# IMD0105 - Special Issues in Information Technology VI

## Introduction to research methods

Natal-RN
April 2017

# Agenda

1. Introduction
2. How to proceed a research
3. Methodology
4. Statistic
5. Data
6. Controlled experiments
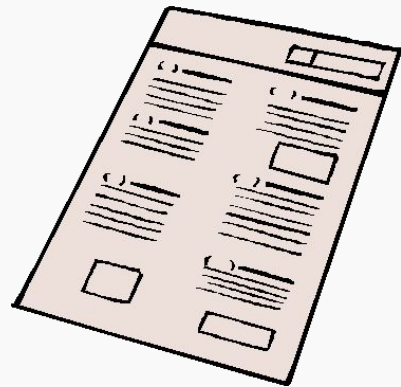7. Project - Analyze Chopstick Length
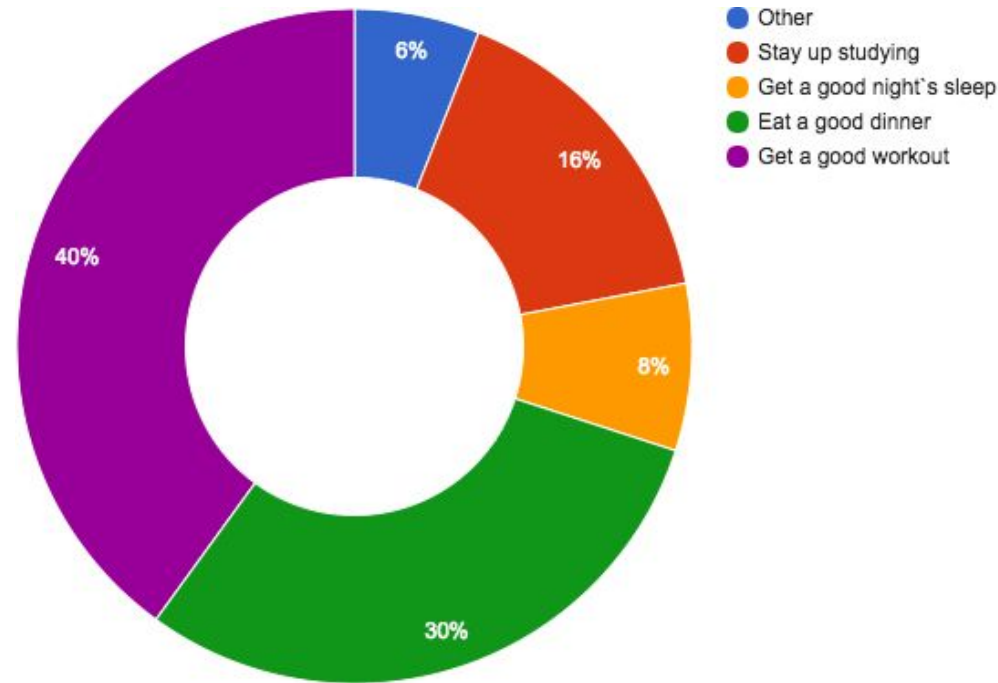
# Methodology

quiz

Helping you to think!!!

# Believe Results

1. You have a big exam tomorrow and your memory needs to be as sharp as possible.
2. What would you to do prepare?

# What will you do the day before the test?



Legend:
- Other
- Stay up studying
- Get a good night's sleep
- Eat a good dinner
- Get a good workout

6%
16%
40%
8%
30%

Would you believe in this survey results?
- How many people I surveyed?
- Who I surveyed?
- How the survey was conducted?

**Sample size -- Representativity -- Methodology**

# Memory Measure

## Memory

- Which factors influence memory?
- How to measure the memory?

# Other answers

https://www.youtube.com/watch?v=J2kY_Xf7i1E

- What do whose answers have in common?

# "BBC Face Memory Test"

http://www.bbc.co.uk/science/humanbody/sleep/tmt/test_1.shtml
http://www.bbc.co.uk/science/humanbody/sleep/tmt/test_2.shtml
http://www.bbc.co.uk/science/humanbody/sleep/tmt/test_3.shtml

"The test is in three parts and we suggest you take a five minute break in between each part."

Put your results here: https://goo.gl/pKCFQO
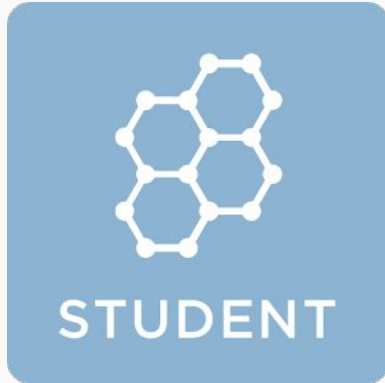
# Results

| Recognition score | Temporal memory score |
|---|---|
| Recognize faces you saw before | Remember when you saw each face |

# How did BBC measure memory?



Install Google Play - Socrative Student
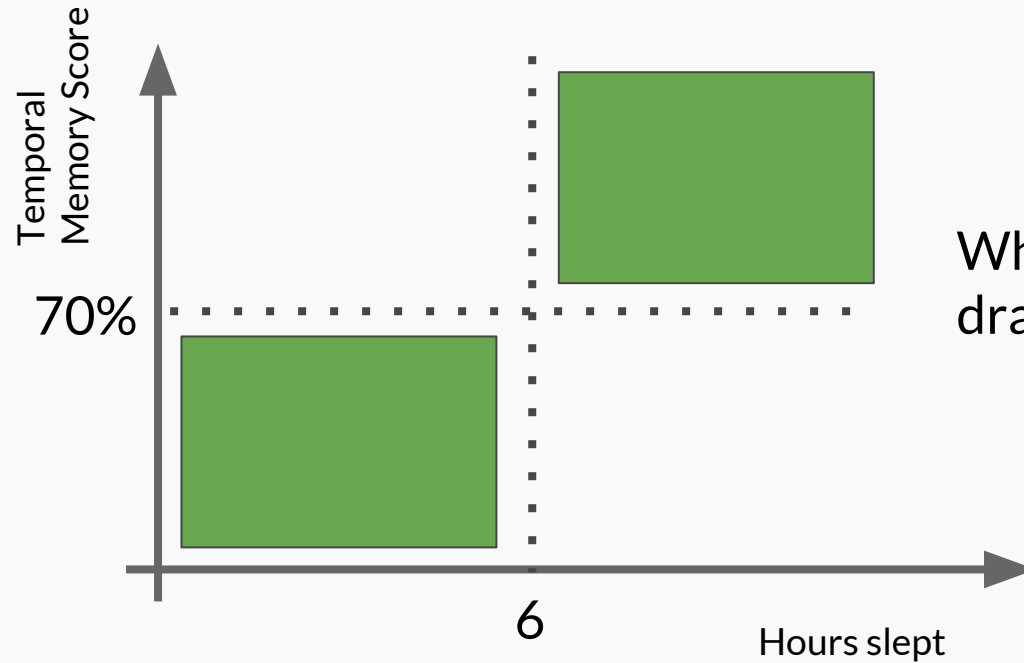
Join the room:

4PSX6ZWHG

# Data

- Data is the most essential part of statistics.
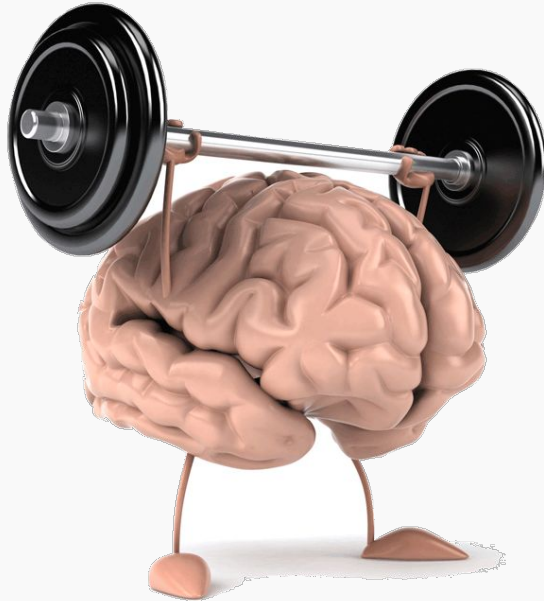- Without date you couldn't do anything.

Results of experiment
**https://goo.gl/7BFSpx**

# Sleep and Memory



Temporal Memory Score

70%

6

Hours slept

What conclusions are drawn theses groups?

# Influence Memory

What else could have influenced your memory?

- Time of day you took the test
- Number of houses in Natal
- Your stress level
- Price of tapioca
- 5-min breaks
- Your age
- Not paying attention

# Influence Memory

- Would you trust this data more if you knew that everyone had taken this test at the same time of the day?
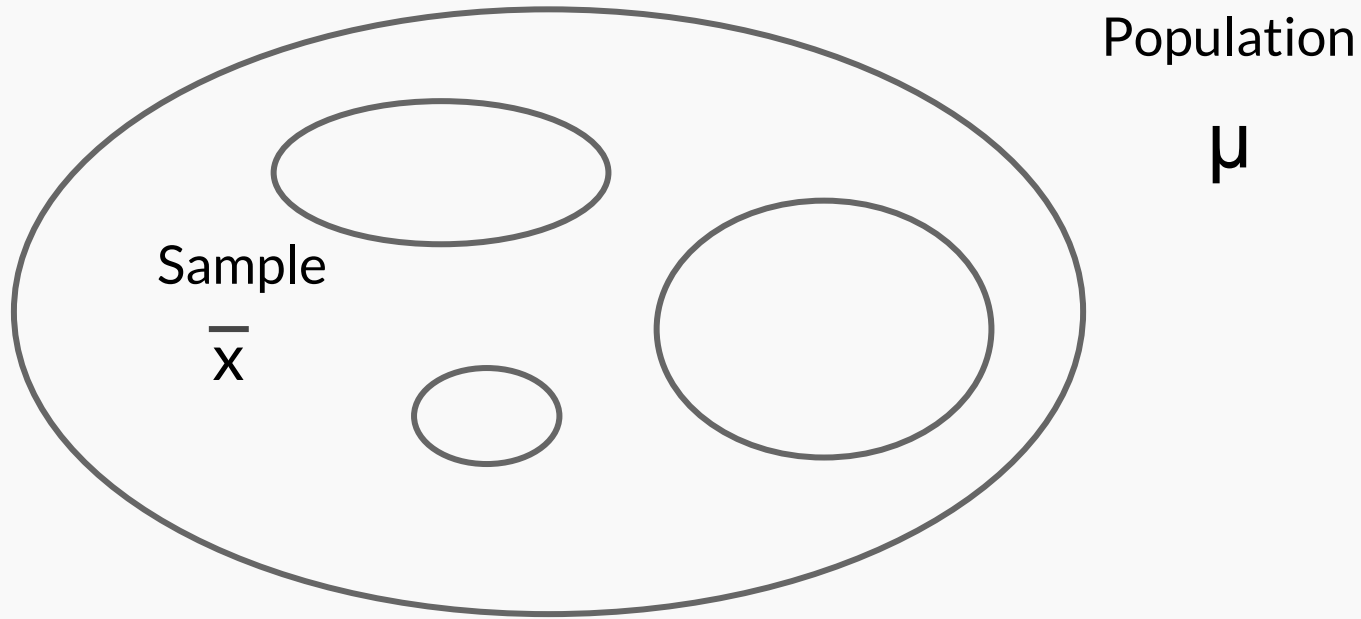
# Same Scores

| BBC's memory test results | |
|---|---|
| Recognition Score | Temporal Memory Score |
| 91.01 | 77.56 |

Do you think the average scores for this class will be exactly the same as those from the BBC study?

# Sample Average



Population

$\mu$

Sample

$\overline{x}$

# Sample Average

Population average: μ

Sample average: $\bar{x}$

$$\bar{x} > \mu$$
$$\bar{x} = \mu$$
$$\bar{x} < \mu$$

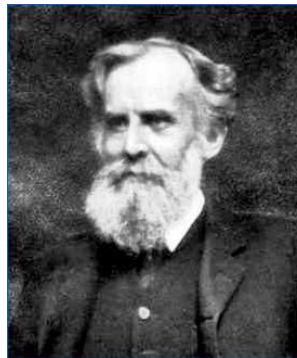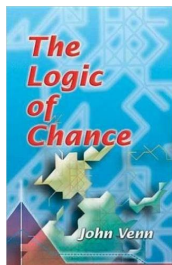| 100 | 82 | 45 |
|---|---|---|
| 98 | 11 | 32 |
| 93 | 60 | 79 |

# Randomness

## John Venn



### 1888



"Perhaps the best typical example that we can give of the scientific meaning of random distribution is afforded by the arrangement of the drops of rain in a shower. No one can give a guess whereabouts at any instant a drop will fall, but we know that if we put out a sheet of paper it will gradually become uniformly spotted over; and that if we were to mark out any two equal areas on the paper these would gradually tend to be struck equally often."

— John Venn, 1888

# Randomness

**Definition:** when you have a random sample, each subject has an equal chance of being selected. Therefore, our sample is more likely to approximate the population.
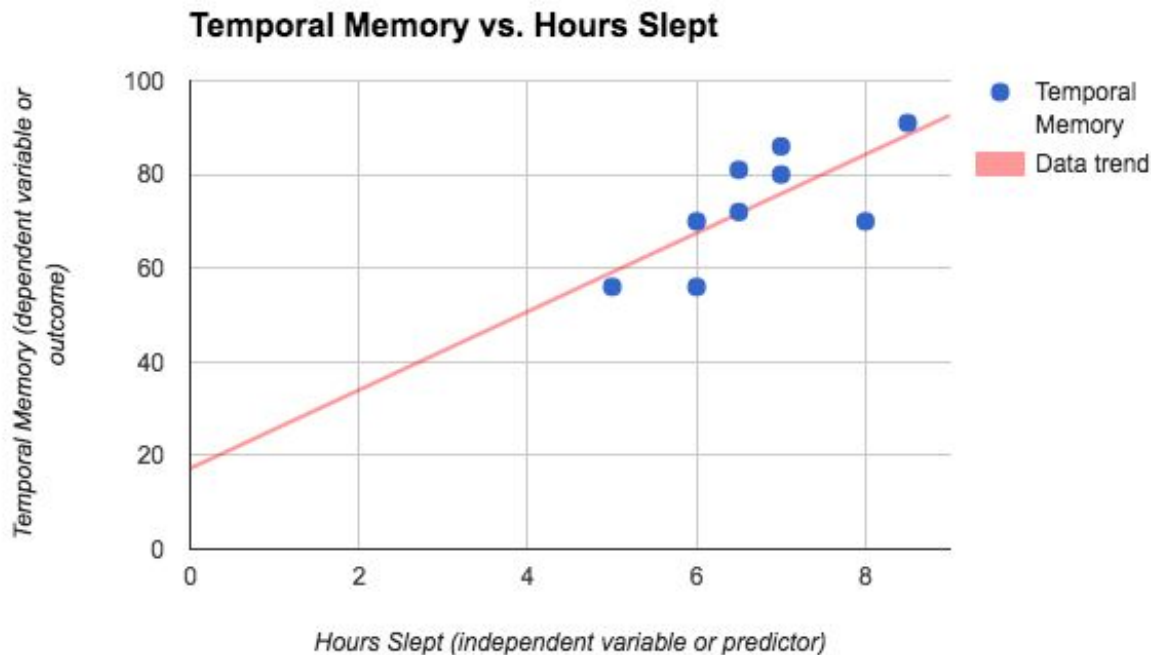
# Visualize Relationship

| Hours Slept | Temporal Memory |
|---:|---:|
| 7 | 86 |
| 8 | 70 |
| 6 | 56 |
| 5 | 56 |
| 6 | 70 |
| 7 | 80 |
| 6.5 | 72 |
| 8.5 | 91 |
| 6.5 | 81 |

# Visualize Relationship

Is it necessarily true that if you go to bed early, your memory will definitely better tomorrow?



**Temporal Memory vs. Hours Slept**

# Golden Arches Theory
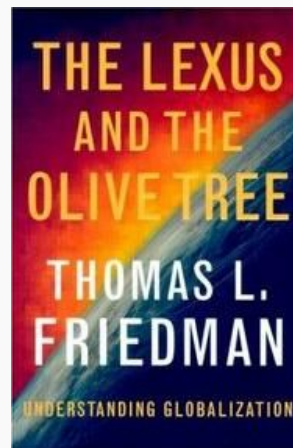


1999

No two countries with a McDonald's have ever gone to war since opening a McDonald's.

# Golden Arches Theory

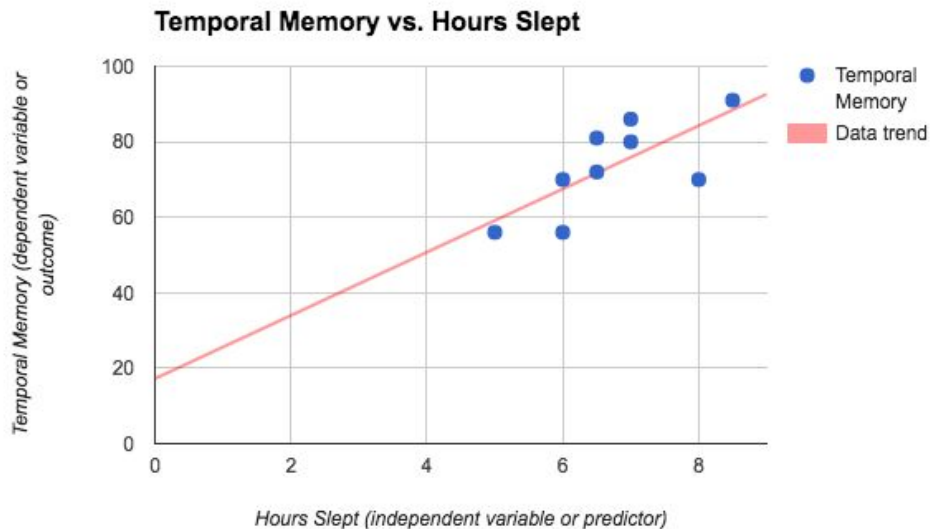https://www.youtube.com/watch?v=29Vf6PytVbA

Correlations does not imply causation

# Causal Inference



Temporal Memory vs. Hours Slept

- Temporal Memory
- Data trend

*Temporal Memory (dependent variable or outcome)*

*Hours Slept (independent variable or predictor)*

1. We can observe a pattern between two variables
2. We cannot necessarily be confident that sleep causes better memory.
3. What if we wanted to prove that sleep causes better memory?

# Controlled Experiments

# Placebo and Blind

Imagine that researchers are testing the effect of some sleep medication on a population (random sample).

Everyone receives a pill, but for some, the pill has medication that supposedly helps you sleep, and for others it's inactive (placebo).
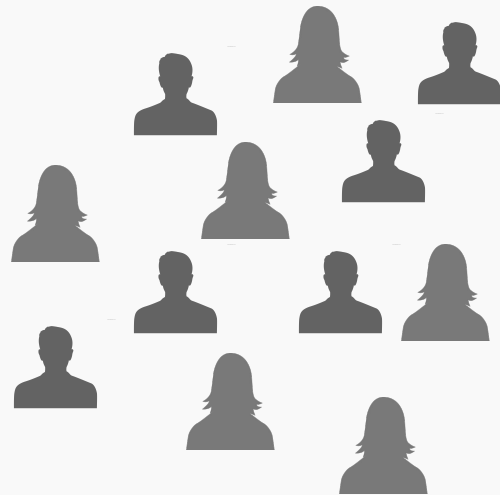
They take the pill at the same time of day, on the same day, and the same place. And then, they all go to bed in a sleep lab at the same time.

The researchers not known which treatment participants received.

Active

Inactive

# Just to record!!!!

Getting a good night's sleep will likely pay off more than a couple of extra hours of study.

https://ww2.kqed.org/mindshift/2013/01/11/why-sleeping-may-be-more-important-than-studying/

# Project P0 - Analyze Chopstick Length

Download IPython Notebook:

● https://goo.gl/Y7mJE5