Basic Definitions

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2

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Statistics

⇔ *Statistics* are a set of tools that help us to

a summarize large sets of data

adata -- set of systematic observations

- the determine if a relation exists between two or more variables
 - *variable* -- an attribute of an object or human that is not constant

the infer if differences exist between different conditions in an experiment

Experiments

Experiments are a special type of research in which all the variables except the independent and dependent variables are held constant

- *Independent variable* -- the variable that the researcher systematically manipulates
- Dependent variable -- the variable that the researcher measures or records

Pick the Variables

- A researcher randomly assigned participants to one of two groups -- either the group that consumes 3 beers or the group that consumes no beer. Then both groups view a list of 20 words that they are to remember. Later they recall the words.
- ⊕ What is the independent variable?
- th What is the dependent variable?

Experiments

The main advantage of performing experiments is that they allow us, using statistics, to infer if the independent variables <u>causes</u> the change in the dependent variable

Experiments and Random Assignment

- ⊕ In true experiments the participants must be randomly assigned to the various conditions
 - ⁽²⁾ If they are not randomly assigned, there may be a systematic difference between the participants in one condition and the participants in another condition
 - Then, we could not tell if the independent variable, or the differences in the participants caused the change in the dependent variable

Quasi-Experiments

- ⊕ A quasi-experiment is similar to a real experiment except that the participants have been assigned to the various groups based on some characteristic of the participant
 - ⊕ E.g., participants are assigned to one of two groups based on whether they are male or female
- # Such variables are called *subject variables*

7

Quasi-Experiments

- A researcher assigned students into one of two groups -- whether they over 8 years of age or 8 years or less. They were asked to repeatedly recite the alphabet backwards until they did it perfectly. The number of recitations of the alphabet was recorded.
- If there is a difference in the number of recitations, can we say it is because of the difference in age?

Quasi-Experiments

Because there is no random assignment of participants in quasi-experiments, there can be no statements of causality

Samples

- ⊕ The *population* is the group of all people or objects that we are interested in
 - Humans are often the population of interest in psychology studies
 - Smaller populations are possible -- all the students in one particular class of introductory statistics
- ⊕ Usually the entire population cannot be studied. Why?

Samples

⊕ In most research, a subset of the population called the *sample* is selected

- ⊕ If the sample is selected so that each member of the population has an equal chance of being selected (called a *random sample*), and
- the sample is sufficiently large, then
- the whatever we learn about the sample will probably also be true of the population

Types of Statistics

- Statistics allow us to summarize, discover relations, and infer if two or more groups are different
- Different types of statistics are used for each of these main purposes
 - Descriptive
 - Inferential

10

Descriptive Statistics

Descriptive statistics allow us to summarize a large set of data, and to determine if there is a relation between two or more variables

 Measures of central tendency tell us about the average value

 $^{\mbox{\tiny GD}} E.g.,$ the mean, median, and mode

Descriptive Statistics

13

14

15

⊕ Measures of dispersion tell us how similar the data are to the average value *⊕* E.g., range, semi-interquartile range, and

standard deviation # *Measures of relation* tell us how strongly two variables covary, or are related to each other

⊕ E.g., correlation coefficient

Inferential Statistics

Inferential statistics allow us to decide if
 one group is different from another
 ⊕ E.g., *t*-test, ANOVA