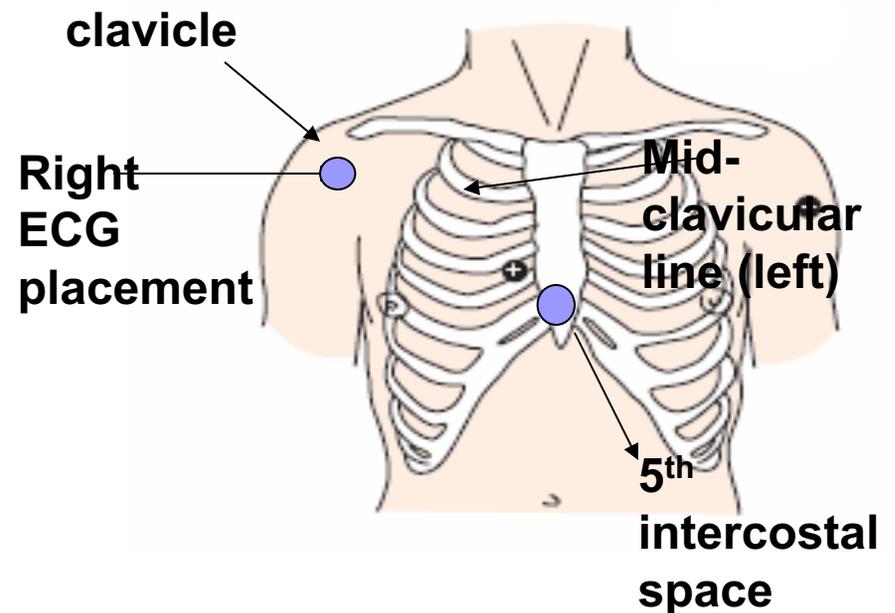
EMG ELECTRODE PLACEMENT

The Leg EMG electrode is placed on the anterior tibialis muscle, 2-4 cm apart vertically.

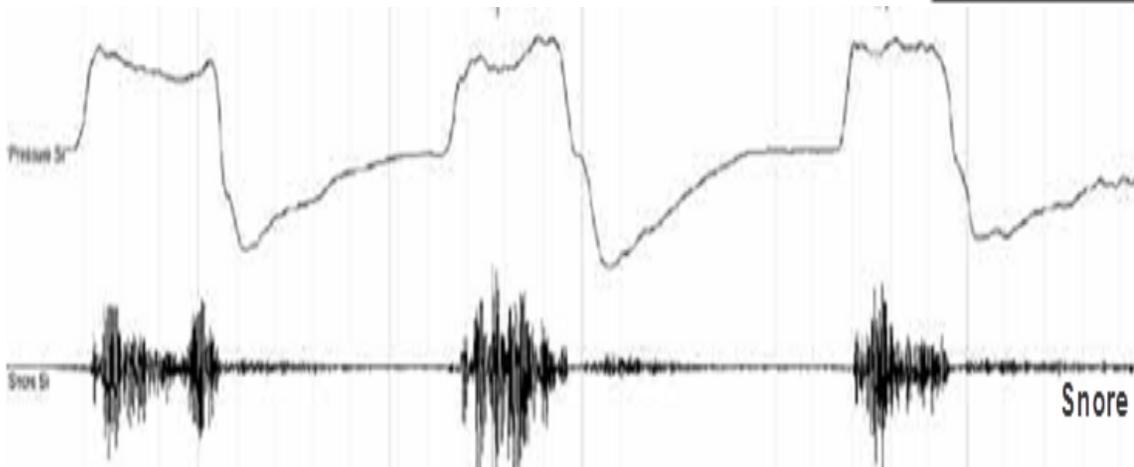
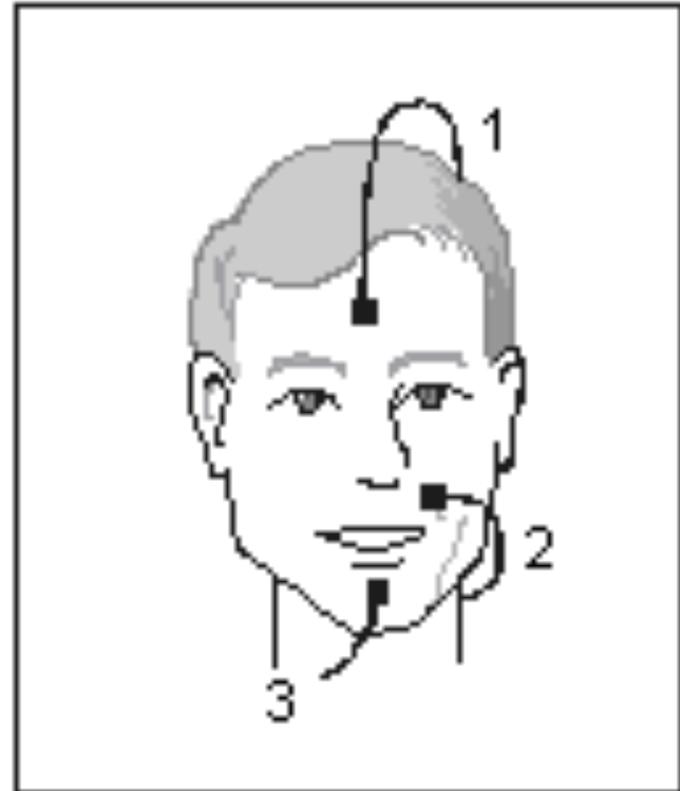


ECG ELECTRODE PLACEMENT

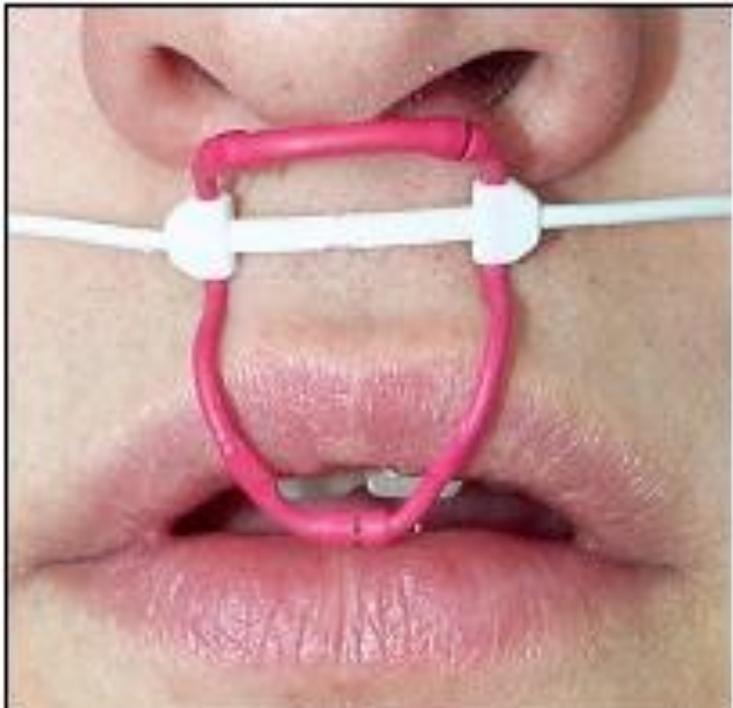
- Electrodes are placed just beneath the right clavicle (collar bone) and at the midclavicular line on the left (slightly lower than the right) and the fifth intercostal space



Snore sensor



Thermistor



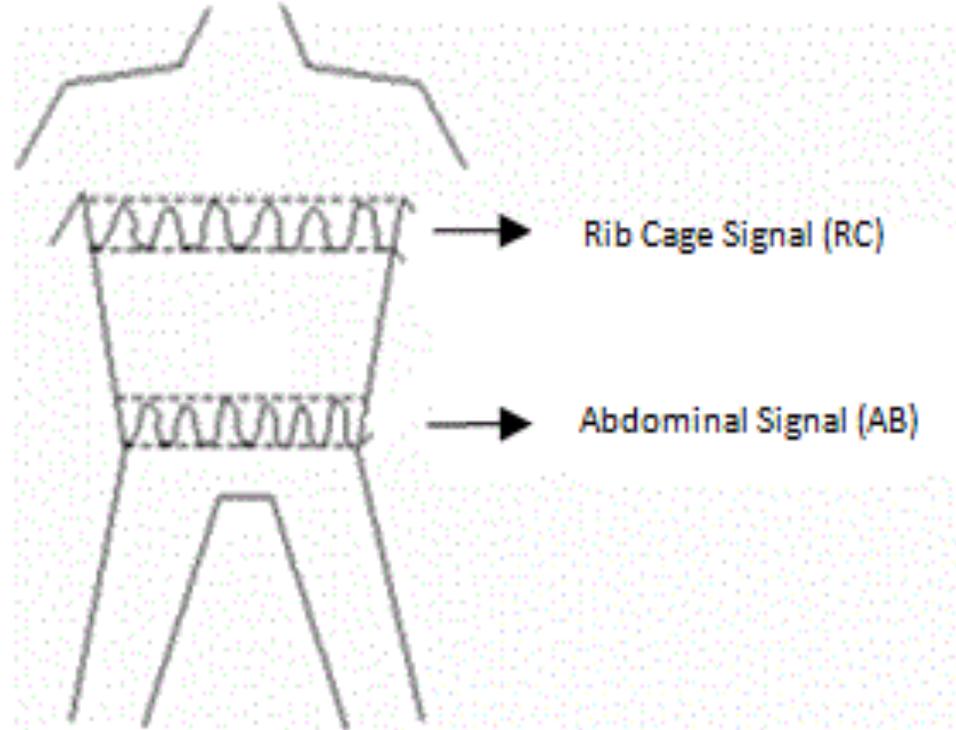
- A thermal sensor generates a signal based on temperature changes driven by the warm air of exhalation and the comparatively cool air of inhalation passing over the sensor
- Detects obstructive apneas

Pulse Oximeter

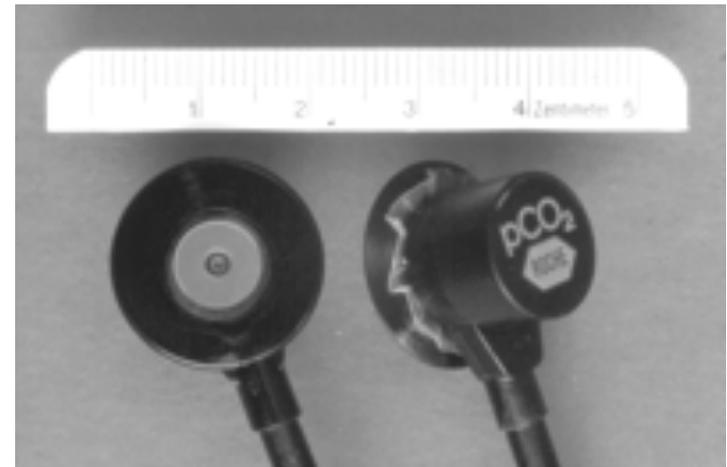


The probe gives off light that is able to tell the oxygen saturation level in the blood. The signal processing identifies the venous blood signal, isolates it, and using adaptive filters, cancels the noise and extracts the arterial signal. It then reports the true arterial oxygen saturation and pulse rate.

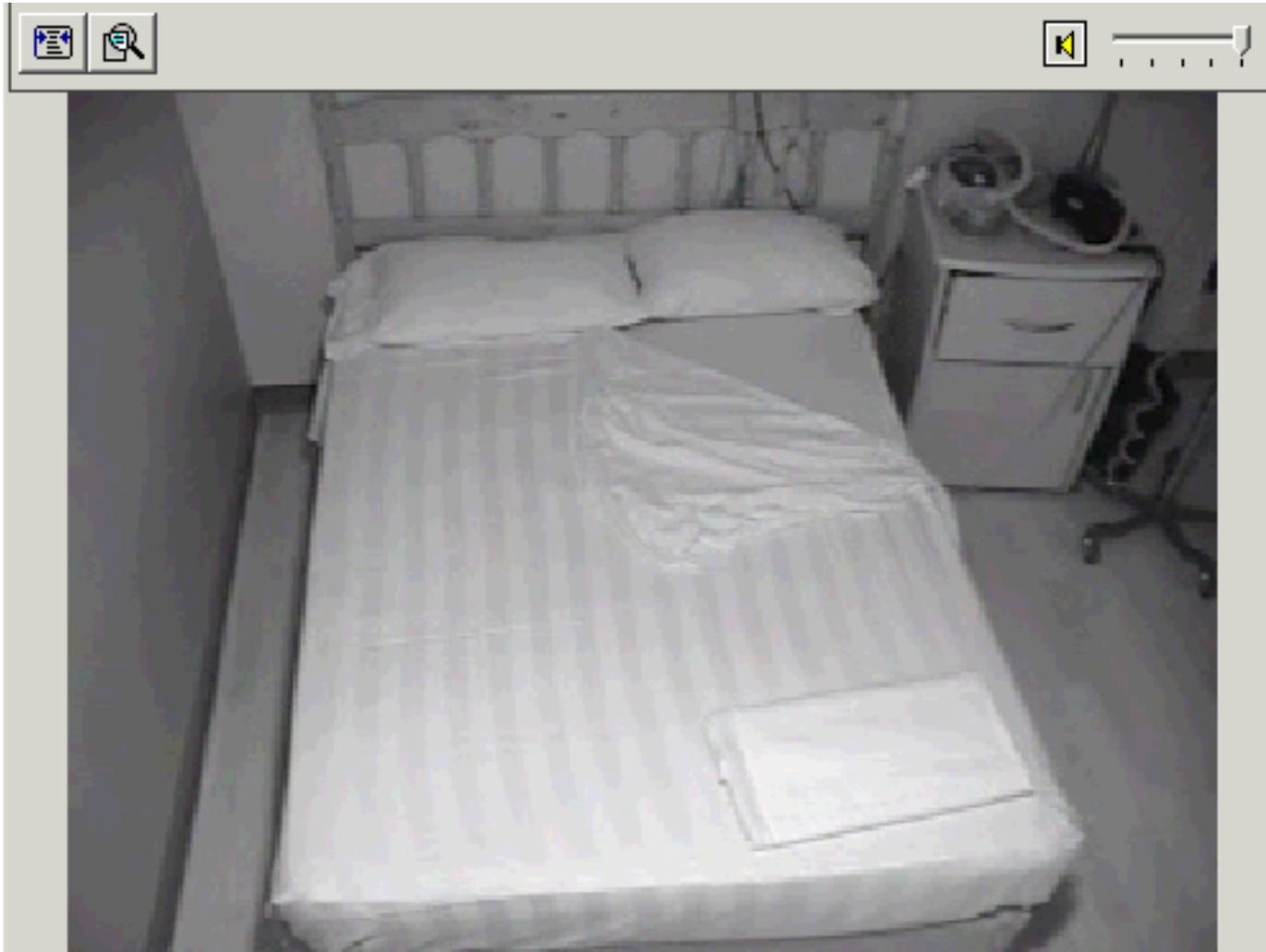
Respiratory Inductance Plethysmography (RIP)

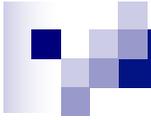


TcCO₂ monitoring provides a continuous noninvasive estimation of the arterial CO₂ value



Audio / Camera – Body Position





WORKING SHIFT WORK



Atypical Work Schedules

- 1/4 of all workers have shifts that are not during the day.
- 1/3 of shift workers state that they sleep less than 6 hours per night on workdays.
- 30% report that they only get a good night's sleep a few night's per month or less.

- 
- Shift workers experience impairment caused by sleepiness at levels equivalent to that of being drunk.
 - Are more prone to developing certain illnesses, including cancer.
 - Some workers experience sleep disturbance and sleepiness even after months or years of shift work.

Definition: Working Shift Work

- Anyone working outside of the usual 8 a.m. – 5 p.m. working day.





Zone of Vulnerability

- Midnight and 6 a.m.
- International accidents in the past 20 years where attributed to the fatigue of shift workers
 - Exxon Valdez oil spill - midnight
 - Three Mile Island Nuclear plant – 4 a.m.
Problem was rectified when the day shift came on – too late
 - Gas leak in India – Bhopal Disaster – in the night



Study on shiftwork

- Shift workers who drink a great deal of caffeine may use
 - Alcohol in excess
 - Smoke more tobacco
 - Use drugs as sleeping pills more than those who work normal hours



Shift workers

- Biological rhythms are not naturally in step with their waking and sleep schedule.
- Adaptation to new circadian rhythm occurs at different rate for different physiological processes.
 - Timing of melatonin secretion is quick but the timing of the body temperature rhythm is slower.



Working The Shift

- Natural powerful aids help in realigning the body clock to correspond with their shiftwork schedule.
 - Eating
 - Sleeping
 - Socialising
- Personal biological rhythms need to be recognised



Sleeping Pills

- Take only when absolutely necessary.
- Speak a professional to know when to take them when working shift work.
- Take only for a short period of time – less than 4 weeks.



Melatonin

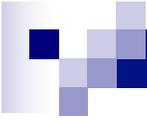
■ hormone

- used in the elderly who have abnormally low levels of melatonin
- Phase delay syndromes – “night owls”
- Role of melatonin in shift workers is unclear
- Ingestion of melatonin only lasts 30 minutes
- Need more studies

Tryptophan

- Initial ingredient for making melatonin
- Increases the brain levels of both melatonin and serotonin
- Found in whole milk
- Promotes sleep for 6-8 hours
- L-Tryptophan supplements





Night Shift workers

- Get as much sleep as possible – make it a priority
- Try to sleep when you get home – you will likely get more sleep
- Take a 20 minute nap before going to work
- Take some time off

- 
- Permanent night time workers – keep your schedule the same on you days off
 - Bright lights when you work – dark room when you sleep
 - Drink caffeine in the early part of the shift – 5 hours before bedtime
 - Eat healthy
 - nap on the job – if possible



Rotating shifts

- A schedule of day, evening, nights then days off is easier



Things Change..

- Biological rhythms change with age and vary from person to person
- Need to re-examine their schedules and adaptations strategies.
- Know when to sleep
- Know your sleep environment
 - Disturbances, light, noise, temperature, bed

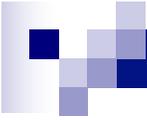


Finally the shift is done.....

- Shift workers seem to be particularly prone to accidents caused by sleepiness on the drive from work.
 - First chance to unwind
 - Vehicle is an ideal haven from noise and stress
 - Soft purr of the engine
 - Guard is let down

Drowsy Driver's Quiz





Drowsy Driver's Quiz

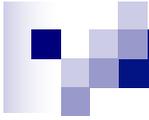
True or False

Being sleepy makes you misperceive things.



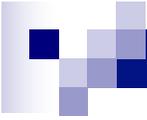
True or False

Coffee overcomes the effects of drowsiness while driving?



True or False

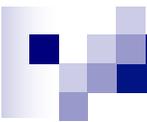
I can tell when I'm going to go to sleep.



Drowsy Driver's Quiz

True or False

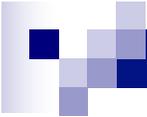
**I'm a safe driver so it
doesn't matter if I'm sleepy.**



Who is a Risk of Driving Drowsy?

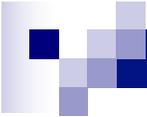
Anyone who:

- has not had adequate sleep
- have consumed alcohol
- have ingested medication
- has been driving for a significant amount of time
- Feel sleepy behind the wheel



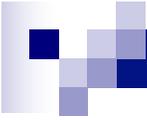
Who is Most Likely to Drive While Fatigued?

- Young people aged 16-24
- Male drivers
- Drivers reporting inadequate sleep
 - (less than 8 hours)
- Driving between 2pm-4pm and midnight and 7 am.



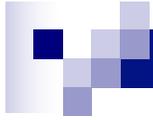
What Can You do to Stay Awake?

NOTHING!



If you must drive.....

- Stop in a safe place to take a short nap (10 – 20 min)
- Stopping to have a coffee.
- These strategies can help you if you are not too far from your destination.
- Be aware that the stimulating effect of caffeine will wear off quickly, especially if you are very tired.



Practice Good Sleep Hygiene

- 
- Go to bed only when sleepy. Try a relaxing bedtime routine - soaking in a hot tub.
 - Establish a good sleep environment with limited distractions – noise, light, temperature. A cold room is best.
 - Avoid foods, beverages and medications that may contain stimulants.
 - Avoid alcohol and nicotine before going to sleep.



More Tips...

- Consume less or no caffeine.
- Exercise regularly, but do so around midday or early afternoon. Over-training or exercising too much is not advisable.
- Try behavioural / relaxation techniques to assist with physical and mental relaxation.
- Avoid naps in late afternoon and evening.
- Avoid heavy meals close to bedtime.



More Tips...

- Avoid fluids before going to sleep.
- Use the bed only for sleep and intimacy – do not eat, read or watch TV in bed!
- Do not sleep with pets.
- Establish a regular wake time schedule even on days off.
- Turn off the cell phone, video games!
- Avoid alcohol – decreased REM



Sleep Hygiene Chart

- Here is a list of behaviours that can affect the quality of your sleep.
- Fill out the chart.
- Select two or three items in the “bad” column and change those behaviours.



Final word..

- Screening for disorders
- Rapid diagnosis
- Treatment plan
- Follow-up to ensure compliance

Are the crucial steps for the proper management of a person that is suspected of having sleep issues....

- OSA and Insomnia are the most common disorders

Get the sleep you need
and get more done at work

