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Left:

1. OCD
2. Development of sexuality
3. Adult sexuality
4. Somatization disorder

The Perspectives of Psychiatry

- Psych has no "Harvey" - no fundamental understanding of how brain works (not like cardio)
- History of epochs
 - **Harvey** - mental disorders emerge from a life; employed "psychobiology" (study at psychological level). Developed history taking, examination; but wrote huge biographies of each patient and didn't know how to treat
 - **Freud / psychoanalysis** - Mental disorders come bottom-up but not everything is important (just libido).
 - Got really big in pop culture; thought it could fix everything
 - Thought theories could explain thought/motivation/behavior in terms of unconscious mind revealed through slips of tongue & dreams
 - Unconscious mind is repressing natural drives because of culture
 - **Empirical psychiatry**
 - **Drugs** modify psychiatry (eg Lithium) - these are particular conditions and not just one universal condition in different manifestations (a la Freud)
 - DSM - field guide (arising from failures of previous symptoms) - just classifying categorically by features
 - Good for diagnostic reliability; often neglects generation & nature
 - Today: **"biopsychosocial model"** - lists everything, so mental disorders come from there somewhere
 - Subatomic particles to the biosphere and everything in between
 - Just organizes things we know about (not useful)
 - Need disease 'derivative' to reveal how these disorders are arising from some cause

Derivative = expression or formula explaining a clinical event.

- For disease derivative, etiology (provocative causes) creates a pathological entity (we call this pathogenesis). This pathological entity creates a clinical syndrome in a process we call pathophysiology. These are lawful outcomes of changes
- Perspectives attempt to see what operation derivatives let us take functional information from biopsychosocial sources to practice & function

Four perspectives and examples:

- **Disease perspective:** logic of *categories*, what the patient has
 - Schema: Etiology, pathogenesis to create pathology, pathophysiology to make clinical syndrome (like other diseases)
 - Examples: delirium (consciousness), dementia (cognition), memory syndromes, aphasia (language), bipolar disorder (affect), schizophrenia (executive / integrative functions)
- **Dimensional perspective:** logic of *gradation and quantification*, what the patient is
 - Schema: potential (personality) <--> provocation (life circumstances) <--> response (neurotic symptoms)
 - Examples: cognitive capacity, affective vulnerabilities (neuroticism, extraversion/introversion, etc).
- **Behavioral perspective:** logic of *teleology and goals*, what the patient does
 - Schema: triangle with choice, physiologic drive, conditioned learning
 - Examples:
 - sexual disorders, eating disorders, sleep disorders (disordered innate drive)
 - substance abuse (disordered acquired drives)
 - suicide, anorexia, hysteria, gender identity disorder, crime (social attitudes resting on assumptions or role search)
 - truancy, kleptomania, gambling, pyromania (from emotional arousal or thrill)
- **Life story perspective:** logic of *narrative*, what the patient encounters
 - Schema: setting >> sequence >> outcome with distressing life events occurring throughout
 - Examples: grief, demoralization/discouragement, homesickness, jealousy, PTSD

These all interact, linking psychiatry and neuroscience - four ways to view the same patient. Can't just look at a patient under one of them.

The Mental Status Exam

Purpose:

- Confirm symptoms reported in history
- Elicit/define mental symptoms not elicited in history
- Describe how patient looked at given time

The components:

- **Appearance & behavior**
 - Appearance: body habitus, grooming, dress, expressiveness
 - Behavior: attitude, posture, movements, unusual activities, eye contact
- **Speech**
 - Rate, rhythm, tone, fluency [mute, monosyllabic, telegraphic], spontaneity
 - Logic and associations: verbigeration, word salad (no logical connections), loose associations (can kind of connect), flight of ideas, tangentiality (comes back to question eventually), intact - can tell about thought disorders
- **Mood**
 - Stated mood (mood = persistent, pervasive emotional state); rated mood (1-10)
 - Apparent mood = affect
 - Apparent / reported self attitude (self-value)
 - Suicidal / violent thoughts, thoughts of death -> passive death wish -> planning -> attempting
- **Thoughts / perceptions**

- Hallucinations: perception without stimulus in any sensory modality (vs. illusion, misperception of actual stimulus)
- Delusions: fixed false idiosyncratic belief
- Obsessions/ compulsions: irrational thoughts, worries, behaviors that are repetitive & recurrent despite efforts to suppress
- Phobias: fear with avoidance of situations or objects
- **Insight / judgement**
 - Insight: acknowledgement of problems
 - Judgement: informally = is person seeking help; formally = give scenarios (what would you do if you see a fire in a crowded room)
- **Intelligence / fund of knowledge**
 - Intelligence: informal = rough estimate on vocabulary, ability to grasp abstractions, education level; formally = analogies
 - Fund of knowledge: last 5 presidents, etc.
- **Cognitive functioning**
 - Level of consciousness (stuporous, drowsy, alert, hyperalert, agitated) and how it varies throughout day
 - Cognitive function: informal = can recall recent events with coherence, logic, good recall?; formal = MMSE & others

MMSE: 30 point scale, screening tool (not diagnostic), results vary based on age & education

- **Orientation** (year/season/date/day/month; where are we (state/city/hospital/building/floor))
- **Registration** (name 3 unrelated objects & repeat back)
- **Attention & Calculation** (serial 7's, world backwards, etc.)
- **Recall** (name those three items back)
- **Language / praxis** (name pencil/watch, repeat phrase 'no ifs ands or buts,' follow 3-stage command (e.g. take, fold, place paper), read & obey written command, write sentence, copy two-pentagon design)

Psychiatry is Medicine

- Psychiatry is an exciting field! Whoo-hoo! Psych conditions cause lots of DALYs! Psych diseases are stigmatized like cancer used to be.
 - Depression, schizophrenia, Alzheimers have physiological/genetic components being worked out over time
- What's a **physician?** Diagnosis (clarifies what's wrong), prognosis (knowing what will happen so you can make decisions), management (what should we do)?
- **Diagnosis** can sometimes guide treatment of disease, **formulation** is much more complete clinical assessment to guide treatment of patient
 - Elements of formulation: what is nature of impairment (disease), who has the illness (personality), does what they do affect it (behavior), what are expectations, fears, hopes (life story)

Perspectives on Cognition (& Dementia)

Take-Home Lessons

- Cognitive capacities are *dimensional* traits - for most part universal, smoothly-gradated attributes in population
- Cognitive capacities are *altered by disease* - either congenitally or throughout life
- Cognitive capacities *affect behavior* - in many ways
- Cognitive capacities *affect life story* - in health, in illness

Intelligence is a developmental attribute

- Constructed but intuitively apprehended; informally assessed via language

- "Aggregate / global capacity of individual to act purposefully, think rationally, and deal effectively with [his] environment"
 - Aggregate: composed of various elements/features that aren't independent but still differentiable
- One thing rather than many; reflects ability to acquire knowledge; independent of achievement / what's been learned
- Ability to learn actually isn't fully independent of what's been learned - over time, achievement/ intelligence become intertwined - yet earlier measures aren't always better

Ways to conceptualize:

- general intelligence (derived from various measures)
- could break into math, verbal, etc.
- Or break into verbal/educational (numbers, verbal) and practical (mechanical, spatial, manual, figural)

Intelligence as a spectrum is skewed by people who have physiological mental subnormality - more people at bottom of curve than normal distribution

- No relationship between achievements of children's parents and IQ for these people

Clinical neuropsychology

- Study of brain-behavior relationships in health & disease
 - Disease, drugs, experimental conditions
 - Diagnose, characterize phenomenology, learn course (prognosis)
 - Rationale: every individual has basic ability; specialized skills vary around that expectation, deviations may be disease / other interference with normal function
 - Method: establish basic expected level (IQ tests, etc.), survey perceptual, cognitive, motor performances, document pattern of strengths & weaknesses, compare with disease that have been studied & characterized
 - Tests: general intelligence, language, motor/perceptual organization, memory (verbal/figural/recall/recognition), attention/motor function, executive function (planned, purposeful way to be functional & efficient)

Things you can **test** for:

- **Language:** spontaneous talk (circumlocution, paraphasia=abnormality of language), comprehension, naming, fluency, writing, spelling
- **Perceptual organization / motor:** non-motor perceptual organization, visual-motor construction, rhythm/musicality
- **Memory:** short/intermediate/long term, language vs spatial, recall vs recognition, declarative (who as 39th president) vs source (when did you learn that fact) vs procedure (can you remember to ride a bike), incidental learning (if not asked to do it), prospective memory (remembering to do something)

Random terms & presentations:

- **Aphasia** - loss of ability to produce / comprehend language (vs. **dysarthria** - motor speech disorder)
 - **Anomia** - problem recalling words / names
 - **Agnosia** - can't recognize objects, people, shapes but no memory or sensory deficit
 - **Alexia** - lose ability to read
 - **Agraphia** - lose ability to write
- **Apraxia** - loss of learned motor programs, e.g. dressing
- **Amnesia** - loss of memory

Delirium vs. dementia

Delirium - clouding of **consciousness** is key (also cognitive impairment, slowness, drowsiness or manic-like symptoms, hallucinations, delusions)

Dementia

- Global / multiple deterioration of **cognition** in *clear* consciousness
- **Cortical dementias** - memory loss; aphasia/apraxia early on (Alzheimer's disease, Lewy body dementia, vascular dementia, frontotemporal dementia)

- **Subcortical dementias** - slowing, forgetfulness; visuospatial affected more than verbal functions (Huntington's, Parkinson's, MS, HIV dementia, etc)
- Small changes in cognitive function can be more significant to pt. life than injury or disease - affects what patients can actually *do*

Behavior problems in brain injury

- Stimulus boundedness (obsessiveness/persistence, lack of planning, behavioral apathy, dependency, intolerance to change)
- Self perception (egocentricity, selfishness, coarseness)
- Social perception (one perspective at a time, loss of empathy, embarrassing behavior)
- Self-regulation (unpredictable./random, impatient, impulsive, restless, repetitive)
- Emotional changes (labile, apathetic, irritable, hypersexual, "silly")

Stress in **caregiving** for cognitive changes:

- Patient: physical, behavior changes; devastates self esteem
- Caregiver: lonely, trapped, depleted, conflicted, avoided
- Spouses: unsanctioned grief, social limbo, lost intimacy, protect children, old problems exacerbated

The Dimensional Perspective

Emotive triad:

Potential (traits, vulnerabilities) <--> **Provocation** (challenges, life circumstances) <--> **Response** (neurotic symptoms)

Neurotic paradigm: an individual who falls at the extreme on a trait may be especially vulnerable to environmental demand, producing symptom/disorder

Intelligence - aggregate / global capacity of individual to act purposefully, think rationally, deal effectively with his environment

- Inferred from skills/performance
- Genes / environment
- Arbitrary groupings

Personality - individual differences with consistency across time and situations

- Attributes grouped into traits by factor analysis
- Arbitrary distinctions between normal and abnormal
- Extremes can be adaptive or maladaptive based on circumstances

Temperament - "constitutional factors," experienced viscerally, mostly genetic in origin, stable in adulthood (except neuroticism)

Character - experienced cognitively; substantially learned in environment, elaborated in development

Major **traits**

- Neuroticism - distressed, complaining, poor resilience, poor satisfaction with treatment
- Openness - lively interest (but maybe not adherence)
- Extroversion - "now-focused" tendency, reward-focused
- Agreeableness - like to agree with things
- Conscientiousness - low = disorganized/unmotivated, high=obsessive/perfectionistic

Child Development

General issues: continuous/discontinuous, one track vs many tracks, nature vs nurture

Historical development - kids as little adults (medieval), born evil and need fixing (reformation), blank

slate (enlightenment - Locke) or noble savages (Rousseau), biological investigation (Darwin - like evolution), mental testing (Binet - IQ developed), conflicts between biological / social (Freud), cultural context (Erikson)

Behaviorism / social learning

- Watson - classical conditioning (little Albert trained to associate loud noise / crying with furry animals)
- Skinner - operant conditioning, consequences shape behavior

Cognitive - developmental: predictable sequence of stages based on what they can understand

Sociocultural - culture matters

Kids

2 years old: high activity, 1-3 words together, make believe play, big on "no", engages others, illogical

4 year old: pretty still, sentences, friends, concrete stuff (names)

7 year old: sits still, tics; complex structure in language, reciprocity; identifies friends/differences/values, able to abstract sometimes

11 year old: sits still; complex language & conversation; recognizes friends, activities, social context; has ideas/values

13 year old: sits still, fewer tics, complex language & conversation; self-aware & aware of social context, ideas/values

14 year old: sits still (posture), complex language & conversation, very self conscious, larger view of own opinions / comparisons

Rituals

Toddlerhood - routines, rigid, get bossy

Preschool - solitary, less rigid, get upset around transitions (e.g. bedtime)

Elementary school - group play (rules, rhymes, jinx, cooties); hobbies & collections

Jr/ Sr High - fads, focused interests

Superstitions

Good/bad luck objects, don't want to jinx things, keep safe from harm, wishing (esp. in exams & sports)

Normal rituals & superstitions are good, common, reassuring, social acceptable, **diminish** after childhood

Obsessions - persistent ideas, thoughts, impulses, images

- **intrusive** and inappropriate, cause **anxiety** or **distress**
- e.g. contaminations, doubts, ordering, aggression, sexual imagery - try to ignore/suppress/neutralize

Compulsions - repetitive behaviors to try to reduce anxiety or distress (not produce pleasure);

- excessive/unconnected to what they're designed to neutralize/prevent
- washing, checking, counting, repeating

Obsessions/compulsions are distressing, socially isolating, **increase** after childhood

Autism

Pervasive developmental disorders (PDD)

- includes autism, PDD-NOS (not otherwise specified), Asperger's syndrome (all autism spectrum disorders, ASD)
- Spectrum disorder - heritable; autism just means you have more symptoms than Asperger's or PDD-NOS

Some DSM criteria

- Qualitative impairment in **social interaction** (peer relationships, nonverbal behaviors, spontaneous sharing of enjoyment, bad emotional/social reciprocity)
 - **Affective/gaze information** (problems recognizing faces, physical expression of emotion poor, affect not well integrated with gaze/communication)
 - Don't know what to expect from others emotionally / socially
- Qualitative impairment in **communication** (poor spoken language, poor sustaining conversation, uses repetitive language, no spontaneous imaginative play)
- **Stereotyped, repetitive behaviors & interests** (focus on one thing, inflexible in routines/rituals, repetitive motor mannerisms (e.g. hand flapping), preoccupied with parts of objects (e.g. part of toy))

Things that are spared: attention, attachment (different form), some inhibition, declarative learning, constructive play, visuo-spatial abilities (hyperlexia), object based knowledge

Different from:

MR: uneven cognitive profile (not universal deficit)

ADHD: more social impairment & ADHD doesn't have the communication deficits or repetitive behavior

OCD: different focus/content

Can be comorbid!

Dx of autism: need good communication/parent involvement; 70% have MR, 50% nonverbal after 5yo, most dx > 3yo

Dx based on presence of **symptoms**, variable presentation across children

Detect early and you can affect trajectory (brain plasticity) - treatable, not curable

Autism is a brain disorder, but currently medical test or cure - need to ID symptoms & highly variable (probably multi-gene, environment interactions)

What causes it?

- Genes (polygenetics, gene/environment)
- Brain growth changes in development (big heads - brain develops too fast, too early), overgrowth in various regions

Epidemiology: 1/150 ASD, 1/250 autism, 3:4 males / 1 female

Recurrence risk in subsequent pregnancies probably 10-25% (4-10% observed but with stoppage effects)

Treatment: Applied behavior analysis, environmental restructuring, sensory-motor training

Early is better!

Schizophrenia

Initially "Dementia Praecox" - Kraepelin identified difference between manic depression (mood disorder) and schizophrenic-type disorders

Probably a group of different diseases

Symptoms:

- **Positive:** abnormal mental experiences
 - **Hallucinations:** sensory perception without experience
 - **Delusions:** fixed, false, idiosyncratic ideas
 - **Disorganized thought processes** - e.g. loosening of associations, etc.
- **Negative:** loss of mental energy/efficiency
 - Limited emotional expression
 - Social withdraw / Indifferent to others
 - Thought/speech poor
 - Lack of motivation / interest

Different from dementia: cognitive impairment across multiple modalities **without** gross dementia; happens in **clear consciousness**

Typical: Onset in 20s, chronic course with waxing and waning severity

Diagnosis of **exclusion** - exclude delirium, dementia, mood disorders (in that order) first after you have these symptoms

Other common positive symptoms

Auditory hallucinations:

- Patient hearing his/her thoughts being spoken aloud
- Voices referring to pt in 3rd person or commenting on activity
- Thoughts being tampered with (inserted/blocked/interrupted/broadcast)

Somatic hallucinations (Bodily sensations being inflicted by outside agent)

Delusional perceptions

Passivity experiences (somebody else is controlling feelings/impulses/experiences)

Epidemiology: 5/1000 prevalence, 0.2/1000 incidence; earlier onset in males

Outcome is worse in developed countries (weird)

Impacts on patients:

- Suicide, tormenting symptoms & bad medicine side effects, 2-3x greater mortality rates, 20% shorter life expectancy
- Poverty, homelessness, crime but more likely victimization
- Substance abuse (37% active at intake)
- Stigmatized

Social impact:

- Family (stigma, financial, emotional, physical)
- Society: \$62.7 billion/year

Variants: schizoaffective disorder (with mania or depression), paraphrenia (late-life onset with mostly positive symptoms), delusional disorder (e.g. becoming a stalker but no other schiz features), schizotypal personality disorder (like milder form of schizophrenia without delusions, hallucinations, thought disorder)

Disease?

- Familial but not simple mendelian inheritance; highly **genetic** (twin & adoption studies)
- Other risk factors: 10% higher winter than summer; 30-40% higher in males, 100% higher if birth complications, 300% higher older fathers, infection? 200-400% greater in urban areas, 200-2500% marijuana use (cause or effect?)
- Probably tons of factors contributing to multiple overlapping phenotypes
- Brain studies - enlarged ventricles, volume loss as disease goes on, prefrontal activation decreased, fewer dendritic signs - but all too subtle/variable for diagnostic use

Treatment:

Antipsychotic medication:

- **Typical agents:** chlorpromazine first used, others about the same (same side effects)
 - Side effects - parkinsonian movements, other motor abnormalities (striatal D2-receptor blockade)
- **Atypical agents:** like clozapine - best efficacy but some bad side effects, others mimicking but not as good
 - Side effects - metabolic (Gain weight)
- Halperidol (typical) is one of most popular (off-patent, cheap, efficacious)

Comprehensive: psychotherapy (individual, group, family); CBT, social skills, case management, meds as useful

Dementia

Cognitive disorder DDx:

	MR	Focal disorder	Delirium	Dementia
Onset	Birth	Anytime	After birth	Adulthood
Single/multiple symptom	Multiple	Single	Usually multiple	Always multiple
level of alertness	Not impaired	Not impaired	Impaired	Not impaired
Permanent	Yes	usually	usually not	Usually permanent

Dementia definition

- Acquired decline of cognitive function
- Multiple cognitive functions affected
- Normal level of consciousness / alertness

Cortical: Normal early motor exam, amnesic (reminding doesn't help), aphasia, normal attention early

Subcortical: abnormal/slow early motor exam, slow memory but improves with reminding, dysarthria, apathetic early

Alzheimer's disease

Diagnosis

- Slowly progressive dementia
- No other identifiable etiology
- Memory impairment plus aphasia, apraxia, and/or agnosia

Pathology: beta- amyloid plaques (extracellular) and neurofibrillary tangles inside cells

Epidemiology: more common in older age, Down's syndrome, family history, female / head injury

Etiology: smaller brain at autopsy; big loss of cholinergic receptors, genetic factors (30% attributable risk)

Delirium

De lira = off the path

Need to know how to assess mental status

Prognosis: 5x higher rate of nursing home patient, bad ability to consent, 50% of all hospital days, doubles inpatient mortality risk

Types:

- **hyperactive**/agitated delirium (hyperarousal, hallucinations/delusions, disorientation, agitation - hard to miss),
- **hypoactive**/disoriented delirium (hypoarousal, lethargy, confusion, sedation - often mistaken for depression) -
- and **mixed** types too

Definition: an **acute, transient** disturbance in the **level of consciousness** that is:

- Characterized by change in mentation, primarily manifested as an **impairment in attention**
- with **fluctuating symptoms** (sine qua non = fluctuation level of inattention)
- and **diurnal variation**, usually worse at night (sundowning)

To remember:

Delirium = **Clinical diagnosis, state of fluctuating inattentiveness**, absence of evidence is not evidence of its absence (don't need etiology to make dx)

Clinical features:

- **instability of mental status findings over time**
- perceptions altered (misperceptions, illusions, 70% **visual hallucinations** (vs. auditory for schiz) - **VH are delirium until proven otherwise**)
- prodrome (restlessness, anxiety, sleep changes, irritability),

- waxes and wanes, decreased attention,
- **disorientation** (time>place>person),
-
- cognitive impairment (perseveration = repetition over and over, immediate memory impaired, attention/recall/calculation impaired, mistake familiar for unfamiliar)
- sleep-wake disturbance
- emotional lability
- neurological symptoms (asterixis - flapping hands on extension)
- autonomic disturbances (vital signs)

Course: sudden onset -> fluctuating intensity -> clouding of consciousness -> stupor, coma, death.

Etiology: final common pathway in neurotransmission disruption (cortical/subcortical) - Ach is major NT involved (**anti-Ach medications** are very common cause!); also dehydration, drug dependence, fevers for the young, etc. Common when people have lowered physiologic reserves

Dx: use family, nurse, changes in MSE and MMSE over time, physical and neuro exams

Tx: prevent it; treat underlying causes, use frequent observation & minimize environmental disturbances. Antipsychotics can help, benzos ONLY if for EtOH (otherwise it would exacerbate situation)

Eating disorders

Spectrum of motivated behavioral disorders

Anorexia Nervosa: self starvation, <85% ideal body wt, fear of fatness & body image dissatisfaction, amenorrhea,

- Restricting type or with some binge/purge behavior

Bulimia Nervosa: binge eating (2x/wk for 3 mo), sense of loss of control over eating, guilt/shame/discomfort after binging, compensation by purging (vomiting / laxatives / etc) or exercising; body dissatisfaction & fear of fatness but *not* underweight

- Purging and non-purging type

Also **Eating Disorders NOS** (not otherwise specified) e.g. binge eating, subthreshold AN/Bn, atypical disorders

Dieting disorders cycle: Cognitive disturbance (fear of fatness = overvalued idea) <--> Behavioral disorder (disturbance in eating habits)

Why onset at **adolescence?** Puberty, menarche, increased fat

Why **increasing?** Disorder of our times (thinness, fashion models, social comparison more important in females)

Risk factor: adolescent **dieting** (for both eating disorders and obesity).

How do they come about?

Birth --(predisposing factors)--> Development of behavioral precursors (dieting) --(precipitating factors e.g. puberty)--> onset --(maintaining factors)--> established eating disorder

Vulnerabilities: (everybody exposed to dieting - why do only some develop ED?)

- **Personality** (perfectionism, obsessionality, narcissism, introversion) - psychiatric comorbidity
- **Life experience** (dieting / critical parents, peer pressure, stressors)

Pts are often ambivalent in behavior disorders - want treatment on their own terms, battle of wills & rationalization

Treatment: behavioral therapy, nutritional education/rehabilitation, group therapy, family therapy, small role for meds

- AN: 45% recover wt and menstruation, 75% improve somewhat, 5-10% long term mortality
- BN: 50% recover long-term

Why are they motivated behavioral disorders?

- Problem is what patient does;

- behavior is driven/compelled,
 - appetitive drive modified by social learning,
 - becomes consuming passion,
 - and expression reinforces repetition (disturbs physiology of hunger/satiety & increases reward)
-

Sleep

Occurs on regular basis:

- relaxed body habitus
- eyes closed
- decreased responsiveness to stimuli
- physiological / EEG changes
- reversible (naturally rhythmic)

Regulation of sleep-wake cycle: two processes

- **Homeostatic** process: balance of sleep (1/3) /wake (2/3) throughout 24 hr. day, doesn't matter when
 - Acute/chronic deprivation increases homeostatic drive = sleepiness
- **Circadian** process: cycle of physiologic systems (endogenous circadian clock), influences *timing* of sleep at approximate same nighttime hours
 - Reinforced by daily photoperiod (jet lag interferes); intrinsic **periodicity slightly greater than 24 hours**
- **Normal process:** night: sleep 1st part because we've been up (homeostatic), second part because circadian sleepiness is powerful; day: up 1st part because we slept all night, awake 2nd part because circadian arousal is powerful

Circadian intrainment: rods/cones output to suprachiasmatic nucleus in anterior hypothalamus (**SCN = timekeeper**) - +/- loops of gene expression

Architecture of sleep: use EEG, EOG (Electro-oculogram), EMG (electromyogram) for brain, eye, muscle (also EKG, airflow, O2sat, penile tumescence monitoring)

Typically cycle (1-2-3/4-2-REM), about 90 minutes, repeated throughout night (REMs **longer later** in night)

- **REM (15-25%)**
 - Distinct physiological state, rapid eye movements on EOG, decreased muscle tone on EMG (dreaming), penile tumescence, dreaming, blood pressure & pulse labile
- **non-REM (75-85%)**
 - Stage 1: slower EEG frequency, greater EEG magnitude, alpha waves drop out (wakefulness)
 - Stage 2: Sleep spindles, K-complexes in EEG
 - Stage 3/4 = slow wave sleep/delta sleep: delta waves on EEG (big amplitude & slow = synchronous activity in brain)

Sleep deprivation: need enough to be alert during daytime; 8 hours is usual; consequences include sleepiness, accidents, mistakes, poor academic performance, immune/hormonal disturbance

Sleep wake disturbances

1. **Insomnia** - most common; daytime somnolence = more likely to get treatment, can be primary or comorbid, transient (stress) or chronic. Conditioned aspect of sleeplessness (frustration/arousal associated with bed, reinforced by repetition). Behavioral management / CBT and hypnotic meds can help.
2. **Excessive sleepiness**
 1. Sleep deprivation
 2. Sleep apnea - episodes of decreased airflow, fragmenting sleep
 3. Narcolepsy - genetic disorder - causes daytime sleepiness; associated with cataplexy (sleep paralysis in daytime), sleep paralysis, hallucinations
 4. Med abuse, meds, medical conditions, etc.

3. **Parasomnias** - disorders associated with sleep (sleepwalking, sleep terrors, sleep-related eating, nightmares, seizures, asthma, GI reflux during sleep)

Major points:

- Homeostatic process promotes sleep/wake balance in 1:2 ratio
 - Circadian process organizes timing, periodicity slightly >24hr
 - Peak of internal sleepiness cycle at 4-5 AM, alertness cycle at 7-8PM
 - Sleep-wake cycle is reset/reinforced by photoperiod
 - Sleep is REM/NREM
 - REM includes dreaming, decreased skeletal muscle, tone, heart rate / BP lability, penile tumescence
 - Typical sleep walking does NOT occur during REM sleep
-

Introduction to Behavior

Behavior: goal-directed purposeful action/activity

- **Classical conditioning:** behavior elicited by a previously neutral stimulus that has been paired with another stimulus that would elicit a behavior (e.g. Pavlov's dog) - can be extinguished by repeated unpaired exposure (bell, no food)
- **Law of effect:** probability of a behavior can be increased or decreased depending on its immediate consequence (active learning)
 - Exposure-behavior-consequence which increases (positive consequence) or decreases (negative consequence) probability of future behavior
- **Operant conditioning** (Skinner) adds idea of positive & negative stimuli. Reward with good or remove bad stimulus = reinforcement, apply negative stimulus or withdraw good stimulus = punishment
 - Deliver positive stimulus = positive reinforcement
 - Withdraw positive stimulus = negative punishment,
 - Deliver negative stimulus = negative punishment
 - Withdraw negative stimulus = negative reinforcement

Continuous positive reinforcement increases **rate** and **probability** of behavior (e.g. cocaine)

Intermittent positive reinforcement increases **probability** and **longevity** of behavior (e.g. gambling)

What drives behavior:

- Operant/classical conditioning
- Appetite/internal drive
- Social pressure/modelling

Behaviors express meaning but telling patient meaning might not affect treatment, and the reason to start a behavior often isn't reason it continues

Reciprocal - patients condition doctors, doctors condition patients

Substance abuse = conditioned behavior that becomes self-sustaining

Disordering addictions (use to abuse ratio); non-disordering addictions (nicotine/caffeine), less disordering addictions (methadone < heroin)

Addiction: continued, increasing, repetitive, stereotyped behavior that continues despite mounting consequences that disrupt function in all realms of life

- Disease model: broken part. Good because less blame/stigma, emphasizes medical tx. Bad because no good models, removes pt. responsibility
- There is a volitional component unlike disease - need to emphasize rehabilitation instead of drugs

Paradigm of motivated behavior:

Behavior --> reward/reinforcement --> satiation --> internal drive/craving --> behavior cycle

- Environmental exposure & response play into behavior (operant /classical conditioning)
 - Temperament, life experience, disease all play into drive, reward, satiation cycle
-

Addiction

Definition:

- Repeated use of a psychoactive drug (often stereotyped, ritualistic fashion) which makes you feel good
- Apparent (to others) loss of control (use more than report, fail to stop despite stated attempt to do so)
- Continued use & effort it takes to get drug make problems that would make a reasonable person stop

Risks: anybody can get addicted but more with family history, 2:1 men:women, increasing with generations

Damage: Death (including 50% of suicides - alcohol especially), disease (e.g. hep C), crime, broken lives

Funny "disease": Sufferer seeks out pathogen, acts as if he "wants to be sick" and avoids/fights treatment, appear to be able to choose against drugs when motivated correctly (volitional component), influenced by social attitudes about "symptom"

- Kind of like sex (don't die if you don't have it, almost everybody has it, if you try not to it's hard to do, optional but would risk life & limb)

Addiction: Craving (intense desire for drug, excruciating or pleasant) --> Triggering (stimulus associated with past behavior triggers craving/use) --> Relapse (resumption after period of abstinence: stopping is easy, staying stopped is hard)

Forces at play:

- Driven behavior (behavior - satiate - wears off - drive) cycle
- Social learning (peers/conspecifics' behavior influences our behavior)
- Classical conditioning (eg triggering - irrelevant stimulus passively associated with behavior)
- Operant conditioning (consequences affect behavior)
- Behavioral economics (if other behaviors available, can change relative importance of one behavior)

Results in elegant model of behavioral control; drugs short-circuit the control (serves no purpose but reinforces itself so strongly other things become irrelevant - "disorder of behavioral economy")

Addiction pharmacology:

- Reinforcing properties (pleasurable)
- Pharmacodynamics/-kinetics: rapid onset (more addictive), powerful effect, rapid offset (to encourage repetition & training)
- Physical dependence (tolerance/withdrawal)

Types of drugs - withdrawal is opposite of effect (developed compensation mechanism now unchecked)

- **Sedatives/hypnotics** (EtOH, benzos, barbs, GHB - increase inhibition, unpredictable effects, potentially lethal withdrawal (overexcitation))
- **Stimulants** (cocaine, amphetamines, meth - more DA, NE release, more energy/wakefulness, subjective withdrawal)
- **Opioids** (morphine, heroin, oxycodone, mu-opioid agonists, analgesics/hypnotics/autonomic effects; OD can = death; withdrawal state torture but not lethal)
- **Hallucinogens** (LSD, PCP, peyote, mescaline; grab-bag that disturb perception, not very addictive but big in subcultures)
- **Cannabis** derivatives (cannabis, hashish, etc.; becoming more potent; widely used)
- **Inhalants** (toluene, glue, gasoline - some kind of drowning reflex)
- **Weird** stuff (MDMA = ecstasy - combining stimulant, hallucinogen, empathogen - like people you don't know; ketamine - dissociative anesthetic)

Polysubstance abuse is becoming more common - use drugs to modify others or treat withdrawal (speedball = heroin + cocaine, opioids to come down from ecstasy), bad for prognosis

How do you stop it?

Try to stop drive (e.g. methadone - kill reward of drug)

Reward adherence (increase consequences, encourage other behaviors instead - behavioral economy)

Change environment (models & triggers)

Relapse is a big problem

Differing opinions on Tx - cure (impossible?)? abstain & prevent relapse (AA?)? reduce harm (needle exchange, etc)?

Tx: abstinence can be obtained through sustained effort by patient, support & guidance from care system. One shot cures don't exist.

Alcohol

- Carcinogenic, teratogenic, neurotoxic, contributes to violence/suicide/accidents/deaths, worsens medical condition - but people (& societies) tolerate it
- "Alcohol Attributable Fraction" - If alcohol disappeared - 45% decrease in violent injury, 28% suicide, 75% esophageal cancer
- Half of all Americans drink; 20% wt males -> alcohol addiction, 6% overall incidence/year, 1/10 of country consumes 50% alcohol
- Abuse vs dependence - prefers abuse (pseudodistinction - they don't need alcohol)
- Never been eradicated from culture successfully

Model (from addiction): models & triggers -> drug use (self-reinforces) -> consequences & other behavior

Facts:

- Heavy drinking associated with youth; earlier 1st drink increases risk of alcohol addiction (more, longer, more severe)
 - Probably from availability, siblings, peers (via parental monitoring / family style), not genetics or family hx
- People whose religion / country / culture says no alcohol are less likely to have problems (cultural plasticity)

Alcohol is carrot and stick

- Stimulant - euphoria, gregariousness, incr. confidence (ascending BAC)
- Sedative - confused, inattentive, sleepy (descending BAC)
- May be some genetic vulnerabilities (innate tolerance for children of alcoholics = more time spent on ascending curve than descending; Aldehyde Dehydrogenase Deficiency (immunity altering balance towards punishment),)

Alcohol addiction relatively common - but many "alcoholics" in youth remit spontaneously with no formal treatment.

Behavioral economy - time matters (the longer you're sober, the better chance it'll stick - other behaviors)

Predictors of recovery: females, more time, older = positive; severity = negative. Tx reduces effects of time, increases prognosis

Social - marriage, parenthood, full-time job help (behavioral economy = crowd out old behaviors). Bad sign if addiction persists

Pharmacology

- No specific receptors - interactions with ligand-gated ion channels (increases GABA-A & Glycine (inhibit cortex, spinal cord); decreases Glutamate NMDA (excitatory))
- Overall alters inhibitory/excitatory balance to more inhibition diffusely
- GABA-A receptors may be especially important (benzos, etc. cross-tolerant & good for Tx)
- Absorption affected by concentration, time in stomach (freshman drinks fast, passes out -> still absorbing from stomach. Opposite of what pass-out is supposed to do)
- Peak concentration also depends on body composition (Men<women, younger<older)
- BAL 30 (1 drink) = euphoric, social, BAL 50 (2 drinks) = jovial, less inhibition, risk, impaired eye movements, BAL 100 (5-6 drinks in 2 hrs) = drunk, slowed rxn time, slurred speech, stagger; BAL 200 = sloppy drunk / lethargic, BAL 300 = deaths from resp. suppression, BAL 400 = LD50, BAL 500 = very high risk of death

Tolerance / withdrawal

- Tolerance - greater quantities needed to produce same effect over time

- Mechanisms - receptor effects, metabolic changes, behavioral tolerance (act like not drunk)
- Tolerance is complex - chronic alcoholics seem sober at BACs that would kill normal person
- Withdrawal - compensatory mechanisms of tolerance are unopposed
 - State of diffuse cerebral disinhibition / hyperexcitation
 - Minor abstinence syndrome (8-48 hrs), withdrawal-induced seizure (same), Delirium Tremens (2-5 days, delirium, hypersympathetic state - how you die)
 - Tx - give benzos @ tolerance dose then wean off

How to stop it? treatment, recovery programs, job based on abstinence, AA (new social network, etc.) - no good drugs

Intersex

People with indeterminate biological sex (a.k.a. "disorder of sexual development" (prejudicial), historically hermaphrodite)

INSA = advocacy group

Definition: "Biological condition of being between male and female", group of conditions with ambiguous/incomplete sexual differentiation.

Statistics - 1/100? Hard to estimate.

Sex/gender:

- **Sex** - genitals, genetic / anatomic
- **Gender** - sense of "maleness" or "femaleness" as well as psychological, sociocultural assumptions we make about our sex
- **Sexuality** - erotic nature, who / what turns us on, includes sexual orientation

Chromosomes:

- XX / XY - normal female/male
- **XO - Turner's** syndrome (phenotypically female)
- **XXY - Klinefelter's** syndrome (phenotypically male but with female characteristics)
- **XYY - Jacob's** syndrome (larger male)
- **XXX - Triple X**
- **Fused XYY - Chimera** (some cells XX or XY)

Hormones: more important than chromosomes

- **XX - Congenital Adrenal Hyperplasia (CAH)** - more androgens available (corticosteroids not synthesized so adrenals overgrow - need lifelong corticosteroids), masculinizes
- **XY - Androgen Insensitivity Syndrome (AIS)** - no androgen reception so feminized
- **XY - 5 alpha reductase insufficiency** - no androgens converted early in life; feminized but get androgens @ puberty so "convert to male"

Gender:

- Gender Identity = internal, subjective sense of being male/female. GID, transsexuality = variants
- Gender role - sex-related behavioral expectations, many culturally based (effeminate males, butch females)

Sex development: SRY directs testes development, no SRY = female (default). Hormonal secretions drive rest of structures.

Intersex - often apparent at birth (genitalia) but sometimes detected at puberty or autopsy

Gonadal intersexuality: usually both gonads contain ovarian/testicular tissue (ovotestes) - female structures dominate (have gender identity of female)

- Can have XX chromosomal pattern with SRY gene translation, or chimera - gonadal dysgenesis

Non-gonadal intersexuality: much more common, many manifestation - affects genitalia but not gonads

- Eg large clitoris vs small penis, labia vs scrotum, fused vs open vagina

- Commonly - epispadias/hypospadias (urethra doesn't fuse)

Surgery vs. no surgery (parental distress, good techniques, bonding, less trauma early, confirm gender - but oppositions include long-term trauma, problems with sexual function)

Gender identity - still unsure what factors determine our gender - gender assignment is a guess

Who should decide - parent, physician, child (delayed)?

Parental autonomy with oversight - need to be well informed, diagnosis, all options, understand difficulty predicting gender identity, lack of scientific evidence for traditional practices.

Neuroendocrinology of sexual behavior

Sexual behavior - appetitive & consummatory components (rats, humans) - sex-typical behavior

Sex steroid hormone action is causally related to activation of sexual behaviors in animals. Individual differences maintained after T replacement in men

Men: Testosterone increases desire, performance in hypogonadal men (higher threshold for desire than intercourse / nocturnal erections)

Women: at ovulation, increase in female-initiated sexual interactions - but modified by culture (increased if a partner's around, decreased if don't want to become pregnant, etc)

Steroid hormones - diffuse into cell (lipophilic), bind as ligand to receptor; receptor acts as transcription factor

- **Testosterone** can be metabolized to androgen (via 5-alpha-reductase) or estrogen (via aromatase) in brain - happens in both males and females
- Aromatase inhibitor (no estrogen) blocks T effects on ejaculation in castrated rats (need estrogen for sexual behavior even in males)

Brain stuff: performance/response

- **Pre-optic area** is key (males if lesioned lose performance / response)
- Male circuit known via tract tracing - POA to PAG to nPGi - in some animals
- Ejaculation generating cells in spinal cord IDd (only in males)
- PET scans have id'd brain areas associated with ejaculation in men - e.g. Ventral Tegmental Area (VTA) - involved in dopamine / reward (like cocaine); basal ganglia but not hypothalamus, various cortical areas
- Female mice (study lordosis) - similar to male POA to PAG to nPGi (sexual reflex), Similar forebrain responses
- Sex difference - males activate hypothalamus, amygdala in desire but not while copulating
- Orgasm in women - activate various areas (fMRI) - perception in caudate, midbrain; physical response in cerebellum

Monoamines: catecholamines / serotonin;

- **Dopamine** released in **nucleus accumbens** in association with male sexual response (and in POA in response to female)
- Dopamine agonists enhance male response, as do adrenergic antagonists
- Fluoxetine treatments inhibit appetitive & consummatory measures of male sexual behavior

Various species differences in brain (e.g. songbirds when learn to sing; also humans - no females have spinal cord neurons that innervate penis)

Can be acquired - males have bigger pmDAmygdala than females (not at birth) - regulated by hormones

Hypothalamus & **INAH-3**: females, homosexual males have smaller INAH-3 sizes than straight males

Finger-length: 2nd-4th finger ratio (males longer 4th finger, homosexual women intermediate) - from androgen exposure

Behavior problems in children

Behavioral perspective:

- Motivated behaviors
- Goal-oriented behaviors
- A-B-Cs (antecedent-behavior-consequence)

Major problems - only 2 ways to develop:

- Reciprocal, coercive interactions
- Monitoring deficits

Coercive interactions - power struggles, escalating

- negative reinforcement (when behavior decreases noxious stimulus, will re-occur next time)
- positive reinforcement (behavior followed by experience that makes it more likely for behavior to recur - reward in eye of beholder)
 - Engaging maladaptive behavior increases likelihood it'll happen

Escalation - parents & children get frightened, give hug - rewarding - try new interventions (stronger) - escalates; kids get afraid and resist, "learned helplessness" and parents give up

End stage - physical/emotional abuse for parents, suicide gestures/running away for kids

Talking is bad (usually like nagging) - stable families have fewer verbal interactions

Monitoring: knowing where child is / what doing / who with / attending to details

- Otherwise kids will lie - you're training them to get what they want - if you just ask them what they're doing
- Monitoring - knowledge of child, child knows you "get them" parental self-awareness, recognizing patterns of behavior/interaction
- Poor supervision - accidents, fire-setting in childhood to substance abuse, sexual activity, delinquent behavior as adult
- Power struggles lead to poor supervision (give up)

Treatment - home is key (parents need to be involved) - also child factors e.g. medical problems, stressors, demographics, etc.

Model - power struggles and lack of supervision facilitate development of maladaptive behavior; neither parent nor child aware of behavioral forces

To decrease behaviors, need to decrease power struggles and increase supervision

How to fix: behavior program (schedule to reduce power struggles, structure + rewards + punishments, prevent relapse)

Parents need to know & feel what it means to be in charge, ignore behavior, set limits, be consistent

- Decrease verbal interactions, increase predictability & awareness
- Child feels better, parents can be less involved, task-reward with predictable rewards, child will generalize these principles to rest of life (starts at home)

Summary: power struggles & poor supervision; fix with parent behavior and management training

ADHD

- 5% school-age children, 50% child psych practice, high comorbidity with disruptive/mood/anxiety disorders
- 3 types (DSM)
 - Combined/full (ADHD)
 - Predominantly inattentive (ADD)
 - Predominantly hyperactive-impulsive (HI)

Symptoms (DSM): inattention (careless mistakes, easily distracted, difficulty organizing, loses things); hyperactivity/impulsivity (fidgets, on-the-go, talks excessively, interrupts, etc)

Predominantly HI - preschoolers, predominantly ADD - residual in adults or with learning disability; leads to alcoholism /drug abuse

- Heterogeneous condition: interviews, questionnaires, rating scales are fuzzy; observations are hard, no clinical exam or lab tests to rule in/out - but developmental motor coordination disorders are highly comorbid
- ADHD diagnosis modified by environmental influences - discordant ratings home/school/clinic, environmental variability, IQ is environmental, socioeconomic status, etc.
- Most with ADHD can "concentrate" or "focus" on what interests them if it's immediately rewarding
- Girls harder to diagnose until early (socially unacceptable to be disorganized - compensate by overwork)
- Can be secondary to other biological disorders

DISORDER OF SELF-CONTROL (impulsivity) - Barkley

- Inhibition, response preparation (need inhibition to prepare response via working memory) linked
- Executive function = control processes; no inhibition or response preparation or working memory, problems with education / metacognition

Brain - parallel circuits (frontostriatal), cerebellum/thalamus maybe; EEG problems, fMRI differences, reduced total cerebral volume, volume of cerebellum, abnormal frontal morphology, etc.

Neurotransmitters - DA high in midbrain only, NE system indirectly - could be secondary (DA is neuromodulator), serotonin may be involved (aggressive comorbidity)

Genetic basis? one gene only increases ADHD if mother smokes

Stimulant medications: effective in 75-90% of ADHD cases, few, rarely serious side effects - but response to stimulants is not diagnostic of ADHD

- Stimulants neither cure nor cause
- Must individualize meds for target symptoms & times
- Combination with non-drug methods is better

ABC of CBT / applied behavior analysis- need positive contingency valence (not negative like schools do) - engineer for success (tutoring, coaching, motor skills building). Pure cognition is not effective (e.g. i need to settle down). Not great coverage in schools

Take-aways

- ADHD may be class of related neurobiological/developmental disorders (like epilepsy)
 - Frontal-striatal-cerebellar parallel motor & executive dysfunctions with ADHD
 - Stimulant medication should be separated from biomedical nature of ADHD - neither necessary nor sufficient
-

Feeding

"Motivated behavior in social context"

Motivated behavior: drive towards goal, stereotyped behaviors to satiate drive; satiation is temporary so makes a cycle (modified by internal/external factors e.g. illness, food availability), leads to learning over time with iteration through cycle

Drive = construct, element of behavioral model that provides "motive force" - embodied in **physiological control mechanisms**

- drive to eat serves **energy homeostasis**; act is hedonic (rewarding) to ensure repetitive feeding
 - Homeostasis = maintenance of stable internal state despite changing environment (e.g. body temp in mammals)

Feeding cycle: food consumption, satiety, hunger, food acquisition, food consumption. Repeated over time, leads to learning

- Leads to stereotyped meal patterns, frequency/timing, size, social context, content
- Physiological satiety signals, meal initiation signals, long-term homeostatic signals, GI physiology
- Overdetermined - layers and layers of redundancy to ensure feeding happens

CCK - prototypic peripheral satiety signal.

- peptide released from gastric/duodenal mucosa when stimulated by food
- Plasma level peaks 10-30 min post-meal, subsides over 3-5 hrs
- Signals via vagus to brainstem satiety centers; also functions as NT

Ghrelin - hunger signal

- Neuropeptide synthesized in stomach
- Levels increase with food deprivation, peak prior to meals
- Receptors in hypothalamus = homeostasis
- Levels increase after weight loss but pattern stays the same

Hedonic control - meal size is function of food palatability & macronutrient content (Better something tastes, more you eat)

- **Nucleus accumbens** - important reward locus, has opioid receptors (eating affects DA + opioid systems)
 - Gets input from feeding centers
 - Opioid antagonists block sweet food intake (naloxone)

External factors:

- **Population's** energy balance shifting (much more obesity, incl. child/adolescence)
- Increased energy in, decreased energy out
 - Supersizing - high calorie, cheap foods esp. using HFCS (less effective at reducing subsequent intake in people trying to diet)
 - Homeostasis normally defended against perturbation (e.g. meal size - big/small pieces, eat same amount - but bigger portions, don't defend portion size)
- High, energy-dense food is everywhere, leads to decreased locomotor activity

Review:

- Eat to maintain energy homeostasis; complex, overdetermined system of physiological elements drive behavior
- Eat high-energy-dense food because they taste good; lots of HFCS so they don't satiate, available everywhere; then less likely to exercise

Biological Studies of Sexual Orientation

Definition of **sexual orientation:** thoughts/fantasies, sexual activity, inner identity/subjective sense, public social role - may be incongruent

Differs from gender dysphoria (think they're wrong sex)

Kinsey scale - 0-6 with 0 heterosexual, 6 homosexual, huge data set from interviews. Around 5% exclusively homosexual; peaks in adolescence & declines; majority heterosexual

Natural history of homosexuality:

- gender nonconformity is key (not predictive of effeminate males but rather gay males, for instance)
- Aversion to aggressive behavior is one of most highly correlated factors for males
- Prospective studies of effeminate boys (highly correlated) - 68% male vs. none in control group

Mechanisms (all but genetics are causally ambiguous; genetics wouldn't be only relevant one probably):

- Psychosocial (classic unloving father/doting mother, small role only)
- Anatomic differences
- Neuroendocrine
- Genetics

Biology:

- Early awareness of orientation (age 10) & stability - suggests biological trait
- No reliable physical/hormonal differences - but some subtle physical variations (e.g. finger length); INAH-3 data are suggestive but not compelling. Some brain imaging (click-evoked otoacoustic emissions) big difference for homosexual/heterosexual females
- Early hormonal response may be critical
- "Fruitless" fly - one gene causes male courtship behavior (splice variants). If male gets female splice, tries to mate with males

Genetics

- Family studies - heterosexuals 4% homosexual brothers; homosexuals 20% homosexual (single males interviewed)
 - Twin studies (homosexual proband) - suggests about 50% genetic loading (50% monozygotic twins discordant = important nongenetic factors)
 - Pedigree evidence - maternal transmission (X-linkage, maternal effects, imprinting - or decreased reproductive rate in homosexual males)
 - Linkage analysis - 33/40 pairs of "affected sibs" shared markers at Xq28 vs expected 20/40; later researchers couldn't confirm
-