PSY360: Research Methods

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Preface

Welcome to PSY360: Research Methods! The goal of this course is to introduce you to the world of research and discuss *how* research is conducted, *why* research is conducted, and *what* it means to conduct research.

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1 Introduction

This is a book created from markdown and executable code.

See Knuth (1984) for additional discussion of literate programming.

```
1 + 1
```

[1] 2

Part I

Lectures

2 Chapter 1: Reading and Writing an APA Style Paper

Reading an APA paper can seem like a daunting task at first glance. Some articles can be dozens of pages and the results section can make the statistically-weak-stomached run and hide!

The key to reading an APA paper is to break it down into its sections

2.0.0.1 Abstract

2.0.0.2 Introduction/Background

2.0.0.3 Method

2.0.0.4 Results

2.0.0.5 Discussion

2.0.0.6 References

3 Chapter 2: Working with Descriptive Statistics

Descriptive statistics *describe* what the data *looks* like. You likely recall seeing the bell curve in PSY248 (statistics). You may even remember the phrase *central tendency*. The idea behind these values is that they give us a metric of where the data (likely) comes from.

Let's go over the usual suspects: Mean, Median, Mode, and Range

3.0.0.1 Mean

The mean represents the average of a set of numbers. Mathematically represented by the following equation:

$$\overline{X} = \frac{\Sigma x}{n}$$

In a simple group, the mean can be seen by *eyeballing* the data:

```
x <- rnorm(5,1,0)
x
```

```
[1] 1 1 1 1 1
```

The *only* number that exists here is 1, so the mean *has* to be 1...right?!

```
paste0("The mean of x = ", mean(x))
```

```
[1] "The mean of x = 1"
```

However, when the numbers become more spread out and varied, it is not as easy.

```
y <- rnorm(15,5,2) |> round(0)
y
```

```
[1] 1 5 6 4 6 8 5 5 3 3 4 5 5 8 3
```

Eyeballing this data will not do us any good!

```r
paste0("The mean of y = ", mean(y) |> round(2))
```

```
[1] "The mean of y = 4.73"
```

$$\sigma = \frac{\Sigma(x - \bar{x}}{n - 1}$$

> 💡 Never trust the eyeballing of data as a replacement for calculation!

3.0.0.2 Test

4 Let's Take a Sentence

```r
library(stringr)
library(dplyr)
```

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union

```r
library(janeaustenr)
library(ggplot2)
library(wesanderson)
library(tidyr)

sent <- sample(sentences,1)

sent
```

[1] "The best method is to fix it in place with clips."

4.0.1 How many characters?

```r
str_length(sent)
```

[1] 49

4.0.2 How many words?

```r
length(unlist(str_match_all(sent, "\\b\\w+\\b")))
```

```
[1] 11
```

4.0.3 How many words start with a vowel?

```r
sent_split <- unlist(str_split(sent, boundary(type = "word")))

str_extract(sent_split, "^[aeiou]\\w+" )
```

```
 [1] NA    NA    NA    "is" NA    NA    "it" "in" NA    NA    NA
```

4.0.4 How many words start with a consonant?

```r
sent_split <- unlist(str_split(sent, boundary(type = "word")))
# We only need to change one character!
str_extract(sent_split, "[^aeiou]\\w+" )
```

```
[1] "The"    "best"   "method" NA        "to"     "fix"    NA        NA
[9] "place"  "with"   "clips"
```

5 Summary

In summary, this book has no content whatsoever.

```
1 + 1
```

```
[1] 2
```

References

Knuth, Donald E. 1984. "Literate Programming." *Comput. J.* 27 (2): 97–111. https://doi.or
g/10.1093/comjnl/27.2.97.

Part II

Laboratory

6 Lab 1: Brainstorming Ideas

You will be working in a group this semester. You will develop a project, gather measures, find background literature, collect data, analyze results, all culminating in a final paper.

How do *you* think groups should be decided?

1. What if we clustered groups together by GPA? (consider using means clustering from {cluster} package.

```r
meth1 <-
  data.frame(
  student = 1:20,
  gpa = c(rnorm(5,3.4,.3),
          rnorm(5,3.0,.3),
          rnorm(5,2.2,1),
          rnorm(5,2.5,.5))
)

cluster::agnes(meth1, metric = "euclidean", method = "average")
```

```
Call:    cluster::agnes(x = meth1, metric = "euclidean", method = "average")
Agglomerative coefficient:  0.8731684
Order of objects:
 [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
Height (summary):
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 1.000   1.066   1.511   2.477   2.593  10.051

Available components:
[1] "order"  "height" "ac"      "merge"  "diss"    "call"    "method" "data"
```

2. What if we sorted groups alphabetically?

```r
df_test <-
  data.frame(
```

```r
  student = paste0(
    sample(babynames$name,30), " ", sample(LETTERS,30,replace = T), "."
))

num_gr <- 5

colname <- paste0("Group ", 1:5)

df_abc <-
  df_test |>
  group_by((row_number()-1) %/% (n()/num_gr)) |>
  tidyr::nest()

df_abc_d <-
  df_abc$data |>
  as.data.frame() |>
  hux() |>
  theme_article()

df_abc_d[1,1:5] <- colname

df_abc_d |>
  set_left_border() |>
  set_caption("Study Groups")
```

Table 6.1: Study Groups

Group 1	Group 2	Group 3	Group 4	Group 5
Carrel N.	Tremell K.	Davy C.	Korina O.	Kai U.
Yamari Q.	Taniya Q.	Gabe R.	Vernetta S.	Wilhemina L.
Willette D.	Jestine I.	Shamaine Y.	Armelia R.	Blakleigh F.
Jennings H.	Finesse H.	Lamorris C.	Len M.	Aimie N.
Debbi I.	Zayvion M.	Shamaria V.	Jewell M.	Tranda N.
Courtenay O.	Hillarie T.	Lou D.	Clorinda C.	Oneil X.

```
num_gr <- 5

colname <- paste0("Group ", 1:5)

df <-
  df_test |>
  group_by((row_number()-1) %/% (n()/num_gr)) |>
  tidyr::nest()

df_t <-
  df$data |>
  as.data.frame() |>
  hux() |>
  theme_article()

df_t[1,1:5] <- colname

df_t |>
  set_left_border() |>
  set_caption("Study Groups")
```

Table 6.2: Study Groups

Group 1	Group 2	Group 3	Group 4	Group 5
Carrel N.	Tremell K.	Davy C.	Korina O.	Kai U.
Yamari Q.	Taniya Q.	Gabe R.	Vernetta S.	Wilhemina L.
Willette D.	Jestine I.	Shamaine Y.	Armelia R.	Blakleigh F.
Jennings H.	Finesse H.	Lamorris C.	Len M.	Aimie N.
Debbi I.	Zayvion M.	Shamaria V.	Jewell M.	Tranda N.
Courtenay O.	Hillarie T.	Lou D.	Clorinda C.	Oneil X.

3. What if each group was assigned a letter of A,B,C,D, or E?

```
df_test |>
  mutate(lettergrp = sample(LETTERS[1:5],length(student),replace = T),
         lettergrp = factor(lettergrp))
```

These are all methods of *assignment* which we will cover later on in lecture!

6.0.1 Identifying a Research Topic

Take 5 minutes and brainstorm with your group.

It can help to first identify the *field* in which you (and your group) are interested. For example, if you are interested in Sports Psychology, you might think about how exercise or coaching can effect how a player performs on any given game.

6.0.2 Search for the topic!

You can use the Farmingdale Databases or my personal favorite, Google Scholar. When you find an article you like, click on *Cited By* to see recent studies that have included the current study in their references.
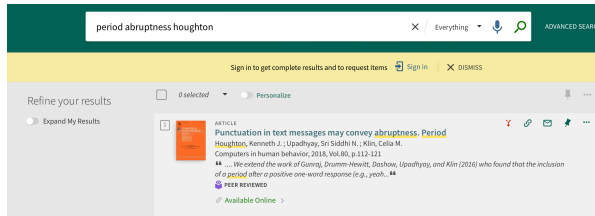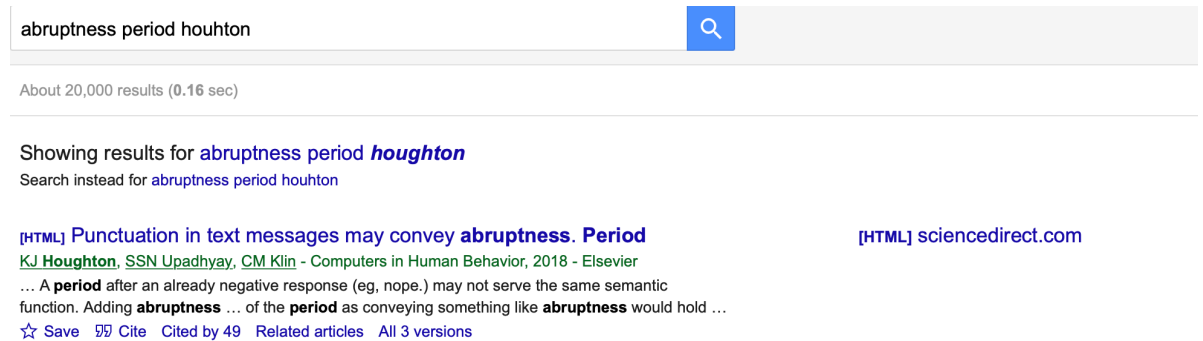

(a) Library

Figure 6.1:

6.0.3 Connected Papers

6.0.4 Defining Variables
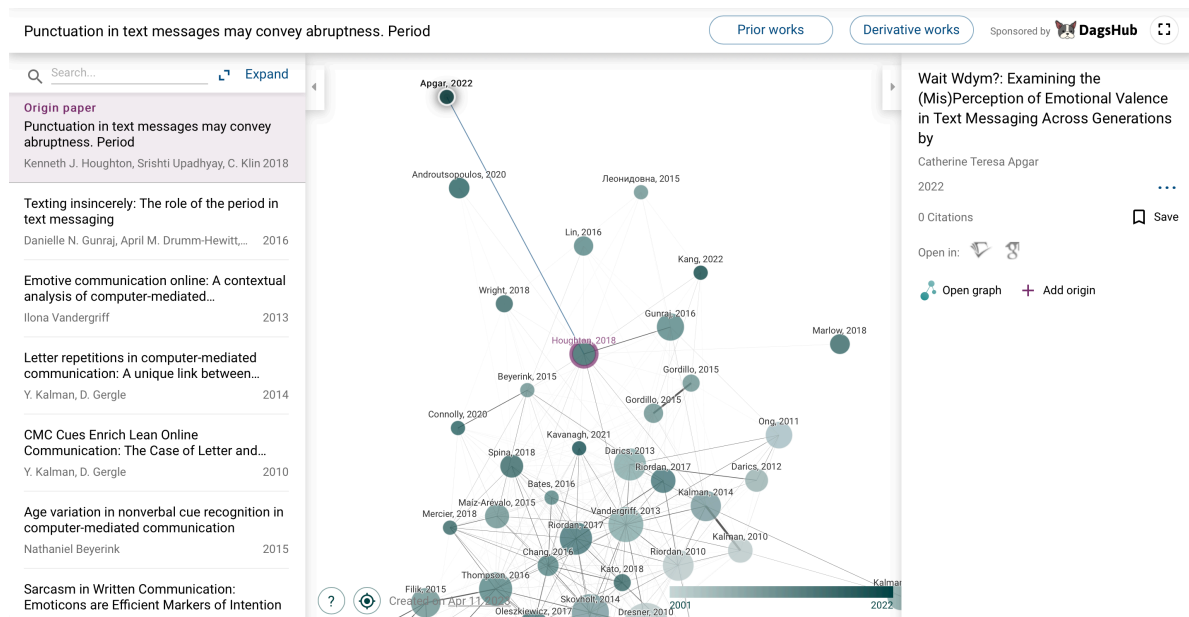
1. What is your Independent Variable

Figure 6.2: Connected Papers: Visualize Article Connections

2. What is your Dependent Variable
3. What is/are your operational definition(s)
4. What is/are your conceptual definition(s)

6.0.5 Group Experiment Planning Worksheet

student	lettergrp
Carrel N.	D
Yamari Q.	E
Willette D.	E
Jennings H.	B
Debbi I.	D
Courtenay O.	D
Tremell K.	D
Taniya Q.	D
Jestine I.	E
Finesse H.	E
Zayvion M.	E
Hillarie T.	C
Davy C.	E
Gabe R.	B
Shamaine Y.	E
Lamorris C.	C
Shamaria V.	C
Lou D.	B
Korina O.	A
Vernetta S.	D
Armelia R.	E
Len M.	B
Jewell M.	D
Clorinda C.	E
Kai U.	B
Wilhemina L.	A
Blakleigh F. 21	C
Aimie N.	A
Tranda N.	D
Oneil X.	C

7 Lab 2: Conducting a Literature Search

8 Lab 3: Structure of Research Articles

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