

# **Week 1 - Introduction & Review**

**PSY 3307**

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# Agenda

- Introductions
- Syllabus
- Review
- Types of Research
- Steps of Conducting Statistics Within the Research Process
- Levels of Measurement
  - Measurement Error
- Measurement Scales

# About Me

uo grad

- My name is Jonathan A. Pedroza (he/him)
  - please refer to me as **JP** unless around other instructors/faculty
- First-generation Graduate
  - CPP Alumni (2014)
  - CSUDH (2017)
  - University of Oregon (2021)

hiking

lucy

- Hobbies include: fishing, hiking, cooking, and coffee

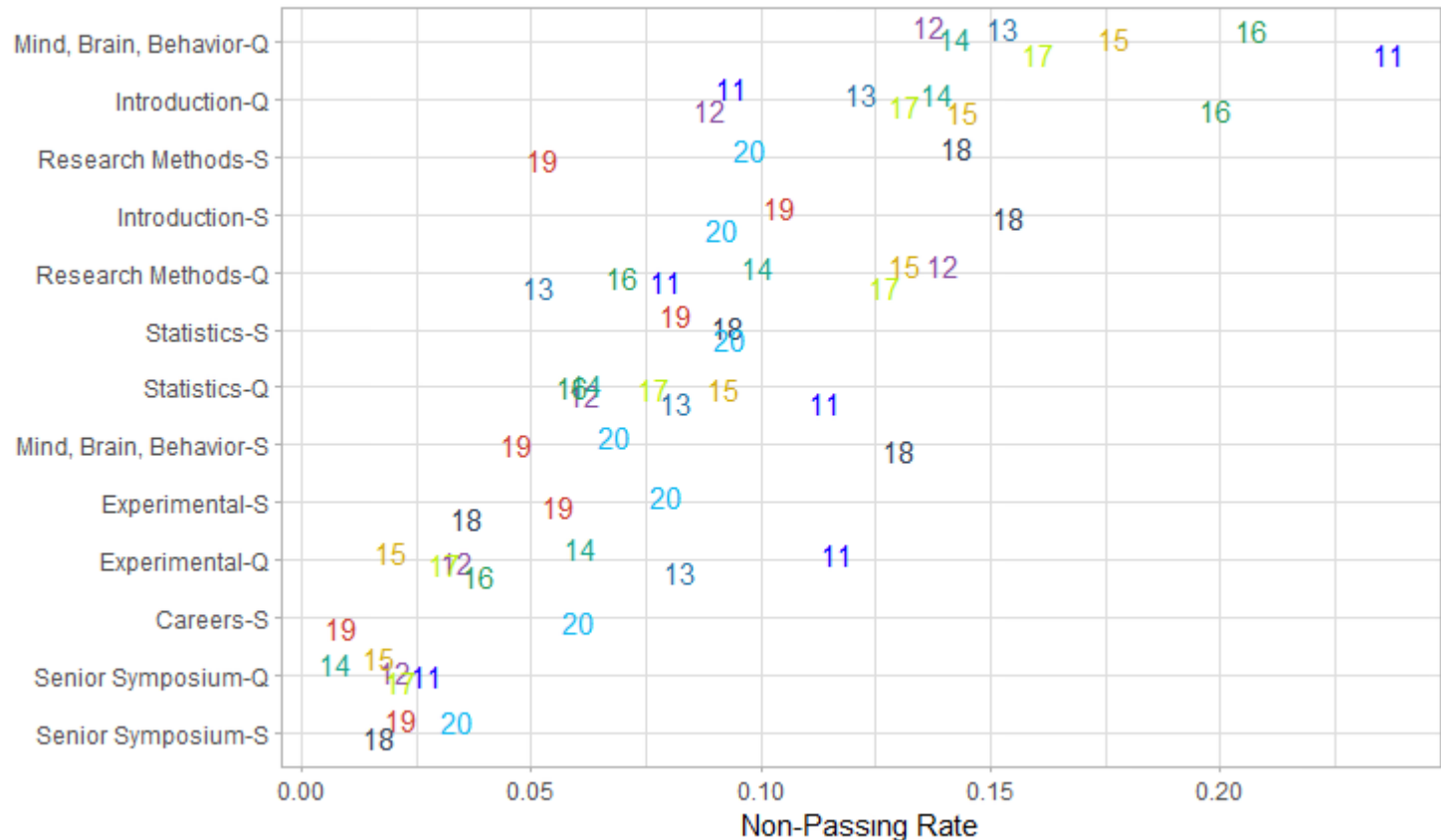
# Nerdy Stuff

- Passion/Nerdy Topics:
  - I love creating data visualizations in R
  - health inequities in communities of color
  - examining environmental variables that influence health behaviors

# Nerdy Stuff

## Non-passing rate for core Psychology classes

Comparisons between Quarter and Semester



Data gathered from Tableau resources from Cal Poly Pomona

# Break-out Rooms - Tell Me About Yourself

- Name & pronouns
- What do you want to do after you graduate?
- What is your experience with statistics?
- What is your experience with SPSS?
- Something that you are passionate/nerdy about

# Learning Objectives

- Use SPSS to compute statistics
- Read/Interpret Descriptive & Inferential Statistics
- Understand & Solve Formulas for Statistical Tests
- Understand Sampling, Statistical Null Hypothesis Testing, Effect Sizes, Confidence Intervals
- Demonstrate ability to apply these skills to test hypotheses using real data



# Topics Covered

- Descriptive Statistics
- Probability
- Random Selection
- Normal Curve & Sampling Distribution
- Hypothesis Testing
- Rules for Statistical Decisions (Types I and II Errors)
- Sample Size Importance (One- vs Two-tailed Tests)
- Z-scores, z-ratio, and t-ratio (single group, independent-samples t-test, paired)
- Analysis of Variance (One-way, Two-way, Repeated-measure, mixed)
- Confidence Intervals/Error bars in plots
- Most common plots (histograms, boxplots, scatterplots)
- Correlation & Regression Analysis
- Chi-square (One-way, Two-way)
- Non-parametric statistics

# You Might be Feeling Like...



# What I Need From You

- Cameras are optional
  - It helps me see if you are confused
- Unmute yourself and interrupt me
- put in the chat that you are confused
- private message me in the chat that you are confused

# Review

- **Variable**

- anything that can produce different scores; scores that vary

- **Relationship**

- the connection between two variables

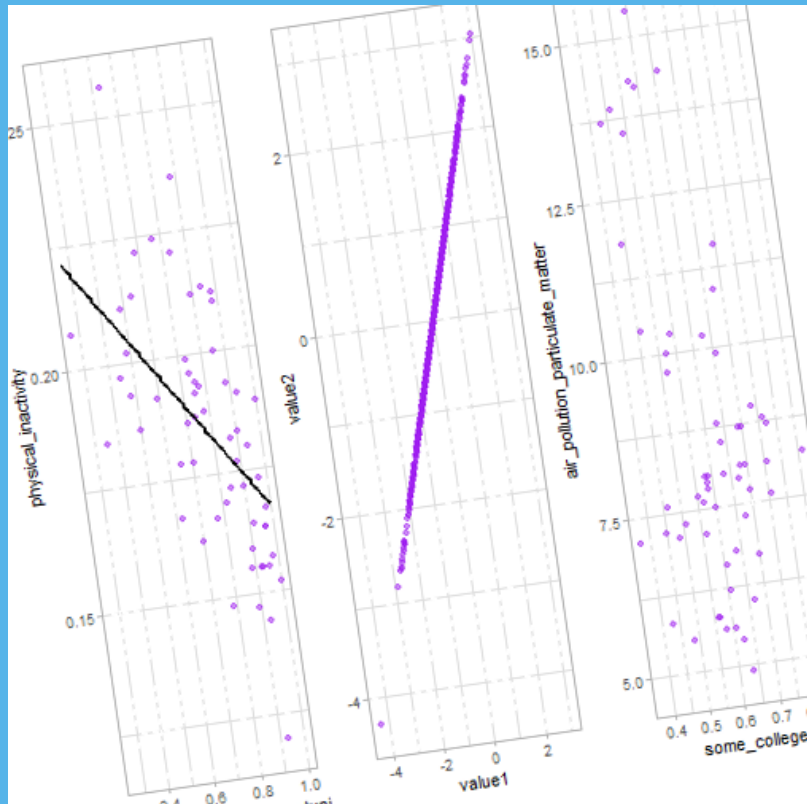
- Three different types of relationships

- **positive relationship** is when one variable increases, the second variable increases
- **negative relationship** is when one variable increases, the second variable decreases
- **no relationship** shows no clear connection between two variables

# Poll: Is it a Variable?

- Height
- Age
- Class Standing
- Name

# Relationships



# Descriptive & Inferential Statistics

- **Descriptive Statistics** used for organizing and summarizing your data.
- Tells the reader how the data looks.
- **Inferential Statistics** used to estimate or infer if there is a relationship in your sample data that represents the population studying
- Tells the reader if there is a relationship.

# Examples of Descriptive & Inferential Statistics

1. The average amount of physical inactivity in California counties
2. The association between parks and physical activity engaged
3. The *difference* in the number of liquor stores between San Diego and Los Angeles counties.
4. The number of males and females in PSY 3307.



# Types of Research

- **Qualitative**
  - testing theories using language
- **Quantitative**
  - testing theories with numbers

# Poll: Types of Research

- Finding the average age of students that take PSY 3307
- Conducting interviews with people on why they won't get vaccinated
- Focus groups on improving graduation rates at CPP
- Testing to see if drinking more coffee makes you better at math

# Variables

- **Independent variables** are often seen as the cause of some effect
  - Experimental designs = cause
  - Correlational designs = predictor
  - **Predictor variable** predicts an outcome; IV --> DV
- **Dependent variables** are variables that are affected by the independent variable(s)
  - Outcome based on changes from the independent variable
  - Also called **outcome variable**
- Independent variables = IV
- Dependent variables = DV
- This class, most analyses will be focused on one IV and one DV
  - More advanced statistics can have multiples of both

# Conditions

- **Conditions** are the categories of the IV to measure DV scores in an experiment
- Example: Examining test scores of students in a class. Half of the class gets a study guide while the other half is given nothing.

IV = Study guide DV = Test scores Conditions: 1 = Group receiving study guide; 2 = Group receiving nothing (control group)

- For experiments, you can say "IV had an effect on DV" or the "IV caused DV" but for correlational studies that is a big NO NO. Every time JP hears/reads a correlational study that describes the effect of IV on DV he cries a little inside.

# Levels of Measurement

- What is being measured and the numbers that represent what is being measured is the **level of measurement**
- **Categorical variables**
  - entities are divided into distinct categories
  - variables that do not allow fractions
- Ex: Getting an 94.5 on a exam
- **Continuous variables**
  - a score for each person/distinct score
  - variables that can be measured with decimals
- Ex: Being a 4th year compared to a 3rd year student

# Categorical Variables

- **Binary variables**
  - there are only two categories (sex)
- **Nominal variables**
  - categorize into groups; categories are not ordered (race/ethnicity groups)
  - can be binary and nominal
- **Ordinal variables**
  - ordered categories
  - categories indicate rank order (race order)

# Continuous Variables

- **Interval variables**

- equal intervals on the variable represent equal differences in measurement
- zero is not an absolute zero

- **Ratio variables**

- similar to interval
- true zero (zero is the smallest number)

# Measurement Scale Examples

1. California Counties
2. Temperature measured in Celcius 2b. Temperature measured in Kelvin
3. Olympic Medal Winners (Gold, Silver, Bronze)
4. Money
5. Income Brackets [0-10k, 11-20k, 21-30k, ...]
6. Miles per hour (mpg)
7. 10 most common baby names
8. Grades (A, B, C, D, F)
9. Grades (100-95, 94-90, 89-85, 84-80, ...)
10. Grades (100-0%)



# Measurement Error

- **Measurement error** is the discrepancy between the actual value you're trying to measure and the value you obtained
- A participant's ID states a weight of 130lbs
- Their actual weight is 134lbs
- There is a measurement error of 4lbs

# Learning Greek & Roman

$\Sigma = \textit{Sum}$

$\bar{x} = \textit{sample mean}$

$\mu = \textit{population mean}$

# Learning Greek & Roman

$$s^2 = \text{variance}$$

$$s = \text{standard deviation}$$

$$\sigma = \text{population standard deviation}$$

$$\sigma^2 = \text{population variance}$$

# Learning Greek & Roman

$N = \text{Total Observations (Either Sample or Population)}$

$f = \text{Frequency}$

$n = \text{observations for categories in survey}$