

# Quantitative Measures

EDUC 641: Class 2

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# Quiz

# Roadmap

<i>Research is a <u>partnership</u> of questions and data</i>		What types of data are collected?	
		Categorical data	Continuous data
What kinds of questions can be asked of those data?	Questions that require us to <u>describe</u> single features of the participants	<ul style="list-style-type: none"> <li>How many members of class have black hair?</li> <li>What proportion of the class attends full-time?</li> </ul>	<ul style="list-style-type: none"> <li>How tall are class members, on average</li> <li>How many hours per week do class members report studying, on average?</li> </ul>
	Questions that require us to examine <u>relationships</u> between features of participants	<ul style="list-style-type: none"> <li>Are male-identifying students more likely to study part-time?</li> <li>Are PrevSci PhD students more likely to be female-identifying?</li> </ul>	<ul style="list-style-type: none"> <li>Do people who say they study for more hours also think they'll finish their doctorate earlier?</li> <li>Are computer-literate students less anxious about statistics?</li> </ul>

# Class goals

1. Describe types of and differences in measurement scales

# Types of data

<i>Research is a <u>partnership</u> of questions and data</i>		What types of data are collected?	
What kinds of questions can be asked of those data?	Questions that require us to <u>describe</u> single features of the participants	Categorical data	Continuous data
	Questions that require us to examine <u>relationships</u> between features of participants	<ul style="list-style-type: none"> <li>• How many members of class have black hair?</li> <li>• What proportion of the class attends full-time?</li> </ul>	<ul style="list-style-type: none"> <li>• How tall are class members, on average</li> <li>• How many hours per week do class members report studying, on average?</li> </ul>
		<ul style="list-style-type: none"> <li>• Are male-identifying students more likely to study part-time?</li> <li>• Are PrevSci PhD students more likely to be female-identifying?</li> </ul>	<ul style="list-style-type: none"> <li>• Do people who say they study for more hours also think they'll finish their doctorate earlier?</li> <li>• Are computer-literate students less anxious about statistics?</li> </ul>

**How we collect and quantify the data informs the kind of analysis we will conduct.**

# Levels/scales of measurement

**What is measurement?** assigning categories or numbers based on a set of rules

This concept is **critical** to quantitative research: we have some idea of a "thing" we want to examine (sometimes called a construct), and we need to figure how to turn the observed thing into a category or number.

**Levels of measurement:** how categories/numbers are defined

Each type of measurement has a set of properties which determines the appropriate analysis.

## Four levels/scales of measurement

1. Nominal
2. Ordinal
3. Interval
4. Ratio

# Nominal scale

No hierarchy among levels of a variable

Levels are unordered, representing labels

A variable defining whether someone is an omnivore, vegetarian, vegan or fruititarian is on a nominal scale

Most demographic variables are nominal:

- Hair color
- Race
- Ethnicity
- Gender

# Ordinal scale

Levels are logically ordered; a higher level indicates "more"

Distances between levels are not necessarily equal

Level 1 < Level 2 < Level 3 < ... (monotonicity)

Examples:

- Grades (A - F letter grades)
- Competition (1st place, 2nd place, 3rd place)
- Likert scale (on a scale of 1 to 10 with 1 being *very unhappy* and ten being *very happy*, how happy are you today?)



# Interval scale

Represents *quantity* and has *equal units*

Ordinal scale + equal measurement units

**There is no absolute zero**

Examples:

- The Fahrenheit temperature scale
  - The difference between 20 F and 30 F is the same as the difference between 60 F and 70 F
  - 0 does not represent "no temperature"
  - There is no concept of dividing or multiplying values on the scale. There are no ratios. We can't describe 50 F as half as hot as 100 F or twice as hot as 25 F

# Ratio scale

Interval scale + True zero point

True zero means a point where the thing being measured does not exist

Examples:

- Height
- Mass
- Distance
- Length of a piece of wood
- Test score (?)

# Levels of measurement

	Indicates difference	Indicates direction of difference	Indicates amount of difference	Has absolute zero
?????????	X			
?????????	X	X		
?????????	X	X	X	
?????????	X	X	X	X

**Can you match the four measurement scales to their characteristics in the above table?**

Try not to peek ahead to the next slide?

# Levels of measurement

	Indicates difference	Indicates direction of difference	Indicates amount of difference	Has absolute zero
Nominal	X			
Ordinal	X	X		
Interval	X	X	X	
Ratio	X	X	X	X

# Alternative measure terms

## Categorical variable

- Nominal and ordinal measures
- Use labels to describe

## Continuous variable

- Interval and ratio measures
- Data with arithmetic properties

# Four levels/scales of measurement

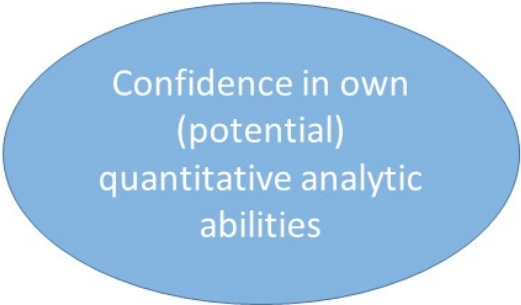
1. Nominal
2. Ordinal
3. Interval
4. Ratio

**Why does this matter?** Different scales contain different information and have different mathematical properties.

Is someone who says they are at 8 on a happiness scale twice as happy as someone who says they are at a 4?

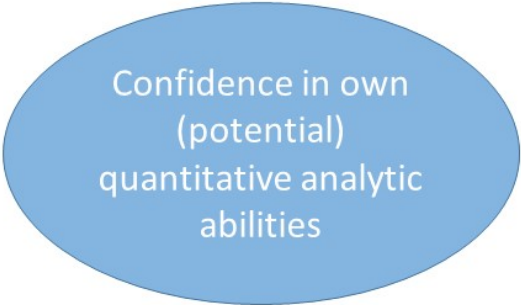
Is there a mean (or standard deviation) for the hair color of the students in this class?

# The measure of our class



Confidence in own  
(potential)  
quantitative analytic  
abilities

# The measure of our class



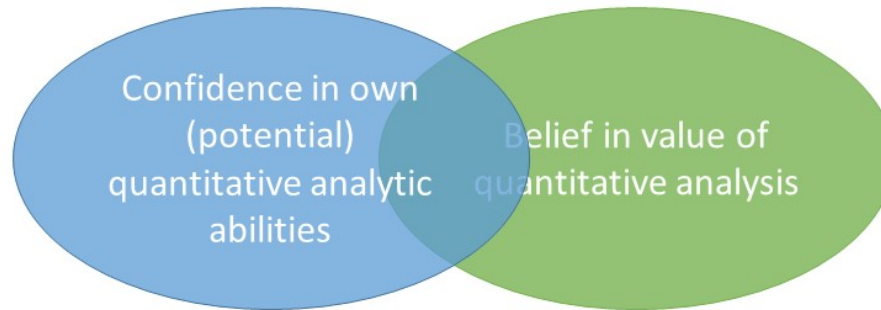
Confidence in own  
(potential)  
quantitative analytic  
abilities



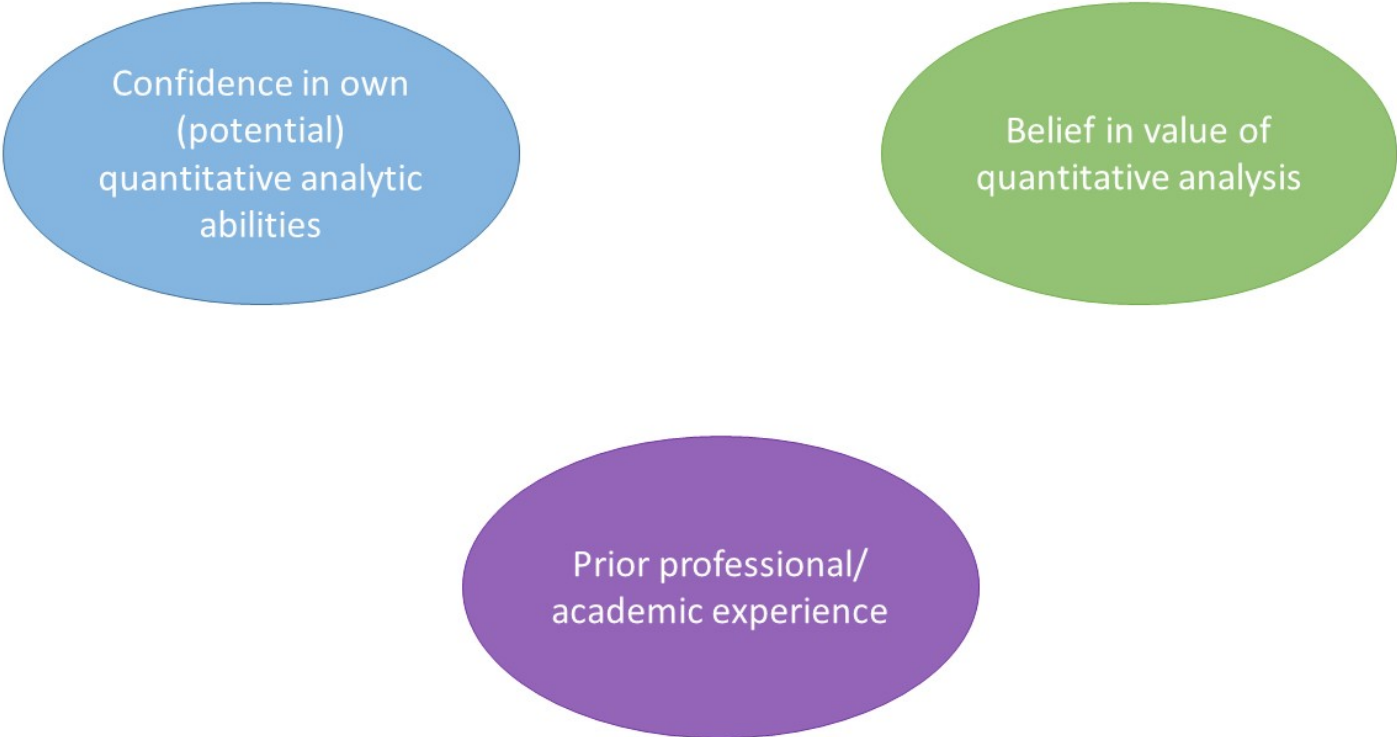
Belief in value of  
quantitative analysis



# The measure of our class



# The measure of our class

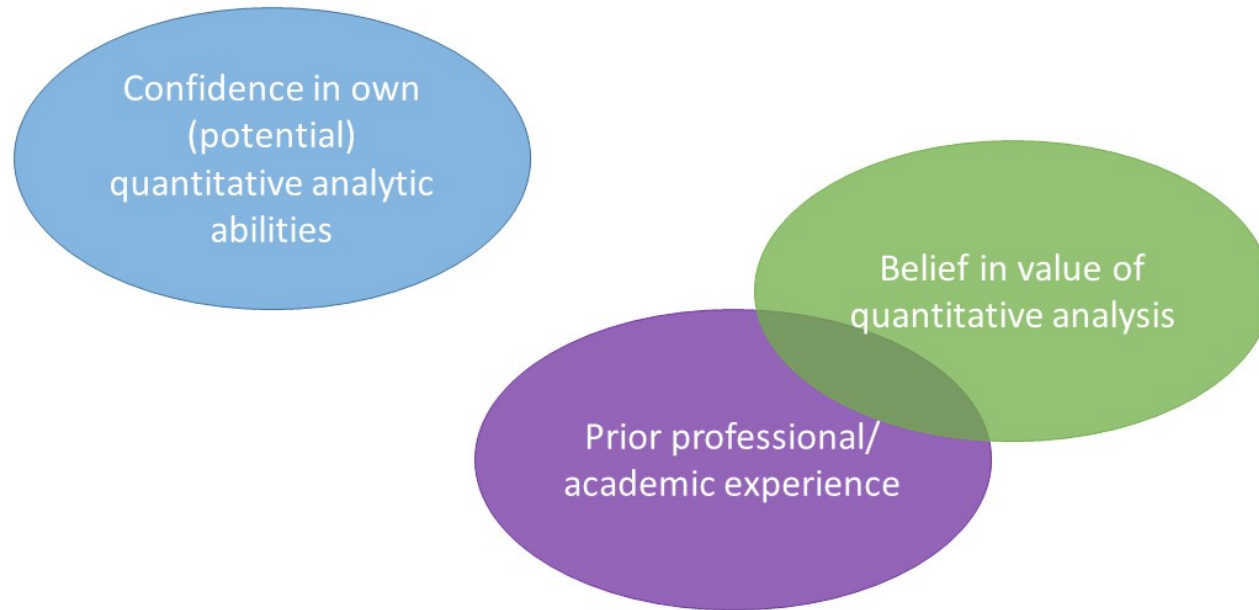


Confidence in own  
(potential)  
quantitative analytic  
abilities

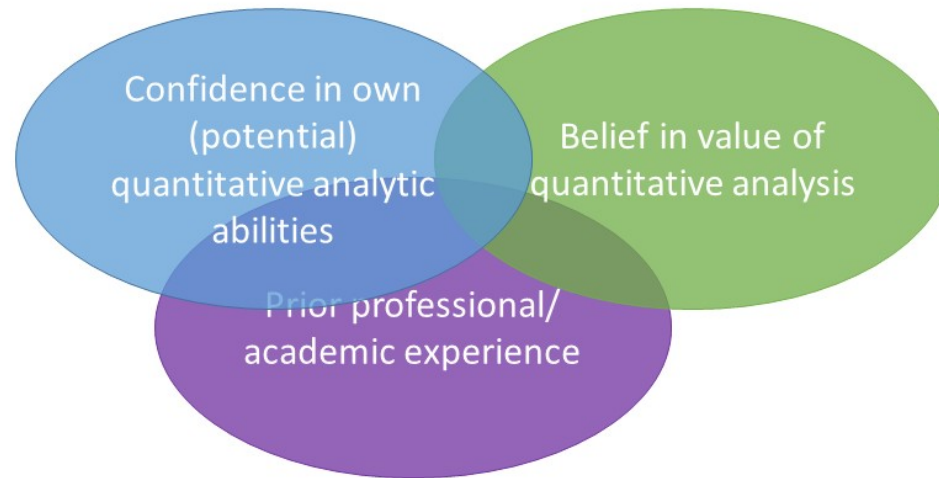
Belief in value of  
quantitative analysis

Prior professional/  
academic experience

# The measure of our class



# The measure of our class



# The measure of our class

Qualtrics

# Synthesis and wrap-up

# Class goals

1. Describe types of and differences in measurement scales

# To-Dos

## Optional follow-up:

- Complete Module 4 in R Bootcamp (data types)
- Complete Module 5 in R Bootcamp (vectors)