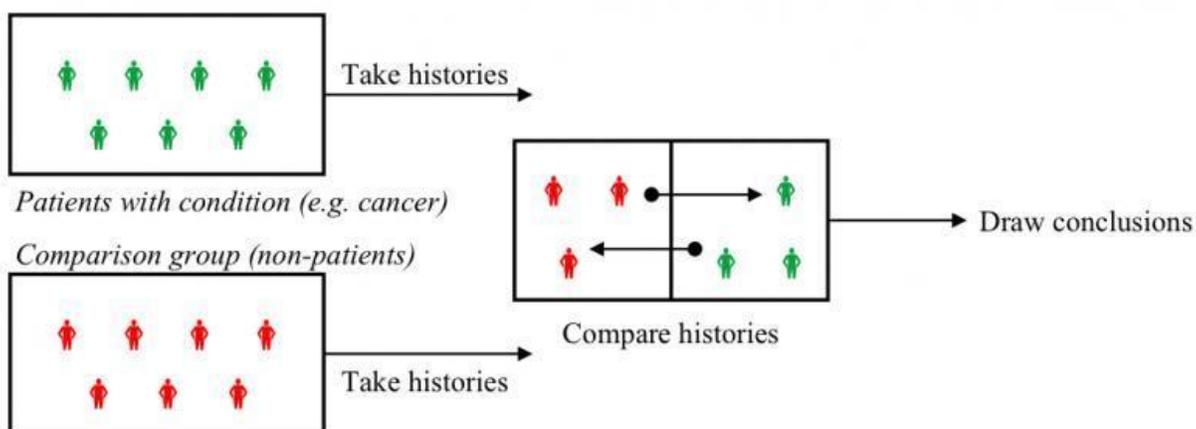


## Misc terms

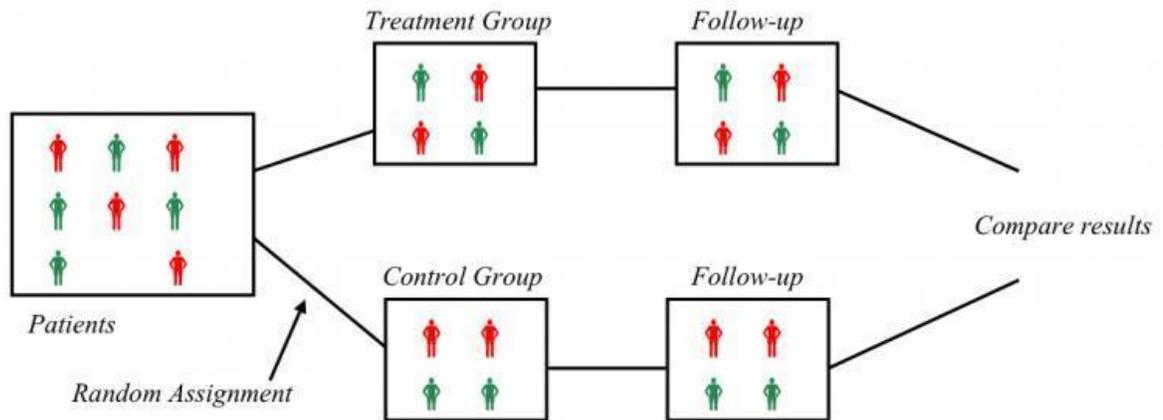
**Regression to the mean** – if first measurement is extreme, second measurement will be closer to the mean. Repeated testing that leads to extreme measurements becoming more normal is called regression toward the mean.

## Study Types

- **Cross-sectional study** – look at a group of *different* groups of people (ex. a population) *at a specific point in time*.
  - ex. study that looks at prostate cancer rates between 20 y/o, 50 y/o, and 80 y/o
- **Longitudinal study** – data is gathered for the same subjects repeatedly over a period of time (ex. years or decades). Subjects don't necessarily share a common characteristic.
  - **Ex. Cohort study** – following a particular cohort of the population over a period of time. A cohort is a group of people who share a defining/common characteristic (ex. people born at the same time, people exposed to same pollutant/drug/etc.)
    - A retrospective cohort design looks back at events that have already taken place.
    - A prospective cohort design follows a group of individuals over a period of time.
- **Case-control study** (retrospective study) – observational study where 2 groups differing in outcome are identified and compared to find a causal factor (i.e. what was one group exposed to that the other wasn't?). ex. comparing people with the disease with those who don't but are otherwise similar.



- **Clinical trial** - highly controlled interventional studies
  - **Randomized Controlled Trial (RCT)** – participants are randomly assigned into their study treatments. Often used to test efficacy/side effects of medical interventions like drugs. Gold standard for a clinical trial.



- **Experimental design/study** – participants are allocated to the different conditions in an experiment, conditions are manipulated such that they are different between groups
- **Quasi-Experimental Design** - lacks random assignment. This type of design describes an effect on a specific cohort of the population.
- **Observational Study** - In an observational study, the researcher is unable to control or manipulate the assignment or conditions of groups (typical of longitudinal and cross-sectional studies) ('opposite' of experimental studies)
- **Self-Report Study:** Cheap and not labor intensive. Potential for poor reliability, vulnerable to subjective interpretation, hard to compare with those from other measures.
  - Ex. survey, questionnaire, poll, interview.
  - May include open questions (qualitative data) or closed questions (quantitative data)

## Reliability

**Reliability** – degree to which a specific assessment tool produces stable, consistent, and replicable results (i.e. any significant results must be more than a one-off finding and must be inherently repeatable)

- **Internal reliability:**
  - **Split-Half Method** – a method to assess the internal consistency of a test. It measures the extent to which all parts of the test contribute equally to what is being measure.
    - It is done by comparing the results of one half of a test with the results of another half. If the two halves of the test provide similar results, this would suggest that the test has internal reliability.
- **External reliability:**
  - **Test-retest reliability:** measure of reliability in obtaining similar scores over time (shown by a high positive correlation between the first, second, third... administration of a test)
    - ex. high test-retest reliability if 3 IQ tests taken on consecutive days produce similar results

- **Inter-rater reliability:** measure of the degree to which two different researchers or raters agree in their assessments (consistency when two different people measure the same thing)
  - ex. low inter-rater reliability if five Olympic judges of diving vote 2,5,6,6,10, while high if they voted 8,9,8,8,7

Types of Reliability	
<p><b>INTERNAL</b> (extent to which a measure is consistent within itself.)</p> <hr/> <p><b>split-half method:</b> measures the extent to which all parts of the test contribute equally to what is being measured.</p>	<p><b>EXTERNAL</b> (the extent to which a measure varies from one use to another.)</p> <hr/> <p><b>test re-test:</b> measures the stability of a test over time.</p> <hr/> <p><b>Inter-rater:</b> to the degree to which different raters give consistent estimates of the same behavior</p>

## Validity

**Validity** – how well an experiment/test measures what it claims/tries to measure.

### Internal validity

- Concerned with whether the results of a study properly demonstrate a causal relationship between two variables.
- It is a measure which ensures that the experiment design closely follows the principle of cause and effect, and ensures that the observations and results can't be explained by an alternative cause (confounding variable).

### External validity

- Concerned with whether results can be generalized to other settings or populations.
- Split into two distinct types:
  - **Population Validity:**
    - Evaluates whether the sample population represents the entire population, and whether the sampling method is acceptable.
    - To protect population validity, the sample must be completely random and sample groups should be as representative as possible.
    - ex. Looking to generalize the finding of a study to cover children at every US school. An educational study that looked at a single school would have very low population validity, while a study that looked at every pupil of a certain age group would have exceptionally strong population validity.
  - **Ecological Validity:**

- Evaluates the testing environment and determines how much it influences behavior.
- To protect ecological validity, all situational variables must be tightly controlled, such that the testing environment itself has minimal (if any) effect on behavior.
- ex. study that wants to generalize the results from an experiment which involved pupils taking a test. If pupils are used to regular testing, then the ecological validity is high because the testing process is unlikely to affect behaviour. On the other hand, taking each child out of class and testing them individually, in an isolated room, will dramatically lower ecological validity, since the child may be nervous and is unlikely to perform in the same way as they would in a classroom. Generalization now becomes difficult, because the experiment does not resemble the real world situation.

### Test validity

- A measure of how much meaning can be placed upon a set of test results
- **Criterion validity**
  - Assess whether a test reflects a certain set of abilities by either calibrating it against a known standard or against itself, or its ability to predict future abilities.
  - **Concurrent validity**
    - *Comparing the test with an established benchmark*
    - Measures the test against a benchmark test
    - High correlation indicates that the test has strong criterion validity
    - Ex. statistically analyzing a new intelligence test against a standard IQ test. If there is a high correlation between the two data sets, then criterion validity is high
  - **Predictive validity**
    - Measures how well a test predicts abilities.
    - Involves testing a group of subjects for a certain construct and then comparing them with results obtained at some point in the future.
    - Ex. using high school GPA to predict 1<sup>st</sup> year university grades. If there is a strong correlation between the two, then we say that high school tests have strong predictive validity.
- **Content validity**
  - Concerned with whether a measure represents every single element of a construct.
  - ex. an educational test with strong content validity will represent the subjects actually taught to students, rather than asking them unrelated questions.
- **Construct validity**
  - Defines how well a test or experiment measures up to its claims, whether a scale or test measures a construct adequately.
  - It refers to whether the definition of a variable actually reflects the true theoretical meaning of a concept.
  - ex. you might want to know whether an educational program increases artistic ability. Construct validity is a measure of whether your research *actually measures* artistic ability.
  - Important when a measured variable is somewhat abstract or qualitative.
  - **Convergent validity**
    - Tests that constructs that are expected to be related are, in fact, related

- Ex. researcher wants to measure self-esteem, but knows that two other constructs (confidence and social skills) are related to self-esteem and have some overlap. The ultimate goal is to isolate self-esteem. The researcher would check that confidence and social skills are in fact related.
- **Discriminant/Divergent validity**
  - Tests that constructs that should have no relationship do, in fact, not have any relationship
  - Ex. in the above example, the researcher would check that self-esteem and other constructs that are believed not to overlap (ex. intelligence) truly *do not* overlap.

### **Face validity**

- A measure of how representative a research project is 'at face value', and whether it appears to be a good project.
- The degree to which a lay person who takes a superficial look at an experiment agrees that an experimenter is measuring what they say they are measuring.
- Face validity is a weak measure of validity, since it is more general, but is still used
- Ex. after a group of students sat a test, you asked for feedback, such as whether they thought the test was a good one. This enables refinements for the next research project and adds another dimension to establishing validity.

## **Variables**

An **independent variable** in a study is manipulated, whereas the **dependent variable** is the factor in a study that is expected to change based on manipulation of the independent variable.

- ex. The executives are manipulating price (independent variable) and expect to see changes in sales (dependent variable)

**Confounding variables** – changes in dependent variable may be due to existence of or variations in a third variable

- A confounding variable is a third variable in an experiment that could provide an alternative explanation to the relationship between the variables of interest.

**Temporal confounds** – time-related confounding variables (ex. doing an experiment on allergies during spring – pollen allergies could be a temporal confound that would not be present had the study been done in winter)

**Good-subject tendency** – the tendency of participants to act according to what they think the experimenter wants.

**Counterbalancing** – a method to control for any effect that the *order* in which stimuli are present might have on the dependent variable.

**Practice effects** are considered a common subtype of **order effects**. Practice effects can be defined as influences on performance that arises from a practicing a task. Even after practice trials are performed in/for a study, participants have a tendency to perform initial trials poorly because they are still not warmed up to it. Performance can, however, improve after more trials are conducted because this allows participants to become more accurate and a lot quicker. Participants' performance may decrease again, however, because they do have a tendency to become bored and/or fatigued after a while.

**Carry-over effects** are when participants respond in a more biased manner to later questions because of any earlier questions.

### Types of Control groups

- **Vehicular control** – control that follows the *treatment* of the experimental group but without the desired effect
  - ex. experimental group gets a drug dissolved in saline and injected intravenously, then the vehicular control group would get just an intravenous injection of saline to ensure that the effect seen is due to the drug and not the vehicle (saline injection)
  - ex. injecting an empty viral vector into the vehicular control group and a viral vector expressing your gene of interest into the experimental group (viral vector is the vehicle).
- **Positive control** – group gets treatment with known and expected response
- **Negative control** – group gets treatment with no response expected

## Hypotheses and Error Types

**Null Hypothesis ( $H_0$ )** – a statement that suggests there is no relationship between two variables.

- The opposite of what you're testing
- Looking to reject the null hypothesis

**Alternative Hypothesis ( $H_a$ )** – a statement that suggests there *is* a relationship between two variables

- 'Opposite' of the null hypothesis
- The claim you're testing

**Type I error** – Accepting a true null hypothesis

**Type II error** – Rejecting (failing to accept) a false null hypothesis

**Type I**   **Type II**

T  $H_0$    F  $H_0$   
rej.   acc.

(T = true, F = false)

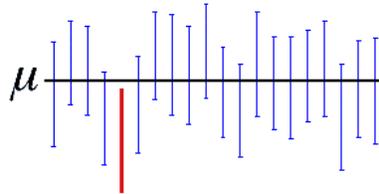
**Type I and II errors are in reference to rejecting/accepting true/false null hypothesis**

- Type I = Rejecting a true null hypothesis = Accepting a false alternative hypothesis (false positive)
- Type II = Accepting a false null hypothesis = Rejecting a true alternative hypothesis (false negative)

$\alpha$  – the probability of making a Type I error (significance level)

**Confidence Interval** – the probability of *not* making a Type I error (C.I. =  $1 - \alpha$ )

- **C.I.** = a range of values that is likely to contain an unknown population parameter
- If you draw a random sample many times, a certain percentage of the C.I. will contain the population mean. This percentage is the **confidence level**
- Ex. a 95% confidence level implies that 95% of samples from the same population will produce confidence intervals that contain the true population parameter



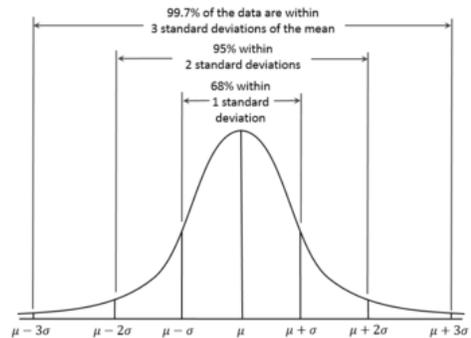
$\beta$  – the probability of making a Type II error

**Power** – the probability of *not* making a Type II error (power =  $1 - \beta$ )

- The probability that the test will correctly reject the null hypothesis when it is false (i.e. alternative hypothesis is true)
- Greater power = Less type II errors (false negatives)

**68 95 99.7 rule of normal distribution**

- 68% of data is within 1 S.D. of the mean
- 95% of data is within 2 S.D. of the mean
- 99.7% of data is within 3 S.D. of the mean



## Types of Bias

**Bias:** Failure to be objective (i.e. failure to not be influenced by personal feelings or opinions)

**Hindsight bias (knew-it-all-along effect) (creeping determinism)** – the inclination, after an event has occurred, to see the event as having been predictable, despite there having been little or no objective basis for predicting it.

**Normalcy Bias** – a bias to underestimate both the possibility of a disaster occurring and its possible effects. People have a bias to believe that things will always function the way things normally function.

**Reconstructive bias** – memories of the past are not as accurate as we think, especially when we are remembering times of high stress.

**Attrition bias** – a source of biases caused by attrition (loss of participants) whereby trial subjects that did not run to completion are discounted, and if some differing characteristic of that participant would have been related with the trial's outcome, a bias is introduced.

**Social desirability bias** – a response bias that is the tendency of survey respondents to answer questions in a manner that will be viewed favorably by others.

**Selection/Sampling bias** – a bias in which a sample is collected in such a way that some members of the intended population are less likely to be included than others, meaning that the **sample obtained is not representative of the population**.

**Subjective Bias** – a bias by which a person will consider a statement or another piece of information to be correct if it has any personal meaning or significance to them

- ex. looking at reviews for a product while online shopping, and coming across one review that was written by someone your age, height, sex, ethnicity, and with similar interests, making you relate to them on a personal level. You consider their ideas to be the most valid, and use their opinion to make your decision.
- Subjective = based on/influenced by personal feelings, tastes, and opinions
- Objective = not influenced by personal feelings, tastes, or opinions

**Implicit bias** – a bias to understand, act, or make decisions in a particular unconscious manner based on implicit attitudes or stereotypes. These biases, which encompass both favorable and unfavorable assessments, are activated involuntarily and without an individual's awareness.

- ex. associating back people with criminality without even realizing you're doing it

**Cognitive bias** – the tendency to *think* in certain ways. Cognitive biases often cause deviations from a standard of rationality or good judgment.

**Procedural bias** – researchers put some sort of pressure on subjects to provide responses (ex. monetary incentive, rushing the participant, etc.)

#### **Fairness:**

- The fairness of an exam refers to its freedom from any kind of bias.
- The exam should be appropriate for all qualified examinees irrespective of race, religion, gender, or age.
- The test should not disadvantage any examinee, or group of examinees, on any basis other than the examinee's lack of the knowledge and skills the test is intended to measure.
- Item writers should address the goal of fairness as they undertake the task of writing items.
- In addition, the items should also be reviewed for potential fairness problems during the item review phase. Any items that are identified as displaying potential bias or lack of fairness should then be revised or dropped from further consideration.

### Types of analysis:

- **Content Analysis** – a method for summarizing any form of **content** by counting various aspects of the **content** (qualitative → quantitative)
- **Social network analysis (SNA)** – the process of investigating social structures through the use of network and graph theories.

**Participant observation** – a type of data collection whereby the observer participates in ongoing activities and records observations. Participant observation extends beyond naturalistic observation because the observer is a "player" in the action.

- Its aim is to gain a close and intimate familiarity with a given group of individuals (such as a religious, occupational, sub cultural group, or a particular community) and their practices through an intensive involvement with people in their cultural environment, usually over an extended period of time.
- ex. Karl Pilkington learning about different cultures in 'An Idiot Abroad'
- **Reactivity** – refers to the way that, since the observer is a participant in the activities and events being observed, it is easy to influence other people's behavior, which influences what is observed.

**Embedded Field Study** – researcher poses as a participant in the study

- A type of participant observation whereby the researcher would assume the role of a participant or the role of a community member that they wish to study.
- Ex. studying a hospital ward, the researcher might get admitted as a patient to that ward. This reduces the barrier between your role as the researcher and the role as the participant or community member.

**Operationalization** – the process of strictly defining variables into measurable factors. The process defines 'fuzzy' concepts and allows them to be measured, empirically and quantitatively. Allows for the establishment of a causal relationship between variables. You want to manipulate the variable at varying levels for this to occur.

- Ex. colours → colour codes

**Demand Characteristics** – experimental artifact where participants form an interpretation of the experiment's purpose and subconsciously change their behaviour to fit that interpretation.

### Types of relationships:

- Unidirectional Relationship: Cause → effect
- Reciprocal Relationship: Cause ↔ effect

### Reciprocity

- Reciprocity is a social rule that says we should repay, in kind, what another person has provided us. That is, people give back the kind of treatment they have received from you. By virtue of the rule of reciprocity, we are obligated to repay favors, gifts, invitations, etc. in the future. If someone remembers us on our birthday with a gift, a reciprocal expectation may influence us to

do the same on their birthday. This sense of future obligation associated with reciprocity makes it possible to build continuing relationships and exchanges. Reciprocal actions of this nature are important to social psychology as they can help explain the maintenance of social norms.

- Individuals who benefit from the group's resources without contributing any skills, helping, or resources of their own are called free riders. Both individuals and social groups often punish free riders, even when this punishment results in considerable costs to the group. So, it is unsurprising that individuals will go to great lengths to avoid being seen as a moocher or free loader.

**Response Rate** – a part of survey researcher than looks at the number of people who answered the surface divided by the total number of people in the sample.

**Completion rate** – the number of surveys started by respondents divided by the number of surveys started by respondents.

**Word association test** – instructed to respond with the first word that comes to mind after given a cue word (by Freud)

- “the connection and production of other words in response to a given word, done spontaneously as a game, creative technique, or in a psychiatric evaluation”
- “I say apple, you say hungry”

**Implicit Association Testing (IAT)** – a test to detect the strength of a person’s automatic association between concepts

- ex. given a word and asked to categorize into one of two categories:
  - White / Good
  - Black / Bad
- Same thing done but given two different categories:
  - White / Bad
  - Black / Good
- Might take longer in the second case if the person has an association between black and bad.

**Operational Span Testing** – A task in which subjects are asked to perform a simple mathematical verification (e.g.,  $4/2 + 1 = 3$ ) and then read a word, with a recall test following some number of those verify/read pairs. The maximum number of words that can be recalled is the "operation span"

- Used to argue that a general pool of resources is used in every type of working memory.

**Psychophysical discrimination testing** – varying a physical stimulus slightly and observing the effect on a subject’s experience or behaviour, in order to better understand perceptual processing (ex. slightly change the distance between two objects until subject notices a difference)

- In discrimination experiments, the experimenter seeks to determine at what point the difference between two stimuli, such as two weights or two sounds, is detectable.
- A way to [directly assess our perception of stimuli in relation to their true physical properties](#).

**Methods of Limits** (a type of psychophysical discrimination testing) – In the ascending method of limits, some property of the stimulus starts out at a level so low that the stimulus could not be detected, then

this level is gradually increased until the participant reports that they are aware of it. For example, if the experiment is testing the minimum amplitude of sound that can be detected, the sound begins too quietly to be perceived, and is made gradually louder. In the descending method of limits, this is reversed. In each case, the threshold is considered to be the level of the stimulus property at which the stimuli are just detected.

- In experiments, the ascending and descending methods are used alternately and the thresholds are averaged.
- A possible disadvantage of these methods is that the subject may become accustomed to reporting that they perceive a stimulus and may continue reporting the same way even beyond the threshold (the error of habituation).
- Conversely, the subject may also anticipate that the stimulus is about to become detectable or undetectable and may make a premature judgment (the error of anticipation).

**Method of Constant Stimulation** – Instead of being presented in ascending or descending order, in the method of constant stimuli the levels of a certain property of the stimulus are not related from one trial to the next, but presented randomly. This prevents the subject from being able to predict the level of the next stimulus, and therefore reduces errors of habituation and expectation. For 'absolute thresholds' again the subject reports whether he or she is able to detect the stimulus. For 'difference thresholds' there has to be a constant comparison stimulus with each of the varied levels.

**Method of Adjustment** (aka **method of average error**) - The method of adjustment asks the subject to control the level of the stimulus, instructs them to alter it until it is just barely detectable against the background noise, or is the same as the level of another stimulus. This is repeated many times. In this method the observer himself controls the magnitude of the variable stimulus beginning with a variable that is distinctly greater or lesser than a standard one and he varies it until he is satisfied by the subjectivity of two. The difference between the variable stimuli and the standard one is recorded after each adjustment and the error is tabulated for a considerable series. At the end mean is calculated giving the average error which can be taken as the measure of sensitivity.

Two aspects of generalizability:

- **Generalizing to a population** – applying results from a study sample to the larger population (from which the sample was originally selected)
- **Generalizing to a theory** – moving from observations to hypotheses. Requires time- and place-specific observations to create a universal hypothesis.
  - ex. observation that 647/649 lung cancer patients in London hospitals were smokers. This led to more researcher studies, with increasing sample sizes, with differing groups of people with differing amounts of smoking, etc.
  - When the results were found to be consistent across person, time, and place, the observations were generalized to the hypothesis that cigarette smoking causes lung cancer.

**Social group** – two or more people who interact with one another, share similar characteristics, and collectively have a sense of unity (however, some theorists are wary of definitions which stress the importance of interdependence or similarity)

- **Exogamy** – a social arrangement where marriage is allowed only outside a social group. The social groups define the scope and extent of **exogamy**, and the rules and enforcement mechanisms that ensure its continuity.
- **Endogamy** – the practice of marrying within a specific ethnic group, class, or social group, rejecting others on such a basis as being unsuitable for marriage or for other close personal relationships.
- **Homogamy** – marriage between individuals who are, in some culturally important way, similar to each other.
  - Homogamy may be based on socioeconomic status, class, gender, ethnicity, religion, or age.
- **Heterogamy** – marriage between two individuals who are culturally different.
- **Homophily** – the tendency for people to choose relationships with other people who have similar attributes. People often prefer mixing with those who are similar to themselves.
- **Heterophily** – is the tendency of individuals to collect in diverse groups; it is the opposite of homophily.

#### Brain regions involved in specific emotions:

- **Orbitofrontal cortex:**
  - Associated with the processing of both positively and negatively balanced emotions.
    - Right hemisphere – primarily processes negative emotions
      - When activity is lowered in the right hemisphere, euphoria is experienced.
    - Left hemisphere – primarily processes positive emotions
      - When activity is lowered in the left hemisphere, depression is reported.
    - *Mnemonic: think of a guy OBRITING the FRONT of the brain's CORTEX. When he is LEFT there, he is happy, but gets sad when you remove him because he feels like it is his RIGHT to be there.*
  - Vision, taste, olfaction, and touch are all first integrated in the orbitofrontal cortex.
- **Subcallosal cingulate**
  - Involved in the recognition of facial expressions associated with **sadness**
  - *Mnemonic: think of a CALLOSED man eating a SUB, who has been CINGLE for so long that he can recognize the FACIAL EXPRESSIONS ASSOCIATED WITH SADNESS on other people who have also been single for so long*
- **Insula and basal ganglia** are most often associated with **disgust**.
  - The anterior insula receives signals from the senses of olfaction and gustation (mouth/nose are in front of body), while the posterior insula receives signals from audition and somatosensation (rear of body)
  - *Mnemonic: INSULIN injections were originally pretty BASic and DISGUSTING (pig insulin was used)*

- Most perception of *warmth* also occurs in the insula. (*Mnemonic: INSULAted = WARMTH*)
- **Left superior temporal sulcus** is associated with **anger**
  - *Mnemonic: ANGRY* Budda with his LEFT toe missing, sitting ANGRLY at the SUPERIOR TEMPLE thinking 'this SUCKS'
  - Damage to the basal ganglia causes problems recognizing angry facial expressions.

### Memory techniques:

- **Mnemonic link system** – utilizes order and connections (links) to facilitate memory recovery. It is a method of remembering lists based on creating an association between elements of that list
  - Ex. memorize the list (dog, envelope, thirteen, yarn, window) by creating a story about a “dog stuck in an envelope, mailed to an unlucky thirteen black cat playing with yarn by the window)
  - Story is easier to remember than the list itself.
- **Chunking techniques** – long strings of information are reduced into shorter, more manageable chunks

**Prosopagnosia** – a neurological disorder characterized by the inability to recognize familiar faces, including self-recognition of one’s own face.

- The area damaged in this disorder is the **fusiform gyrus** – part of the visual system in the brain that plays a role in high level visual processing and recognition (part of temporal and occipital lobe)

**Temporal lobes** – responsible for processing auditory signals, interpreting visual stimuli, and language recognition.

**Parietal lobes** – responsible for spatial reasoning and receiving somatosensory information.

**Visual agnosia** – inability to recognize an image. Disorder of the ventral pathway (acronym: **V**isual = **V**entral)

**Synesthesia** – a neurological phenomenon in which stimulation of one sensory or cognitive pathway leads to automatic, involuntary experiences in a second sensory or cognitive pathway.

**Ca<sup>2+</sup>** = indicator of chelation. This positively charged ion is extremely versatile. A rise in this ion, post-synaptically, in dendritic spines is essential for activity-dependent plasticity. This ion is an important second messenger in the neuron. Abnormal amounts of signaling in this ion has been implicated in disease states such as Huntington’s, Alzheimer’s and schizophrenia.

### Doctor-patient relationship

- **Beneficence** – actions that promote the well-being of others (either by removing harms or improving situation)

- Resuscitating a drowning victim, providing vaccinations for the general population, encouraging a patient to quit smoking and start exercising.
- **Non-maleficence** – “do no harm” – the avoidance of harm or hurt
  - Physicians must refrain from providing ineffective treatments or acting with malice towards patients.
  - This principle offers little useful guidance to physicians, since many beneficial therapies also have serious risks.
  - Examples: stopping a medication that is shown to be harmful, or refusing to provide a treatment that has not been shown to be effective.
- **Autonomy** – the capacity to be one’s own person, to live one’s life according to reasons and motives that are taken as one’s own and not the product of manipulative or distorting external forces.
  - Beneficence and non-maleficence may in certain circumstances mean failing to respect a person’s autonomy.
- **Informed Consent** – the process by which the treating health care provider discloses appropriate information to a competent patient so that the patient may make a voluntary choice to consent to (or refuse) treatment.

#### Drug classes

**Antipsychotics drugs** (aka **major tranquilizers** or **neuroleptics**) – a class of psychiatric medication primarily used to manage psychosis (including delusions, hallucinations, paranoia or disordered thought)

- Uses:
  - Principally for schizophrenia and bipolar disorder
  - Increasingly being used in the management of non-psychotic disorders (such as anxiety seen in dementia, OCD, and anxiety disorders)
- Typical antipsychotics (or 1<sup>st</sup> generation, such as **neuroleptics**):
  - MoA – block DA pathways
  - Effects:
    - Tend to decrease positive symptoms of schizophrenia but can increase negative symptoms
    - Parkinsons-like symptoms due to causing disabilities in extrapyramidal motor control
- **Atypical antipsychotics (AAP** or 2<sup>nd</sup> generation antipsychotics, SGAs)
  - MoA – block DA pathways *but also* block serotonin too.
  - Effects:
    - Less likely to cause extrapyramidal motor control disabilities (i.e. less likely to cause Parkinson’s-like movements)
    - Less likely to cause negative symptoms (such as low mood)
    - However, come with an increased risk of stroke, cardiac death, blood clots and diabetes.

**Thomas theorem** – a theory of sociology which states ‘If someone defines a situation as real, then it is real in its consequence’. In other words, the interpretation of a situation causes the action.

- If you believe something (perception of a situation), it will affect your behavior or action (regardless of reality)
- Mnemonic: “In THEORY, if we DEFINE THOMAS the Tank Engine as REAL, it becomes real as a CONSEQUENCE”
- Ex. Guy in prison with a violent history thinks other people in the prison are talking about him even though they aren’t (define a situation as real, even if it’s not), but since he thinks they are, he goes over and hits them (consequence)
- Ex. boy is scared of because he thinks ghosts are in his room, so he stays up worrying and doesn’t sleep. The consequence (worrying, not sleeping) is real, simply because the boy *defined the situation* as real. His action is determined by his belief, not reality.

### Touch and sensation:

- **Haptic perception** is the exploration of objects through touch, most often by the hand or fingers.
  - **Active touch** occurs when a person uses haptic perception to actively inspect an object.
  - **Adaptation** is at the sensory level, and habituation is at the perceptive/cognitive level
  - **Phantom pain** is the perception of pain in an area of the body which has been removed or lost due to injury.
  - **Tonotopy** is the special mapping of sound frequencies that are processed by the brain, also called the tonotopic map.
  - The **dermatome** is an area of skin with sensory nerve fibers from a single posterior spinal root ganglion.
  - The **connectome** is a neural map of the connections within the brain.
  - The **homunculus** is a cortical body map of how different areas of the skin are represented in the primary somatosensory cortex
- 
- **Interference** occurs when the participant takes longer to read a word because it is more *emotionally charged* than a neutral word.
  - The **Stroop effect** is a demonstration of interference in the reaction time of a task.
    - When the name of a color (e.g., "blue", "green", or "red") is printed in a color not denoted by the name (e.g., the word "red" printed in blue ink instead of red ink), naming the color of the word takes longer and is more prone to errors than when the color of the ink matches the name of the color.

**Agoraphobia** – a fear of open spaces, crowds, malls, busses etc. due to a perception that the environment is unsafe with no easy way to get away

- *Mnemonic: think terrorist attacks causing GORE and the panic that people face when they have NO WAY TO GET AWAY.*

Drugs:

- LSD – serotonin neurotransmission
- Nicotine – CNS stimulant by working as an ACh agonist.
- Amphetamine – DA r/u blocker
- Alcohol – CNS depressant

Schizophrenia

- Positive symptoms are delusions, neologisms, and hallucinations (addition of something that others don't experience)
  - Mesolimbic pathway – associated with reward, motivation, and many of the positive symptoms of schizophrenia.
- Negative symptoms describe loss of emotional affect and social withdrawal (loss of something that others do experience)
  - Mesocortical pathway – associated with the negative effects of schizophrenia

Dopamine release in the tuberoinfundibular pathway inhibits prolactin release in the pituitary.

The nigrostriatal pathway is associated with motor planning and purposeful movement

Hypochondriac - a person who is abnormally anxious about their health.

Illness anxiety disorder - Individuals diagnosed with illness anxiety disorder are often more concerned with illness or the idea of being ill and often lack or have minimal somatic symptoms.

The DSM-5 describes paraphilia as any intense and persistent sexual interest other than genital stimulation or fondling in phenotypically normal, physically mature, and consenting human partners. Paraphilias include sexual sadism (inflicting humiliation, bondage, or suffering), masochism (being humiliated, bound, or suffering), transvestic (sexually arousing cross-dressing), in addition to voyeurism (spying on others) and frotteurism (touching or rubbing genitals against a nonconsenting individual), and pedophilia (sexual focus towards children).

- **Teratogen** – a substance or environmental factor that can disrupt normative fetal development.
- **Phenylketonuria** – genetic problem (so consumption of diet soda during pregnancy would not directly cause phenylketonuria)
- **Polycystic kidney disease** – genetic problem.
- **Autism spectrum disorder** – not a birth defect

Neuropeptide Y in humans inhibits the feeding circuit, blocking satiety. The inhibition caused by peptide Y may cause the inhibition of other neurotransmitters such as cholecystokinin (CCK), which limits meal size by sensing the distention of the duodenum. This may cause eating without being sensitive to the signals that the individual is full.

The **paraventricular nucleus** (PVN, PVA, or PVH) is a neuronal nucleus in the hypothalamus. It contains groups of neurons that can be activated by stressful and/or physiological changes. Many PVN neurons

project directly to the posterior pituitary where they release oxytocin or vasopressin into the general circulation. Other PVN neurons control various anterior pituitary functions, while still others directly regulate appetite and autonomic functions in the brainstem and spinal cord.

**Short-term maturation effects** – physiological changes that can occur during a very short time period (hours to days) that causes peoples behavior to change. Ex. good mood -> bad mood. These can affect outcome measurements and therefore reduce the internal validity of an experiment.

**Sensory stimulus** – refers to the type of information being received by your receptors which elicits a response, ex. light, heat, touch, sound, etc.

**Proximal stimulus** – the stimulation that actually occurs when your sensory receptors are activated - the neural activity.

- The physical stimulation that is available to be measured by an observer's sensory apparatus.
- It can also refer to the neural activity that results from sensory transduction of physical stimulation.
- The patterns of stimuli from distal stimuli that actually reach your senses (eyes, ears, etc.)

**Distal stimulus** – the actual stimulus or object in the real world that you end up sensing and then perceiving, which results in the proximal stimulus.

- Objects and events out in the world around you – the object that provides information for the proximal stimulus

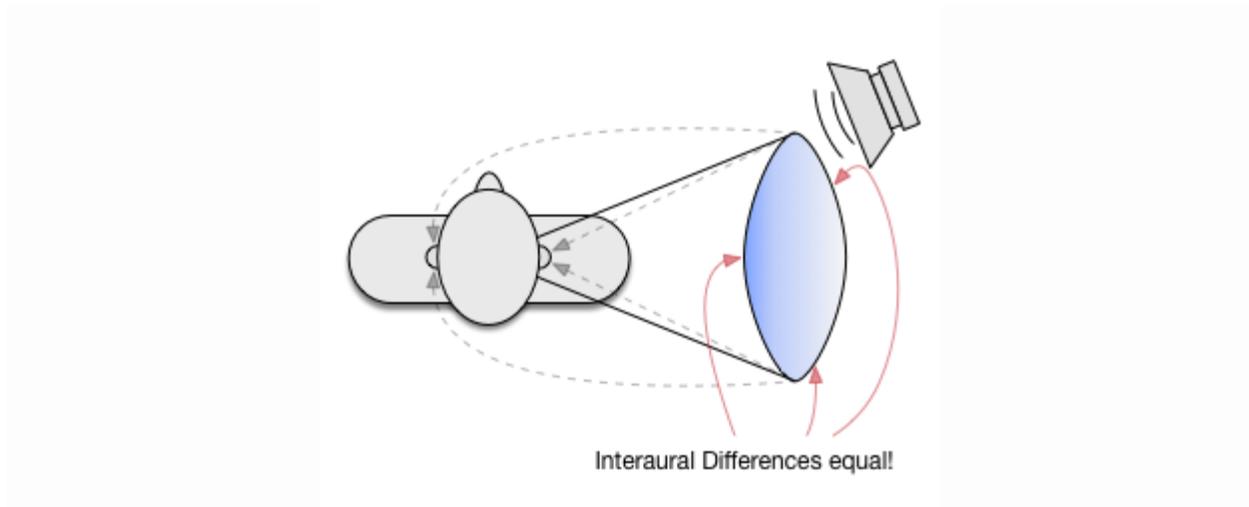
“The **distal stimulus** is an object which provides information for the proximal stimulus. The **proximal stimulus** registers, via sensory receptors, the information given by the distal stimulus”

- Ex. a person looking at a shoe on the floor. The shoe itself is the distal stimulus. The image recorded onto the person's retina (sensory receptor) is proximal stimulus.
- Ex. the ringing of the telephone is the distal stimulus. The sound being recognized and understood as the ringing of a telephone, by our sensory receptors, is the proximal stimulus.

Sound localization

- **Interaural time difference** – the difference in time it takes a sound to reach the left vs the right ear.
- **Interaural level difference** – the difference in sound pressure level between the ears.

- The head dampens the overall sound to the far ear and reduces the intensity of the high frequency tones, but not the low frequency tones (same reason why we can hear really bass-y sounds through walls but not treble-y sounds)
- Most mammals are proficient at resolving the location of a sound source using interaural time and level differences. However, a sound source located on any point on the surface of the **cone of confusion** will produce the same interaural time and level differences, such that the listener will be incapable of determining whether the sound originated from the back, front, top, bottom, etc.
  - Tilting one's head will remove any ambiguities.



## NTs

- GABA is the primary inhibitory neurotransmitter in the CNS
  - It plays the principal role in reducing neuronal excitability throughout the nervous system, and is found in decreased levels in patients with anxiety disorders.
- Monoamines (NE, Serotonin, and DA) are involved in mood regulation, and are also used by the hypothalamus to manage the endocrine system.
  - DA is most often associated with reward, learning, and attention.
  - Serotonin is most often associated with mood, appetite, social behavior, and memory.
- Hypocritin (aka orexin) works in the CNS to control sleep, arousal, wakefulness, and appetite.

**Temporal monotonicity** – Imagine two identical sequences of experiences, to one of which an improvement is added. Temporal monotonicity means that the changed sequence will be preferred to the unchanged one or, while if you worsen part of it, the unchanged sequence will be preferred.

- Ex. adding more pain at the end of a painful will worsen the retrospective evaluation of the experienced pain and adding pleasure at the end will enhance the retrospective evaluation.

Posner and Snyder described an action as automatic if the *action did not affect other mental activities*.

The buildup of acetaldehyde causes symptoms such as nausea, headache, flushing of the face, and internal organ damage.

### Sleepiness and caffeine

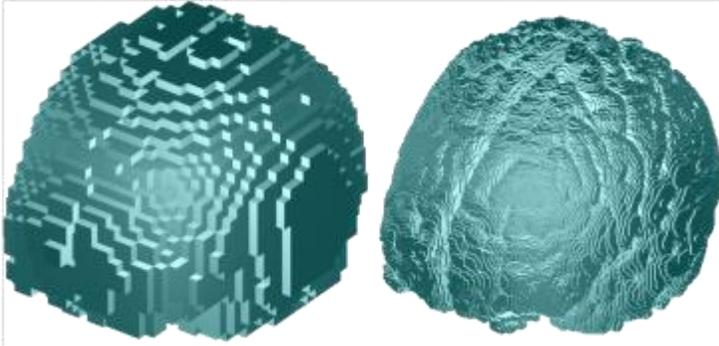
- Sleepiness is a consequence of the accumulation of adenosine, since the cells responsible for arousal are inhibited by adenosine monophosphate (AMP).
- Thus, when you have a build-up of AMP, cells responsible for arousal are inhibited, and you feel sleepy.
- **Caffeine** inhibits phosphodiesterase (PDE), an enzyme that breaks phosphodiester bonds (ex. cAMP → AMP)
  - **The decrease in AMP** means that cells that are responsible for arousal are not inhibited.
  - **The increase in cAMP** increases glutamate production.
    - Glutamate is associated with increased cortical arousal
    - This increase in cellular activity results in action potentials that are briefer and released in bursts.

Spreading activation finds the shortest circuit. Asymmetry occurs because of STDP (Spike Time Dependent Plasticity); the synapse that fires regularly is strengthened in that direction, while the other synapse direction is weakened.

### Functional neuroimaging

- Involves the measurement of brain activity.
- The specific technique used to measure brain activity depends on the imaging technology being used (ex. fMRI, pet)
- Regardless of which technology is used, the scanner produces a 'map' of the area being scanned that is represented as **voxels**.
  - Each voxel typically represents the activity of a particular coordinate in 3D space.

- The exact size of a voxel will vary depending on the technology used, although fMRI voxels typically represent a volume of 27 mm<sup>3</sup> (a cube with 3mm length sides).



Aphasia – communication disorder that results from damage to the parts of the brain that control language

- Anomia – a form of aphasia characterized by the inability to name everyday objects.
  - *Nom = name* in French
- Agraphia – a form of aphasia characterized by the loss of the ability to form graphemes (the smallest meaningful unit *in a writing system*), which causes a loss in the ability to communicate through writing.

**McGurk effect** – a change in auditory perception that occurs when an auditory stimulus does not match the visual stimulus during speech perception – *what we see overrides what we hear*.

- Ex. Sound of a guy saying ‘bah’
  - When the sound is matched with the visual of a man moving his lips in a ‘bah’-like way, we hear ‘bah’
  - When the *same sound* is matched with the visual of the man moving his lips in a ‘fah’-like way, we hear ‘fah’.

### Aphasia

- **Non-fluent / Expressive** – speech production is halting and effortful. Grammar is impaired.
  - **Ex. Broca’s** – unable to produce speech properly, but has no difficulty understanding verbal speech.
  - **Ex. Global** – resulting from damage to a large portion of the left hemisphere. Patient has difficulty producing *and* understanding speech, and is likely unable to read or write.
  - **Melodic Intonation Therapy (MIT)** – used to help patients with communication disorders caused by damage to the left hemisphere of the brain that result in non-fluent forms of aphasia

- **Fluent / Receptive** – person is able to produce connected speech, sentence structure is relatively intact but lacks meaning. The individual is unable to understand the meaning of communication
  - **Ex. Wernicke's** – 'word salad', meaning that words come out fluently connected but lacks meaning

**Risk factors** – increase a person's chances/risks of experiencing some negative outcome

- ex. abuse home life as a child is a risk factor for drug abuse later in life

**Protective factors** – decrease a person's chances/risks of experiencing some negative outcome

- ex. learning self-control as a child is a protective factor against drug abuse later in life

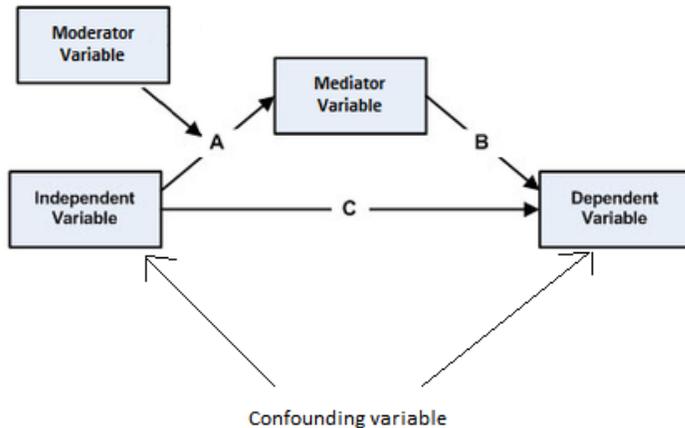
**Mediating Variable:** A mediating variable specifies a given cause (original predictor variable, independent variable) that works indirectly through a more direct cause (mediator variable) to a final effect (outcome variable, dependent variable). The mediator adds to the overall variance accounted for in the data and can explain how the dependent and independent variables are related. A mediating variable is one which explains the relationship between two other variables.

- **Explains the relationship between IV and DV**
- **IV accounts for variations in DV**
- **IV variations account for variations in MediatorV**
- **MediatorV variations account for variations in DV**
- **When mediatorV is added to the mix, the relationship between the IV and DV decreases**

**Moderating Variable:** A moderating variable is a variable that specifies conditions under which a given predictor is related to an outcome. The moderator explains 'when' a dependent and independent variable are related. A moderator variable is one that influences the strength of a relationship between two other variables.

- **Changing the strength or direction of the relationship between IV and DV by enhancing or dampening the effect of the mediator**
- **Does not explain why there is a relationship between IV and DV**

**Confounding Variable:** A confounding variable is often not taken into account during analysis and can adversely affect the study. A confounding variable is one which is not typically of interest to the researcher but is an extraneous variable which is related to both the dependent and independent variables.



- Example: Study to look at the effects of soil quality on the chance of disease in potatoes
  - To know: Potato heavily relies on some nitrogenous compound for disease resistance
  - IV = Soil quality
  - MedV = Concentration of nitrogenous compound in the soil
  - ModV = Fertilizer that drains the nitrogen away from soil.
  - DV = Chance of disease in potatoes
  - CV = Season the potato was planted in
    - Affects both soil quality (IV) and disease resistance (DV)

Say you are performing a study on the effects of soil quality (dependent variable, DV) on the chance of disease in potatoes (independent variable, IV). Suppose there is a causal, directly proportional relationship: better soil quality, lesser % of diseased crops; poorer soil quality, greater % of diseased crops.

A mediator variable explains the how or why of a causal interaction between the DV and IV. Say there is some nitrogenous compound the potato relies heavily on for disease resistance. The concentration of that nitrogenous compound would directly explain the causation. **Mediators are essentially the causation that's underlying the overall correlation.**

A confounding variable affects both the DV and IV. Take the season the potato was planted in. The season may affect the soil quality, and it may affect disease resistance (idk, via temperature/moisture/precipitation/sunlight etc). The key here is that the **DV and IV do not affect the confounding variable**. Which makes sense, because the season it was planted can't be changed by the other variables.

Moderators help identify interaction effects, where **the mediating effect is directly affected by the presence of the moderator**. Say that some potatoes were grown with a certain fertilizer that drains the nitrogen in the soil in some way. The effect of the fertilizer enhances the causal nitrogen relationship. **Moderators should be thought of as modulators that either enhance or dampen the effect of the mediator.**

### Amygdalae

- Gold-balled shaped groups of nuclei, located in the temporal lobes
- Assist in the processing of memory, decision-making, and emotional reactions.

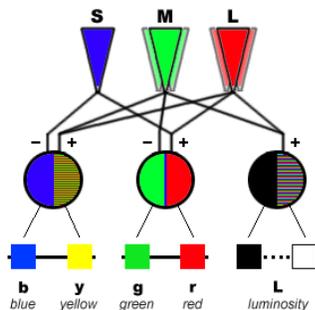
**Social cue** – a vocal or non-vocal suggestion, which can be positive or negative. These cues guide conversation and other social interactions. A few examples of social cues include: facial expression, tone of voice and body language.

## AAMC additional terms and concepts

**Beck's Cognitive therapy (CT)** is a type of psychotherapy developed by American psychiatrist Aaron T. Beck. CT is one of the therapeutic approaches within the larger group of cognitive behavioral therapies (CBT) and was first expounded by Beck in the 1960s. Cognitive therapy is based on the cognitive model, which states that thoughts, feelings and behavior are all connected, and that **individuals can move toward overcoming difficulties and meeting their goals by identifying and changing unhelpful or inaccurate thinking, problematic behavior, and distressing emotional responses**. This involves the individual working collaboratively with the therapist to develop skills for testing and modifying beliefs, identifying distorted thinking, relating to others in different ways, and changing behavior

**Opponent-process theory** – a psychological and neurological model that accounts for a wide range of behaviors, including color vision.

- Based on the idea that some colours don't blend (ex. no such thing as 'reddish green'), and also on negative afterimages.
- Different to trichromatic theory.
- Says that we have three independent receptor types which all have opposing pairs (White/Black, Blue/Yellow, Red/Green)



**Diathesis–stress model** – serves to explore how biological, psychological, or genetic pre-dispositions/vulnerabilities (diatheses) interact with environmental influences (stressors) to produce disorders, such as depression, anxiety, or schizophrenia

- Diathesis = disposition or vulnerability, which can take the form of genetic, psychological, biological, or situational factors.
- A large range of individual differences exist between persons in their vulnerability to the development of disorder.

**Ethical Research:** requires that all participants voluntarily participate in the study. At any point, participants should be able to freely withdraw their participation and their data can then no longer be used.

**Socioeconomic Status (SES):** defined as consisting of income (or wealth), educational attainment, and/or occupational status

**Ethnographic Research:** involves observing social interactions in real social settings.

- **ex:** studying the experience of role strain through observation can increase our understanding of how physicians cope with the challenging demands of extending life with interventions while accepting the reality of death.

**Interventional research** – experimental group gets some intervention (ex. new drug that helps symptoms of insomnia) while control get no intervention (ex. no treatment or placebo)

**The Flynn effect** – an observation regarding the growth of IQ from one generation to the next.

- *Mnemonic: **Flynn** Smarts is smarter than his Dad, Notso Smarts, who himself is smarter than his Dad, Barely Smart*

**Emotional intelligence** – the ability to understand emotions present in oneself and how those emotions motivate oneself and others.

**Altruism** – proposes that some human actions are based on the desire to help other people.

**Egoism** – processes that motivations and instincts for an all of an individual's behavior are based on their own self-interest and welfare and the benefit that they will receive from it.

**Prevalence** – proportion of cases in the population at a given time (current cases)

Incidence – probability of occurrence of a given medical condition in a population within a specified period of time (new cases)

**Etiology** – the *cause* of a disease or condition

- Ex. smoking is the major etiology of lung cancer

**Cross's Nigrescence Model** (Negro-to-Black Conversion Experience)

- Pre-encounter (before discovering one's racial identity, the initial being or frame of reference that will alter upon facing the encounter. In this stage, one is unaware of his/her race and the social implications that come with it)
- Encounter (significant racial incident causes the individual be 'awakened' into racial consciousness, ex. first time a child is treated differently because of their skin color)
- Immersion-Emersion (following the encounter, the individual immerses themselves in their race, and becomes adamant in proving that they are Black, taking pride in their blackness )

- Internalization (individuals become comfortable with racial identity, and has a strong sense of his/her own racial identity to be able to forge relationships with members from other racial groups)
- Internalization-Commitment (involves reaching a balance of comfort in one's own racial identity as well as the racial identities of others)

**Minority influence** occurs when a smaller group over time is able to persuade the majority to join their side. Minority influence uses conversion as a means for the minority group to be influential- conversion is convincing someone who originally doesn't agree with your views that you are right.

- Examples of minority influence include the Suffragette and Civil Rights movements in the United States. These originated within a smaller group who over time were able to convince the majority to sympathize and agree with their side.
- When a new idea arises, it is automatically a minority opinion. This idea can then be spread through the influence of the minority on others accepting this view.

**Approach-approach conflicts** – when someone must choose between two options that are equally appealing.

**Avoidant-avoidant conflicts** – when someone must choose between two options that are equally unappealing

**Approach-avoidance conflict** – one goal or event that has both positive and negative effects that make the goal appealing and unappealing simultaneously.

- Ex. Conflict that arises when you have to decide if you want to get married or not, since marriage comes with companionship (approach) but also dealing with annoying in-laws (avoidant)

**Double (or 'Multiple') approach-avoidant conflicts** – two options, each of which have appealing and negative characteristics

- Ex. Jury's dilemma – if they ruled the defendant guilty, then they could be punishing a criminal (approach) or maybe punishing an innocent (avoidant). If they ruled the defendant innocent, then they would be letting a criminal walk away unpunished (avoidant) or freeing an innocent (approach).
- Ex. The conflict that arises when you have the choice between a boring job (avoidant) that pays well (approach), or a fun job (approach) that pays badly (avoidant)

Cialidini's Six key principles of influence

1. **Reciprocity** – People tend to return a favor, thus the pervasiveness of free samples in marketing. In his conferences, he often uses the example of Ethiopia providing thousands of dollars in humanitarian aid to Mexico just after the 1985 earthquake, despite Ethiopia suffering from a

crippling famine and civil war at the time. Ethiopia had been reciprocating for the diplomatic support Mexico provided when Italy invaded Ethiopia in 1935. The good cop/bad cop strategy is also based on this principle.

2. **Commitment and Consistency** – If people commit, orally or in writing, to an idea or goal, they are more likely to honor that commitment because of establishing that idea or goal as being congruent with their self-image. Even if the original incentive or motivation is removed after they have already agreed, they will continue to honor the agreement. Cialdini notes Chinese brainwashing on American prisoners of war to rewrite their self-image and gain automatic unenforced compliance. See cognitive dissonance.
3. **Social Proof** – People will do things that they see other people are doing. For example, in one experiment, one or more confederates would look up into the sky; bystanders would then look up into the sky to see what they were seeing. At one point this experiment aborted, as so many people were looking up that they stopped traffic. See conformity, and the Asch conformity experiments.
4. **Authority** – People will tend to obey authority figures, even if they are asked to perform objectionable acts. Cialdini cites incidents such as the Milgram experiments in the early 1960s and the My Lai massacre.
5. **Liking** – People are easily persuaded by other people that they like. Cialdini cites the marketing of Tupperware in what might now be called viral marketing. People were more likely to buy if they liked the person selling it to them. Some of the many biases favoring more attractive people are discussed. See physical attractiveness stereotype.
6. **Scarcity** – Perceived scarcity will generate demand. For example, saying offers are available for a "limited time only" encourages sales.
  1. While conveying scarcity, in general, can influence others, in the case of an opinion, the more people that agree, the more likely others are to follow, so scarcity is not desirable.

**Spatial Discrimination** – the ability to perceive as separate points of contact the two blunt points of a compass when applied to the skin.