

PSYCTRY 79 – Applied Positive Neuroscience
Spring 2023 – Professor Alexander Korb

Psychiatry 79 Midterm Notes

Lecture 1:

- Professor plays Ultimate Frisbee

Foundational Ideas

- You use your whole brain all the time
 - Brain circuits may interfere each other
 - Notion of use only 10% is false
- PERMA Model of Wellbeing (Happiness is subjective and too vague)
 - Positive Emotions
 - “Spring break effect”
 - Engagements
 - Staying focused
 - Relationships
 - Meaningfulness
 - Accomplishments
- Brain is same across all people, circuitry can be different
 - Combination of brain tuning and circuits cause problems, issues are not isolated to certain regions of the brain.
 - Issues are often snowball effects
 - Microphone and Speaker

Connection Reduces Worry

- Coan, 2006: fMRI machine analyzes married woman getting shocked with hand holding
 - Dorsolateral Prefrontal Cortex and Ventrasingular Cortex that were significantly less active

Exercise

- Fumoto, 2010: Infrared blood sensors to analyze people’s brains on exercise bikes
 - 15 minutes of biking influenced emotional control, increased serotonin

Brain produces Pain Relievers

- Walch, 2005: Patients recovering with sunlight in room vs no sunlight
 - Sunlight required 25% less morphine to pain (sun creates endorphins)

Upward Spiral: Korb, Positive Life Changes causes Positive Brain Changes

Neurons (about 100 billion neurons in brain)

- Dendrites
 - Listens to other cells
- Axon
- Cell body
- Nucleus
- Myelin
 - Facilitates transport of electric signals

Upward Spiral

- Understanding
- Exercise
- Biofeedback
- Sleep
- Mindfulness
- Gratitude
- Habits
- Social
- Professional

Lecture 2: Overview of Neuroscience

Neuroscience Basics

- 10% of brain is neurons/brain cells

Neuron

- Dendrites: Listens for chemical signals from other neurons
- Axon: Varies in sides, connects brain regions
- Myelin: Wraps around axon to make it perform/transmit faster

Neural Networks

- Synapse: Connection between two neurons

- Neurons has ~7000 connections on average

Grey Matter: Body of neuron (where nucleus, processing is) mainly on surface of brain

White Matter: Where axons are connected together

Basic Brain Organization

- Cortex
 - Surface of brain
 - Most of grey power/processing power of brain
 - Wrinkly (to maximize surface area and increase grey matter)
- Occipital Lobe
 - Involved in vision
- Parietal Lobe
 - Sensation and Touch
- Temporal Lobe
 - Hearing
- Frontal Lobe
 - Moving different parts of body (Motor-wise)

Important Regions

- Prefrontal Cortex
 - Thinking, planning, impulse control
 - Decision-making, Impulse Control, Working Memory, Planning
 - Upper part (dorsal)
 - Cognitive
 - Thinking about thinking
 - Lower part (ventral)
 - Emotional
 - Thinking about emotions
 - Awareness and analysis
 - Middle part (medial)
 - Focused on self
 - Outside part (lateral)

- Focused on outside world
- Orbitofrontal
 - Parts of brain near eyeball
 - Helps modulate goal-directed behavior
- Limbic System
 - Emotion and memory
 - Learns from past
 - Hypothalamus
 - Key role in stress
 - Regulates flight, fleeing, feeding, and procreation
 - Maintains bodily functions, breathing, water
 - Amygdala
 - “Fear center”
 - Involved in decisions with uncertainty
 - Threat detector
 - Hippocampus
 - Anticipates danger
 - Learning in memory
 - Records emotions and memories in memory
 - Draws upon past experiences to guide current experiences
 - Anterior Cingulate Cortex
 - Plays role in attention
 - Involved in pain
 - Notices mistakes (in terms of goal making)
- Striatum
 - Impulses, routines, reward
 - Short term rewards
 - Action Conversation: Decisions are made using long-term goals, routines, or impulses
 - Dorsal striatum
 - Upper portion

- Holds deepest, most engrained habits, routines
- Has stimulus response (acts based on most common reaction)
- No distinction between good and bad habits
- Nucleus Accumbens
 - Prioritizes immediate pleasure and reward
 - Dopamine release
 - In response to reward
 - In anticipation of reward
 - Motivates actions to achieve that reward

Growth Mindset

- Myers, 2016: Belief that through effort, one can improve talents and abilities
 - Power of “yet”
- Stronger belief in growth mindset → Dorsolateral PFC & Dorsostriata
- Fixed mindset
 - Not good at math
- Growth Mindset
 - Not good at math yet

Neural Communication

- Neuroplasticity: Brain is malleable, the brain changes based on how you use it
- Synaptic neuroplasticity: More connections are used, stronger connectors get (neurons that fire together wire together)
- Neurons come together at synapse
 - Pre-Synaptic → Post-Synaptic
 - Neurotransmitters move to Post-Synaptic

Neurotransmitters (The chemicals themselves)

- Glutamate → Learning memory (most common)

Neurotransmitter Systems (All the neurons that release or are affected by release of neurotransmitter)

- Serotonin
 - Willpower, Mood
 - Improves willpower, motivation, mood
 - Overrides immediate impulses
- Norepinephrine
 - Enhances thinking, focus, dealing with stress
 - Stress Response, Enhances thinking
- Dopamine
 - Habits, Enjoyment, Reward
 - Increases enjoyments and necessary for changing bad habits
 - Produced in Nucleus Accumbens, Brain Stem
- Oxytocin
 - Promotes feelings of love, trust, connection, reduces anxiety
- Melatonin
 - Improves sleep
- Endorphins
 - Pain, relief, and elation
- Endocannabinoids
 - Improves appetite and increases feelings of peacefulness and wellbeing
- GABA
 - Increases relaxation and reduces anxiety

Lecture 3: Stress

Stress: Organism's response to an environmental change

- Linked with homeostasis (ability to survive)
 - Mediated by hypothalamus

Sources of stress

- Hunger
- Thirst
- Extreme Temperatures

- Pain
- Lack of Sleep
- Danger
- Social Exclusion

Maslow's Hierarchy of Needs (Research shows needs are not hierarchy)

1. Self Fulfillment Needs
 - a. Self-actualization
 2. Psychological needs
 - a. Esteem needs
 - b. Belongingness and love needs
 3. Basic needs
 - a. Safety needs
 - b. Physiological
- Not true: Parent that starves themselves to give more food to child

Psychological Stress: Feeling of strain or pressure

- Anxiety

Physiological Stress: Bodily need

Psychological and physiological stress are not easily separable

- Hangry, low blood sugar, lack of sleep can effect stress
 - They all effect same brain regions and chemicals

The Stress Response

- How brain and body mobilizes to react to changes in environment
 - Hypothalamic Pituitary Adrenal Axis (HPA) → Adrenaline
 - Stress hormones: cortisol and adrenaline

STRESS is not bad (in general)

- People who do not have pain receptors can mess up skeleton when sleeping

Autonomic Nervous System (One way which brain connects with body)

- Sympathetic Nerves / Stress Response (Fight or Flight response)
 - Nerves that can change internal organs based on current level of stress
 - Dilate pupils: Focus on lion vs inability to focus on tests
 - Increased heartrate
 - Involved in sex
 - Crush texts back, butterflies in stomach
 - Brain crushed by depression may not care about anything
- Parasympathetic Nerves / “Rest and Digest”
 - Essentially the opposite of sympathetic nerves
 - Short term stress
 - Constricts pupils, slows heartrate and digestion

Lecture 3 Part 2:

Stress in College Students

- Wunsch, 2017: Scientists picked day to analyze stress of students, recorded physical activity, wellbeing
 - Higher activity, higher wellbeing, better sleep

Exercise as Effective as Antidepressants

- Blumenthal, 1999: Recorded older adults, Graphs designed to show differences better
 - In certain groups with depression, exercise can be as effective as antidepressant medications

Exercise and Cortisol

- Nabkasorn, 2006: Adolescent women joins jogging class or stick with regular activities
 - Women in jogging class had significantly lower depressive symptoms
 - Cortisol: One of key stress hormones, marker of fight or flight response
 - After 8 weeks, exercise group had lower levels of cortisol
 - Non-exercise group also lowered a little (likely due to analyzing behavior)

Exercise, Dopamine and Striatum

- JanseVanRensburg, 2009: Smokers told to abstain from smoking for 24 hours, placed in fMRI machine

- fMRI machine: Checks for subtle blood flow changes, checks more movement activity in brain
- After exercise, cravings were lessened (dorsostriatum didn't react as strongly)
 - Significant changes in dorsostriatum (habit part of brain)

Exercise and Recreational Drugs

- Sparling 2003, Boecker 2008: Runners asked how they felt after 45 minutes running
 - Increased levels of endocannabinoids, non joggers had little increase in Endocannabinoids
- Endorphins: Port man tou of indogineous morphine Reduces pain, enhances wellbeing
- Endocannabinoids: Brains own form of cannabis, improves feelings of wellbeing, peacefulness

Strengthening the brain

- Rovio, 2010: Scientists asked older people how much exercise they got
 - Exercise increases BDNF
 - Strengthens and grows new neurons (in hippocampus)
- Older adults have more PFC grey matter from midlife exercise
- Exercise increases serotonin (regulates mood, improves willpower)

Lecture 3 Part 3: Biofeedback

Biofeedback: Body's impact on the brain

Breathing

- Modulates activity in vagus nerve
- Increased Heart Rate Variability means less stress

GABA

- Neurotransmitter, Primary inhibitory neurotransmitters
 - Calms down receiving neurons
- Anxiety benefits from yoga is correlated with GABA produced
- Target of anti-anxiety medications (Valium, Xanax)

Yoga and GABA

- Gerbarg, Streeter 2020, 2010: Measure MRI of people exploring yoga

- Yoga increased GABA, anti-anxiety benefits correlated with higher GABA output

Lecture 4 Part 1: Scientific Evidence

Case Study: Look at one person and noting what happened to them

Phineas Gage

- 1 inch thick metal rod shoots through Gage's brain
- Lived normally, rod caused change in behavior
 - Before Accident
 - Calm
 - After Accident
 - Irritable, Alcoholism
- Damage to orbitofrontal cortex: Increased impulsivity

Observational Study: Look at a bunch of people

Observational Study: Gaming Addiction

- Weng, 2013: Structural MRI (HD photo) compared gaming addiction with and without
 - Atrophy, smaller regions of orbitofrontal cortex, involved in impulsivity and regularity of addiction
 - We can recognize damage, but not how it occurs

Lucas, 2011: Two Basic Types of Scientific Studies

Observational

- Observes subjects and measures variables of interest
- Tells if two things are related

Experimental

- Researcher applies intervention or treatment and measures an outcome variable of interest
- Tells hows two things are related (if one causes the other, or no relation entirely)

Exercise Improves Sleep

- Reid, 2010: Measure sleep of people who exercised and who didn't
 - More exercise proved better sleep

Correlation does not imply causation

Lecture 4 Part 2: Sleep

College students need 8 hours and 24 minutes on average

Sleep debt

- VanDongen, 2003: Measured people's ability to pay attention to letters on computer screen
 - Consistent amount of bad sleep can result in general grogginess and focus
 - Too little sleep is better than too much sleep

Sleep Architecture (Sleep Quality)

- Stage 1: Light sleep
- Stages 2-4: Slow Wave Sleep
- REM
 - Body is paralyzed, eyes move
 - Disrupting REM sleep can destroy memory

Sleep Regulation

- Homeostatic process: More time awake, more sleep needed
 - Linear
- Circadian process: Driven by internal clock
 - Cyclical
 - Controlled significantly by light
 - Releases melatonin around 30 minutes before bedtime
 - Releases Cortisol when you wake up
 - Hippocampus controls internal clock

Sleep Hygiene

- Regular bedtime
- Uninterrupted sleep
- Bright light during day
- Calming routine

- No naps
- Alcohol as sleep aight

Killgore, 2014; Thomas, 200: PET image showing glucose metabolism after 24 hours of sleep deprivation

Sleep helps

- Improve mood
- Reduces pain and stress
- Improves learning and cognitive performance
- Boost immune system
- Reduces reward response for unhealthy behaviors

Sleep-Stress Cycle

- Vgontzas 2001; Nofzinger 2006: Brain images of people with insomnia
 - Insomniacs have greater levels of cortisol, and more cortisol is correlated with more struggles in getting sleep
- Inadequate sleep increases stress, increased stress disrupts sleep

Sleep and Limbic System

- Yoo, 2007: Sleep deprivation for 36 hours, showed emotional pictures in fMRI
- Sleep helps consolidate memory
 - Communication between hippocampus and Prefrontal Cortex during slow-wave sleep
- Sleep reduces amygdala reactivity

Disrupted sleep increases pain

- Smith, 2007: People either got 6 or 8 hours of sleep and either woken up in the middle or sporadically around the night

Why is sleep restorative?

- Xie, 2013: Researchers analyzed lymph system

- Sleep is restorative as it cleans away metabolic junk via cerebrospinal fluid (CSF)

Prefrontal Deficits in Insomnia

- Altena, 2008: Insomniacs performed tasks related with PFC
 - Insomnia reduces prefrontal activity (due to disruptions)
 - Reductions improved by sleep therapy

Lecture 5: Stress

Stress Pros: Essential for survival and performance

Stress Cons: Can cause physical and mental health problems, ruin happiness and wellbeing

Yerkes-Dodson Law: Optimal performance is like upside-down U

- Blier, 2011; Diamond, 2007:
- Performance corresponds with prefrontal dopamine and norepinephrine
- Burton, 1988; Do anxious swimmers swim slower?
- Keeley 2008: Anxiety and Performance for undergraduate students
 - Test-taking study: Best performance is slight anxiety prior to exam
 - Athletic Performance: Swimmers and somatic anxiety (activations of bodily changes)

Chronic Stress:

- High blood pressure
- Immune system impairment
- Pain
- Gastrointestinal problems
- Blood sugar dysregulation
- Mental illness

Psychological Influences on the Limbic System:

- Controllability
- Certainty

- Consequences

Perceived Control

- Sanderson 1989: Panic disorder with higher levels of CO₂, lightbulb flares on to give perception that users could lower CO₂ levels
 - Higher anxiety in group without control of situation

Controllability and vmPFC

- Kerr, 2012: Presenting video clips of snakes to 21 snake phobics, in some cases they had control over presentation of videos and in some cases they did not
 - Greater controllability is reflected in greater vmPFC activity and greater communication between vmPFC and amygdala
 - Snake videos: More control means greater vmPFC activity

Voluntary vs Forced

- Cortman 2002; Leasure 2008: Exercise has positive effects when user feels that it does
- Brain Derived Neurotrophic Factor (BDNF)
 - Grows and strengthens neurons in the hippocampus
- Mouse Wheel vs treadmill
- All exercise is voluntary, not all exercise feels voluntary
- Proposals, Flirting, Tests

Uncertainty and Stress

- De Berker, 2-016: Lift rocks, if there's an image of snake, you get shocked, measured sweat and stress
 - More uncertainty, more stress
 - There's an upside-down U correlation
 - ACTIONS TO PROMOTE CERTAINTY → vsn br sgsindt long t erm interest

Amygdala and Consequences

- Sarinopoulos, 2009: fMRI study of certain and uncertain neutral and aversive pictures
 - Uncertainty doesn't matter unless it matters (there is some consequence)

- Stress means important component of situation
- Certainty and Uncertainty both influence amygdala (not one alone)

Expectations (about what is going to happen)

- Anterior cingulate cortex (limbic, mediates communication between PFC and limbic system, involved in what to pay attention to such as mistakes) and error monitoring
- Mistakes cause Anterior Cingulate Cortex to flare up, can trigger stress system (for optimal stress or worse)
- Reacts differently based on different situations, Anterior Cingulate Cortex tries to alert you when mistakes are imminent, tells you to focus more, out of the ordinary

Expectations can impede happiness

- Happiness = Reality – Expectations

Anterior Cingulate focuses on difference of expectations

Nucleus Accumbens is activated when expectations deals rewards

Reality vs Expectations Study

- Abler, 2006: Variable Likelihoods of winning from gambling game, fMRI study of bloodflows
 - Big increase of Accumbens activity is when winning when expecting loss
 - Biggest decrease of Accumbens activity is losing when expecting win
 - Reward circuitry is same if expected wins and expected losses
 - Getting paid at work

Gratitude: The feeling and the cognitive process

Feeling: Acknowledge breathing and water, doesn't feel grateful

Gratitude should not be about comparison

Cognitive Process: 3-5 things that were happy caused more exercise

Gratitude Intervention

- Emmons, 2003: Three groups, one wrote about good things, one wrote about bad things, one wrote about normal things
 - People who focused on grateful things had better feelings about life and upcoming week, reduced physical symptoms, and got in more exercise

Benefits of Gratitude

Relieves pain, etc

Expressing Appreciation:

- Kini, 2016: Took people going through psychotherapy, one group wrote gratitude letters, another group did control writing
 - 3 months later, group who wrote gratitude letters had greater improvements in therapy and anterior ciliate cortex responded differently to positive interventions

Lecture 6: Stress

Limbic Structure

Hypothalamus: Triggers stress response around body (for homeostasis' sake)

- Sympathetic Nervous System
- Parasympathetic Nervous System
- Flight or Flight Response

Amygdala

- Threat detection
- Uncertainty, Lack of Control, Consequences and intereactions of those (small and big)
- Prepares and Anticipates stressful situations
 - Transfers to Hypothalamus

Hippocampus

- Learn from previous experiences
- Monitors environment to similar experiences
 - Nudges amygdala to react in a similar way

- If new situation, nudges amygdala indicating stress of new experience
- Whenever amygdala gets activated significantly, hippocampus is indicated to remember

Intersingulate:

- Filters the world to focus on what is important to you
- Responds to emotional and physical pain

Insula:

- Evero, 2012
- Groove on side of brain
- Physical and emotional sensations of internal organs (Not just feelings but sensations also)
 - Sense of touch, pain, butterflies in stomach
- Beta blockers: Targets heart (slows heart rate and blood pressure)

Amygdala: Pays attention to and identifies threats, can identify before we are conscious of it

Fear: Response to imminent danger

- Amygdala, hippocampus, anterior cingulate, hippocampus, insula
- Uncertainty and possibility that bad things may happen
 - Seeing lion staring at you

Anxiety is engagement of the fear circuitry in response to the possibility of danger

- Often subconscious
 - Wondering if lion is wondering in grass around you

mPFC and Worry

- Paulesu, 2010: People with and without generalized anxiety disorder were asked to think about highly stressful prompts
 - Both high-worriers and low-worriers experienced the same amount of worry, however low-worriers were able to stop it more quickly
- Worry is thinking about a possibility of danger
- Medial PFC and anterior cingulate
- Reduces amygdala activity, activation of PFC

Generalized Anxiety Disorder → More sensitive amygdala

Cognitive-Behavioral Therapy: Problem-Solving based, development of personal coping strategies for dealing with unhelpful cognitions of behaviors in emotion regulation

- Make brain work *for* you
- Changing thoughts (awareness), changing behaviors, changing environments, cognitive reappraisal
 - Reframing thoughts
 - Identifying incorrect beliefs
- Rewires brain, reduces amygdala reactivity

Psychodynamic/Psychoanalysis: Look at root of problems and solve through realizations, change problematic behaviors by discovering their unconscious meaning and motivations

Unhelpful Thinking

- Overgeneralization
- Mental filters
- All or nothing thinking
- Disqualifying the positive
- Jumping to conclusions
- Magnification (Catastrophising) and minimization

Unhelpful Behaviors

- Avoidance
- Risk Taking
- Procrastination
- Isolation

fMRI, CBT and Social Anxiety

- Mansson, 2013: Scientists monitored Change in anxiety, change in amygdala activity
 - CBT for social anxiety works by reducing amygdala reactivity

fMRI compares two conditions that are similar but distinct in one way

Emotion Regulation and Response to Uncertainty

- Sokol-Hessner, 2013: People played gambling game, and either had to accept outcomes or regulate mood, analyzed behaviors
 - Reframing (Cognitive Reappraisal) can help mediate amygdala response to uncertainty
 - Non Regulators do not change, regulators have significant changes in amygdala because more active

Dorsolateral Prefrontal Cortex:

Expectation and Placebo Effect

- Khan, 2015: Treatments vs Placebo Effect
 - Brain causes effects in body by taking action that brain believes will help you
 - Activates endorphin system

Placebo and Pain

- Eippert, 2009: Gave people electric shock with and without pain cream
 - Pain Cream: Significant reduction in pain score on sunscreen crew
 - Uses naloxone to block endorphins/opioids
 - Placebo activates the endorphin system (PAG)

Placebo without Deception

- Kaptchuk, 2010: IBS participants explicitly given and told placebo and its effects
 - Brains reduced experiences of symptoms

DLPFC

Lecture 7: Habits

Motivation for Behaviors:

- Goal Directed
 - Motivated by desirability of goal
 - Flexible

- Stimulus Driven
 - Motivated by stimulus or environment
 - Not flexible

Types of behaviors (Dopamine matters in all types of behaviors)

- Intentional/Willful Actions
 - Prefrontal Cortex, Goal directed
- Impulses
 - Nucleus Accumbens (ventral striatum), Goal directed
- Routines/Habits
 - Dorsal Striatum, Stimulus Driven
 -

Different Domains of Habits

- Behavioral
 - Walking to Class
- Cognitive
 - Telling yourself that everything will be ok
 - Mental patterns: Automatic responses to situations
- Emotional
 - Getting angry when someone tells you you cannot do something
- Social
 - Distracting yourself by hanging out with friends

Impulses

- Dopamine release in nucleus accumbens
 - Novelty (new things)
 - In response to reward
 - In anticipation of reward
 - Motivates actions to achieve that reward

Stress and Impulsive Choices

- Maier, 2015: fMRI study where people were decided to choose healthier food, people pursuing and failing at maintaining a healthier diet, posing a self-control challenge
 - Stress group with ice, control group → Stress impedes rational thought
 - Amygdala and Nucleus Accumbens activated

Goal Directed vs Stimulus-Driven Choices

- Schwabe, 2009: Stress caused by ice water (tested through cortisol (more cortisol means more stress))
 - Unconsciously associated shapes with drinks, removed implicit desire for drinks. Control quickly stopped wanting chocolate milk, Stress group still requests chocolate milk without any desire for it
- Calm states can be more influenced by goals, stress causes stimulus driven decisions

Routines

- Mindfulness: “Paying attention in a particular way: on purpose, in present moment, and becoming aware of judgements”
 - Anxiety/Stress/Depression reduction
 - Increased wellbeing
 - Improved test-taking
- Kabat-Zinn 1994: Mindful people have smaller amygdalas

Mindfulness and Anxiety

- Zeidan, 2014: How to mindfully breathe, compare between mindful breathers and control, meditation reduces anxiety
 - Increases in several parts of medial Prefrontal Cortex, Anterior Cingulate Cortex, and insula

Coping Habits (Dorsostriatum doesn't care if these have positive or negative effects)

- Socializing
- Procrastinating
- Worrying

- Exercising
- Eating
- Drinking

Rituals

- Pre-game
- Gambling superstitions
- Religious ceremonies

Stress Triggers Habits

- Scott, 2006: Ice in water to cause stress, Pain stress causes dopamine release in dorsal striatum which pulls you into old habits

Habit Loops

Cue → Routine → Reward →

- Stress is cue, reward is less stress → Coping mechanism

All habits benefit you

Reinforcement, Habits and Addiction

- Fixed ratio rewards (Reinforcement schedule)
- Variable ratio rewards (based on probability)

Striatum Activity in Heavy Drinkers

- Vollstadt-Klein, 2010: fMRI scan of light and heavy drinkers
 - Light drinkers showed greater activity in nucleus accumbens (positive reaction)
 - Heavy drinkers showed increased activity in dorsal striatum (compelled to drink)

Lecture 8: Changing Habits

Self-Affirmation

- Leads to habit change as one can focus on strengths and what they can control

Types of CBT

- Behavioral Activation Therapy
 - Context/environment is more important than internal factors
 - Do this but don't do that, do anything except the bad habit
 - Target negative behaviors
- Mindfulness-based Cognitive Therapy
 - Concentration
 - Become aware of behaviors, accept and experience
 - Non-judgmental awareness
- Acceptance and Commitment Therapy
 - Instead of controlling thoughts and feelings, accept them
 - Choose valued actions
 - clarify your values and reframe situation to get closer to goals

Changing Cues

- Understanding triggers
 - Thoughts, interactions, external stimulus
- Changing environment
 - Hippocampal triggers
- Reduce stress

All bad habits benefit you in some way

- Dorsostriatum acts on impulses

Replacing Routines

- When cue occurs, don't listen to Dorsostriatum

Getting Things Done

- Capturing *all* the things that need to get done in a logical and trusted system

- Disciplining yourself to make front-end decisions about all of the “inputs” you let into your life
- If it’s on your mind, your mind isn’t clear
- Clarify exactly what your commitment is and decide what you have to do, if anything, to make progress toward fulfilling it
- Once you’ve decided on all the actions you need to take, you must keep reminders of them organized in a system you review regularly

Goals and Intentions

- Enhance attention and perception, enjoyment

Intention and Perception

- Wykowska, 2012: People given page of dots, given an intended action to do, see if it’s easier to perceive things are pointable if one is already pointing
 - Visual cortex, increasing activity of certain things and ignoring others

Decisions Enhance Enjoyment

- Rao, 2008: Gambling Game consisting of blowing up balloon, risk is either given to user or predetermined by computer
 - Greater activity in nucleus accumbens and insula when users were given choice to gamble (Voluntary vs Involuntary risk)
 - Deciding also increases the impact of losing

Examples of Cognitive Strategies

- Not letting yourself get carried away by feelings
- Regulate emotions by putting feelings into words

Monetary Incentive Delay

- Staudinger, 2011: Show users how much money they could win, testing for cognitive strategy and mindset
 - Regulating Feelings

- Significant differences in striatum activity based on whether user would win 5 cents or \$1
- Dorsolateral Prefrontal Cortex: Modulates relation between money and striatum activity

Putting feelings into words

- Amygdala reacts to human emotions
- Labelling emotions allows prefrontal cortex to mediate amygdala reactivity

Values Reduce Stress

- Creswell, 2005: Audience Members solve math problems out loud
 - Value affirmation task prior to Trier Social Stress Test
 - Participants who affirmed their values had significantly lower cortisol responses to stress

Lecture 9

Shaping the Circuitry

Genetics

- DNA is not destiny, but rather blueprint of how things will turn out

Pezawas, 2005:

- People with less efficient gene for serotonin transporters
 - Greater risk for depression
 - Altered limbic system development and activity
 - Smaller sized amygdala, less effective anterior singulate and amygdala
 - Depression risk gene variant confers smaller size to amygdala and ACC, and **uncoupling of ACC-amygdala communication**
 - Short allele of serotonin transporter gene is less efficient.
 - Short allele carriers show significantly less functional coupling between amygdala and perigenual anterior cingulate cortex than Long/Long individuals

Early Experiences shape neural development, gene expression and habits

- Gene expression: Gene → Emotion

- Attachment
- Early Stress/Trauma
 - Some genes may “turn off”
 - Based on perception of parents
- Current Circumstances
 - Exercise, sleep, mindfulness, may change synapses
 - Can be somewhat controllable, tends to be “louder”

Epigenetics: Modification of gene expression, rather than the genetic code itself

Talge 2007 – Even prenatal stress can influence the development

Body Image

- Subjective sense or mental image of one’s own body
- Related to Anxiety rather than sense of health
- Neighbors 2007 – 310 college students. Men and women similarly dissatisfied with weight (~8 pounds) though women are much more dissatisfied with bodies.
 - Men have more mixed desires (some want gain)
 - Body image has the potential to create stress (mainly due to controllability and consequences)
 - Body image is much less related to physical health than it is to sense of “ideal” body and anxiety

Tripartite Influence Model of Body Image

- Keery, 2004
- Three formative influences
 - Peers: In adolescence
 - Parents
 - Media
- These affect/INFLUENCES body image through two mediational mechanisms
 - Internalization of thin-ideal

- Appearance Comparison

Influences on Body Image

- Direct Comparisons
 - To other body, shape, hair skin
 - Karazsia, 2009: In men, comparisons to athletes had a big impact
- Indirect comparisons
 - Internalizing influences, internalizing societal ideals
 - Lev-Ari, 2014: In women, comparison to best friend was strongest influence

Comparing Self to Media Images

- Friederich, 2007: fMRI study of 18 healthy women (age 16-35)
 - Contrasting interior design and body image
 - Measured anxiety ratings, interior design generally brought low levels of anxiety, body image brought higher anxiety ratings
 - Anterior Cingulate activation (error in sense of comparing self size with image size)
 - Amygdala (concerned with lack of control, anxiety, consequences)
 - Dorsal Striatum (anxiety → coping habits, can reflect coping habits or self-criticism habits)

Media Exposure on Male Body Image

- Agliata, 2004: Had men watch videos of game shows, commercials were shown related to appearances,
 - Muscular commercials significantly increased dissatisfaction, depressive symptoms
 - ANXIETY FOR THINGS THAT WE CARE ABOUT
- Judge, 2010: Correlational study
 - Thinner Women make more money
 - Bigger men make more money

Body Image Across Cultures

- Swami, 2010: People picked on scale what is ideal size of women
 - Less socioeconomically developed societies idealize heavier figures
 - Men's ideal size of women is slightly heavier than women's perceived ideal
 - More dissatisfaction, thinner the ideal body size is
 - More Western media, the thinner ideal body size is

Interoceptive Awareness (How to become aware of body's sensations)

- Sensing signals internal to the body
 - Thirst
 - Hunger
 - Pain
 - Physical sensations (digestive, heart, etc)
- People with eating disorders often have disrupted interoceptive awareness (e.g. difficulty counting heartbeats)

Body Dysmorphic Disorder (Hyperfixation on idea that body is misshapen)

- Feusner, 2010: Show pictures of themselves with distortions
 - Not based on reality
 - Regional brain activity (Anxiety) correlating with symptom severity
 - Dorsal Striatum
 - Anterior cingulate

Pride and Shame

- Roth, 2014: fMRI study of 25 volunteers, asked questions about memories and showed images to trigger positive and negative events, examining self-referential emotions
- Pride
 - Increased insula activity
 - Increased Dorsomedial Prefrontal Cortex Activity
 - Increased Nucleus Accumbens Activity

- Increased Amygdala Activity
- Shame
 - Increased insula activity
 - Increased Dorsomedial Prefrontal Cortex Activity
 - Increased Nucleus Accumbens Activity
 - Decreased Amygdala Activity (Shame is increased perceived control)

Felitti, 2010: Morbidly obese people, restrict calories in hospital

- All people gained all weight back in regular lives
 - History of childhood trauma
 - Abusive relationships
- “It’s hard to get enough of something that almost works”
 - Food leads to comfort

Self-Compassion and Body Image

- Kelly, 2016: Daily diary, asked about eating behaviors, wellbeing
- Self-compassion and self-esteem are highly correlated
- People with more self-compassion have better body image and appreciation
- Daily self-compassion correlates with increases in body image and appreciation
- Albertson 2014 (With Kristen Neff) – Show that self-compassion meditation improves body image

Lecture 10

Mother is responsible in nature

- Ducks climbing stairs
- Baby must learn to stick with their parent as it cannot survive on its own
- Mother duck must learn to teach kid
- Imprinting

Social Animals

- Humans evolved in groups
 - Social networks beyond relatives
- Our survival depends on others
- Relationships allowed us to be successful
- Relationships rely on key brain regions to reduce stress and make relationships rewarding
 - Humans gained strategic advantage
 - Carrot and stick (Calming to be comforted by others, stressful to be left out by others)
 - Limbic System
 - Nucleus Accumbens

Brain Development Depends on Others

- Mehta, 2009: Assembly line approach of child care, due to overflux of orphaned children
 - Only way to get some chemicals is from influence of others
 - Children raised in Romanian orphanages compared to non-institutionalized children
 - 15% less grey matter
 - Larger relative amygdala size

Cyberball and the Pain of Rejection

- Person put in fMRI scanner, playing catch with two other people
- Computer stops throwing ball at user
- Illicits feelings of social rejections
 - Activates interior singular cortex similarly to pain
- Social rejection is lessened when person socialized with others prior to the game

Social Rejection Hurts

- Eisenberger, 2004, 2007:
- 2004: Social exclusion activates dACC
- 2007: Social support reduces cortisol reactivity as well as dACC reactivity in cyberball

Lick your Kids

- Francis, 1999: Babies that got licked a lot, placed into new environment
 - Babies that were licked a lot were more exploratory, unlicked stayed where they were familiar
 - Licked babies were more resilient, lower stress
 - Baby offspring of licked babies continued licking their babies
 - Behaviors switched in hippocampus as licked babies gained more activation
 - Some mice genetically had anxiety, some mice were more resilient to stress
 - Individual differences in the expression of genes in brain regions that regulate stress reactivity can be transmitted from one generation to the next through behavior

Nature or Nurture

- Holmes, 2005: Compared anxious mice (AJ) vs exploratory mice (C57BL/6J)
 - Expl. mice raised by expl. mothers were exploratory
 - Anx. mice raised by anx. mothers were anxious
 - Expl. mice raised by anx. mothers were still exploratory
 - Anx. mice raised by expl. mothers were also exploratory
 - Some mice are gonna be exploratory no matter what, whereas others are more sensitive to their parenting.

Oxytocin

- Released by:
 - Breastfeeding
 - Hugs/light caresses
 - Sex
 - When someone shows they trust you
 - Talking
 - Protective Instincts (Tribalism in Momma bear and cub)
- Effects
 - Increased attachment, trust and protective instincts
 - Decreased stress, pain and drug cravings

Oxytocin Modulates Reward

- Shahrokh, 2010:
 - Oxytocin neurons from hypothalamus project to ventral tegmental area (VTA) where dopamine is produced
 - High licking mothers have higher hypothalamic OT
 - Direct infusion of OT into VTA increased dopamine signal in nAcc
 - oxytocin producing neurons project to the VTA, and dopamine neurons project to the hypothalamus
-

Oxytocin and Amygdala

- Domes, 2007: In fMRI double-blind, placebo-controlled within-subject design, we measured neural responses to fearful, angry, and happy facial expressions after intranasal application of 24 IU oxytocin compared with placebo
 - Oxytocin reduces amygdala activity
 - We are calmer around people that we know

Oxytocin and Hippocampus

- Leuner, 2012: Forced swimming
- Oxytocin causes growth of new neurons in hippocampus
 - Makes neurons stronger, reduces stress
- Reverses the effects of stress

Attachment and the Strange Situation

- Stranger enters room, mother leaves and returns to room
- Type of attachment
 - Secure: Sees mother as reliable source of safety
 - Anxious-Resistant: Insecure, less exploratory, clings to mother, resistant to leave mother and play, baby resists and cannot be calmed down when mother returns

- Anxious-avoidant: Insecure, less exploratory, ignores mother, plays for a little bit, ignores stranger, ignores mother leaving, ignores mother entering, sees mother as not important (Mother did not engage with baby)
- Disorganized: Insecure, less exploratory, no patterns,

Adult Attachment Styles

- Secure: Easy to become emotionally close to others
- Anxious-Preoccupied: Want to get close to others, thinks its too hard
- Fearful-Avoidant: Want to get close with others, avoid stress
- Dismissive-Avoidant: Comfortable without close emotional relationships

Cyberball and Attachment Style

- De Wall 2012:
 - During social rejection, activity in dACC and insula correlates positively with anxious attachment
 - They correlate negatively with avoidant attachment
 - Because people with anxious attachment fear rejection, while people with avoidant attachment don't mind being alone

Oxytocin does not Solve Everything

- Bartz, 2010:
 - In men with positive maternal relationships OT increased positive feelings
 - But in men with negative relationships, the effect was the opposite

Lecture 11

Attachment and the Stange Situation

- Types of Attachment:
 - Secure
 - Anxious-Resistant
 - Resisting being consoled
 - Anxious Avoidant

- Given up on parents
- Disorganized

Adult Tactics: Scan people's brains in cyberball experiment

- Influenced by Dorsostriatum
- Preoccupied: High Anxiety of Abandonment, High Seeking, More sensitive Interior Singulate, Insula
- Secure: High Seeking, Low Anxiety of Abandonment
- Dismissing: Low Anxiety of Abandonment, Low Proximity Seeking
- Fearful: High Anxiety of Abandonment, Low Proximity Seeking

Cyberball and Attachment Style

- De Wall 2012:
 - During social rejection, activity in dACC and insula correlates positively with anxious attachment
 - They correlate negatively with avoidant attachment
 - Because people with anxious attachment fear rejection, while people with avoidant attachment don't mind being alone

Oxytocin does not Solve Everything

- Bartz, 2010: Men asked for level of attachment in relationships, asked about relationship with mother
 - In men with positive maternal relationships oxytocin increased positive feelings
 - But in men with negative relationships, the effect was the opposite

Sad Babies

- Some people care about crying babies
- Other people don't

Sad Babies and Oxytocin

- Riem, 2011: Series of comparisons between control and babies crying, given either oxytocin or placebo

- Oxytocin increase increased insula activity, creates more feelings
- Less amygdala activity (oxytocin makes us feel more caring (we feel control))
- Bakermans-Krenenburg, 2012: Oxytocin or placebo, listening to babies crying and asked women about childhood experiences, squeeze rip bar
 - Gentle Discipline relaxed grip on crying on oxytocin
 - Gentle Discipline gripped harder with placebo
 - Harsh behavior's unchanged with or without placebo

Oxytocin and Genetics

- Costa, 2009: Looked at who had which gene, looked at who had low vs high adversity in childhood. Measured anxiety
 - People with depression are more likely to have a particular oxytocin gene which correlate separately for anxious or dismissive attachment
 - People with AG gene and high adversity in childhood interacted to cause more anxiety
- Thompson, 2011:
 - Genes that control oxytocin receptor contribute to anxiety and depression and interact with family environment
 - Interaction between genes and environment

Disregulated Oxytocin

- Jokinen, 2012:
 - People with lower levels of oxytocin are more likely to think that life isn't worth living
- Heim, 2009:
 - Child abuse survivors have lower oxytocin
 - Can increase drug use/addiction

Addiction and Isolation

- Baarendse, 2014: Some rats raised alone, some socially, both tested with cocaine reinforcement
 - Rats isolated in adolescence and bored rats show increased cocaine motivation

- Social rats had less addiction to cocaine

Oxytocin and Addiction

- Sarnyai, 1992: Rats given meth while exercising, measure how much they travel
 - Repetitive cocaine decreases hypothalamic Oxytocin
- Carson, 2010:
 - Oxytocin reduces methamphetamine effects
 - Decreased meth-related physical activity
 - Oxytocin dulls meth's effect on nucleus accumbens activity
 - Nucleus Accumbens activity extremely increased by meth
 - Oxytocin injection stimulates Oxytocin in hypothalamus
- What can you do?
- Talk to friends and family
- Make new friends
- Hug someone
- Get a massage
- Get a dog
- Practice gratitude

Relationship Drives

- Attachment increases Oxytocin/Vasopressin (Hypothalamus)
- Attraction increases Dopamine (Nucleus Accumbens)
- Lust increases Sex hormones (Testes and Ovaries)

Love in the Brain

- Cacioppo Review, 2012: Brain networks involved in passionate love, had people in romantic committed relationships, MRI machine on partner vs close friend
 - Anterior Singulate activity increased with partner
 - Dorsostriatum, more habits and routines with partner
 - Ventral Tegmental Area, dopamine is produced in brain stem

- Metaanalysis: Comparing love vs sexual desire, the latter has greater nucleus accumbens, amygdala, and hypothalamus activity
 - Oxytocin is coming, things and people are new, releases more dopamine
- Increased activity Anterior Insula
- Temporo-parietal Junction: processes sense of self

Monogamy and Cheating

- Prairie voles vs Montane voles
 - Prairie voles are monogamous with many vasopressin/oxytocin receptors
 - Zietsch, 2015: Women with certain gene for vasopressin receptor are more likely to cheat
 - Men with gene for lower dopamine receptor sensitivity are more likely to be both promiscuous and cheat

Lecture 12: Communication

Loneliness, Social Support and Depression

- Lawlor: People grouped as socially integrated or not, feeling of loneliness increased depression regardless of categorization
 - Loneliness and social isolation are independent risk-factors for depression
 - Integrated people had less depression
 - Loneliness is a feeling, social isolation is a behavior

Social Skills, Stress, and Depression

- Segrin, 2000: Sample of 118 high school students moving over 200 miles away to go to college
 - On average, more stressful the life events, the higher the lines are (greater increase of depression or depressive symptoms (sleep abnormalities, etc))
 - Students with high social skills experienced the highest buffer

Communication

- Difficult Conversations, essential to healthy relationships

- Communication is less about what you say and more about what the other person hears
 - Many influences including mood and different perceptions of intent and impact
 - Multiple conversations occurring on at once: what happened, feelings, identity
 - Many circuits that we've already discussed play a role
- It is easier to communicate if you are exposed to environments that communicate
- Tone matters (perception matters as it can differ)
- Difficult conversations create stress

3 conversations in any conversation

- Literal conversation: what literally happened
- Feelings conversation: how you feel
- Identity conversation: what does this mean?

Express Appreciation

- Kini, 2016: Gratitude letters change emotions
 - Lasting effect on perception of good things around you

Express Appreciation

- Kohls, 2013: Do tasks in fMRI, incorrect responses got positive social feedback
 - NAcc is activated by positive social feedback
 - Activates parts of nucleus accumbens as winning money
- Izuma, 2008:
 - Positive social reward (Being associated with positive attributes) activates similar striatum regions as winning money

Listen

- PERCEPTION OF LISTENING
- Kawamichi, 2015: Brain study when someone is listening with full attention (eye contact, smiling) vs not perception of listening
 - Activates nucleus accumbens when listening
 - Insula creates more feelings (can be good or bad)

Withhold Criticism

- Is this something I want to say because it feels good or is it something that they want to hear?

Avoiding Criticism

- Kohls 2013 - NAcc is activated by positive social feedback, and avoiding negative social feedback
- Activates Nucleus Accumbens (when avoiding)
- Uncertainty is stressful

Smile

- Mukamel 2010 – Mirror neurons in humans activate for smiling
- Is contagious
 - Fowler 2009, Yellow=happy, green=neutral, blue=sad
- Neighbor is happier, you are happier
- You lose job, friends get sad
- Has ripple effect within local communities

Moral Elevation

- Piper, 2015: Watching videos of people doing good things activates parasympathetic nervous system and sympathetic nervous system
 - Energizing and calming simultaneously, medial prefrontal cortex (understands other people's emotions)
 - Videos of moral elevation activate both parasympathetic (HRV) and sympathetic nervous system (Heart Rate) and mPFC
- Izuma, 2010: fMRI donate to charities with real money, made decision either by themselves or when other people were watching
 - Mere presence of someone watching you increased donation, activation of nucleus accumbens which differs between situations (strong activation from nucleus accumbens when around other people)

- No change in activation when there are no people around when donating
- When you know that other people are watching and appreciating your good actions, you find them more rewarding (more L NAcc activity in presence of observers when giving to charity)

Monkey See, Monkey Do

- Scientists recorded cells in monkey motor cortex, grad student eating gelato, monkey's brain responded
- Mirror neurons respond during actions and perception of actions
 - Respond and activate when we do action and when we see others doing same action
- Mirror neurons encode intention
- Disrupting the mirror neuron system in humans disrupts imitation
 - Sports can be learned through watching others play

Ways of Relating

- Empathy
 - Feeling what another person's feeling
 - You do not have to have empathy to understand another person's experiences
- Sympathy/Validation
 - Understanding another person's suffering
 - Medial Prefrontal cortex
- Compassion
 - Taking action (or willingness to act) to relieve another person's suffering

Mind-reading and Miscommunication

- Suda 2010 – some people's brains are more cooperative
- Generic representation of perception in brain
- Assumptions may or may not be correct
- Princess Bride poison

Shapes Behaving Badly

- Heider & Simmel 1944
- We associate things with emotions

Theory of Mind

- Ability to attribute mental states (beliefs, intents, desires, pretending, knowledge) to oneself and others and to understand that others have beliefs, desires, intentions, and perspectives that are different from ones own
- You are unaware until you are aware

Lecture 13: Communication 2

Theory of Mind

- Mental states can be attributed to other people
 - Shapes behaving badly
- Understanding what others are thinking on a cognitivist level
- Understanding goals of oneself and others through perception and communication
- Stress decreases prefrontal cortex's ability to function correctly

Theory of Mind Cartoons

- Gallagher, 2000: fMRI case, patients shown different cartoons requiring understanding of others perspectives to understand humor
 - Contrasting cartoons that do or do not require Dorsomedial Cortex

Theory of Mind Network

- Mars, 2012:
 - Dorsomedial Prefrontal Cortex
 - Temporo-parietal Junction
 - Sense of Self
 - Overlaps the default mode network (regions that are active by default)
 - Focus can cloud judgement of people (whether they are helpful or not)
 - Treat objects as people → Treat people as objects

How vs Why

- Spunt, 2012: fMRI study look at videos of people performing behavior or people reading about other people doing behavior, some asked to focus on how a person performs task, others asked on why person performs task
 - Examine differences between evaluating others actions and intentions

Theory of Mind vs Mirror Neuron System

- Spunt, 2012:
 - Mirror Neuron System encodes HOW
 - Premotor cortex, part of frontal lobe, prepares to do a movement
 - Ventrolateral Prefrontal Cortex (more concrete part)
 - Theory of Mind encodes WHY
 - Dorsomedial Prefrontal Cortex
 - Orbitofrontal Cortex: Helps understand others motivations for behaviors
 - Ventrolateral Prefrontal Cortex
 - Temporo-parietal Junction

Empathy and Fairness

- Singer, 2006: Monetary Prisoner's Dilemma, separate men and women
 - Empathy for others being shocked
 - In insula (pain and emotion)
 - Decreased empathy for unfair people
 - Greater difference for men
 - Decreased insula and Anterior Cingulate Cortex activity
 - Desire for revenge engages nucleus accumbens (only significant for men)

Social Emotions

- Warren, 2006:
 - Triumph, amusement, fear, disgust
 - Social emotion sounds engage the mirror neuron system
 - Positive more than negative

- Premotor cortex preparing

Social Laughter vs Real Laughter

- McGettigan, 2015: fMRI listening to real vs social laughter
 - Hearing fake laughter activates dorsomedial Prefrontal Cortex and Anterior Cingulate Cortex (Brain engaged on interpreting laughter)
 - Reflect on previous experiences with people

Social Brain Systems

- Hu, 2016: People given oxytocin or placebo, person gets choice to punish unfair player or reward good player or person watches computer make decision
- Oxytocin
 - Attachment
- Mirror Neurons
 - How a person behaves
- Theory of Mind
 - Why a person behaves
- These systems interact and inform each other

Difficult Conversations

- Anything you find hard to talk about
 - Sexuality, race, gender, religion, politics
 - Relationship issues
 - Any disagreement or conflict
- They are stressful
 - Uncertainty, uncontrollability, consequences
- Solution: Avoid or confront (Or is there a third option?)

It's generally not about what you think it's about

- Hardest conversations are often with oneself

Why we see the world differently

- Different information
 - Notice different things
 - Know ourselves better
- Different interpretations
 - Influenced by past experiences
 - Apply different implicit rules
- Out conclusions reflect self interest

Effective Communication

- Stephens, 2010: Telling a story during fMRI scanning
 - During effective communication
 - Synchronization in listener's brains
 - Some regions in listener lagged behind speaker
 - Insula, parietal regions, nucleus accumbens
 - Some regions in listener preceded speakers
 - Medial Prefrontal Cortex, orbitofrontal Cortex, dorsolateral Prefrontal Cortex, Nucleus Accumbens

Context Matters

- Yeshurun, 2017: Gave two groups of people exact same story between 3 coworkers, one group is told about marriage and cheating, other group told that wife was not cheating but husband suspected
 - Completely different reactions

Intent vs Impact

Emotional Predictors of Divorce and Satisfaction

- Gottman
- Graber 2011
- Frewen 2011 – Negative social processing needs more mPFC

- Contempt
- Criticism
- Defensiveness
- Stonewalling

Lecture 14: Technology

Advances make things easier

- Health
- Travel
- Stay Connected

Advances Change Expectations

Rapid pace of change can be:

- Exciting
- Stressful

Smartphones, Video Games, and Dopamine

- Dopamine released by novelty
- Dopamine released by surprises
 - Different is better (Pepsi logo changes)
- Dopamine released by accomplishing goals
 - Or moving towards goals

Technology and Addiction

- Wang, 2016
 - Smart phone addicts have reduced impulse control
 - Reduced Anterior Cingulate Cortex and Prefrontal Cortex gray matter (medial Prefrontal Cortex, Dorsolateral Prefrontal Cortex)
- Weng, 2012:
 - Online game addicts have reduced gray matter
 - Orbitofrontal cortex
 - Insula

Multitasking

- Buser, 2011: People engaged in similar mental tasks (sudoku and word search), three rounds, 1st round is single task for 10 minutes, 2nd round is single task followed by multitask for 10 minutes, 3rd group had choice of single and multitasking for 10 minutes
 - Switching attention requires prefrontal resources
 - Multitasking undermines productivity
 - Focus on one task

Multitasking Undermines Happiness

- Etkin, 2016: People were asked to do high variety of tasks over period of time or asked to do similar tasks for same period of time, ask people how much progress and how happy they had
 - Similar tasks were happier
 - Short Term happiness is similar, long term happiness is different

Physical Impact

- Reduced exercise
- Increased pain
 - Headaches
 - Posture problems
 - Back pain
 - Carpal Tunnel
- Sleep problems

Physical Impact

- Bravata, 2007: Measure amount of steps they were taking, look at amount of steps
 - Activity Monitoring: Increased amount of steps
- Brauner, 2013:
 - Gamification
 - Relies on nucleus accumbens

- Heart rate monitor, pedometer
 - Exergame, Pokemon Go
- Liang, 2016:
 - Sleep monitoring
 - Can cause sleep problems

Emotional Self-Awareness

- Kauer, 2012: Studied a mood-mapping app in 14-24 year olds
 - Self-monitoring increases Emotional Self Awareness, which in turn decreases depressive symptoms

Access to Healthcare and Information

- Johanasson, 2012: Internet-based Cognitive Behavioral Therapy with varying levels of support
 - Users lose motivation due to lack of interaction
- Aiken, 2012: Cyberchondria
 - 10% of patients freak out over information from online

Apps and Tools

- Ginger, This Way Up, Happify, SuperBetter, HeadSpace, Happy Not Perfect

Technology and Memory

- Working Memory
 - Dorsolateral prefrontal cortex
- Long-Term Memory
 - Hippocampus

Technology and Relationships

- Przybylski, 2012: Two strangers meet up and have a conversation Desk either had cell phone or book, asked for varying levels of conversation
 - Presence of cell phone impacts closeness, connection ,and conversation quality
 - Absence of cell phone did not effect surface level conversations

- Absence of cell phone did increase levels of trust, empathy, and connection on deeper conversations

Culture of Availability

- Benefits
 - Stay connected
 - Peace of mind
 - Unexpected messages are exciting
- Problems
 - Always connected
 - Unimportant interruptions
 - Signals to people you're with that they're less important
 - Uncontrollability and Uncertainty

FOMO

- Fear of missing out
 - Anxiety about social rejection
- Coping responses often reinforce the anxiety

Lecture 15: Art and Creativity

Is social media good for your health?

Facebook and Life Satisfaction

- Kross, 2013: Text people 5 times per day for 2 weeks to ask about mood and facebook use
 - Facebook use predicts negative shifts on both feelings and life satisfaction
 - Steers, 2014: Relationship between Facebook and depressive symptoms is mediated by social comparisons

Online Support

- Griffiths, 2012: Study compares 3 months of support group vs self help conducted on internet
 - Control, Self Help (course), Self Help (support group), Group with both
 - At 3 months, all groups improved equally
 - Online support is better than self-help in the long term (6-12 months)

Benefits of Social Media

- Gonzales, 2011: Managing your profile can improve self-esteem
- How you use social media dictates whether you benefit or not
- Newman, 2011: Selective sharing of information with supportive communities can improve

Benefits of the Arts

- Expression
 - Reduce stress
 - Elevate mood
 - Improve cognition
 - Greater enjoyment
 - Enhanced empathy
- Appreciation
 - Reduce anxiety
 - Elevate mood
 - Greater productivity
 - Improved theory-of-mind
- Kongkasuwan 2016 – In stroke recovery patients art therapy improved outcomes in depression, improve physical functions and quality of life compared to just PT
- Puetz 2013 – In cancer patients, creative art therapies reduced anxiety, depression, and pain
- DiBlasio 2015 – Expressive writing reduce depression and PTSD symptoms in women with post-partum depression

- McGarry 2011 – Dance therapy can enhance empathy via the mirror neuron system
- Lowe 2006 -writing emotional poetry improved immune function (related to improved mood)
- Noice 2004 – improved cognition in elderly patients from theater and visual arts
- Kidd 2013 – Reading literary fiction enhances theory of mind
- Nilsson 2009 – Listening to music post-operatively reduces stress and anxiety

Physiological Response to Music

- Bernardi, 2009:
 - Uniform emphasis reduced blood pressure
 - Crescendos increased blood pressure

Pleasure from Music

- Blond, 2001:
 - Intensely pleasurable music gives you chills
 - Correlated positively with:
 - Nucleus Accumbens
 - Insula
 - Anterior Cingulate Cortex
 - Correlated negatively with
 - Amygdala
 - Ventromedial Prefrontal Cortex

Pleasure from Music

- Blood, 2001:
- Goldstein, 1980: Endorphins may also play a role
 - Midbrain region that produces endorphins
 - Blocking endorphins with naloxone reduces thrills and chills from music

Relaxing Music

Nilsson, 2009: Study of soothing music for patients recovering from surgery

- Increased relaxation and reduced cortisol levels
- Increased oxytocin

VISUAL ART

Visual Arts and fMRI

- Lacey, 2011:
 - Art selectively activates nucleus accumbens and orbitofrontal cortex

Art Therapy

- Kongkasuwan, 2016:
 - In patients recovering from stroke, adding art therapy to physical therapy had many benefits
 - Physical function
 - Depression
 - Quality of Life
- Puetz, 2013: Meta-analysis of cancer patients, showed art therapy improved
 - Anxiety and depression
 - Pain symptoms
 - QOL

Effects of Awe and Wonder

- Chirico, 2017: Awe inspiring nature springs
 - Improved mood
 - Positive correlation between looking at awe inspiring nature and altruism
 - Improves immune function
 - Increases parasympathetic activity
 - Awe is interesting, because it does not change facial expressions the way most positive emotions do. There are different types of awe. It can be enjoyable, uncomfortable, or overwhelming, or even all of those. (Chirico 2017). It can be both energizing and calming at the same time.
- Stellar, 2015:

- Awe has stronger effects than other positive emotions (reduces proinflammatory cytokines). This was in a healthy sample, but people with depression tend to have higher inflammatory markers anyway.
- Joye, 2015:
 - Awe inspiring natural scenes (expansive mountain vistas, high waterfalls) improved mood the more than mundane nature or neutral images
 - Positive correlation between awe and mood improvement and between awe and altruism
 - In all “nature conditions” participants indicated felt more connected to others, more caring, and more spiritual than in the neutral condition.

Correlations with Awe

- Ishizu, 2014:
 - Activation of
 - Striatum
 - Parts of the lateral Prefrontal Cortex (imagination)
 - Hippocampus
 - Deactivation of default mode network regions
 - Decreased significance of self

Creativity and Flow

- Flow is achieved with a balance between challenge and abilities

Elements of Flow

- There are clear goals every step of the way
 - There is immediate feedback to one’s actions
- There is a balance between challenges and skills
 - Action and awareness are merged
 - Distractions are excluded from consciousness
 - There is no worry of failure
 - Self-Consciousness disappears

- The sense of time becomes distorted
- The action becomes for its own sake (autotelic)

Lecture 17: Lecture

PERMA Model of Wellbeing

- Positive Emotions
- Engagement
- Relationships
- Meaningfulness
- Accomplishments

Culture changes ourselves, our perceptions and our opinions, our ethics, our interactions, our depth, our meaning

Happiness across Cultures

- Ye, 2015: Analysis of cultures around the world who fill form about happiness
 - Subjective wellbeing (i.e. happiness and life satisfaction) is predicted by:
 - Higher GDP, Education, Human Rights (9%)
 - Higher Performance (11%)
 - Humaneness (8%)
 - Lower Power Distance (23%)
 - Degree to which individuals expect and agree that power should be unequally shared
 - Higher Gender Equity (17%)
 - Degree to which a society minimizes gender role differences

WEIRD People

- Western
- Educated
- Industrialized
- Rich

- Democratic

Two Main Types of Culture

- Individualistic Cultures
 - Values Independence
 - Each works for their own individual goals
 - USA, Europe, Western cultures
 - Higher Insecure-avoidant people
- Collectivist Cultures
 - Values cooperation
 - Working towards the family or group goals
 - Japan, Israel, Eastern cultures
 - Higher Insecure-resistant people
- Differences in Attachment

Self vs Other and the medial prefrontal cortex

- Zhu, 2007: Native and Western participants decided whether a given trait adjective described themselves, their mother, or an unrelated other
 - Similar medial Prefrontal Cortex activity when comparing self vs other
 - Different medial Prefrontal activity when comparing self vs other

Culture and Social Dominance

- Freeman, 2009: fMRI study of American and Japanese participants viewing silhouettes of bodies in either dominant or subordinate postures
 - Culturally congruent postures activated:
 - Nucleus Accumbens/Striatum
 - Medial Prefrontal Cortex
 - Americans mPFC flares up on dominant stance, Japanese mPFC flared up on subordinate stance

Culture and Emotion

- Park, 2016: Showed pictures of people with facial expressions which participants were in fMRI scanner
 - Different cultures value emotions differently
 - America prioritizes excitement, China prioritizes wisdom
 - Preferences are apparent in differential activation of Nucleus Accumbens in Chinese participants

Disgust is universal, specific things that disgust us are highly influenced by culture

- Eating dogs

Disgust

- Vicario, 2017: Basic human emotion
 - Recognized across cultures
 - Activates insula
 - Core Disgust: Infections, bad food
 - Mediated by orbitofrontal cortex and striatum
 - Social Disgust: Eating from same plate of food with friend
 - Mediated by orbitofrontal cortex and striatum
 - Moral disgust: Ethical violations (sleeping with cousin)
 - Mediated by medial Prefrontal Cortex

Moral Foundations Theory (Haidt)

- Graham, 2012:
 - Morality is agreed upon across political spectrum
 - Political identity's effects on moral decisions
 - Care (harm)
 - Fairness (cheating)
 - Loyalty (betrayal)
 - Authority (subversion)
 - Sanctity (degradation)
 - Liberty (oppression)

- Kanai, 2011:

Politics and the Brain

- Graham, 2012:
 - Liberals had greater gray matter volume in anterior singulate cortex (makes sense of things, manages conflicts)
 - Conservatives see things more black and white
 - Conservatives have more reactive amygdalas
- Kanai, 2011:

Understanding Each Other

- Adams, 2010:
 - People in this study were more accurate at mind-reading members of their own culture

Empathy and Racism

- Azevado, 2012: fMRI study viewing images of pain to own race and others people, images were people poked by either needle or Qtip
 - Decreased empathy-related activity for other races