Stat 101L: Lecture 37

Experiments

- We wish to conduct an experiment to see the effect of alcohol (explanatory variable) on reaction time (response variable).

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Factors and Treatments

- The manipulated factor will be the amount of alcohol consumed.
- There will be two treatments
  - No alcohol (Control group – drink grape punch)
  - Alcohol (Treatment group – drink grape punch spiked with grain alcohol)

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Experimental Design

- The twelve participants will be split, at random, into two groups of 6. Each participant will drink two 8 ounce glasses of grape punch in half an hour. Reaction time of each participant will be measured after drinking the punch.

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Experimental Design

- Control of outside variables.
  - Each participant drinks grape punch.
  - Each participant has reaction time measured in the same way.

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Experimental Design

- Randomization
  - Participants are randomly assigned to treatment groups.
- Replication
  - There are 6 participants in each treatment group.

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Natural Variation

- Participants will vary in terms of their natural reaction time.
- Randomization spreads this variation evenly across the treatment groups.

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Data

- 1. Control Group
- 2. Treatment Group

$n_1 = 6$	$n_2 = 6$
$\bar{y}_1$	$\bar{y}_2$
s_1	s_2

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Analysis of Results

- The data gathered from this experiment can be analyzed using the methods presented in Chapter 24 (Lectures 33 and 34).
- Two independent samples.

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Natural Variation

- We cannot control the natural variation in reaction time, i.e. make each participant have the same reaction time to begin with.
- We can account for this natural variation by introducing a blocking variable.

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Block Design

- Have each participant serve as a block.
- Each participant will experience both treatments (no alcohol, alcohol) in a random order.

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Block Design

- There is no variation in the natural reaction time within a block (it is the same person within a block).
- Therefore we can better assess the effect of alcohol on each person's reaction time.

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Data

- With this block design we will get a pair of observations (reaction time after grape punch and reaction time after grape punch with alcohol) for each participant.

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Two Independent Samples

- Two separate sets of individuals.
- One value of the response variable for each individual.

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Paired Samples

- One set of individuals.
- Two values of the response variable (a pair of values) for each individual.

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Know the Difference

- It is important to know the difference between data arising from two independent samples and data arising from paired samples.

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