Module 2:
Central tendency, shape, and difference in means

MSIR 525

Monday, September 23, 2019

Recap of Module 1 (check list from syllabus; see pages 1-2)

- We learned about the NHST framework
- We developed an understanding of *p*-values and how they can be used to inform evidence-based management decisions
- We compared different types of error that can threaten our inferences and conclusions
  - We also learned how one can attempt to avoid these errors and disclosures that must be given if a study is underpowered
- We contrasted three different research designs (e.g. observational) and two different data collection approaches (e.g., longitudinal)
- We learned about different data sources and data types
- We summarized several types of validity and phenomena that may threaten them

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  - Module 2 recap and software tutorial (R ***must*** be installed by this date!!)

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- 10/7/2019
  - In-class exercise for credit (i.e., a hackathon)
  - Applying what we learned in M2 to ascertain whether or not a meaningful group difference exists

Agenda for Module 2

- Let’s get started! ☺

Summarizing Data

- Frequency distribution

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5	8	7	9
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Table 2. Frequency Distribution

Rating	Stress	WLB	Job satisfaction	Pay satisfaction
10	0	0	0	3
9	0	0	0	0
8	0	2	1	0
7	3	0	3	2
6	2	0	0	2
5	2	1	0	0
4	0	1	2	0
3	0	0	1	0
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1	0	0	0	0
0	0	0	0	0
Count	7	7	7	7

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CAN BE USED TO SUMMARIZE ALL TYPES OF DATA (SEE MODULE 1)

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$$\text{Relative frequency} = \frac{frequency\ of\ response}{total\ number\ of\ responses}$$

$$= \frac{3}{7} = 43\%$$

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Cumulative frequency$_n$ = frequency$_n$ + *c*umulative frequency$_{n-1}$

Table 3. Frequency Distributions for Stress

Rating	Frequency	Relative frequency	Cumulative frequency	Cumulative percentage
10	0	0 (0%)	7	1.0 (100%)
9	0	0 (0%)	7	1.0 (100%)
8	0	0 (0%)	7	1.0 (100%)
7	3	.43 (43%)	7	1.0 (100%)
6	2	29 (29%)	4	.58 (58%)
5	2	.29 (29%)	2	.29 (29%)
4	0	0 (0%)	0	0 (0%)
3	0	0 (0%)	0	0 (0%)
2	0	0 (0%)	0	0 (0%)
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$$\text{Average job satisfaction rating} = \frac{7+7+7+8+3+4+4}{7} = 5.71$$

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4 out 7 =“high” scores

4/7 = .57 (57%)

3 out 7 =“low” scores

3/7 = .43 (43%)

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  - A hypothetical estimate of the “typical” score

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- Mean, **median**, mode
  - Represents the middle score of a set of ordered observations
  - When there is an even number of observations the median is the average of the two scores that fall either side of what would be the middle value

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Calculate column median (mid-point of distribution)

Median job satisfaction rating = 7

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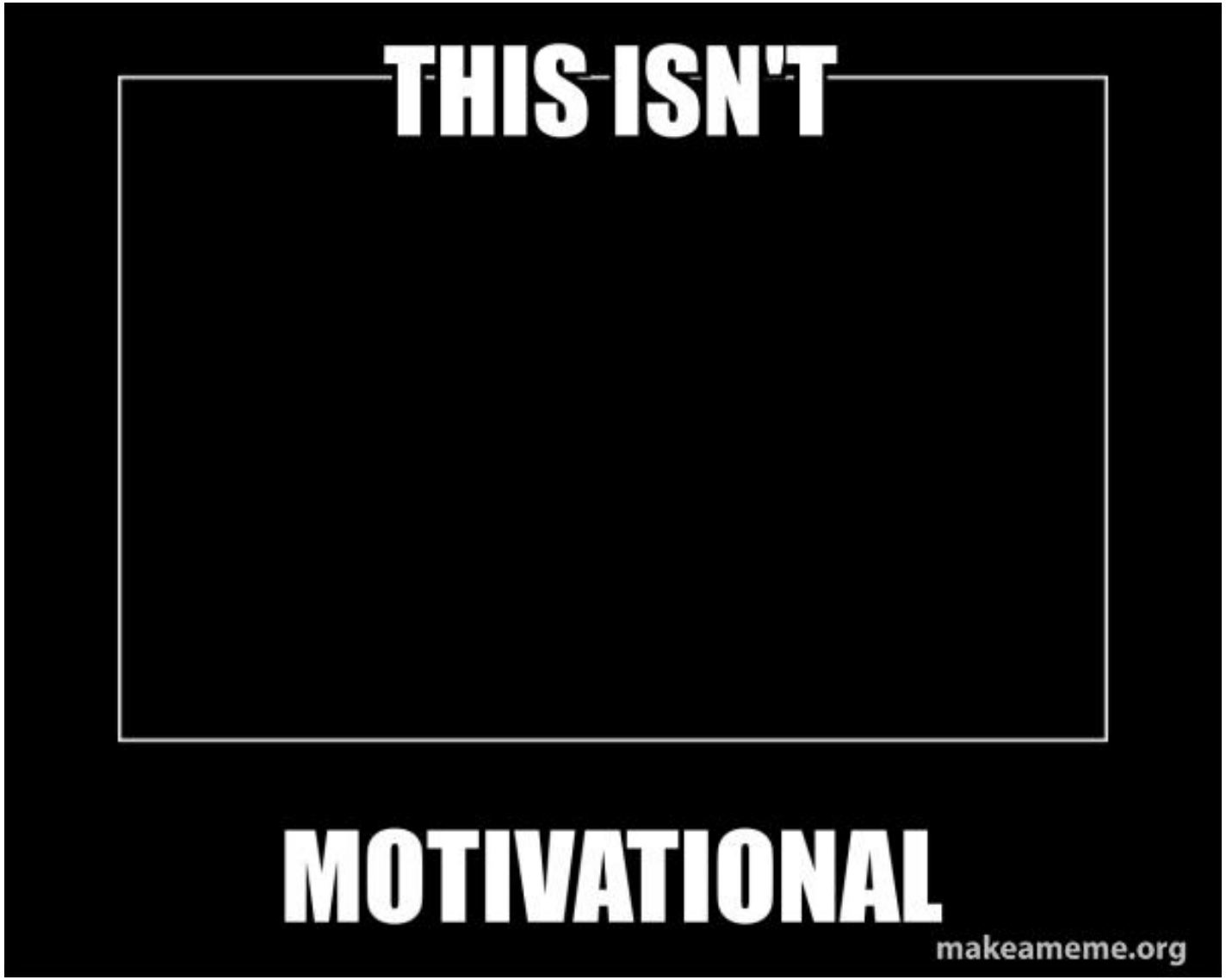
Calculate column mode

Modal job satisfaction rating = 7


WE'RE MASTERS STUDENTS...
WHY TF ARE WE TALKING ABOUT MEAN, MEDIAN, AND MODE
imgflip.com


Because mean,
median, and
mode are important
CHANGE MY MIND
imgflip.com


THIS ISN'T
MOTIVATIONAL
makeameme.org


ME WAITING ON THE POINT TO BE MADE
makeameme.org

The point is…

- Although we know about these measures of central tendency, we may not be using them to their full potential

- Many of the descriptive statistics that we aware of (e.g., mean) are meaningless if they are not reported in tandem with other important information

- What other important information should accompany the mean…

Variance

- Standard deviation
  - SD is an estimate of the average variability (spread) of a set of observations around the mean
  - Importantly, SD is expressed in the same units of measurement as the raw scores
  - It is the square root of the variance (sqrt[sum of squares/number of values])

Variance

- Range
  - The range of scores is the value of the smallest score subtracted from the highest score

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$$\text{Range} = Highest\ score - lowest\ score$$

$$= 8 - 3$$

$$= 5$$

Shape

- Skewness
- Kurtosis

Threats to descriptive statistics

- Missing data
- Outliers
- Range restriction

Interpreting descriptive statistics

Comparing means