

PSYC 2317 - Lecture 1

Plan:

- (1) What are we doing this for?
- (2) Review of basic statistical concepts
 - measures of center
 - measures of variability

Part 1 - 30,000-foot view of course

↳ what are we doing this for?

Behavioral scientists do research — let's look at an example:

Task — name the color of each word as quickly as possible

BLUE
GREEN
RED

BLUE
GREEN
RED

slower!

This "Stroop effect" says something about how what we read is automatically processed.

→ how do we understand it?

→ we do research to test competing models of human behavior

research = set up experiment
↳ measure things
↳ collect data

model = quantitative instantiation of some observed behavior

Ex: Stroop effect = difference in response times between "congruent" words and "incongruent" words

Model 1: stroop effect = 0

Model 2: stroop effect > 0

Primary question: which is the better model of our observed data?

How do we answer this question?

1. Describe our data

- what is the most typical measurement? (Unit 1)
- how much do we expect these measurements to vary? (Unit 1)
- what is the standardized effect size? (Unit 2)

2. Make inferences with our data

- use tools of probability theory (Unit 3) to make best guess about true magnitude of effect, accounting for uncertainty in our measurements (Unit 4)
- estimate size of the effect (Units 5/7)
- assess adequacy of models of effect
 - t-tests (Unit 6)
 - analysis of variance (Unit 8)
 - Bayesian methods (Units 9/10)

Part 2 - Review of basic statistical concepts

- Measuring center / most typical value

↳ Mean (i.e., average)

$$\bar{x} = \frac{\sum x_i}{N}$$

Key:

\bar{x} = mean

$\sum x_i$ = sum of each data point

N = # of data points

Example: find mean of 2, 3, 5, 8, 12

$$\bar{x} = \frac{\sum x_i}{N} = \frac{2 + 3 + 5 + 8 + 12}{5} = \frac{30}{5} = 6$$

↳ Median - the middle number

↳ put numbers in order

↳ if odd number, median = unique middle number

~~2~~ ~~3~~ 5 ~~8~~ ~~12~~
 ↑
 median

↳ if even number, median = avg. of two middle #s

~~2~~ ~~3~~ 5 6 ~~8~~ ~~12~~ median = 5.5

- Measuring variability

↳ How much, on average, does each number differ from the most typical value?

Deviations		
x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
2	-4	16
3	-3	9
5	-1	1
8	2	4
12	6	36
$\bar{x} = 6$		

← find average

$$= \frac{16 + 9 + 1 + 4 + 36}{5}$$
$$= \frac{66}{5} = 13.2$$

Average "squared" deviation

average "deviation" = 0
Not helpful!

Based on this, we define variance as the average of the squared deviations.

$$\text{variance} = \frac{\sum (x_i - \bar{x})^2}{N}$$

For the data set 2, 3, 5, 8, 12, we found a variance of 13.2

↳ variance is supposed to measure "average distance from the most typical value," but this seems too big.

↳ problem: we squared the deviations, so now we have an average squared distance

↳ solution: take the square root!

Definition: the standard deviation is the square root of the variance.

$$SD = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N}}$$

Ex: for the data set 2, 3, 5, 8, 12, the standard deviation is:

$$SD = \sqrt{\text{variance}} = \sqrt{13.2} = 3.63$$