

CAFFEINE ;ELECTRONICS AND PARENTAL INVOLVEMENT IN HEALTHY SLEEP

*common sense ;knowledge; biological
clock ; follow the advice*

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Valentine Coffee

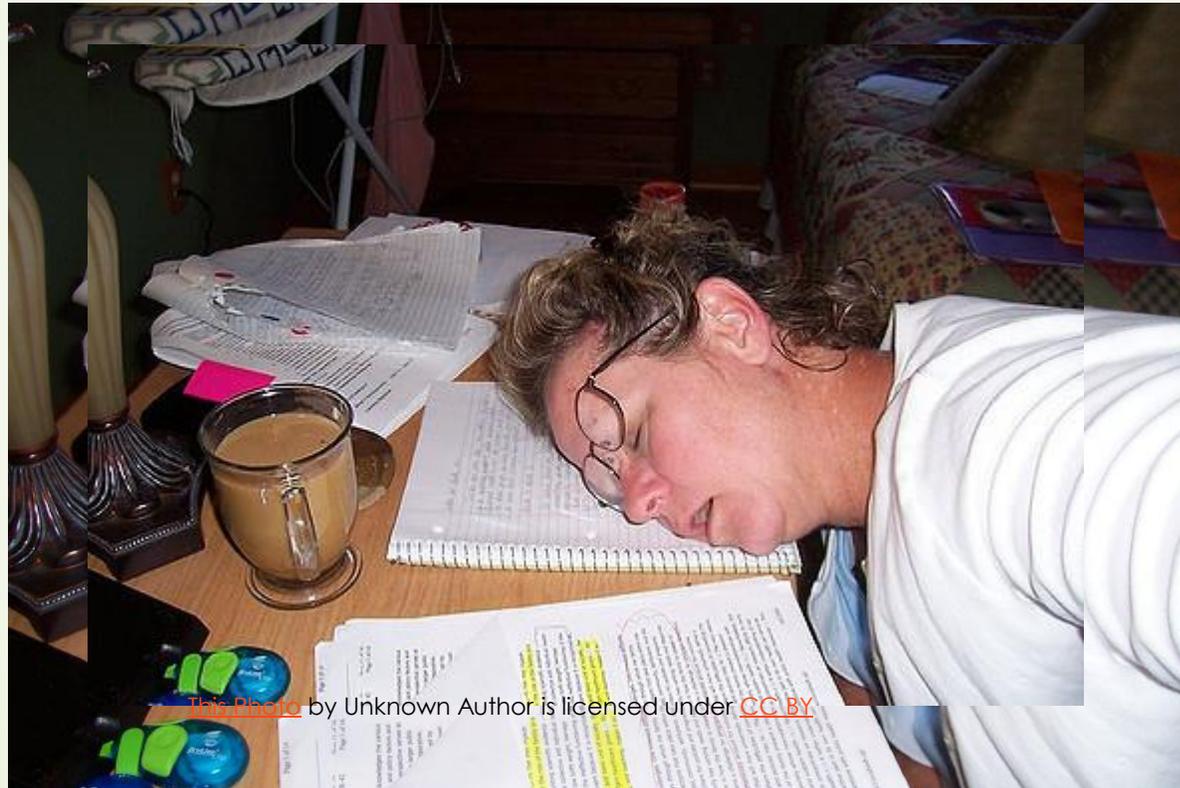




Caffeine is a drug

- **2.5 billions cup** of coffee all over the world
- One cup 100- 200 mg
- **It is a drug** with Effects and Side effects :
- Brain stimulant ,diuretic , bronchodilator, mydriatic , Euphoric
- Morning cup followed by another cup and another cup.
- Till evening or till bed time
- **Stimulant in 15 -20 minutes ,**
- **Half life 6-8 hours**
- Increase in Adrenaline, Suppression of Adenosine

Coffee and Sleep



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Caffeine and sleep

Caffeine Found in 60 different plants : Coffee beans; Tea leaf; Kola Nut; Cacao Pod; Chocolate; Drinks ; Energy drinks

- **Caffeine can not replace or substitute sleep**
- Increase in Serotonin, Dopamine, Adrenaline and Norepinephrine
Decrease in slow wave sleep ; N3
- Decrease in REM Sleep
- Crash when effect wears off
- Caffeine intoxication; Restlessness, agitation , excitement, rambling thoughts and speech
- **Even morning cup can have its effect on night's sleep**



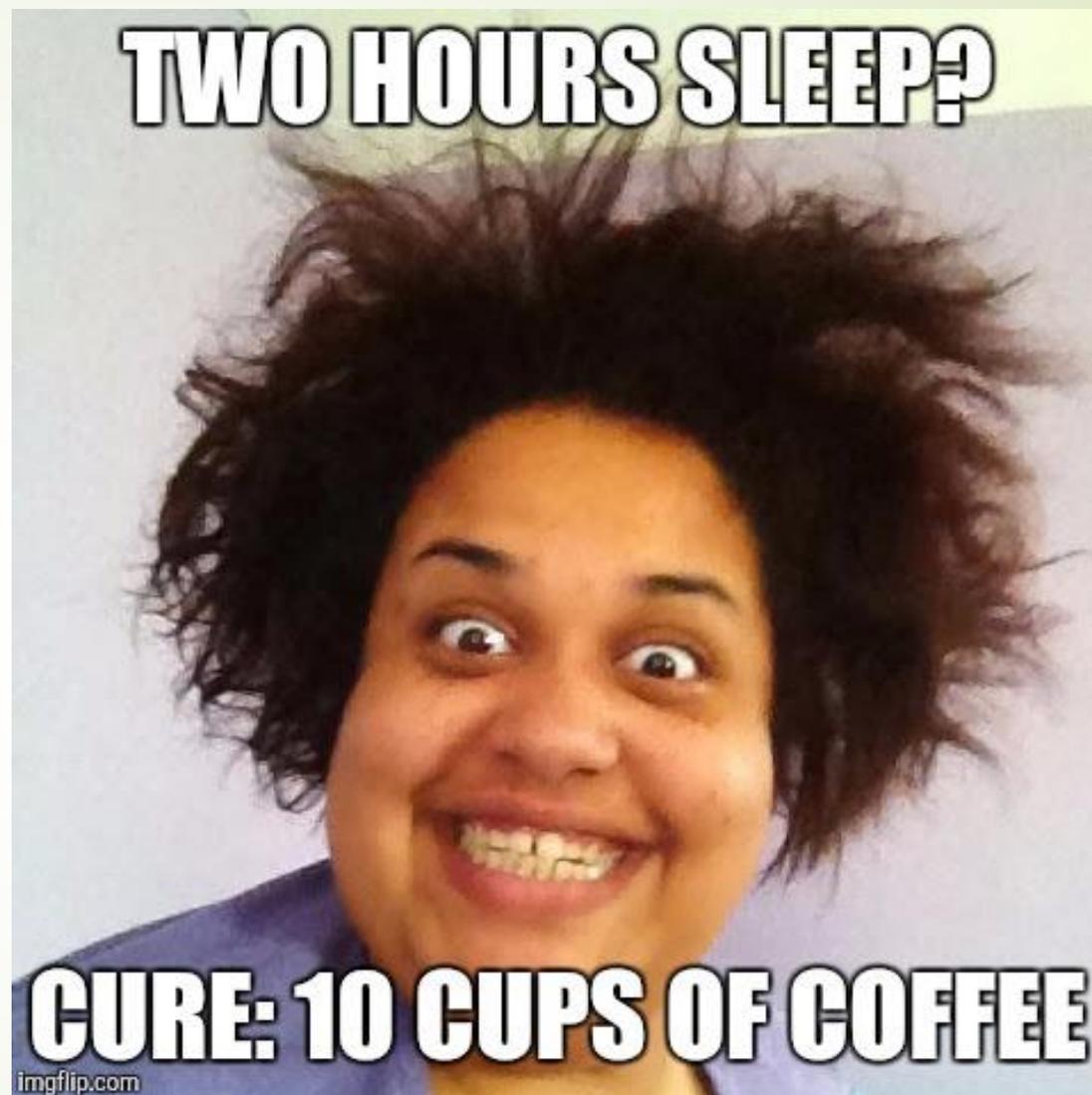
Mechanism of Action of Caffeine

- **Increases 3'5'Cyclic Amp** by inhibition of Phosphodiesterase
- CNS stimulation
- Increases the sensitivity of Medullary Respiratory Center to PaCO₂
- Increase respiratory drive
- Increase Diaphragmatic contraction
- Prevention of Apnea in neonates: by competitive inhibition of Adenosine
- Pharmacologically Xanthine derivative such as Theophylline

Caffeine Metabolism

- Metabolism ; fast track : **rapid metabolizers**
- **Slow metabolizers** : such as (Chinese are slow acetylators of Isoniazid)
- **PDSS2 Gene** associated with slows metabolism of Caffeine
- Over consumption
- Caffeine induced sleep disorder :-----
- Delayed Sleep onset
- Decrease REM Sleep
- Shorter total sleep time
- Awakenings during sleep
- Diuresis causing awakening and dehydration

I need more
coffee





Intoxication and Adverse Reaction of caffeine

- Angina ;Chest pain ; flushing; Palpitation ;Sinus tachycardia supraventricular tachycardia; vasodilatation ; V. arrhythmia; Urticaria
- Sphincter tone decrease; Gastritis ; Esophageal Dysmotility
- Diuresis ; Fasciculation ; increase intraocular pressure; Mydriasis
- Anxiety ; Hepatic impairment; Renal impairment; Seizure Disorder
- Breakthrough seizure
- IN Neonates: Necrotizing Enterocolitis; Respiratory distress; Seizures
- Metabolic Acidosis ; Intracranial hemorrhage; Hypertension ; CV Collapse
- Caffeine is a substrate for Cytochrome P450,1A2, (Cyp1A2) ;Cyp2c9
- Inhibitors of Cyp1A2 resulting in decrease metabolism of Caffeine ;resulting in enhanced effect of Caffeine and potential toxicity

Adverse reaction of caffeine and Intoxication

- Decrease therapeutic effect of Adenosine with disturbed Sleep
- Enhancing tachycardic effect of Sympathomimetics
- Increase sympathomimetic effect of Cocaine
- Increase sympathomimetic effect of LABA and SABA
- Decrease Serum concentration of Lithium
- With Linezolid : may enhance hypertensive effect
- Chronic insomnia : if taken late in the evening
- Restless leg syndrome : worse with caffeinated drinks
- DSM V : **INTOXICATION WITH Caffeine** intake more than 250 mg with 5 or more of these: restlessness, nervousness, excitement, insomnia, flushed face, diuresis, GI disturbance, muscle twitching, tachycardia, high energy and psychomotor agitation
- AND NO other Sleep disorder should be accompanied with



Caffeine works differently in different people

- ▶ Some have no sleep issues
- ▶ Mostly it **Interferes with the modulatory mechanism** in sleep regulation
- ▶ Can have long lasting effect on sleep and brain maturation; in critical maturation period; young ; adolescent
- ▶ **85% of American consume coffee products**
- ▶ **Average daily consumption is 300 mg per person**
- ▶ It is **3X higher than the rest of the world**
- ▶ Works best if taken intermittently
- ▶ Regular use creates **a kind of tachyphylaxis**

I CAN NOT STOP DRINKIGN COFFEE



How much coffee?

- ▶ 50- 200 mg is moderate
- ▶ 250 maximum ; till 2 PM ; which is (2-3) ,8 oz cups
- ▶ 500-600 mg is like a **dose of Amphetamine**
- ▶ Delays the timing of your biological clock
- ▶ Older people are affected more due to less deep sleep in old age
- ▶ Stop at least 6 hours before bed time
- ▶ High dose can cause : Diarrhea, Sweating, Nausea, Increase heart rate
- ▶ Coffee withdrawal : Head ache ; sleepiness ; Low energy; Bad moods
- ▶ Coffee powder sold as dietary supplement : uncontrolled strength
- ▶ Very Strong and actual caffeine content can not be estimated



There is no nutritional need for Caffeine

- ▶ 2-3 ; 8 Oz cup is moderate intake = 250 mg of caffeine
- ▶ **6 or more is called excessive**
- ▶ Peak level in blood 30 -60 minutes
- ▶ Caffeine half life is 3-6 hours
- ▶ 54% consumption is through Coffee
- ▶ 43% is through tea and other beverages
- ▶ 85% of American use some type of coffee product
- ▶ Average daily consumption is 300 mg per person that is **3X higher than rest of the world**
- ▶ England and Sweden mostly use tea

How much Caffeine is in Red bull ?



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Rockstar ;caffeine



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NOS : 160 MG CAFFEINE



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MONSTER : 173 MG CAFFEINE



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JOLT

200 MG



BANG HOW MUCH CAFFEINE???



HOW MUCH CAFFEINE ???????



ZEITGEBERS

German word ; Time Givers; Synchronizer

- ▶ External Environmental Cues that entrains or Synchronizes an organisms biological rhythms
- ▶ **Circadian Rhythms**: biological process in the body which repeats itself over 24 hours and maintain its rhythm **in the absence of external stimuli**
- ▶ **Jurgen Aschoff** : Founder of the field of **chronobiology**(time effect, rhythm)
- ▶ His work : Described **endogenous biological clock** which synchronizes biological rhythm.
- ▶ He also found: **Exogenous external Cues** Which he called **Zeitgebers** influence the timing of the internal clocks
- ▶ **Light ; Atmosphere; Temperature; Social interaction; Pharmacologic manipulations ; Exercise; Eating and drinking patterns**

Exposure to morning sun light is the Circadian rhythm modulator



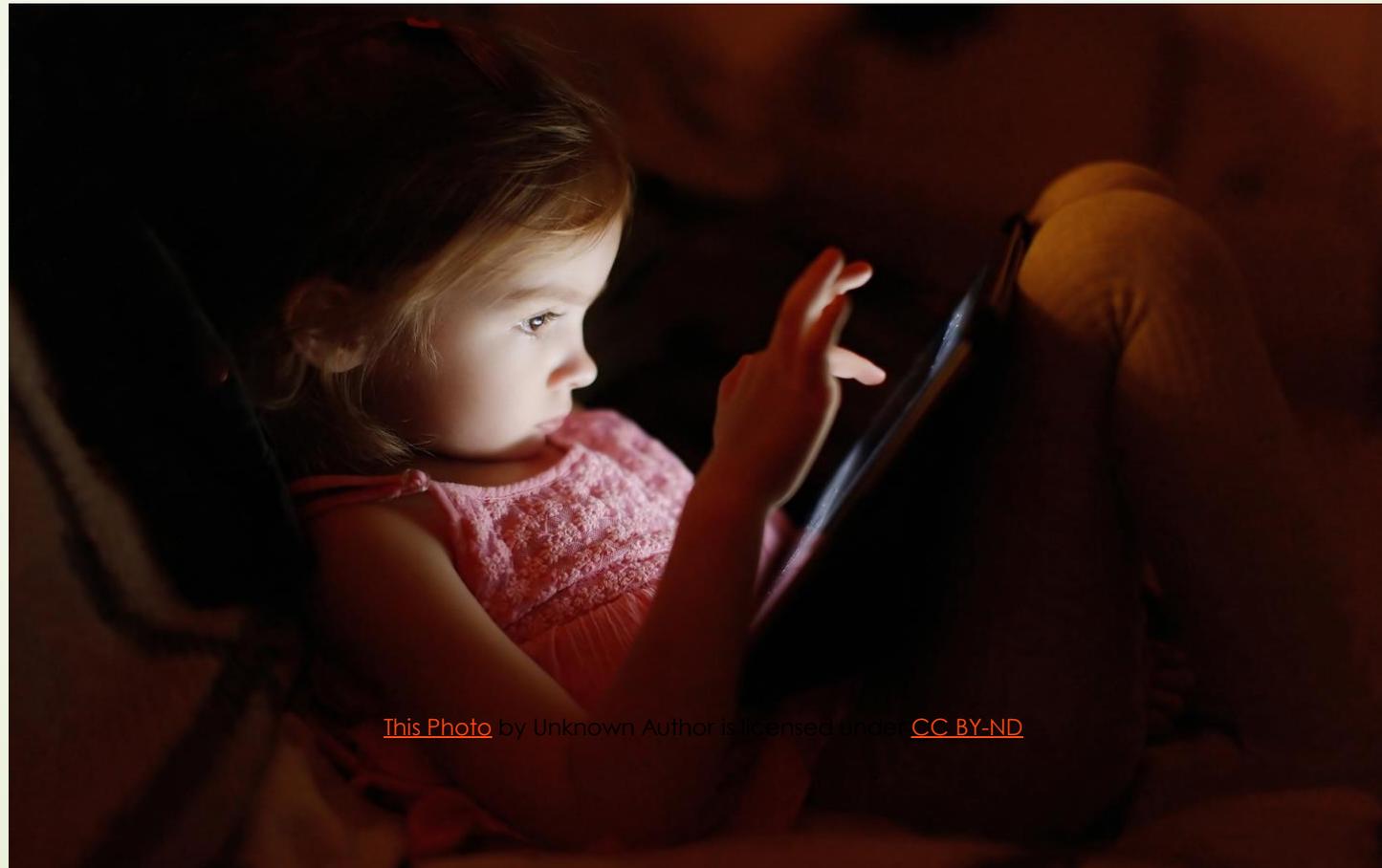
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SUPRACHIASMATIC NUCLEI IN HYPOTHALAMUS

- *Internal pace maker of sleep*
- Regulates body's biological rhythm and circadian phase of sleep
- **Influenced by Combination of internal and external cues**
- Normal healthy adults of all ages have Circadian clock at $24 + 11 \text{ min } \pm 16 \text{ minutes}$
- Clock resets in 24 hours cycle of Earth's rotation
- Deprivation of an individual of Zeitgebers ;**light ; social interaction allows the body to develop free running environment**
- **Seen in blind people with free running, non 24 hours sleep wake cycle**

What a nice time to play !!!
NO disturbance from Mom or Dad



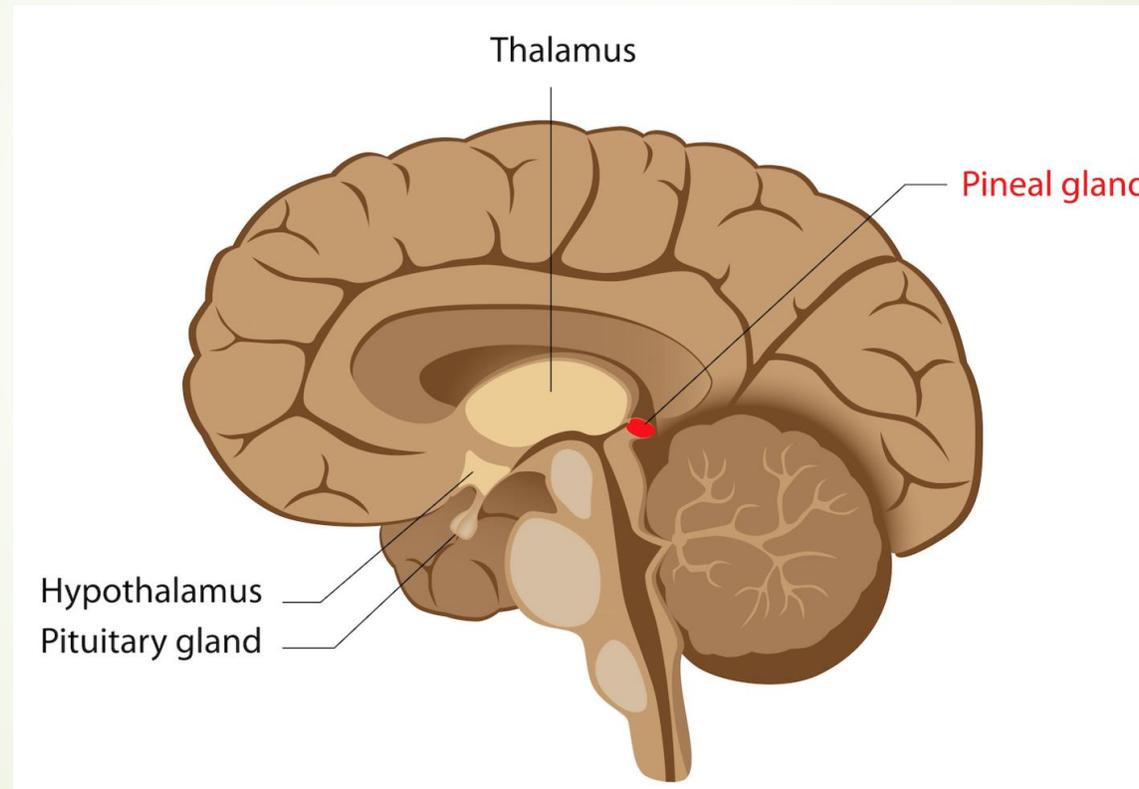
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Retina ;suprachiasmatic nuclei ;pineal gland ;Rods ; cones ;IPRGC

- ▶ Retina with two photoreceptors : **Rods and cones**
- ▶ Cones to see the color and sharpness of vision in bright light
- ▶ Ultrasensitive rods are for night vision; motion detection and peripheral vision
- ▶ There is a third kind of cells “**ipRGC**”
- ▶ Discovered in 2002
- ▶ “**Intrinsically Photosensitive Retinal Ganglion Cells**”
- ▶ They are most sensitive to **blue light**
- ▶ Sending ambient light information to the **master circadian clock(SCN)**
- ▶ Circadian clock is connected to Pineal gland

Retina ; suprachiasmatic nuclei ; pineal gland



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ELECTRONIC GADGETS AFFECTING SLEEP

- ▶ Common use of at least one electronic by 89% Americans at bed time
- ▶ **75% of children have at least one electronic device in their bed room**
- ▶ **Bed room TV** ; luxury ; ease of use ; entertainment before sleep
- ▶ Rather **it works Paradoxically**
- ▶ Home work on computers near bed time; tablets, video games, cell phones
- ▶ Sleep onset delays ; intermittent awakening to see and respond to the messages : sleep fragmentation
- ▶ Blue light from the spectrum; short wave length(415 – 445 nm ; deep penetration
- ▶ Retina ;connection to pineal gland ;**delayed melatonin release**
- ▶ Content of the Screen ; drama ; romance ; sex; aggression ; violence; horror
- ▶ Emails ; video games strangely don't appear to affect sleep significantly

JUST CHECKING LAST MESSAGE BEFORE SLEEP





Effect of Electronic use Before Sleep

- ▶ Prolongs Sleep latency
- ▶ Delays Circadian clock
- ▶ Suppresses Melatonin
- ▶ Reduces the amount of REM Sleep and delays the sleep onset.
- ▶ Increases alertness just before bed time which delays bed time
- ▶ Reduces the alertness next morning due to sleep deprivation
- ▶ All of this occurs due to the **BLUE LIGHT**
- ▶ Blue light is a part of light spectrum with **short wave length(415-445 nm)**
- ▶ Penetrates deeper in eye ,suppresses melatonin and may damage the retina

V. Sleepy but Can't leave the phone





Electronic devices Physiologically and psychologically stimulating

- ▶ They all delay body's internal clock (**Circadian Rhythm**)
- ▶ Artificial short wave length **blue light**, pushes the melatonin back
- ▶ Sleep delays and sleep deprivation
- ▶ Not only the blue light effect
- ▶ **Content of the program**
- ▶ Mental attachment to the character
- ▶ Possible associated **PTSD**
- ▶ Decrease in alertness in AM

Let me send her the last message before sleep





Sleep deprivation and its effect on body

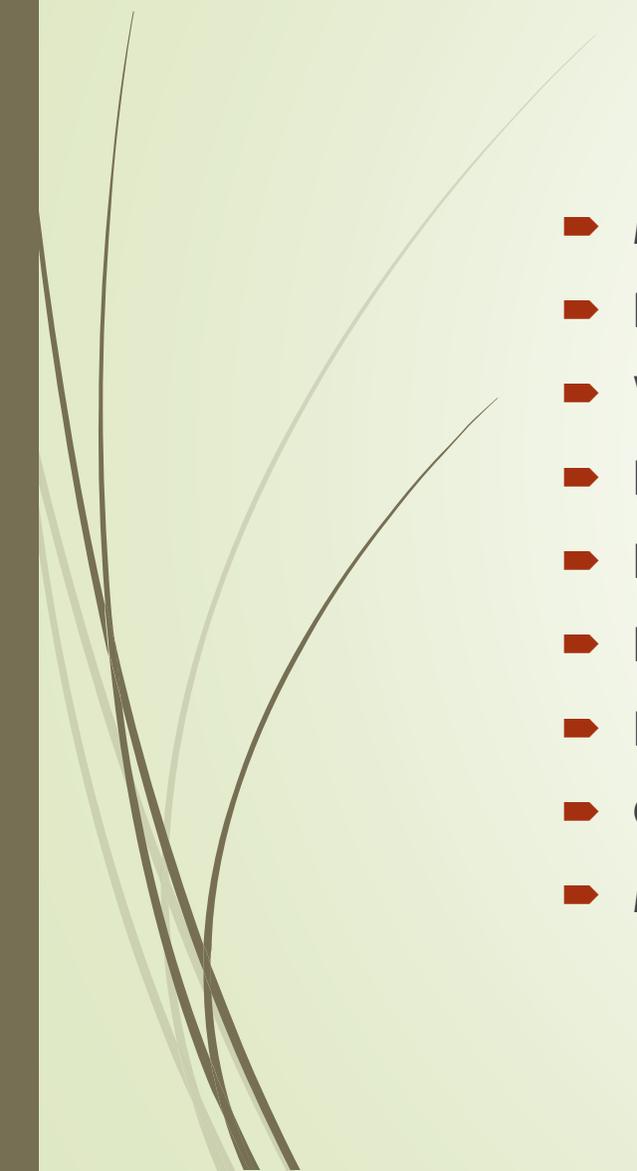
- **American Students are most sleep deprived**
- **In US 80% of 13-14 year old are sleep deprived**
- Other countries :**57% of same age**
- Sleep is needed for release of **growth hormone**
- REM Sleep is needed for **Mental Growth ,Memory and Learning**
- Decrease Grades due to decrease alertness in School
- Moodiness
- Suicidal ideation
- Impulsive behavior

Recommended Sleep hours

- New born to 3 months: 16-18 hours
- 4 month to 12 months : 12-16 hours
- 1 -2 year : 11-14 hours
- 3-5 year : 10-13 hours
- 6-12 year : 9-12 hours
- 13 -18 year : 8-10 hours



Consequences of insufficient sleep

- Motor vehicle accidents
 - Depression
 - Weight gain ,Obesity (Excess Ghrelin)
 - Diabetes
 - Heart disease
 - High BP
 - Risk taking Behavior
 - OSA with obesity
 - Metabolic Syndrome
- 

Parental involvement MOST IMPORTANT





Parental involvement in maintaining good sleep

- ▶ Keep early and consistent bed time appropriate for the age
- ▶ Keep a regular bed time routine
- ▶ Keep good sleep hygiene ; **be a good role model yourself.**
- ▶ Look for **signs of sleep deprivation in your teen**
- ▶ Discuss with Teachers; sleepiness and grades
- ▶ Set a **technology curfew** and **limit Screen time before sleep**
- ▶ Avoid large meals before bed time; light healthy snack ,if hungry; is OK
- ▶ Remove caffeine containing foods or liquids from diet in the evening
- ▶ Parental knowledge and understanding about adolescent sleep needs
- ▶ Providing knowledge to your child



Parental involvement in maintaining Good sleep

- Know that *Teen sleep phase is usually delayed at age 13-19*
- Melatonin release is late *maximum at 11 PM*
- This is **natural Phase Delay**
- *Teens need 8.5 -9.25 hours* of sleep at night
- Maintain a **consistent sleep wake pattern**
- Avoid **Caffeine and Electronics** at the bed time
- Exposure to **sun light in AM**
- Keep Sleep conducive **environment**
- Be an example yourself for good sleep to your child



Educate teens about sleep

- ▶ Texting affects sleep and grades
- ▶ Texting with lights off is worse than lights on
- ▶ Dim the light in the bed room ; helps melatonin release
- ▶ Disengage from your device
- ▶ Turn it off ,put in the drawer away from you ; no communication; no texting
- ▶ Room temp 60-67 degree F
- ▶ Humidity : 50 %
- ▶ White noise for sleep
- ▶ Exposure to bright light in AM



Effect of decrease melatonin on body

- Insomnia
- Diabetes
- Migraine
- Lupus
- Cancers (high rate of Breast ; ovarian and prostate Cancers)
- Depression
- Retinal damage
- Cataract
- Early AMD (Age related macular degeneration)



Advice for Teens

- Understand the **dangers of insufficient sleep**
- **Discuss** with your friends your sleep needs
- Know your body's requirement for sleep; **8.25 - 9.5 hours** of sleep at night
- **Don't drive drowsy**
- Discuss sleep ; bed time activities and **positive attitude** towards sleep
- Stay clear of Raves ; drugs and **avoid being a night owl**
- Finish the **home work in the evening**
- Keep a **routine activity at bed time**; listening to slow soothing music
- Read a **paper book ; not on tablet or computer**



What School authorities can do for middle and high schoolers

- Understand the **Circadian Rhythm**
- Understand the **Phase delay in teens**
- Re arrange the **Transportation time**
- Co ordinate with **Sports Coach**
- Parents have to **adjust** their **time** also
- **Most concerns and worries are unfounded about changing the school time**
- It has been adopted in **Seattle ,Virginia and Idaho** with good results
- **MVAs were reduced 16% by teenagers ; in Kentucky**
- Students are more motivated ;depression dropped ; attendance improved
- American Academy of Pediatrics recommendation 8:30 AM or later



TAKE HOME MESSAGE

- ▶ GIVE IMPORTANCE TO SLEEP
- ▶ **SLEEP 8-9 HOURS** AT NIGHT ; AVOID NAPPING DURING THE DAY
- ▶ **STOP** WATCHING TV ; LAP TOP ; CELL PHONES ; TEXTING AT BED TIME
- ▶ AT LEAST **2 HOURS BEFORE SLEEP**
- ▶ STOP ALL CAFFEINATED DRINKS AT LEAST **6 HOURS BEFORE SLEEP**
- ▶ KEEP **A FIXED SLEEP SCHEDULE** ; INCLUDING WEEKENDS
- ▶ EXPOSE TO **SUN LIGHT IN AM** ;20-30 MINUTES (*remember Zeitgebers*)
- ▶ REGULAR **PHYSICAL ACTIVITY** DURING THE DAY ; NOT CLOSE TO SLEEP TIME
- ▶ GET PLENTY OF SLEEP BEFORE THE TEST

References used

- **European Sleep Research Society** (Sleep duration estimates of Canadian children and adolescent)2016
- www.amerisleep.com; www.faa.gov;
- **Journal of clinical sleep medicine**;2011;Care giver knowledge ,Behavior, and Attitude regarding Healthy sleep in children
- **American Academy of Pediatrics**; technical report ;insufficient sleep in Adolescents and young adults :An update;2014
- **American Thoracic Society**; Healthy sleep in Teens; www.thoracic.org
- **AASM ; Sleep education**: Student see improvement in later School time
- **AASM; Sleep and caffeine** 2013; www.sleepeducation.org
- **National sleep foundation**: Caffeine and Sleep
- **Journal of clinical sleep medicine**: Caffeine effects on Sleep taken 0,3,or 6 hours before going to bed Volume 09 ;No.11

References used

- **Wikipedia** : Caffeine induced Sleep Disorder
- **Health and science**: Blue light from electronics disturbs sleep for teenagers
- **Sleep education : AASM** : Healthy sleep duration
- **Sleep education: AASM** : Studies Link Caffeine to bad sleep habits and poor school performance in young teens
- **Journal of Family Psychology** : Parental involvement, Psychological distress and sleep ;2007,Vol.21;No1
- www.amerisleep.com: www.washingtonpost.com
www.sleepfoundation.org; www.aap.org
<http://kidshealth.org/parents>
- <http://journalsleep.org>; www.drowsydriving.org
- www.uptodate.com

GOOD NIGHT AND SWEET DREAMS

