PSY1101 Notes from Readings
Reading: Chapter 1
Thinking Critically With Psychological Science

The Need for Psychological Science

Did we know it all along? Hindsight bias

- The Hindsight bias (also known as the I-knew-it-all-along phenomenon) → we need psychological research
- As a check on their biases, psychologists report their research with precise operational definitions for procedures and concepts e.g. sleep deprived = "X hours less"
- Similar results = confidence in the finding's reliability
- The scientific method = a self-correcting process for asking questions and observing nature's answers. Theories lead to hypotheses which lead to research an observations that confirm, reject, or revise the original theory

Overconfidence

- We tend to be more confident than correct
- We often suffer from hindsight-bias after we've learned a situation's outcome, that outcome seems familiar and therefore obvious

Perceiving Order in Random Events

- We perceive patterns because of our natural eagerness to make sense of our world
- Random sequences occur more often than people expect
- With any large enough sample, any outrageous thing is likely to happen → given enough random events, some weird-seeming streaks will occur
- NOTE: hindsight bias, overconfidence, and our tendency to perceive patterns in random events often lead us to overestimate our intuition → scientific inquiry can help us sift reality from illusion
- "The really unusual day would be one where nothing unusual happens" - Diaconis

The Scientific Attitude: Curious, Skeptical, and Humble

- Magician James Randi used empirical approach when testing those claiming to see glowing auras around people's heads
- To sift reality from fantasy, sense from nonsense, therefore requires a scientific attitude; being skeptical but not cynical, open but not gullible
- Psychologists approach the world of behavior with a curious skepticism
- Humility = what matters us not my opinion or yours, but the truths nature reveals in response to our questioning … " the rat is always right"

- Curiosity, skepticism, and humility made modern science possible

Critical Thinking

- Smart thinking

Research Strategies: How Psychologists Ask and Answer Questions

- Scientific method → a self-correcting process for evaluating ideas with observation and analysis

The Scientific Method

- A good theory produces testable predictions, called hypotheses. Such predictions specify what results (what behaviors or events) would support the theory and what results would disconfirm it
- Our theories can bias our observations e.g. Iraq had weapons of mass destruction
- As a check on our biases, psychologists report their research with precise operational definitions of procedures and concepts e.g. sleep deprived = "x hours less"
- Replication is confirmation, and enables scientific self-correction → must report similar findings to their original studies
- We can test hypothesis or refine our theories using *descriptive* methods (describing behaviors using case studies, surveys, or naturalistic observations), *correlational* methods (associate different factors), and *experimental* methods (which manipulate factors to discover their effects)
- Each method allows different conclusions

Description

- Case studies = in-depth analyses of individuals or groups
- Naturalistic observations = watching and recording the natural behavior of many individuals
- Surveys and interviews = asking people questions

The Case Study

- Examines one individual or group in depth
- E.g. much of our knowledge today about the brain came from people who suffered a particular impairment after damage to a certain region of the brain
- Atypical individual cases may mislead us
- Dramatic stories or anecdotes (personal experience) command our attention and are easily remembered

- NOTE: individual cases can suggest fruitful ideas. What's true of all of us can be glimpsed in any one of us. But to discern the general truths that cover individual cases, we must answer questions with other research methods

Naturalistic Observation

- Records behavior in natural environments
- "Small science" → can be done with pen and paper
- New technologies are enabling "big data" observations e.g. social media, smartphones, body-worn sensors
- Like the case study, naturalistic observation does not explain behavior, it describes it
- Behaviors of animals are far more complex than previously thought
- Disadvantage: not being able to control for all the factors that may influence the observed behavior/interaction

The Survey

- Looks at many cases in less depth
- Asks people to report their behaviors or opinions
- Answers often depend on how questions are worded and respondents are chosen
- **Wording effect**: "aid to the needy" compared to "welfare"
- **Random sampling**: to obtain a representative sample of a population
    - Sending each person a questionnaire wouldn't work because the conscientious people who returned it would not be a random sample
    - Large representative samples are better than small ones, but a smaller representative sample (100) is better than a larger unrepresentative sample (500)
- NOTE: consider the sample when reading survey findings

Correlation

- A statistical measure (the correlation coefficient) helps us figure how closely two things vary together, and thus how well either one predicts the other
- Correlation coefficient = a statistical index of the relationship between two things (from -1.00 to +1.00)
    - +1.00 = perfect positive correlation (rare)
    - 0.00 = no relationship

    - -1.00 = perfect negative correlation → the two sets of scores relate inversely, one set going up and the other goes down
- Scatterplots can reveal the relatedness of two factors → show patterns of correlation
- NOTE: a correlation coefficient helps us see the world clearly by revealing the extent to which two things relate

Regression Toward the Mean

- Statistical phenomenon
- The tendency for extreme or unusual scores or events to fall back (regress) toward the average
- E.g. extraordinary events tend to be followed by more ordinary ones
- Failure to detect regression is the source of many superstitions and of some ineffective practices
- NOTE: when a fluctuating behavior returns to normal, there is no need to invent fancy explanations for why it does so. Regression toward the mean is probably at work
- "Once you become sensitized to it, you see regression everywhere"

Correlation and Causation

- Why do correlations enable prediction but not cause-effect explanation?
- Thinking error is assuming that an association, sometimes presented as a correlation coefficient, proves causation → but no matter how strong the relationship, it does not
- NOTE: correlation does not prove causation. Correlation indicates the possibility of a cause-effect relationship but does not prove such

Experimentation

- Experiments enable researchers to isolate cause and effect. They aim to manipulate an independent variable, measure a dependent variable, and control confounding variables.
- Experimental group = receive treatment. → Manipulating the factor(s) of interest
- Control group = does not receive treatment → holding constant other factors
- Random assignment to the groups minimizes pre existing differences → equalizing the two groups
- E.g. experiment to test if breast milk = smarter babies
- NOTE: unlike correlational studies, which uncover naturally occurring relationships, an experiment manipulates a factor to determine its effect
- Testing for drugs

    - Group 1 gets treatment, group 2 receives pseudo treatments (an inert placebo)
    - Participants are blind (uninformed of which treatment they're receiving
    - In a study that uses a double-blind procedure, neither the participants nor those who are administering the treatment and collect the data will know which group is receiving what
- The placebo effect = experimental results caused by expectations alone → shown to reduce pain, depression, and anxiety
    - E.g. when people unknowingly drinking decaf coffee feel it boosts alertness
    - The more expensive the placebo = the more "real" it seems ($2.50 pill has better results than $0.10 pill)
    - To know how effective a therapy really is, researchers must control for a possible placebo effect

Independent and Dependent Variables

- Manipulated experimental factor = e.g. drug dosage → independent variable because we can vary it independently of other factors to see the effect that it has on the dependent factor
- Other factors, which can potentially influence the results of the experiment are called *confounding factors*
    - Random assignment controls for possible confounding variables

Predicting Real Behavior

- The experiment intends the laboratory environment to be a simplified reality, one that stimulates and controls important features of everyday life
- Goal is not to recreate everyday life behaviors, but to test theoretical principles
- NOTE: psychological science focuses less on particular behaviors than on seeking general principles that help explain many behaviors

Psychology's Research Ethics

Protecting Research Participants

- Animals
    - Study because they are interesting and to learn about people
    - We *are* animals, share common biology
    - Should we not respect out animal relatives? We cannot defend our scientific work with animals on the basis of the similarities

between them and ourselves and then defend it morally on the basis of differences
        - Two issues
            - (1) well-being of humans above of other animals. Is out use and consumption of other animals as natural as the behavior of carnivorous cats?
            - (2) how to we protect the wellbeing of animals in research? We must ensure the comfort, health, and humane treatment of animals and minimize infection, illness, and pain
        - Experiments have also led to increased empathy and protection for them
    - Humans
        - Obtain participants' informed consent before experiment
        - Protect them from harm and discomfort
        - Keep information about individual participants confidential
        - Fully debrief people → post experimental explanation of the study

Values in Research

- Values affect what we study, how we study it and how we interpret results
- Values can also color the facts → preconceptions can bias observations and interpretations
- Labels describe and labels evaluate e.g. *discreet* or *secretive*

Questions

(1) What does a good theory do?
    (a) It organizes observed facts, it implies hypotheses that offer testable predictions and, sometimes, practical applications, it often stimulates further research

(2) Why is replication important
    (a) Psychologists watch eagerly for new findings, but they also proceed with caution - bye awaiting other investigators repeating the experiments to see if the findings can be confirmed

(3) You hear the school basketball coach telling her friend that she rescued her team's winning streak by yelling at the players after an unusually bad first half . What is the explanation of why the team's performance improved?
    (a) The team's performance was not their typical behavior. Their return to their normal - their winning streak - may just have been a case of regression toward the mean

(4) What measures do researchers use to prevent the placebo effect from confusing their results?
    (a) Research designed to prevent the placebo effect randomly assigns participants to an experimental group or a control group. A comparison of the results will demonstrate whether the real treatment produced better results than *belief* in that treatment
(5) In the rental housing experiment, what was the independent variable? The dependent variable?
    (a) Independent → the ethnically different names, dependent → % of responses from landlords
(6) By using random assignment, researchers are able to control for _____ _____, which are other factors besides the independent variable(s) that may influence research results.
    (a) Confounding variables

Statistical Reasoning in Everyday Life

- Critical thinker will apply simple statistical principles to everyday reasoning
- If not used can produce public misinformation
- Doubt big, round, undocumented numbers
- Precise numbers are more credible

Describing Data

Measures of Central Tendency

- A single score that represents a whole set of scores, summarizes the data
- Mode → the most frequently occurring score(s)
- Mean → arithmetic average
- Median → midpoint
- Mean can be biased by a few extreme scores
- NOTE: always note which measure of central tendency is reported. If it is a mean, consider whether a few atypical scores could be distorting it

Measures of Variation

- The amount of variation in the data is useful to know → how similar or diverse the scores are
- Averages of scores with low variability are more reliable than averages from scores with high variability
- The range of scores (from lowest to highest) provides only a crude estimate of variation → a couple of extreme scores

- Standard deviation is much more informative than mean alone
    - The computation assembles information about how much individual scores differ from the mean → it uses information from each score
    - Large numbers of data often form a symmetrical *bell-shaped* distribution in nature → *normal curve (normal distribution)*
    - Most cases fall near the mean, and fewer cases fall near either extreme
- Summary: The average of a distribution of scores is the mean. The score that shows up most often is the mode. The score right in the middle of a distribution is the median. We determine how much scores vary around the average in a way that includes information about the range of scores by using the standard deviation

Significant Differences

- Inferential statistics help us determine if results can be generalized to a larger population

When is an Observed Difference reliable?

- Representative samples are better than biased samples → keep in mind what population a study has sampled
- Less-variable observations are more reliable than those that are more variable → average is more reliable when it comes from scores with low variability
- More cases are better than fewer → averages based on many cases are more reliable (less variable) than averages based on only a few cases

When is an Observed Difference significant?

- (1) When sample averages are reliable (averages from different population) = low variability, and (2) when the difference between them is large (the averages are very different) → we can say that the difference has **statistical significance**
- This means that the observed difference is probably not due to chance variation between the samples
- NOTE: statistical significance indicates the likelihood that a result will happen by chance. But this does not say anything about the importance of the result.
- Descriptive statistics summarize data, while inferential statistics determine if data can be generalized to other populations

Review

(1) Intuition = an effortless, immediate, automatic feeling or thought, as contrasted with explicit, conscious reasoning
(2) Hindsight bias = the tendency to believe, after learning an outcome, that one would have foreseen it

(3) Theory = an explanation using an integrated set of principles that organizes observations and predicts behaviors or events
(4) Hypothesis = a testable prediction, often implied a theory
(5) Operational definition = a carefully worded statement of the exact procedures (operations) used in research study
(6) Replication = repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding extends to other participants and circumstances
(7) Critical thinking = thinking that does not blindly accept arguments and conclusions, Rather, it examines assumptions, appraises the source, discerns hidden values, evaluates evidence, and assesses conclusions
(8) Case study = a descriptive technique in which one individual or group is studied in depth in the hope of revealing universal principles
(9) Naturalistic observation = a descriptive technique of observing and recording behavior in naturally occurring situations without trying to manipulate and control the situation
(10) Survey = a descriptive technique for obtaining the self-reported attitudes or behaviors of a particular group, usually by questioning a representative (a random sample of the group)
(11) Random sample = a sample that fairly represents a population because each member has an equal chance of inclusion
(12) Correlation = a measure of the extent to which two factors vary together, and thus of how well either factor predicts the other
(13) correlation coefficient a statistical index of the relationship between two things (from -1.00 to +1.00).
(14) scatterplot a graphed cluster of dots, each of which represents the values of two variables. The slope of the points suggests the direction of the relationship between the two variables. The amount of scatter suggests the strength of the correlation (little scatter indicates high correlation).
(15) experiment a research method in which an investigator manipulates one or more factors (independent variables) to observe the effect on some behavior or mental process (the dependent variable). By *random assignment* of participants, the experimenter aims to control other relevant factors.
(16) experimental group in an experiment, the group exposed to the treatment, that is, to one version of the independent variable.
(17) control group in an experiment, the group *not* exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment.
(18) random assignment assigning participants to experimental and control groups by chance, thus minimizing preexisting differences between the different groups.

(19) double-blind procedure an experimental procedure in which both the research participants and the research staff are ignorant (blind) about whether the research participants have received the treatment or a placebo. Commonly used in drug-evaluation studies.

(20) placebo [pluh-SEE-bo; Latin for "I shall please"] effect experimental results caused by expectations alone; any effect on behavior caused by the administration of an inert substance or condition, which the recipient assumes is an active agent

(21) independent variable in an experiment, the factor that is manipulated; the variable whose effect is being studied.

(22) confounding variable in an experiment, a factor other than the independent variable that might produce an effect.

(23) dependent variable in an experiment, the outcome that is measured; the variable that may change when the independent variable is manipulated.

(24)

Notes Oct 2

Brain Plasticity

- Why children have more plasticity?
- 5 year old brain → natural death of
- More difficult for brain to rewire at older age
- Brain compensates the loss of brain section by increasing size of another
- As you grow older, you can use both hands to write better → doesn't mean brain area expands

How do we know much about the brain?

- Structural techniques → CT scan, MRI scan
- Functional techniques → PET scan, fMRI. These allow us to see action during the time of stimuli. More costly, more staff