Sleep and Dreams - Introduction

Why Study Sleep and Dreams?
- we spend 1/3 of our lives in this sleep state, impacts the other 2/3.
- mystery, curiosity and understanding
- address myths
- societal organization - living architecture, hotels, homeless
- sleep safety, and sleep-wake is species wide (nocturnal [awake and active at night] or diurnal [awake and active in the daytime], crepuscular [active at dawn and dusk])
- how to manage sleep in demanding 24/7 lives
- use of light emitting devices
- shift work, travel
- stress
- common illness, disorders, health impact, life disturbance
- life saving measures
- optimal performance and health
- dream function and state awareness (lucid dreaming), and creativity

Who wants to understand sleep?
psychologists, psychiatrists, neurophysiologists
medicine -pulmonary physiology, gastrointestinal physiology
pharmacology
orthodontics and dentistry
transportation
military
health consultants, insurance companies
athletes, coaches of elite level sport, and sports where sleep deprivation occurs

Sleep is…
death-like, toxic state, poisoned, drunk, where true rest occurs, we regenerate, heal,
the state that opens the door to our deep subconscious
Defn:
"recurring and reversible state characterized by a reduction in environmental awareness/perceptual disengagement lowered skeletal and muscular motility, partial or complete abeyance of voluntary behaviour and consciousness active brain/neural activity"

Sleep is..
not *only* absence of wakefulness
an interdependent state with wakefulness, each influencing the other
more complex as we ascend evolutionary hierarchy
crucial for survival

Dreams are…
paradox: strange, bizarre, puzzling time of clarity
peripheral to our waking lives, although never totally unconscious. Different from reality? Discontinuity from dream to dream, night to night
cannot reduce to only pure neurophysiology
defn: "vivid, complex, hallucinatory experience while asleep,
…generally accepted as real by the dreamer and
…having a mostly logical progression in time"
..readily forgotten, unless reoccurring, recalled frequently or extremely dramatic

History of Sleep and Dreams

Egyptians, Romans

- Tutu (Egyptian), Hypnos (Greek) and Somnus (Roman) - God of Sleep
- Morpheus (Greek and Roman), Serapis (Egyptian) - God of Dreams

Ancient Greece

- 450 BC - Alcmaeon
- earliest documented theory of sleep,
- 400 BC - Hippocrates
- sleep is due to blood retreating
- 350 BC - Aristotle
- sleep due to warm vapours rising from the heart during digestion, time of renewal.
- 162 BC - Galen, physician
- consciousness is in brain

1700-1800's

- 1830 - Robert McNish
- "Philosophy of Sleep" - sleep is temporary metaphysical death
- 1866 - John Davey
- "On the Temperature of Man" - body temp. sleep patterns are not dependent on external

1800's

- 1868- Wilhelm Griesinger - psychiatrist
- eyelids flutter during dreaming
- 1875 - Richard Caton, English biologist
- spontaneous electrical activity, used voltmeter
- 1879- Thomas Edison
- invents lightbulb, impact on sleep patterns throughout the world
- 1880 - Jean Baptiste Edouard Gelineau, French physician
- narcolepsy

1900's

- 1903 - German scientists (e.g., Josef Baron Von Mering) synthesize barbital - first commercial sedative sleeping pill
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- 1911- Rene Legendre, and Henri Pieron, French scientists
- experiments with dogs - identify sleep inducing (hynogenic) molecule that accumulates in body during waking hours

1900's

- 1913 - Henri Pieron, French scientist
- book "Le probleme physiologique du sommeil," first text to examine sleep from a physiological perspective.
- regarded as the beginning of the modern approach to sleep research.
- 1916 - Constantin von Economo - Romanian neurologist
- pinpoint origin of sleep and wake signals in the hypothalamus

1920's

- 1920's - Nathanial Kleitman, Russian born, US
- work on sleep-wake cycles, circadian rhythms, sleep deprivation
- 1925 opened world's first sleep lab, U of C
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1920-1930's

- 1929 - Hans Berger, German psychiatrist
- invented electroencephalograph, first to record EEG in humans from scalp, show

difference between wake and sleep states

- 1930's - Physicians begin treating narcolepsy
- 1935 - Frederick Bremer, Belgian physiologist
- surgery on cats, brain stem at mid-brain brain waves resemble sleep
- theory : brain maintains itself in state of wakefulness due to sensory input

1930's-1940's

- 1936, 1937 - Davis, Loomis, and Harvey
- proposed description and classification system for varying EEG patterns
- A-E, identified cyclic variations in voltage and frequency
- sleep spindles and K complexes
- 1945- Karl-Axel Ekborn - Swedish physician
- restless leg syndrome

1950's - Sleep Research Kicked into High Gear

- 1952, 1953 - Kleitman with Eugene Aserinsky (student)
- studies of eye movement during sleep (EOG), and EEG during REM sleep
- described association of REM with dreaming
- 1963 - text, "Sleep and Wakefulness", refers to papers, books published before 1940

1950's

- 1950's - William C. Dement (med. student of Kleitman)
- 1955 - cyclical REM recurs, alternates every 90-100m with periods of NREM
- proposed scoring system change of NREM and REM
- 1957, 1958 - REM sleep and dreaming associated, published research on cats (lead to explosion)

1950-1960's

- 1960 - Vogel
- recognizes that REM sleep in those with narcolepsy begins near sleep onset

1959 - Michel Jouvet

- REM sleep is distinct phase, alert brain that is similar to wakefulness, and in 1962, identifies pons region of the brainstem as area that controls REM sleep.
- 1965 - H. Gastaut in France, Jung and Kuhlo in Germany
- presence of apnea in patients, using polysomnography
- how much does sleeping brain control vital body functions
- area called "sleep medicine"

1970's - growth of Labs AND Research

- 1971 - Rob Konopka & Seymour Benzer - American geneticists
- PER (period) gene, associated with function of internal circadian clock
- 1972 - several researchers
- circadian clock is definitely located in suprachiasmatic nucleus of hypothalamus
- 1975 - Dement & Mary Carskadon
- longitudinal research, & developed MLP - multiple sleep latency test, as a diagnostic tool to identify sleep disorders.

1980's

- 1980 - Alfred Lewy
- exposure to artificial light can suppress melatonin secretions in humans
- 1980 - Charles Czeisler
- duration and organization of sleep regulated by circadian clock, in 1986 - bright light treatment can effectively shift and reset internal circadian clock

1980's

- 1981- Colin Sullivan
- CPAP - continuous positive airway pressure system - sleep apnea
- 1982, 1989 - Allan Rechtschaffen

- sleep is physiological necessary, rats deprived have severe health consequences and die
- 1989 - Dement, Thomas Roth and Meir Kryger
- "Principles and Practice of Sleep Medicine" - authoritative text in sleep med used today

Sleep Research Today…

- US, and Canada - accredited sleep disorders centers -
- Canadian Sleep Society

History of Dream Research, Interest

- anthropology, biblical accounts
- soul collects experiences, messages
- (permanently leaves=death)
- "divine revelation"
- gods and demons summoning
- visitations, or method for interaction with the dead
- messages for instruction
- foretelling the future
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- 1867- Marquis de Saint Denys
- publishes book on dream interpretation and lucid dreaming
- 1870's-1900 - S. Freud
- 1899 - "The Interpretation of Dreams"
- uncover source of neurosis, unconscious desires/impulses or unresolved conflict
- latent content
- manifest content
- meaning interpretation, "dream work"
- "what is dream repressing, covering up"
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- 1900 - 1950's - Carl Jung
- 1912 - split with Freud, develop own theory of dreams and analysis - content drives the therapist and patient response
- dreams as facts, real experiences; "read" the unconscious, creativity grown via dreams
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- 1940's and into1950's - psychoanalysis, form of psychotherapy, dream interpretation
- 1950's, 60's - Kleitman, Dement & Aserinsky
- studies on dream length, outside stimuli affects dream content, scanning hypothesis-
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- 1977 - Allan Hobson Robert McCarley, Harvard
- feline REM sleep, found pontogeniculo-occipital waves (PGO)
- originate in brain stem/pons, transmit to visual system in occipital (visual) cortex, and occulomotor system (eyeball), twitching of whiskers, muscles
- brain accounts for this info over visual system, synthesizes it to create a perceptual experience
- dreams are non-specific, random; we create links, meaning
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Notes: The Physiology of Sleep

Physiological Sleep "Players"

- physical/anatomical, biochemical, environmental
- brain and body (from head to limbs)
- neurotransmitters, neuromodulators (no direct effect on another neuron, affects recently released neurotransmitters), hormones
- zeitgeber – internal and external cues that influences biological rhythms (light, physical activity) e.g. moonlight, work-out
- sound (TV, movies, light | deep sleeper {easily wake up or not}), tactile disturbance

Reticular Activating System (RAS)

- determines level of alternates
- brain stem, thalamic relay station
- sensory nerve pathways meet, talk to relay neurons which talk to cortex
- RAS excites relay neurons
- Ascending (waking up) Descending (falling asleep) processes

The Pons

- connects 2 sides of cerebellum, controls autonomic function (heartbeat, digestion)
- important for REM motor paralysis/atonia: inhibition of spinal alpha-motor-neurons, skeletal muscle activity is quiet
- continue functioning smooth muscle - diaphragm, intestines/stomach

Suprachiasmatic Nucleus (SCN) – "the timekeeping microchip"

- bilateral clusters, at midline at base of the brain, above where optic nerves cross (can obtain info from the eyes)
- location of the "biological clock" - alternates wake and sleep in 24hr cycles (vs. short bits + pieces, no clustering)
- synchronize with light-dark cycles of the environment through photo receptors in retina (melanospin), send message to optic nerve to SCN
- influences endocrine system: pineal gland, production centre for melatonin
- promotes wakefulness

Biochemical players

- Acetylcholine - NT found during low-voltage and high frequency EEG in waking, and in REMS; very little in NREM
- Adenosine - builds up when awake, hyp: levels in forebrain is cumulative meter of brain activity during waking, which influences how much sleep we need (> level of adenosine => SWS (slow wave sleep), and delta

waves); can be abated with caffeine

- Glutamate - excitatory NT(neurotransmitter), production of SW (slow wave) and spindles
- Glycine - inhibitory NT (in spinal cord), assists in paralysis during REM
- Histamine - used by hypothalamus, produces wake state (e.g., when blocked using antihistamines = drowsiness)
- Melatonin - mildly sleep producing, speed sleep onset; increases in brain 2hrs before habitual bedtime, stays high until habitual awakening (light blocks its production)
- Leptin - elevates during sleep which reduces appetite, hunger (reverses in sleep dep)
- When leptin goes up, in response, ghrelin goes down, hunger goes down

Sleep Measurement + Methodology -- "recording procedures"

- arrive in lab 2-3 hours before start of sleep study (pajamas, other personal items)
- forms, physician questions/exam
- attach electrodes (21+) or cap (cleanse, electrode gel, sticky tape, "wire sock")
- specific measurement, artifact and reference electrodes
- room - comfort, dark; infrared light, video/audio recording, microphone and speaker
- in lab - computers, split screens, speakers
- adjust display (how fast recording)
- keep researchers awake!

Sleep Measurement & Recording—"polysomnography(PSG)"

- biomedical recording of multiple physiological variables during sleep
- continuous display of data
- Include: EEG, left/right eye, heart rate...

Determining Sleep "brain wave activity"

- EEG - electroencephalogram, electrodes on all areas of the upper cranium, spaces 10-20% apart (International system)
- use anatomical landmarks
- minimum: C3, C4 (center); F3, F4 (frontal); O1, O2 (occipital); +referent
- even right, odd numbers are left
- measuring bio-electrical activity
- voltage (height) and frequency (spacing), scored in 30sec epochs
- 0.3 -20Hrz.

EEG

- electrodes: “antennae”
- tonic (consistent and continuous) vs phasic (transit patterns) activity
- cps = cycles per second
- N1 (nonrem1), N2 (nonrem2), N3 (nonrem3), REM

EOG – Electro-oculogram
- electrode outer area of the eyes (taped back)
- Readings: mirror images of hills and mountains
- NREM:
- N1- slow, rhythmic eye movements
- N2-3 - very little to none at all
- REM: jerky, quick, inconsistent, phasic dilation of the pupil, greater density of movements later REM periods
- PIPS: peri-orbital phasic integrated potentials – spikes before eye movements begin

EMG – electromyogram
- electrodes on chin and jaw, body movements, tone
- Readings: shag carpet; wide irregular, thick, higher amplitude = movement
- skeletal musculature, spinal reflex activity relaxed in REM (except: twitches, tremors of face and limbs = phasic activity)
- gross movements do occur in all stages, most frequent in N1, less in N3, total vary from 70-200x; suppression of voluntary movement in REM (except positionally)
- middle ear muscle activity (MEMA); occurs during REM and phasic bursts of eye movement, assoc. with facial and limb twitch

OTHER PHYSIOLOGICAL INDICATIORS respiration/ventilator control
Respiration
- electrodes on chest, nasal pressure changes
- resp. rate decreases: NREM slower, deeper, regular breathing
- tidal volume increases: the volume inhaled and exhaled in a single breath
- decreased metabolic rate in NREM, O2 saturation of the blood decreases
- REM - rapid, shallow (more in infants)
- hypercapnia - strong arousal stimulus, high levels of CO2, body tries to access to more oxygen, sudden wake up
- hypoxemia - weak arousal stimulus, O2 saturation gradually decreases, don’t wake up
- Perfusion: anything physical that influences the O2 transferred to the blood

- intercostal movement reduced (breathing more from belly), diaphragmatic increased
- cough response is suppressed (unless extremely irritated)

Temperature
- 96.5F is average, peak temp 6-8pm, lowest 4-5am, with a mid-afternoon drop
- NREMS - body tries to set-point
- REM- resemble "cold blooded" - no temperature regulation/thermostat at all (we don't sweat or shiver), we wake up instead
- have more REMS in early hours, when body temperature is low, Body temperature decreases while brain temperature increases
- one night 0.25-0.5 litre of sweat
- Feel "chilled" at night? Due to circadian temp., fluxuation, and reduced heat producing muscle movement
- We sleep longer/quality when body temperature is low or dropping, but awake when body temp is high or rising
- When body temp is elevated at bedtime (bath, tea), fall asleep quicker/easier, sleep longer, have more N3 sleep.

BP blood pressure - systole, diastole: arterial pressure
- declines 11-36mmHg during 1st hour of NREM
- lowest during N3
- REM phasic - surges, and very low

HR heart rate - measured with electrocardiogram
- decrease into stages, with variability, and high peaks during REM
- arrhythmias - found in REM
- angina – pain in the heart muscle, due to marked alteration of BP+HR during REM

RELAXED WAKEFULNESS
WAKE
- EEG -
- beta - irregular, low intensity, fast frequency (>13Hz), sharp peaks and valieys
- close eyes = start of alpha waves- regular, mod intensity, intermediate frequency (8-13Hz)
- EOG - movement, quick; eyes closed slow rolling begins
- EMG - highest amplitude, movements

N1
- EEG - more theta waves low voltage and mixed frequency (2-7Hz), some

alpha

- EOG - slow rolling/pendular, possibly binocularly asynchronous, eye movements (starts just before EEG change occurs, considered sleep onset)
- EMG – reducing (higher than other stages but lower than wakefulness), some body movements (can wake up)
- Duration - 1-7 minutes, 5% of total sleep
- Hypnic Myoclonia:
- Sleep onset - retrograde amnesia, sleep starts/hypnic jerks
- Low intensity stimuli can interrupt

N2

- EEG - "mid-amplitude"
- sleep spindles - 12-14Hz in 0.5 sec. rhythmic oscillation (tight zipper)
- K complexes - 1/2 sec. + and – deflection, (mountain followed by valley)
- EOG - lowered, consistent amplitude
- EMG - reduced, with some phasic activity
- Duration - largest percentage of stage recording (40-50%)
- More difficult to wake, stimuli produces K complex/wake

N3 - Delta Sleep/Slow Wave Sleep (SWS)

- EEG - delta waves, large (high amplitude) consistently spaced waves (20%-50% total); few sleep spindles, undetectable K complexes (idling engine)
- EOG - low, none
- EMG - very few movements, phasic
- HR, Resp., BP lowest
- Duration - 15-20% of sleep total sleep time
- Very difficult to wake sleeper (higher arousal threshold), groggy if so
- Less and less as people aged

REM

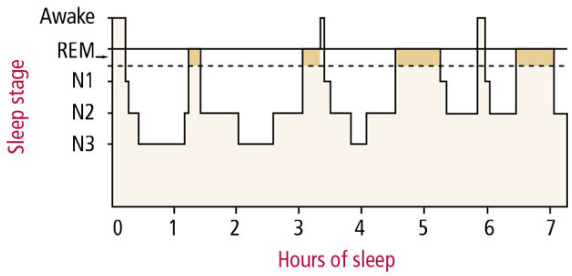
- EEG - appears similar to wake, presence of saw tooth waves (low intensity, mixed frequency, notched appearance), scrambled
- EOG - rapid, sporadic with quiet periods
- EMG - lowest in all stages, paralysis-like, "twitching" or bursts end of a REM period
- HR, Resp., BP - variable, increase/"peak"
- Duration - 15-25% of sleep total sleep time

Typical Cycles in one night

- cyclic alternation: 75% NREM, 25% REM
- typically, 90min per cycle

- REM periods increase in duration in later cycles
- first 1/3rd of night is deepest sleep, last 1/3rd N2 + REM is prominent

Figure 2: Sleep architecture



When experts chart sleep stages on a hypnogram, the different levels resemble a drawing of a city skyline. This pattern is known as sleep architecture. The hypnogram above shows a typical night's sleep of a healthy young adult.

from cycle 1 to 5: REM gets longer, and N3 gets shorter
Most of N3 is earlier

Very different for infants, sleep disorders, and elders.

Other Sleep Determinants

- Sleep latency: the time it takes from "light out"/bedtime to onset of sleep (MSLT: multiple sleep latency test)
- Sleep period: time from when fall asleep to last awakening (e.g., one night)
- Sleep efficiency: proportion of sleep period spent asleep, vs in awake state (number of arousals, whether perceived or not)

Student Notes: Sleep Function & Need

Theories of Sleep Function
RESTORATIVE
- time for rest, recuperation
- repair effects of daily wear and tear
- e.g., phys.activity = asleep faster/more hrs sleep
- exact physiological process that is restored
- growth hormone release from pituitary (at onset of N3)
- increase cellular division, RNA synthesis
- REM - protein synthesis (cell growth), amount of REM increases after learning has taken place, and N3 in neocortex of area taxed in learning

Memory Consolidation & Learning
- consolidation and facilitation of long-term memory
- declarative/explicit memory: conscious recall,
- semantic (concepts, facts, landmarks) + episodic (experiences, events) = SWS needed(slow wave sleep)
- nondeclarative/implicit memory: unconscious recall
- procedures, how to's, motor skills, habits – throwing a ball, learn to drive, recognize faces = REM needed
- the brain rehearses newly learned info in SWS

Adaptive, Survival
Sleep patterns (ow much k, where) due to:
- predator or prey -- lion vs. zebra
- when can use vision optimally – day vs. night; when awake
- caloric use: use less calories when sleep, less food required overall, awake when food for type of species most available
- we are awake when our foods are available
- environment : prevent drowning, sinking, danger = cerebral hemispheres "take turns" sleeping; move to warmth/cool (snake, polar bear)
- safe, preferred sleeping location (rabbits burrow, gorilla nest, horses sleep standing, foxes curl up)
- sleep integrated into annual cycles: hibernation, reproduction

Energy conservation
- small animals – high metabolic rate - sleep longer with shorter NREM-REM cycles
vs. larger animals – slower metabolic rate - sleep less, longer NREM-REM cycles

Mammals, Birds, reptiles, amphibians, fish, invertebrates
- + 90 species of mammals studied, less other classes
- closer to human = more similarity
- All reptiles and birds exhibit N3, REM, but diff., species dependent
- e.g., two-toes sloth: 20hrs/day (80% of life), three-toed 17hurs/day
- length of sleep per nycthemeron…

Animal	Hrs
chipmunk	20
sloth	19
bat	19.5
armadillo	18
cat	14
hamster	14
lions	13-14
rat	12
gorilla	12
chimpanzee	9-10

fox	10
baboon	9.5
human	*7-9*
dog	7
elephant	3-4
goat	4
sheep	2
deer	2
giraffe	1.5

Birds, Canine, Reptiles
- Birds - less REM than mammals, except predator birds (eagles, hawks)
- Owls, moles, opossums - no eye movements (do not move eyes when awake), only moving head
- Dogs, wolves; rabbits and birds- not complete REM paralysis, but eye movement
- Reptiles, tortoise & turtles - high amplitude spikes during sleep (is it sleep or cold blooded torpor: lack of both physical and mental activity, body temperature drops, for few hours at a time, temporary; e.g., frogs, bats, mice… adapt to temperature changes in the environment, to save energy and use just amount to survive)
-

Sleep in See Dwelling or Migratory Animals
- cannot "settle" to sleep, surface breathing, flying long distances
- bottlenose dolphins, porpoises, pigeons, mallard ducks
- asynchronous brain sleeping – one cerebral hemisphere at a time; half-brain in N2-N3, while other awake with eye on opposite side open; one hour each side.
- Large sea mammals - hold breath and sleep for 30min at a time, wake to surface and return down

Other Animals and Characteristics
Bears, caterpillars, frogs:
- hibernation - extended period of rest, extreme lowering of body temp and metabolic rate, respiration, with short periodic bouts of rise over several weeks, no recordable EEG at all
- = hibernation complete - sleep for extended period with increase in N3 (like deprived)
- Fruit fly, marine snail, scorpions, cockroaches, jellyfish = quiescence and activity: no activity

Sleep throughout the lifecycle
Chart: How much sleep do you really need

Infants
Newborn brain too immature to produce EEG wave patterns of adults
▸Active Sleep (AS) : low-voltage, irregular EEG, eye movements, low EMG, rapid eye movement, no motor paralysis (spastic hands, feet, face); first smile
▸Quiet Sleep (QS): EEG similar to N3 in adults, no eye movement, high EMG, absence of body movements
▸Intermediate Sleep (IS): mixture of quiet and active
- healthy newborn 16-17hrs total sleep, > 50% in AS; although late term or premature > 75-80% in AS
- enter AS immediately at falling asleep, kind of like going to REM right away
- distribution of sleep-wake numerous in nychthemeron
QS and AS alternate in 50 min cycles., lengthening in time to 5 yrs old
AS = REM at 3mths; QS = N3 at 6mths

Early Childhood
2-3mths: ability to sleep through the night, with daytime naps
3mths : 40-50% in REM
5mths: at least 50% of infants can sleep during same period as parents
8mths: 33% in REM, sleep 13-14hrs/day (sleep lost is REM)
between 1-2 year: REM stabilizes at 25%, same as young adult
3-5 yrs: 10-13 hrs sleep, and daytime napping ceases
theory: REM important to neural/nervous system maturation; needs stimulation

- studies with kittens, rats

Children (5-12yrs)
- NREM-REM cycle approx. 60 min
- enter N3 sleep quickly (within 10mins), stay in N3 for an hour, and then arousal-sleep EEG, skip first REM
- many position changes
- first REM lasts 10-20min, w/ subsequent periods increasing to 20-25min
by 10yrs: nightly sleep cycles resemble adult, although total sleep time is on average 10hrs
Pre-teen - fall asleep quickly, very deep N3, very difficult to wake

Adolescence (13-19yrs)
- need for sleep per nycthemeron, 9+ hrs
- typically obtain sleep 6-8hrs (+ sleep in, weekends), signs of sleep debt and deprivation apparent
- 25% in REM
- circadian phase delay to later sleep hours
vs. school times, and learning expectation

Adults (20-50yrs)
- all people sleep (unless fatal familial insomnia, death in 12-18 mths)
- average 7-7.5h hrs, SD of 1 hr
- 2/3 of population: 6.5-8.5hrs, cross-culturally
- 16% of pop: over 8.5hrs, 16% of pop: under 6.5 hrs
- sleep less than 5 hrs regularly + healthy: minority (e.g., MissM: sleeps 1 hour a day, but she is healthy)
- …growing concern

Older Adults (50+)
- many variables (sleep disorders, illness/dysfunction, medication use)
- report sleepier in daytime, but less impact of sleep debt or deprivation
- sleep onset more difficult, sleep less at night, fragmented, but naps (even distribution per nycthemeron)
- sleepy earlier in evening, awaken early in morning
naps are always by choice and by preference
- approx., 48-50yrs: 4-6 hrs, dramatic decline in N3
- 50-60yrs: clear N3 diminish, 5-10% of sleep (less in men)
90yrs: disappearance of N3
Alzheimers: reduction in N3 (regardless of age of onset)
theory: deterioration/less growth requirements of brain cells, cognitive abilities
REM: some decrease, but generally maintained into extreme old age (100+)
more REMs earlier in the night, more N1 sleep

Women vs Men's Sleep
Late 1980's definite research focus on gender differences (previously used as a variable to control)
- ▸ women go to bed earlier, fall asleep sooner, total sleep length is longer BUT with more awakenings and time spent awake in each sleep cycle vs men.
- ▸ "aging-related sleep changes" approx.. 10 yrs later in women, 2x as many sleep spindles, slower decline of N3 vs. men
- ▸ older women, longer time to fall asleep, poorer quality and nap more vs. men
- menstrual cycle: natural cyclic progesterone increases sleepiness, and speeds sleep onset, estrogen increases REM length
- oral contraceptives: increase average melatonin levels, increase body temperature during sleep, shift into REM quicker; no effect on N3
- during menstruation: bloating and pain interrupts sleep (2-3 days)

Pregnancy
- ▸ pregnancy - metabolic changes, discomfort :
- 1st trimester – increased sleepiness, disturbed sleep;

- 2nd trimester – "grace period" can sleep well, but organs start to shift,
- 3rd trimester – awakenings increase in frequency and duration; N3 declines approaching absence;
- following birth – recovery from delivery, irregular sleep schedule, breast feeding (more N3, but less time), postpartum depression: hormone changes, worries…
- can take 6mths to 1yr to recover most aspects of sleep, although sleep efficiency remains low and number of awakenings high into childhood (vigilance)

Menopause
- production of progesterone and estrogen decline, cease
- 40-75% women complain of sleep issues
- hot flashes: 1.5 yrs-5yrs typical = brief arousals-multiple (>100) awakenings
- insomnia and sleep disordered breathing
- mixed research with HRT,

Morning Types , Evening Types - Phase Shifting
- phase shifted: phase advanced (up earlier) or phase delayed (up later)
- MT, ET or NT (neither type) ; evidence for genetic predisposition, developmental
- teens become ET, gradually NT, MT characteristics noticeable by middle age
- questionnaire (Horne and Ostberg): time of day you rise, prefer to rise, feel your best, had to sleep at different times

- MT fall asleep more easily, better moods, but wake more during sleep than ET
- ET feel more alert and perform better later in day/night than MT, but have more irregular bedtime habits than MT
- ET experience less jet-lag and tolerate shift work much better than MT's
- More women tend to be MTs than men

OPPONENT PROCESS
1. Biological Clock - Circadian Rhythm
- circadian oscillations of 24 hrs, light/dark of earth
- "clock-dependent alerting": phys process which maintains and consolidates daytime wakefulness in humans + animals
- oscillations in body temperature, hormones, bladder/thirst/hunger, hypocreatin (keeps awakness) /orexin
- SCN, via light
- clock genes Period (per), and Timeless (tim)
  = variability influence individual diff. in circadian rhythms
  = thousands of genes expressing at once in most tissues, organs of the body, regulate cellular function

= vs. stimulation alerting: transitory (unless intense/prolonged) once removed will fall asleep
- one peak/strong alerting in the mid-morning (10am) and one late afternoon (4pm) or early evening
- clock dependent alerting not influenced by prior sleep or wake time
- biological clock ensures that small sleep debt cannot overwhelm us

2. Sleep Homeostasis
- when wake up, sleep drive is weakened, sleep drive increases continuously during wakefulness
- maintain equilibrium by adjusting sleep obtained to match sleep need (xhurs of wake produce need for xhurs of sleep)

THUS, the ability to stay awake any time (day or night) is strongly influenced by an interaction of clock-dependent altering and homeostatic sleep drive

Best sleep when match of biological clock and personal wake-sleep schedule are in synchrony

Sleep Need
"individual requirement of nightly amount of sleep that results in consistent optimal daytime alertness"

less or more than needed
less than needed = tendency to daytime sleep is high
more than needed = tendency to daytime sleep is low

Sleep Tendency and Its measurement

- Sleep tendency - strength of inclination or impulse to fall asleep
- Sleep latency: the time it takes from "light out"/ bedtime to onset of sleep (MSLT)
- Increase/strong sleep tendency = short /decreased sleep latency
- inability to function well in waking state
- greater the accumulated sleep loss = stronger the sleep tendency

Multiple Sleep Latency test (MSLT)

- objective test to measure strength of daytime sleep tendency
- average length of time it takes to fall asleep during the day, if attempting to do so (not resisting), in a calm, quiet, monotonous environment, with no other distractions or disturbances (e.g., light, hunger, sounds)
- measurement: 5 measurements (9, 11am, 1, 3, 5pm) , for 20 min each nap opportunity; averaged for the day to describe physiological alertness.
- measure over several (7-8)days :
- if does not change substantially = sleep obtained is what is needed
- daily minutes it takes to fall asleep decreases (less impulse to fall asleep) – amount of sleep need is less than obtained
- daily minutes increases - amount of sleep need is more than obtained

Maintenance of Wakefulness Test (MWT)

- if attempting to stay awake
- average length of time to sleep, if resisting sleep/motivated to stay awake, reclined in calm, quiet, monotonous, dark room
- 20-40min, in 2 hr intervals

Used by transportation, as measure of post-surgical/CPAP use

Sleep debt

- accumulated amount of sleep less/lost than the daily need
- larger debt = stronger drive/motivation

AND tendency, level of cognitive impairment, affective impact

- Most of us carry some sleep debt!
- Reduced? With extra sleep
- Carry a large debt? Cannot obtain full "payback"

Student Notes - Sleepiness, Sleep Debt and Deprivation

Sleepiness
- range of levels of alertness
    - energetic, motivated, active, peak alertness
    - tired, lethargic, unmotivated (conscious effort not required to be attentive)
    - drowsy, sleepy (active avoidance to fail asleep is necessary)
- pleasant/unpleasant – if you are permitted to sleep, and where
- difficulty communicating our sleepiness – children under 9yrs old + sigma with terms
- we do not judge our arousal states well
- we tend to underestimate the impact sleepiness has daily and long term

Sleepiness - Scales
- Stanford Sleepiness Scale (SSS)
- Epworth Sleepiness Scale
- Multiple Sleep Latencey Test (MSLT)

Sleep Debt
- accumulated amount of sleep less/lost than the daily need
- e.g., need 8hrs… but sleep for 4 hrs for 1 night = 4 hrs of debt … but sleep for 6 hurs for 5 nights = 10 hrs of debt
- larger debt = stronger drive/motivation (think about it, find place) AND tendency, short latency
- larger debt = level of cognitive impairment, affective impact (decision making, reaction time, learning, mood, sense of well-being, energy)
- if you take more than 50 hrs of sleep debt, it will difficult for you to get up each morning, and easily to feel sleepy during the day
- Most of us carry some sleep debt!
- Reduced? With extra sleep (longer in bed, naps)
- Carry a large debt? Cannot obtain full "payback": obtain as much as possible one night, then continue to increase sleep subsequent nights, or nap (less than 3 hours)
- Also, we misattribute activities/meals to sleepiness, when it is sleep debts
- more than 50+ hrs sleep dep = twilight zone of sleepiness

Sleep Dep in History
- Patrick & Gilbert (1896) : 90 hrs
- lowered temp, slowed RT, memory + sensory decline
- Randy Gardner (1965), 17yr old, GWRecord: 260 hours
- fluctuating symptoms: blurred vision, memory decline, irritability, hallucinations, unable to speak
- 4th day: EEG altered, "no longer awake"
- Slept for 15 hrs, then 10.5 hrs, no adverse effects

Sleep Dep - Animal Studies
- Rechtschaffen (1980's) rat on rotating table, above water
- stop grooming, skin lesions,
- lose weight despite increase in food intake, body temp declines, reduced thyroxin levels, large cortisol release
- lymph nodes fill with bacteria from intestine, immune system dysfunction, die within 2-3 weeks

What Leads to Sleep Deprivation?

- screens (phones, tablets, TV, gaming) for communication, entertainment
- caffeine culture – 8-14hrs to excretion
- "fit more in, get it done culture", 24-hr availability
- work schedules or work type
- social events timing, priorities
- stress
- external stimuli – noise, traffic, spouse (snoring, movement), temperature, pets sleeping in the room

Sleep Deprivation - Physiological Effects

- heart palpitations
- slow eyelid closure, itchy eyes
- head drop (baby head) with sudden jerking up/startle response
- yawning
- tremors, muscle aches
- increased tendon reflexes and muscle spasm
- fall in body temperature (0.8-1 degree)
- decreased resistance to infection - marked decline in immune system - 2-3 days - interleukin-2 production drops= lymphocytes, and NK cells unable to fight entering antigens and existing bacteria/viruses (even after some sleep lost in one night)

- recent vaccinations (e.g., flu) can be rendered less of ineffective
- growth hormone severely reduced
- recovery after exercise substantially longer
- increase in cortisol release
- decrease in leptin, increase in ghrelin (increase in hunger) and insulin secretion = causes more storage of fat
- chronic sleep dep: high blood pressure, diabetes, obesity
- brain - compensatory action – more/varied brain regions involved to "help out" in complex/difficult tasks
- caffeine can help general arousal of the brain, but functions dependent on prefrontal cortex remain impaired.
- micro-sleeping: brief NREM sleep, complete inattention, but denial of sleeping
- REM rebound – higher REM % when return to sleep (but you can eliminate REM without deleterious effects – antidepressant drugs)

Sleep Deprivation - Psychological Effects

- psychomotor, cognitive and perceptual effects
- loss of alertness, reaction time (decreases)
- lapse in concentration, esp. if continuous, long, dull, repetitive
- impaired ability on complex tasks
- innovation, creativity and flexibility decreases
- simple, well-practiced, externally motivated (money, rewards), less than 10 min are less effected
- decrease in ST memory
- loss of verbal fluency
- hesitancy in decision making (life or death) or errors of inattention
- mistakes more frequent - if competing distractions and sorting involved (what needs attention, what can be ignored)
- inability to plan ahead
- pessimism, impatience, irritability, anger, controlling negative mood, more susceptible to arguments
- exhibiting inappropriate behaviors, emotional outbursts (laughter/crying)

- inability to judge space/volume (between people, speaking)
- role clarity declines (leadership), personal focus increases
- inability to be empathetic
- more susceptible to suggestions
- disorientation, confusion
- mistrustful, paranoia, hallucinations
- risk taking behavior, impulsivity increases
- increase chance of injury

Sleep Deprivation - Behavioural Effects

- spontaneity
- interest, apathy, indifferent
- less desire to socialize
- decreased sense of humour
- libido, self-esteem
- less able to deal with novel or unfamiliar situations
- slurring of speech
- clumsiness
- increase accidents

Stay awake during Sleep Dep?

- alcohol worsens sleepiness
- splashing cold water, fast moving air, loud music, dance around only temporarily
- + caffeine (150-200mg, 2 cups) followed by a nap (15min-40min) can assist for up to 3hrs
- consider: life and death decision you are making (drowsiness can kill you)

Sleep Deprivation
Societal Effects

- sport performance – "home turf advantage"
- parental information on sleep training, and consequences of sleep deprivation are limited
- school aged children misdiagnosed with behavior disorders
- university students – death on vacation post-exams/deadlines
- severe, fatal MV injuries (over 1500 deaths and 40,000 injuries in one year, 2012)

- driving after 24hr sleep deep = 0.10 blood alcohol level
- firefighters, police, military personnel
- physicians, paramedics, anesthesiologists, medevac
- taxi drivers, bus drivers, air traffic control (and air mechanics)
- emergency utility workers (power outage, snow removal)
- oil tankers, nuclear reactor management

What can we do?

- individually and collective action: try to close the gap between medical scientific sleep knowledge and application to prevent deleterious effects and large catastrophe
- respect sleep, take responsibility, learn to manage it
- if sleep educated, talk about it with family, friends…
- sleep specialists to provide clear, accessible education for all levels
- reach leaders in academia, government + health and safety industries (protect workers and the public)

Practice Midterm

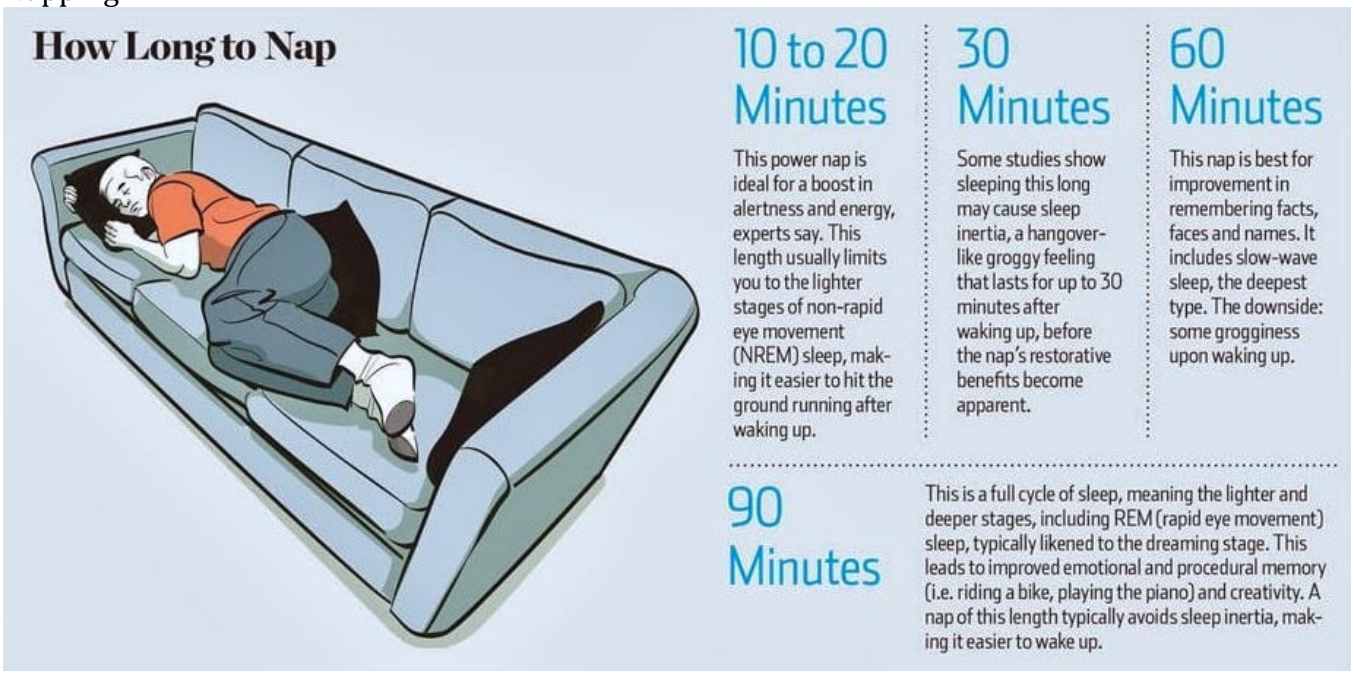
Exam format: M/C, Matching, SA
2 hours to write
Expect material from both the text and the lectures
Bring pencil, eraser, pen

Student Notes: Understanding Sleep in Challenging Situations and Sleep Hygiene

Sleep Crises
- sudden, unexpected need to stay up all night for a critical task or emergency
- "all nighter" – self-chosen willingness to stay awake for a full nycthermeron
- worsened sleep disorder to a point of serious illness/high risk to safety

Sleep Crises- Coping
- knowledge of badness of how sleep debt can affect your health, preparation, use of tools;
- know your sleep need and bio rhythms, best time for perform
- biological clock at lowest ebb in the middle of the night (3-4am) = more prone to distraction, ST memory recall issues, slow reaction time (RT), mistakes and cognitive issues
- attempt to plan ahead (when, where)
- lower sleep debt previous to the crises, if possible
- avoid alcohol (synergistic with sleep dep.), fatty/heavy foods

Napping



- Types
  - emergency nap: to cool with emergent drowsiness
  - preventative: to prevent a late night
  - habitual: usually at same time a day
  - selective, strategic: plans if want to maximize performance

(training for athletes); a 45mins nap can increase alertness for about 6hrs, 1hr nap can improve alertness up to 10hrs

- Time – 10-90mins
- If diurnal schedule, do so before 3-4pm

- improve objective performance more than subjective performance - we do not perceive the actual benefits of the nap

Jet Lag - What is it…
- due to rapid travel, a mismatch of the individual internal circadian clock with the external local arrival clock.
- timing offset – hunger, fatigue/energy, activities
- feel ill, flu-like – nausea, GI upset/constipation/diarrhea, muscle soreness, headaches
- distracted, disorientation, moody
1/3 not affected at all, others mild to debilitating
- worse = travelling east (direction), greater time zones, increased age

Jet Lag - Direction Difference
"east is the beast, west is the best"
- travelling east = body's circadian rhythm is behind local time, problems falling asleep at local bedtime, and difficult to wake up in the morning
    - Vancouverite arrive in Newfoundland at 11pm, it is 6pm Van time, difficult to fall asleep
    - Vancouverite arrive in Hawaii at 10pm, it is 1 am Van time, easier to fall asleep
- very few issues travelling north or south: no time difference, unless very far North/South, not jet leg but the light length everyday (very short/long light time)

Jet Lag - Adjusting
= need to adjust body temp, hormonal rhythms to adjust
-1recovery per time zone travelling to the west, 1.5 recovery days travelling to the east for complete recovery;
- rapid changes the first few days, tapering off (unnoticeable internal changes continue)
- try to "live in the time zone" the arrival clock before you leave, or make small adjustments a week, to 1-2 days before (watch change, eat meals, bed time)

flight and direction
- travel east – take early flight, leave early in the day
- travel west- take evening flight sleep on the plane
- sleeping pill – careful – meant for continuous 8hrs (travelers amnesia)
- length of stay - set/reset if lengthy, not 1-2 days
- attempt to "be local" when you arrive, as much as possible
- exposure to bright light
- melatonin - timing is important; to east: later, to west: earlier.

Shift Work - Types
- day - 7-8am-4/5pm,
- evening/swing - 4pm-midnight, 6pm-1am

- graveyard- 11/12pm-6/8am,
- split - 5/6am-10am AND 7-10/11pm

Shift Work - Challenges
- shifts change regularly
- common- one week on/off
- daytime to graveyard phase shift most difficult (starting when clock-dependent altering is weakest)
- more difficult for MT than ET, people who have a large sleep need, people over 50yrs old, or with chronic illness or sleep disorders
- tend to sleep less, and less efficient if attempting to do so during the day (2-3hrs less per night)
- difficult to live with others on diurnal schedule (family, partner, social events, shopping), will switch during days off

Shift Workers
= tend to have less job satisfaction, more absenteeism
- 50% higher than average number of MVA when driving home from work
- more negative moods, emotional issues, report social isolation family issues, and 57% higher divorce rates
- higher reports of stomach, and GI problems, cardiovascular disease, and cancer, higher mortality rates

Shift Work - Coping
- consistent shifts –stay on day/night for 3+ weeks (provide a week to adjust)
- slow graduating clockwise shifts - day to evening, to night to day
- more light during shift, and very dark situations for sleeping during the day

Sleep Hygiene
- Goal: continuous, quality sleep, for optimal daytime alertness
= Make sleep a priority over other choices

Sleep Environment
- bedroom - associate room only with sleeping and sexuality (not eating, TV, reading, etc.)
    - Note gender differences (post orgasm): men are easier to fall asleep, women are not
- quiet – ear plugs, reduce unpredictable noise, music/TV, voices; if needed white noise use
- dark – window and eye coverings, avoid screens for reading, any other light emitting in the room
- comfortable (mattress, pillows, coverings), clean (uncluttered) bed
- control the temperature, air circulation and humidity – cooler, with warm blankets/clothing

Physical Sleep Practices
- consistent sleep schedule - preparation, time of day/night; including weekends
- avoid working out/exercise 2-3hrs before bed time, depending on type (yoga vs. running), and time of day (late afternoon/early evening/morning)
injuries get from exercises can affect sleep, the pain.
Exercise 4-6hrs before bed time can assist sleep
Trained athlete will be affected if the training is reduced
= stay in bed, try to sleep when drowsy not if wide awake (get up, out of room, do planned relaxing task)

Psychological Sleep Practices
=- adequate time to unwind, calming pre-sleep routine before bed time
- avoid looking at the clock
- mental listing – paper, pen beside bed or do so before heading to bed/bedroom
- worry/anxious – permission to sleep to deal with issue property the next day

Sleep and Substances
- avoid = caffeine post 4pm, alcohol, spicy, heavy/fatty or large meals, large amounts of fluid
- if hungry (small snack), warm drink; tryptophan (mixed research)
- be aware of timing of smoking/reduce – will awaken if nicotine levels reduce during the night
- read your medication inserts carefully; side effects and synergistic interactions
- valerian, chamomile, lemon balm, lavender, kava - compared to placebo, quality and quantity issues, interactions and side effects

Driving
- remember: sleep debt causes drowsiness, not the monotony of driving
- plan ahead – reduce sleep debt before trip + leave when circadian clock has you more alert, don't drive in the darkness
- several drivers
- if you feel drowsy, STOP DRIVING, nap (find safe place – rest stop, at store, hotel parking lot), coffee followed by a nap

Can we have too much sleep?
- "over-sleeping" – sleeping for more than you believe you should or need
- extra sleep – low efficiency, very little N3 (extended beyond 12hrs, it reoccurs), extra alpha that is gained
- feeling groggy/lethargic/"thick headed", sore muscles, emotional, irritability
- irrational, impulsive, socially embarrassing, no memory of activity
- typically, 10-15min post long sleep/nap, up to an hour
- "sleep inertia"

Sleep Inertia
- lack of mobility for extended period
- wake-up when mid-day dip in clock dependent altering

- wake up during N3 period (particularly affects memory)
- worse with remaining uncompensated sleep deprivation – remaining sleep debt exists
- less noticeable following gradual morning awakening after a full night of normal length and quality of sleep
- we cannot “store sleep”, we simply remain awake when we have enough (zero debt)

Student Notes - Sleep Disorders and Treatment

Assessment of sleep disorders
- primary care physician AND/OR sleep lab, polysomnography with multiple physiological measurements
- patient histories, diagnostic information (how, where, do you travel, etc.)
- signs (observable) and symptoms (reported)
- sleep amount, quality, timing and daytime
= technicians, researchers, clinicians (PhD), psychologists and physicians specialists (pulmonary physicians, neurologists)
- meet regularly, review and discuss patients - share knowledge, and for treatment
- case studies, or "grand rounds"
- International Classification of Sleep Disorders (text pg 340-343)

Assessment of Sleep Disorders
- Symptoms of Sleep Disorders - Persistence or frequency

1. unrefreshed sleep
2. excessive daytime fatigue/sleepiness
3. difficulty staying or falling asleep
4. unusual/ violent behaviour during sleep
5. snoring (wake oneself up), breathing irregularities (brief stop of breathing)
6. motor restlessness in the evening/previous to sleep
7. + mood changes/issues (anxiety, fear, agitation)

Insomnia – the "common cold" of sleep problems
- cannot obtain enough time asleep, quality of sleep despite adequate opportunity to do so
- TYPES:

1. Sleep Onset Insomnia - difficulty initiating sleep (lie awake, want to sleep)
2. Sleep Maintenance Insomnia – difficulty maintaining sleep throughout the night (one/several long wake episodes punctuate sleep periods and one night)
3. Early Awakening Insomnia – sleep onset is rapid, sleep continuity is good, but awakening is much earlier than desired, inadequate total amount
4. Sleep Dissatisfaction – not feeling refreshed after a night of seemingly sufficient sleep
5. Idiopathic Insomnia – no found cause, (15% of cases, childhood onset, life-long condition without treatment)
6. Psychophysiological Insomnia – chronically hyper aroused; greater arousal at night + day restless, overactive, nervous, apprehensive; intense and persistent physiological arousal (e.g., higher body temp, HR, hormone release)
7. Paradoxical Insomnia – (5-7% of cases), no daytime impairment, normal sleep length and profile, but report no sleep, highly vigilant, "thinking all night". Physiologically they are doing fine, but they report they are thinking over the entire night and cannot fall asleep.

Insomnia – Causes

Multiple, to countless

= cause for the initial sleep disruption should be found, but not as relevant as perpetuating circumstances

- Comorbid Insomnia – insomnia is caused by medications, illicit drug use, pain/discomfort (injury, arthritis), environmental factors.

= decongestants, caffeine

= alcohol – increase total sleep time, less N3, REM;

= alcoholism – permanent irreversible reduction of N3 and REM (sudden abstinence/ withdrawal – severe sleep onset issues, 10-14 days – months/years, lead to alcohol use relapse)

= time zone, schedule changes

= temperature regulation (too hot/cold, acclimatize to new locale)

= pregnancy, menopause

= unique sleeping environments – different bet/room noises, light changes

= mild to severe psychological issues

job interview/exam, worried about cockroaches in vacation condo

= depression, anxiety, phobia, obsessive-compulsive, schizophrenia

= marital (wedding, or divorce)

= job stress

= grief (pet, family member)

= trauma (break in, robbery, rape)

= war, post-traumatic stress disorder

Insomnia causes - sleep specific cognitive issues

- exaggerated concerns about not "enough sleep"
- self-blame/guilt of lack of sleep, why can't I do it?
- dread sleep time (uncertainty)

pressure to sleep leading to hyper-vigilance about sleep

- if try to self-treat, cannot sleep because monitoring sleep treatment to evaluate its effectiveness
- mental listing, or persistent problem solving

Insomnia Impact

- physical and psychological issues of sleep deprivation
  - concentration, irritability, jitters, diminished well being, inappropriate sleeping locations/episodes, clumsiness to severe accidents
- impact on work performance, communication, relationships
- family/sleep partners –sleep separate, need quiet, sleep envy/resentment, bargaining with partner/children
- unpredictable in planning, choices of activities, lifestyle
- purchasing/relying on "aids" – special pillow, blackout curtains, mattress, herbal supplements, leave on light/music (BUT the more control required, the more hyper-vigilant the sufferer becomes)

Insomnia

- 30-50% of Western pop. report mild or occasional insomnia
- 6-10% report serious problem
- very rare in children 8-10 but 25-35% of retirees/post middle-aged
- 1.5x greater prevalence in women than men (ONLLY 21% of women, 25% of men report NO insomnia in their lifetime)
- more prevalent in those with depression, anxiety, substance abuse, disordered breathing and recurrent health issues
- sleep onset insomnia – more common in younger adults vs sleep maintenance insomnia – more common in older adults
- BUT types can change with physical (acclimatization, different bed) and psychological circumstances (exams, wedding) and aging.
- temporary (1-2 nights -1-2 weeks) or persistent (bouts every month, over month/years; + 3months)

Insomnia – Treatment

Complex! Put the puzzle pieces together

- Sleeping Pills -
- OTC, non-prescription - ineffective/questionable effectiveness
  - antihistamine, acetaminophen (Tylenol PM)
  - magnets, herbal treatments
- prescription - effective for temporary use
  - hypnotics - work on GABA receptors to promote sleep, relax muscles and reduce anxiety
  - "psychological dependency" > physiological dependency
  - administered at correct time in correct way
  - amnesia
  - risks of falls

NOTE: people tend to overdose on non-prescription, thinking they are "safer" or combine with other substances (alcohol), which can be disastrous.

Cognitive-Behavioural Treatment (CBT-1): change thoughts, emotions, beh., "relearn to sleep"

- goal: alleviate perceived, actual nighttime sleep issues, eliminate self-blame and analysis, relief from consequences of poor/lack of sleep
- Effective, Long-lasting
- a few sessions to several weeks, lead by practitioner, resources provided (books, web)
- examine - what contributing to issues, tracking/log (bedtime, how long to sleep, number of awakenings, level of daytime sleepiness, naps, etc.)
- several components sequentially, individually introduced, monitor motivation/compliance and progress; enough in place good sleep will result

Example…

- Lock in wake-up time, sleep restrict to bedroom, bed for 5 hours at a certain time, increase in 10-15minute intervals

- Progressive muscle relaxation, bath/shower, reading
- Scheduled worry, thinking and resting time, write lists of tasks and worry targets

Narcolepsy

- appears in teens, early 20's can appear in adulthood, both genders
- complain of excessive, perpetual sleepiness
- intractable sleep attack, without warning, even in stimulating situations (minutes to an hour in length)
- cataplexy - weakness is limbs, face, speech muscles; fleeting to complete wilting collapse
  - often triggered by emotions or stress response (laughing, exhilaration, anger, crying)
- if minutes, consciousness remains (can be prolonged), but typically over 2min, REM sleep can be triggered
- blurred vision, irregular respiration, slurred speech
- 10-15% have no narcolepsy w/o cataplexy

Narcolepsy

- hallucinations paired with sleep paralysis – reported in 1?2 of sufferers
  - vivid, dream-like occurrence (fear, dread, re-enactment of past few hours of time)
    - visual, auditory, tactile or involve movement
    - hypnogogic – entry to sleep
    - hypnopompic – from sleep
- blackouts - typical wakefulness behaviour, with no memory at all of events, behaviours (min, to hours)

Narcolepsy - Causes

- genetic predisposition
- brain damage, or other medical conditions
- autoimmune- body attacking own tissue in lateral hypothalamus which manufactures orexin/hypocretin 2 (NT)
- abnormally low/absent hypocretin in cerebral spinal fluid;
- and marker of HLA (human leukocyte antigen): DQB1*0602
- cataplexy - caused by increased activity of acertylcholine (NT), and decreased activation of the locus coeruleus (part of pons, assist of emotion and cognitive control)

Narcolepsy - Impact

- work – fall asleep on the job (fired)
- social:
  - dating, group activities

- movies/concerts, sports (strong emotional triggers), dinner parties/cards (quiet activities)
- personal - safety driving (independence)
- appear: dull, emotionally flat, unmotivated, withdrawn, aggressive, lazy or bored
- feel: guarded, anxious, frustrated, depression can result

Narcolepsy – Treatment
No cure

- behavioural + pharmacological treatments necessary
- naps - can be refreshing, albeit inconvenient (scheduled 15-20 min, 1-2x per day)
- good sleep hygiene
- medication
  - stimulant for daytime activities (Mondafinil), side effects
- noradrenergic reuptake blocking drugs, SSRI or GHB (, increase N3, when paired with alcohol has strong) for cataplexy
- psychological support (learn to anticipate attacks, support groups)
- family, peer education and therapy

Restless Leg Syndrome (RLS)

- unpleasant sensation at legs, "creepy-crawly" to painful
- use to move the legs
- when stationary, seated or lying, or at rest esp. at night
- relieved with continuous movement (walking, stretching)
- physical exam, lab tests = no issues
- daytime - report fatigue, sleepiness (some feel alert)
- 5-15% of pop, report it;2x often in females
- onset at any age, can be misdiagnosed as growing pains, or hyperactivity disorder
- highest incident in middle-age to elderly
- 1/3 of cases due to iron deficiency
- 15-40% of people on dialysis complain of RLS
- 20% of pregnancy women

Restless Leg Syndrome- Causes

- caffeine, warm rooms and exposure to cold can intensify symptoms
- disappears with fever (no known reason why)
- dopamine – depletion of dopamine worsens symptoms
- iron – deficiency, transferrin malfunction - protein that assists in transport of iron to the brain -- iron therapy may improve symptoms
- blood loss worsens symptoms

Restless Leg Syndrome- Treatment

- improved sleep hygiene

- awareness of, and control for exacerbating circumstances and substances
- iron supplementation (if serum ferritin tests show low levels)
- aware of blood loss (menstruation, injury, donor)
- stretching, relaxation massage
- medication -
  - dopamine agonists (Mirapex, Requip), -- a couple of days
  - oxicodon hydrocodone(Vicoden) , issues with dependency

Periodic Limb Movement (PLM's)

- jerking of arms or legs during sleep
- short duration (0.5-10 sec), at regular intervals and clusters (every 5 sec -90sec) lasting several minutes to hours.
- more likely during first half of the night
- no awareness of movements during sleep, aware of multiple awakenings
- bed partner typically aware – repeatedly kicked, bed movement
- + insomnia, or excessive daytime sleepiness = periodic limb movement disorder (PLMD)
- PLM's accompany other disorders (OSA, narcolepsy, REM beh. Disorder)
- 5% of general population
- more common in middle-aged, 1/2 of older adults
- Treatment - similar to RLS

Bruxism

- teeth clenching, grinding, crunching, scraping,
- 10-20% of people
- damage to teeth, jaw, muscle injury (TMJ)
- due to stress, pre-existing mandibular or maxillary condition
- during N2 sleep and REM; accompanied by partial arousal with no awareness
- higher HR or other body movements accompany
- dental exam, and correction of anatomic abnormalities
- soft or hard guard over teeth

Sleep Apnea

- apnea = absence of breathing
- sleep apnea - "cessation of breathing lasting 10 sec or longer during sleep, terminated with an arousal or oxygen desaturation"
- observable and measurable (lab)
- Central sleep apnea – absence of effort to breathe, absence of airflow in mouth and nose (rare)
- Obstructive sleep apnea –persistent, increasing effort to breathe, with absence of airflow in mouth and nose

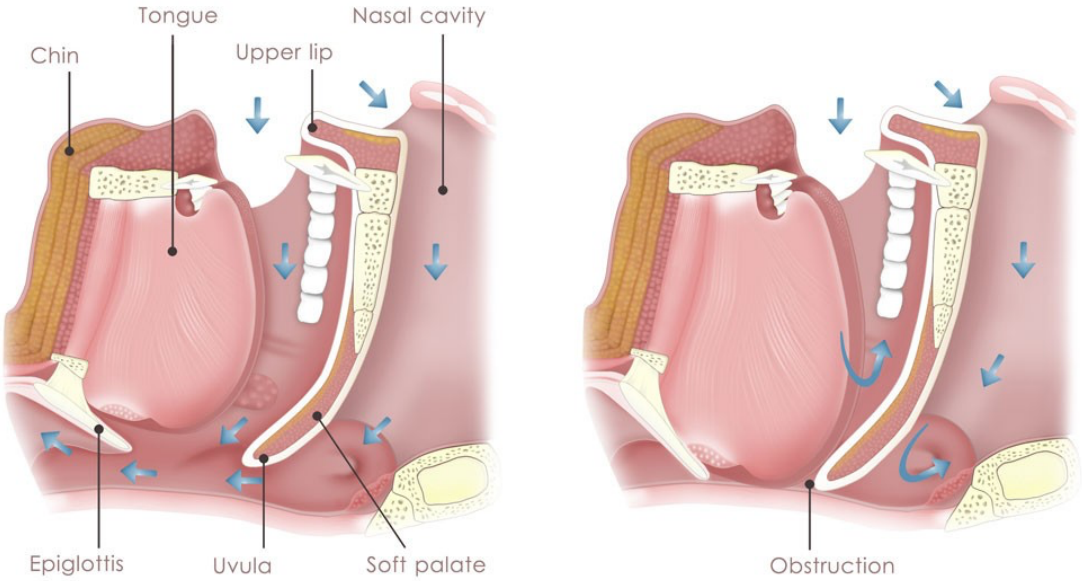
Obstructive Sleep Apnea

- loud snoring + pause, cessation of breathing, followed by gasp of breath
- people tend report:
- night sweats, morning headaches, dry mouth
- sleep deeply and difficult to arouse, but awaken “foggy headed”; blackouts (no memory in the morning time)
- more sleep or naps are not refreshing
- frequent awakenings, with little-no awareness of them
- thrashing or moving (normal respiration)
- *often unaware of illness, even if severe

Obstructive Sleep Apnea
= *Snoring* = sign of airflow and airway obstruction
= throat not completely open, causing air and throat tissue (uvula, soft palate) to vibrate as air is forced through narrow passage
= common in 50% of adults
= normal? Due to congestion (virus), or nasal obstruction (septum deviated) or habitual (non-normal)?
= loud or disturbing others?

Obstructive Sleep Apnea

- thick/adipose tissue at neck, face (+abdomen; obesity), but not all sufferers
- big tongue (in ref. to palate), nasal adenoidal breathing +speech, small jaw = smaller upper airway, pharyngeal dimensions
- + reduced vigor or tone of muscles of the throat (which should pull back during inhalation)
- trying to inspire air through a small opening sucks relaxed tissue closed instead of air into the lungs
- chest moves, trying to inflate the lungs (respiratory effort) but air cannot pass, no airflow through nose and mouth
- = obstructive apnea episode



Open airway during sleep

Sleep apnea present with obstruction

Obstructive Sleep apnea

- hypopnea – inspiration continues, with marked reduced volume of air, respiratory effort increases
- Apnea/Hypopnea Index = # of ap or hyp ending or arousal or O2 desaturation/hours of sleep

8 hours of sleep, 40 times of a micro-wakening = 40/8 = 5,

- mild (5-10), moderate (15-30), severe (45+)
- O2 sat sharply reduces, blood pressure, HR increases
- correlated with high blood pressure (70% of high BP suffer with OSA), with treatment can reduce BP dramatically
- very little or no N3, reduced REMs (apneas more prevalent in REM)
- can trigger grand mal seizure
- worsens with time, can die in sleep (heart failure, stroke) + alcohol, antihistamines, sleeping pills worsen reported symptoms (because pills include muscle relaxant, worsen, dangerous)

Obstructive Sleep Apnea

- sleepiness affects work (type, danger),
- depression, irritable - hostility,
- diminished sexuality
- concentration, judgement, memory issues
- bed partner issues – severe sleep deprivation, sleep in separate room, conflict

Obstructive Sleep Apnea - Treatment

- avoidance of alcohol, opioids, or muscle relaxants
- weight loss
- sleep different position (tennis ball on the back)
- past: surgery to produce chronic tracheostomy (bypass upper airway), stoma capped, difficult socially
- CPAP (continuous positive airway pressure) machine - self-adjusting/auto-titrating, bi-level
- nasal mask, prevent inspiration effort
- compliance issues (lifetime use)
- oral appliance – mouth guard, holding lower jaw forward opening the throat (dentist req"d)

CPAP
= uvulopalatopharyngoplasty (UPPP) - resect uvula, tonsillar pillars, soft palate (can be problematic, or worsen due to scar tissue)
= phased airway reconstruction - UPPP + advancing tongue, mandibular and maxillary advancement

Parasomnias
- undesirable, unpleasant occurrences during sleep
- more take place in waking, NREM, some in REM
- "components of one state intrude on another"
- mechanisms are not always clear
- genetic, environmental factors play a role
- NOT related to psychopathology (contrary to popular belief)
- ICSD (international c sleep disorders) - 15 distinct parasomnias

Somnabulism – sleep walking
- fiction: demons, supernatural, mental disorder, dream enactment
- begins during NREM (not REM), first 1/2-1/3rd of night
- >1min, 15 min up, rare occurrences 1hr or more
- no dream recall
- move in bed, sit up, eyes open
- walk around room, house
- yard, neighbourhood
- movements - purposeless, clumsy, trip/bump into walls, cuts/burns (injury, wakening typical)
- complex (meal, drive, instrument)
- vocalize, conversation, no screaming
- no full mental capacity – memory, planning, interacting with others
- 33% - have immediate family who does the same or sleep terrors (studies of twins show genetic inheritance)
- more common in children, onset 4-6 yrs, peak occurrence at 11-12yrs, abates at 5-17yrs
- very few adult sleepwalkers (3-4%), 1x per year, very rare in elderly

- Causes - sleep deprivation/irregular sleep-wake cycle, other sleep disorders, fever, extreme stress, noise, full bladder (disrupts N3)

sleep walking - what should I do?

- keep out of harm
- awakening – difficult, confusion, resistance/violence possible
- gently lead back to room, bed
- outgrow it
- reduce triggers
- safety – make bedroom safe
- schedule awakenings 15-20 min before typical occurrence
- adult (intense, frequent, or dangerous) – medication, stress management/relaxation therapy,

REM behaviour disorder

- unusual, vivid dreams/nightmares with activity and violent confrontations
- experiencing fear, acts of defence
- behaviour parallels the events in the reported dream/nightmare - animated and violent physical behavior (kicking, punching, grabbing, leaping from the bed, vocalizations) BUT eyes are closed
- injuries to sleeper and sleep partner common
- 2-14x per week, every 90 minutes
- more frequent in 2nd half of night, occur during REM
- remain asleep, no awakening
- 1 in 200 people
- common in older males, average onset is early 60's
- early sign of brain degeneration (dementia, Alzheimers, Parkinson disease)
- can take place in children
- side effect of medication, or psychoactive drug withdrawal
- or co-occur with other sleep disorder (narcolepsy)
- chronic, and becomes progressively worse over time
- motor inhibition (REM paralysis) malfunctions

REM behaviour disorder - Treatment

- safety – making bedromm safe (objects, placement of furniture)
- medication – presses REM
- calm voice/instructions - movement sensor triggers a recording

Somniloquy – sleep talking

- mumbling, garbled, some understandable words, to full sentences
- singing, laughing
- seconds to minutes (rare over hour)

- most common in children, some in adults (almost everyone at some point!), occur in related, family
- secrets, two-way conversations? Unlikely, not replicable
- issues with relationships (content, offensive), believe wake
- during N1, N2 only 20% during REM (more emotions, grammatically correct; nor dream content)
- not treated typically – not dangerous

Nightmares
"night+mare" (goblin/demon)

- "coherent dream sequences that seem real and become increasingly disturbing as they unfold. Emotions usually involve anxiety, fear, or terror and other negative feelings" (American Academy of Sleep Medicine, 2005)
- abrupt awakening, full alertness with increase in HR
- immediate and full recall of the content of the nightmare, distressing
- occur during 2nd 1/2 of sleep period/night, typically 10 mins into REM episode
- persistent -impact daily living, anxiety, insomnia, daytime sleepiness
- all ages, 3-5yrs (10-50%), 70-80% adults report occasional

Bad Dreams

- do not awaken, but recall disturbing content
- triggered by illness, fevers, indigestion/heart burn, withdrawl from drugs/alcohol, or medication side effects
- during crisis, loss or trauma
- BOTH Nightmares and Bad Dreams:
- response to psychological issues/trauma
- replicate memories exactly or metaphorically (tidal wave, fire)
- soon after trauma – terror, fear, vulnerability, followed by grief, anger
- fade away/return when experience revives memory
- more common in people absorbed in fantasy, and with "thin boundaries" (play video games, film producer, writer, etc. at daily phase)

Sleep Terrors – "incubus attack"

- childhood, only 3% peaking at 3-5 yrs, ceasing at adolescence, rare in adults
- boys more likely and frequent than girls
- arouse suddenly (from N3 typical, 1st third of the night), piercing scream, terrified facial expression, possible thrashing
- sweating, racing heart, breathing rapidly, wide open glassy eyes, dilated pupils
- elevated HR, bood pressure
- run out of room/house
- attempts to soothe the child are unsuccessful, physically hostile toward comforter (dazed, unresponsive)

- morning - child has no recall of incident (“monster/walls closing”, picture)
- fever, emotional stress
- awareness of stressors, scheduled awakenings

Nightmares, Bad Dreams - Treatment

- awareness of stressors, scheduled awakenings
- soothing location, away from bed; describe it (calm them, but not reinforce with too much cuddling or into your bed)
- reassurance – protection “cannot hurt you” vs. “not real”
- disconnect emotion of nightmare from the images, “matter of fact”
- CBT (call of behavior treatment)
- drug to suppress REM
- IRT (imagery rehearsal) - write, talk, paint/draw content/about the nightmares then change the components and rehearse the scenarios
- converse with characters when awake
- lucid during the nightmare and change/confront it
- hypnosis can assist
- safe, supportive relationship (psychologist)

Student Notes - Dreaming - Psychophysiology and Function

Dream research "oneironauts"
1. measure overt physiology via polysomnography
- possibly introduce external stimuli (paly white noises, tape, spin water)
- awaken participants NREM or REM (polysom), ask "what was going through your mind" (search for mental activity during all stages)
    - recorded by device, dictated, written by dreamer; standard checklists used, aware of experimenter/peer, gender/age or perception of how data used.
- note: more than 50 words needed for proper analysis

2. home - beeper, alarm clock and recorder (more hostility, aggression, sexuality in home reports)
3. analyze dream journals kept longitudinally, within and across participants (Mary Whiton Calkins)
note: more than 20 dreams per individual req'd to to assess patterns in dreaming, well over 100 needed to compare content differences between people
element consistency in indiv. (teens to elderly)

Challenges of dream research
- no direct access to dreams - simple awakening causes change in functional org. of the brain, affects recall.
- longer from REM (and sleep state), the more difficult to recall content
- if dream is longer than 15min, early part is forgotten (e.g., see only t eh last 1/3 of the film..)
- no clear universal precise definition of "a dream" - night/daydreaming, meditation, drug induced, hallucinations
- any mentation (all thoughts, images, feelings, perceptions…) during sleep…or more elaborate, vivid, story-like, emotional
- NREM mentation can occur (dream? Less vivid, less real, fregments); logical, linear, times/places
- subject bias – "want" to recall content
- people want to recall what "happened" vs. intensity or describing details
- what we recall is often not "the entire story" - recall fragments, wisps, pieces, or not at all
- we cannot independently check the accuracy of dream recall: cannot be certain of findings
- do not want to describe some content (unacceptable or bizarre)
- participants want to "complete" or "fill in" the story
    - **reconstruction**: transformed, embellished or interpreted
    - **deduction**: fill in "links", "this happened due to…"
- minimal funding available for dream research (not a health risk per se)

Dream Recall
- ❖ sense of amazement or curiosity
- ❖ startled or afraid

- ❖ attempt to recall images, details and story
- ❖ attempt to understand why this content, why now (look for external causes)…
- ❖ look for purpose and meaning
- ❖ attempt to interpret impact on waking life

dreams last 9-10mins compare to 2,3mins, they are more vibrant, more lively, and way more distorshened, more violence, longer, more like a film

Dream Recall: Determinants
= Repression Hypothesis: censorship at the dreaming or waking state… *conversely* our dreams contain obnoxious, distasteful, hateful, corrupt, nasty, ridiculous, embarrassing "to" publicly "admit" behaviours
= Salience Hypothesis: the more vivid, bizarre, emotion filled, the more likely to recall the dream (more frequently vivid when 8hrs in bed)
= Interference Hypothesis: distraction during/after awakening unrelated to dreaming, interrupts dream recall
= Non-Reporters: some people cannot/do not recall the dream content

- ❖ takes effort to focus, recall and report
- ❖ consistently sleep deprived (sorter REM periods if 3-5hrs of sleep)
- ❖ or wake from N3 regularly, cannot recall dream periods

Psychophysiological Parallelism

- how closely related are the physiological (brain, body) and physical events (environment) with that of dream content

When we dream..

- activity changes in the areas of the brain (PET, FrMRI)
- lack of motor output
- more activity in limbic system (emotion –fear, anger, joy , survival) …. motivation, episodic memory,
- dopamine increases in the midbrain, activate/initiate dreaming
- less activation in prefrontal cortex (provides reality checks, inhibition, executive function)
- the majority of the frontal cortex is inhibited, prevents awakening
- therefore…we have elements of our waking life experiences, + emotions but lacking in logic or reality testing

ST memory access – On

Do we dream in "real time"
- REM sleep stage has several interruptions of a body movement (completely uninterrupted REM is 5-15mins)
- length of the dream report and length of preceding REM are related, when followed by an interruption of a body movement
- time seems similar, unless there is stop-start, umping from scene to scene

Do external events enter a dream?
- an outside stimulus introduced during REM stage of sleep may modify an on-going dream, create a mild element or change, but it does not initiate it
- can be incongruous to "story" but can certainly enter dream content
    - neutral sounds/tones, train whistle, rooster crowing, traffic, water drop on faces, light flashes, electric shock
- red light – changes hue in the dream, over time (days)
- first night in the sleep study lab - fear, anxiety, electrode fear (more than 1/3rd) of all dreams recalled from REM period awakenings depict lab situation – lab, coats, surgery, long wires
-own voice - you become more assertive, helpful, independent or active – the content doesn't matter
somebody's voice – more passive, observer,
- films, graphic, emotion inducing scenes (amputation, difficult birth, hard core pornography), video games, etc.: intrude, influence dream content but not a certainty
    - if related to dreamer's personal situation or emotional interests or investment (criticism: could occur much later not immediately during study)
- starving/thirsty: no evidence of driving direct dream content of drinking/eating, but could be related to the theme
- food affect dream content - sugar, onions, anchovies - literature has not found relationships

Are eye movements indicative of looking around?
- Scanning Hypothesis: the extra-ocular muscular movement during REM is identical to the eye movements made when we scan our environment
- motor activity generated by the brain as the dreamer visually connects during the dream
- vertical plane = watching an object fall, or up to sky and back to the ground
horizontal plane = looking at a wide field, people at a social gathering
- blind (from birth/before 5yrs) – show no eye movement, only EEG and EMG indicators of REM stage of sleep (dreams = sound, smell, much)

Scanning hypothesis: counter-arguments
- newborns - have much eye movement in REM but their vision is not developed
- cats - eye movements are jerky, solely horizontal, and related to PGO sharp waves, causing non-specific bursts of brain activity, not related to vision "seeing"
- human adults - difficult to predict eye movements in any state! Awake or asleep.

1. Dream Functions: Release
- Instinct "relief valves" for pent-up basic unacceptable unconscious drives that could not be relieved due to societal/personal constraints
- thoughts or actions, sexuality, aggression
- manifest content (actual content, what is reported to the therapists) vs. latent content (the hidden meaning)

- many objects appearing in dreams are “displaced” sexual thoughts, desires (penis, vagina, womb), in which the therapist finds the symbolic substitutions and meanings
- Freud, traditional psychoanalysis

2. Dream Functions: Facilitate Emotional Adaptation
- help to cope with balance of emotions, provide relief with current issues + prepare for future stress, life problems within the safety of the dream.
- Jung - psychic balance, dreams reveal and assist us. He wanted to work with the dreams with the clients. Dreams are about our unconscious and also collective unconscious. Dreams are meant to be interpreted.
- Adler - personal problem solving function. Dreams are linking reality but they can be changed. “our dreams provide info with natural wisdoms”. Also for us to see our failures, and where we can work on to improve.
- Hobson - FrMRI - activation of areas of emotion centres of the brain during REM, shape content of dreams.
- REM increases after day/multiple days of stress, worry and intense learning
- work directly on emotional problem, without fear of ridicule, social constraints, try out different solutions
- Hartmann - dreams make emotions into visual metaphor.
- Kramer - mood regulatory hypothesis - after dreaming mood and beh. can improve, particularly with major life events, pre-post measure of mood following sleep

3. Dream Functions: Creativity
- several unique, original dreams
- suggest solutions to everyday problems, without restraint of logic or realism
    - free from self-criticism, or concern for others impressions
    - reality testing can occur - once awake we can discern reality, more easily recognize that our minds can create images that are not real (children)
    -
    - must be able to recognize that the dream is offering the solution
    - unpredictable when it may occur, so ready to record possibilities
    - musicians, chemists, engineers, writers, artists, students working on thesis…
    - ….possible could have derived solution when awake, or when just falling asleep and the dream reflects this “rehearsal”.

4. Dream Functions: Play
- Bulkeley
- enjoyable, fun
- free, unpressured experimentation, exploration
- exaggeration, variation, non-sensical purpose, actions or consequences
- try out skills, events, social relationships different from our serious life
- provids enhanced flexibility, and prepare us for the future

5. Dream Functions: Memory Consolidation
- off-line memory processing

- consolidating, assimilating information ("filing")
- dreams are portions of recent episodes, mixed with older memories (biographical or sensorimotor), integration of past with the present
- Sitckgold
- Hartmann - do not replay life, but create new connections, centre around a theme, content changes over time
- our recall of material after REM sleep is more accurate, high protein synthesis in the brain during REM
- contrary evidence – anti-depressants that suppress REM, have full memory function

6. Other Functions
- Horne - dreams distract the brain from waking up - the frontal cortex is not keeping stimulation orderly or testing reality, we accept our dreams as reality and distracts us from waking in a stage where we are close to doing so

Revonsou – evolutionary purpose, dreams enable a rehearsal of threats script, ways to avoid them; enhance probability of survival; REM leads to "pseudo-wake" state to test environment for danger

McGrath, Cohen - REM is time for "systems testing" of the nervous system beyond the brain (irregular activation of resp., CV, other autonomic systems)

Dream Functions:
7. None.. epiphenomena
- cognitive neuroscience approach
- Domhoff, Flanagan, Foulkes, etc
- generated as the brain is performing some other function that is required during sleep
= we find pattern or relationship when there is none

Student Notes: Dream Content, Interpretation & Lucid Dreaming

How much are dreams like waking experiences

- Realistic, simulation of waking life but not reproductions or literal re-enactments of daily events
- the reduced capacity of the brain for logic, distinguishing "reality" from "fiction"
- while dreaming, mind is focused on dream, not interrupted by other thoughts, or reflection (awake: flip between internal + external stimuli)
- if bizarre happened in reality, we may react the same

Dreams as…
- visits to another world
- Pantani Malay, Inuit, Tajal of Luzon;
We can lose the ability to have the whole body in this world if we are dreaming and being waked up. There are two different worlds and they are connected.
Borneo, Zulu, Kurdish: if you dream you have a fight or insult with sb in a dream, you should apologize to them right away
- omens, forecast future, predictive qualities
- answers to waking life's issues, problems
- a trigger to waking behaviour change - impactful consequences resulted in dream = we alter our beh/.choices when awake

Dream Imagery

- colourful (majority), some black-white (some suggested happened in long time ago)
- more clear = the more bizarre
- primarily visual
- sound = more than 50% of dreams
- touch = less than 8% of dreams
- pain sensation = rare, typically wake before sensation
-

Dream Content
- content analysis: characters, social interactions, activities, emotions
- complimentary content - compensate or supplement to what has recently occurred in waking life in an attempt to bring overall balance or harmony
friends and colleagues appear more than family members
- continuous content -themes, concerns, events of waking life are taken up again in our dreams (more prevalent)
…does our mind choose one or the other depending on need
- where is the greatest need for the person at the moment

We dream of…
- the past: events already happened, details and altered; from history to the day before the dream occurred
- the future (prophetic?): the events to come, fear of failure, celebration of success

- emotions: embarrassment, anger, desire
- the plausible, the actual
- the absurd, bizarre, incoherent, brilliant and creative

Themes and Content
- Objective content analysis suggests differences to that of "dream dictionaries" (flying, falling, losing teeth); reading these can possible create the content

Age:
- children (3yrs/5yrs-10yrs): animal characters, play, successes, adventure and aggression increase as age
- young adult/middle age dream more of sexuality
- middle/elderly dream more of illness, death

Cultural influences - aggression, cars/houses content highest in US (vs. Japanese) hunter-gatherers dream of huts/tents, animals (yaks, oxen)

Personal waking life, experiences - marital, career changes/upsets; children/not; wealthy/poor, job type
Musicians 2x many dreams w/ music vs non-musicians

Pregnancy
- early = focus on self, changes (body); later= pregnancy itself, baby, birthing, relationship with partner
- women - fertility, miscarriage; adequate mother or parenting concerns, abnormal infant, labour/delivery disasters, career issues;
- men-sex activity early in preg., pregnant also, fathering and partner worries, birthing process, dreaming of their own fathers

Trauma
- Strong Emotional Events (lose loved ones during a car accident, etc.) sexual/physical abuse, burn, war, major surgery, death of family member, stockbrokers losing money in market crash
- exact replays, metaphorical
- terrified, vulnerability

Depression
- first REM period earlier, REMS evenly distributed through night
- recall short dreams, past-oriented, repetitive
- negativity in dreams increases throughout night
- all my fault, unable to beh/make change, objects not functioning, important items are lost (can't move arms, drawers stuck shut, lose all of your keys)
- when depressions abates, characteristics lessen/disappear

Are Dreams Continuous?
- dream episodes appear to be unrelated throughout the night across REM periods

- trivial, or image relationships, role reversals/changes in the characters
- we create continuity, when we interpret the dream
- seeing similar people a manifestation that these people are known to you
- exact dream duplication is unusual, unless recurring (see in PTSD)
- the variety of our dream content is overwhelming and amazing!

Recurring Dreams
- same content, characters, emotions, same sequences, "story-line"
- several months, to years, decades
- begin in childhood, adolescence
- majority negative affect, nightmares, involve only the dreamer
- dreamer attacked, chased by people, animals, living things, (living things) or threatened by natural forces (fire, hurricane, tornado, flood, tsunami/wave)
- correlated with waking anxiety, depression, extreme stress
-some cease naturally
address with lucid dreaming
or reduction of waking psychological concerns, or dream work, "re-write" drawn, confront, change meaning

Dream meaning and interpretation
- attribution of purpose of the dream, the images, or the sequence of events
- dreamer questioned vs. therapist interpret
- content related to living experience.
- how did you feel
- what did it mean to you (if anything)
- what would you do differently based on this information
Experiences and POV can have a different impact on the interpretation of the dream content.

Lucid Dreaming
- first noted by Aristotle, term created by F. W. Van Eden; popularized late 1960's - 70's (C. Green), and A. Faraday; S. LaBerge study lucid dreaming with polysomnongraphy.
- recognition, awareness that we are dreaming, while dreaming
- conscious, feel clarity and cognition
- reflecting on the occurrences as they take place, complex thought is possible
- events are less of a surprise, or feel less bizarre
- awareness that you are dreaming, while in a dream
- dream control possible (not always), - use your will to make the dream take place – where to go, what to do
- the dreamer tends to be the actor, internal perspective or observer
- feel a need during the dream to remember its content
- happens typically in later in the night
- happens during middle of a REM period, transition to lucidity during the REM period (and can reverse, dream that you are in sleeping)
- awakening terminates the lucid dream (or a false awakening can occur)

Lucid Dreamers in Research
- in sleep lab, give pre-arranged signal when lucid dreaming (sequence of eye movements, twitch a finger a number of times), recorded on polysomnography
- can signal exact time of dream event, experimenter can ask to perform action in the dream (and measure), and signal when complete

Purposes of Lucid Dreaming
- uninhibited actions - public speaking, performance (on stage), sexuality, try an activity without training, conflict res.
- fulfilling wishes
- improve physical skills
- take the use of imagery to another state
- healing – image cell repair, or destruction cancer
- assume control of nightmare content, ability to confront situations or figures: childhood trauma, PTSD

How to Lucid Dream
- if you can recall your dreams with ease, more likely to have potential/ability to lucid dream
focus on regular recall
look for "dream signs" – cues of dreaming e.g., purple cat, meet the decreased
in wakefulness – more self-aware, mindful, ability to switch types of focus
- before sleeping, mental focus on ability to read watch dream
- while in dream, look at your hands: own body, flashing light – Nova Dreamer
- not certain effects of: age, sleep dep, other phys. states.
- Q: should we try to control our dreams if they have their own agenda?

Dream Incubation
- Gayle Delaney, PhD
- you drive or determine the content of the dream
- need time before bed and when you wake up
- write down topic and feelings, when prepping for sleep concentrate attention on the desired topic: person, experience, answer a question
- create one-line request/question and repeat this as falling asleep, when wake up write/record as much detail as possible
- more easily achieved if related to personal current concerns, not overly "fantastical"
- another step to "imagery"

Final Exam
M/C
SA

Non-cumulative in details

No hats/water/bathroom

Q's contact TA,