GS_ResMeth_DemoBook

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Table of contents

Preface

This is a Quarto book Draft o1.

To learn more about Quarto books visit https://quarto.org/docs/books.

1 Introduction

This is a book created from markdown and executable code.

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

2 Demonstrations

Demonstrations of stuff

Here is a demo of web-r web-r demo

Here is a demo of webexercises webexercises demo

Here is a demo of a download button downloadthis demo

Here is a demo of a Countdown timer

2.1 another

3 Summary

In summary, this book has no content whatsoever.

4 Webexercises

This is a Web Exercise template created by the psychology teaching team at the University of Glasgow, based on ideas from Software Carpentry. This template shows how instructors can easily create interactive web documents that students can use in self-guided learning.

The `{webexercises}` package provides a number of functions that you use in inline R code or through code chunk options to create HTML widgets (text boxes, pull down menus, buttons that reveal hidden content). Examples are given below. Render this file to HTML to see how it works.

NOTE: To use the widgets in the compiled HTML file, you need to have a JavaScript-enabled browser.

4.1 Example Questions

4.1.1 Fill-In-The-Blanks (`fitb()`)

Create fill-in-the-blank questions using `fitb()`, providing the answer as the first argument.

- 2 + 2 is _

You can also create these questions dynamically, using variables from your R session.

- The square root of 64 is: _

The blanks are case-sensitive; if you don't care about case, use the argument `ignore_case = TRUE`.

- What is the letter after D? _

If you want to ignore differences in whitespace use, use the argument `ignore_ws = TRUE` (which is the default) and include spaces in your answer anywhere they could be acceptable.

- How do you load the tidyverse package? _____

You can set more than one possible correct answer by setting the answers as a vector.

- Type a vowel: _

You can use regular expressions to test answers against more complex rules.

- Type any 3 letters: _____

4.1.2 Multiple Choice (`mcq()`)

- "Never gonna give you up, never gonna:
- (A) let you go
- (B) turn you down
- (C) run away
- (D) let you down

" - "I

- (A) bless the rains
- (B) guess it rains
- (C) sense the rain

  down in Africa" -Toto

4.1.3 True or False (`torf()`)

- True or False? You can permute values in a vector using `sample()`. TRUE / FALSE

4.1.4 Longer MCQs (`longmcq()`)

When your answers are very long, sometimes a drop-down select box gets formatted oddly. You can use `longmcq()` to deal with this. Since the answers are long, It's probably best to set up the options inside an R chunk with `echo=FALSE`.

What is a p-value?

- (A) the probability that the null hypothesis is true

- (B) the probability of the observed, or more extreme, data, under the assumption that the null-hypothesis is true

- (C) the probability of making an error in your conclusion

What is true about a 95% confidence interval of the mean?

- (A) 95% of the data fall within this range

- (B) if you repeated the process many times, 95% of intervals calculated in this way contain the true mean

- (C) there is a 95% probability that the true mean lies within this range

4.2 Checked sections

Create sections with the class `webex-check` to add a button that hides feedback until it is pressed. Add the class `webex-box` to draw a box around the section (or use your own styles).

I am going to learn a lot: TRUE / FALSE

What is a p-value?

- (A) the probability that the null hypothesis is true

- (B) the probability of the observed, or more extreme, data, under the assumption that the null-hypothesis is true

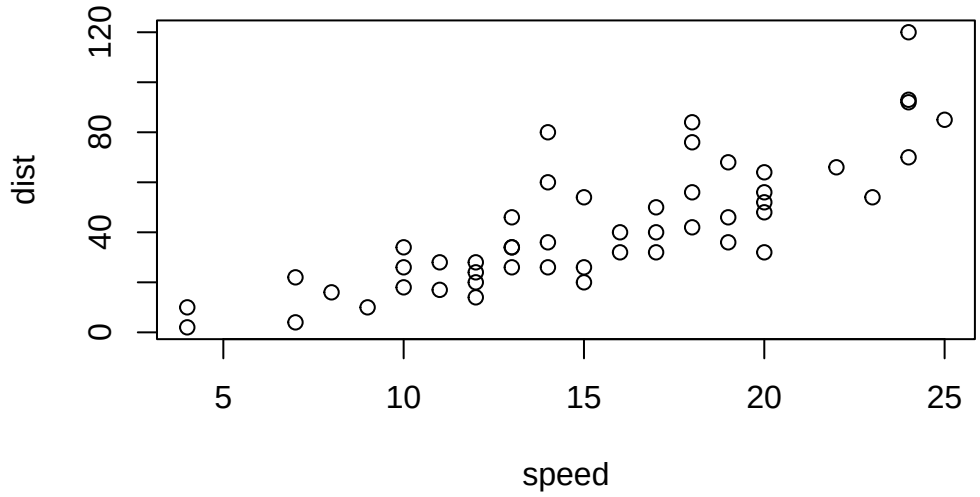
- (C) the probability of making an error in your conclusion

4.3 Hidden solutions and hints

You can fence off a solution area that will be hidden behind a button using `hide()` before the solution and `unhide()` after, each as inline R code. Pass the text you want to appear on the button to the `hide()` function.

If the solution is a code chunk, instead of using `hide()` and `unhide()`, simply set the `webex.hide` chunk option to TRUE, or set it to the string you wish to display on the button.

Recreate the scatterplot below, using the built-in `cars` dataset.



I need a hint

See the documentation for `plot()` (`?plot`)

Click here to see the solution

```
plot(cars$speed, cars$dist)
```

4.4 Deception Example Quiz

This set of exercises will test your knowledge about various aspects of deception in psychology. Answer the questions to check your understanding of key concepts, theories, and research findings in this area.

4.5 Fill-In-The-Blanks

1. The tendency for people to believe they are less likely to be deceived than others is known as the _____ to deception.
2. In deception research, the _____ is an actor who works with the experimenter to deceive the actual participant.

3. The _____ is a genuine smile that involves both the mouth and the eyes, making it harder to fake in deceptive situations.

4.6 Multiple Choice

1. Which of the following is NOT typically considered a reliable indicator of deception?

- (A) Increased blinking
- (B) Reduced hand gestures
- (C) Lack of eye contact
- (D) Increased speech errors

2. The theory that proposes that lying is more cognitively demanding than telling the truth is called:

- (A) Interpersonal Deception Theory
- (B) Cognitive Load Theory
- (C) Four-Factor Theory
- (D) Self-Presentation Theory

3. In a typical deception study, who is usually unaware of the true nature of the experiment?

- (A) Participant
- (B) Experimenter
- (C) Confederate
- (D) Research Assistant

4.7 True or False

1. Polygraph tests are highly accurate and widely accepted in scientific communities as reliable lie detectors. TRUE / FALSE

2. People are generally better at detecting lies told by strangers than by those close to them. TRUE / FALSE
3. Microexpressions are brief, involuntary facial expressions that can potentially reveal concealed emotions in deceptive situations. TRUE / FALSE

4.8 Longer MCQs

Which of the following best describes the "Truth-Default Theory" in deception research?

- (A) The theory that humans are naturally inclined to always tell the truth
- (B) The theory that humans tend to believe others are telling the truth unless given reason to think otherwise
- (C) The theory that truth-telling is easier and requires less cognitive effort than lying
- (D) The theory that cultural norms universally prioritize truthfulness over deception

What is the primary focus of Interpersonal Deception Theory (IDT)?

- (A) The neurological processes involved in creating and maintaining a lie
- (B) The psychological motivations that drive individuals to engage in deceptive behavior
- (C) The cultural variations in perceptions and acceptance of deceptive practices
- (D) The dynamic interaction between the deceiver and the target of deception

4.9 Checked sections

Research suggests that detecting deception is:

- (A) Easy for most people
- (B) Only possible with specialized training
- (C) Difficult, with accuracy rates often only slightly above chance
- (D) Impossible without technological aids

Explain why detecting deception is challenging for most people:

Click for explanation

Detecting deception is challenging for several reasons:

1. Many common beliefs about deception cues (e.g., lack of eye contact) are not reliable indicators.
2. Liars often strategically control their behavior to appear truthful.
3. Individual differences in baseline behavior make it hard to identify deviations.
4. The cognitive load of trying to detect lies can impair judgment.
5. Confirmation bias can lead people to interpret ambiguous cues in line with their expectations.

4.10 Hidden solutions and hints

A researcher wants to study how cognitive load affects lying behavior. Describe a potential experimental design to investigate this.

I need a hint

Consider how you might manipulate cognitive load (e.g., through a secondary task) and measure lying behavior. Think about what control conditions you might need.

Click here to see a possible experimental design

```
# Possible Experimental Design:

# Participants: 100 adults randomly assigned to two groups (50 each)
#
# Procedure:
# 1. All participants are asked to lie about a recent experience
#
# 2. Experimental group:
#    - Must count backwards from 100 by 7s while lying (high cognitive load)
#
# 3. Control group:
#    - Simply lie without additional task (normal cognitive load)
#
# 4. Measure dependent variables:
#    - Speech hesitations
#    - Speech rate
#    - Amount of detail provided
#    - Perceived believability (rated by independent judges)
```

```
#
# 5. Compare measures between groups to assess the effect of cognitive load on lying behavio

# This design allows us to isolate the effect of increased cognitive load on various aspects
```

This set of exercises covers various aspects of deception psychology, including theories, research methods, and key findings. It utilizes different question types to engage learners and test their understanding of the subject matter.

5 webR in Quarto HTML Documents

Each class session has an interactive lesson that you will work through ***after*** doing the readings and watching the lecture. These lessons are a central part of the class—they will teach you how to use {ggplot2} and other packages in the tidyverse to create beautiful and truthful visualizations with R.

Interactive code sections look like this. Make changes in the text box and click on the green "Run Code" button to see the results. Sometimes there will be a tab with a hint or solution.

! Your turn

Modify the code here to show the relationship between health and wealth for 2002 instead of 2007.

5.1 </> Interactive editor

```
gapminder_filtered <- gapminder |>
  filter(year == 2007)

ggplot(data = gapminder_filtered,
       mapping = aes(x = gdpPercap, y = lifeExp,
                     size = pop, color = continent)) +
  geom_point() +
  scale_x_log10(labels = scales::dollar_format(accuracy = 1)) +
  scale_size_continuous(labels = scales::label_comma()) +
  scale_color_viridis_d(option = "plasma") +
  labs(x = "GDP per capita", y = "Life expectancy",
       title = "Health and wealth are strongly related",
       subtitle = "142 countries; 2007 only", caption = "Source: The Gapminder Project",
       color = "Continent", size = "Population") +
  theme_bw()
```

5.2 Hint

Hint: You'll want to change something in the code that creates `gapminder_filtered`. The text in the subtitle won't change automatically, so you'll want to edit that too.

If you're curious how this works, each interactive code section uses the amazing {quarto-webr} package to run R directly in your browser.

6 DownloadThis Demo

How to download files and stuff

```
library(downloadthis)
```

6.1 What a terrific Website

and this is some sparkling content.

How could I possibly download the data you mention?

There you go, mydude!

and

In the foundations of inference chapters, we have provided three different methods for statistical inference. We will continue to build on all three of the methods throughout the text, and by the end, you should have an understanding of the similarities and differences between them. Meanwhile, it is important to note that the methods are designed to mimic variability with data, and we know that variability can come from different sources (e.g., random sampling vs. random allocation, see **?@fig-randsampValloc**). In **?@tbl-foundations-summary**, we have summarized some of the ways the inferential procedures feature specific sources of variability. We hope that you refer back to the table often as you dive more deeply into inferential ideas in future chapters.

Discernibility levels should reflect consequences of errors.
The discernibility level selected for a test should reflect the real-world consequences associated with making a Type I or Type II error.

References

Knuth, Donald E. 1984. *The TeXbook*. Addison-Wesley.

Part I

Overview

Preface

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To learn more about Quarto books visit https://quarto.org/docs/books.

Part II

Week 01

7 Lecture

8 PS53011C/PS71020E Lab Worksheet

These are your slides for the week. Use the arrow keys to navigate. ## Week 4: Multiple Regression (Part 1)

Please attempt all questions in your own words. Model answers will be available on the VLE page following the lab session.

8.1 Learning Outcomes

1. Conduct simple and multiple linear regression analyses using R and the Tidyverse.
2. Explore relationships between regression coefficients and correlation measures.
3. Assess assumptions of linear regression including normality, linearity, and multicollinearity.
4. Compute and interpret simple, partial, and semipartial correlations in R.

8.2 Materials

- **Software**: R (Tidyverse package)
- **Dataset**:

```
library(tidyverse)
```

8.3 Dataset Overview

The dataset includes reaction time (RT) data for participants responding to emotional facial expressions. Of particular interest is the average RT to fearful faces for correct identifications. Predictors include:

- `traitanx`: Trait anxiety (Spielberger scale)
- `ACS`: Attentional Control Scale score
- `Age`: Participant age

8.4 Task 1: Descriptive Statistics and Visualisation

- Load the dataset
- Create summary statistics and visualizations for RT, traitanx, ACS, and Age.

```
fearful_data <- read_csv("data/fearful_faces.csv")
```

```
Rows: 18003 Columns: 9
-- Column specification --------------------------------------------------------
Delimiter: ","
dbl (9): subno, trialnum, Handedness, Gender, Age, Fearful_face_RT, Happy_fa...

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

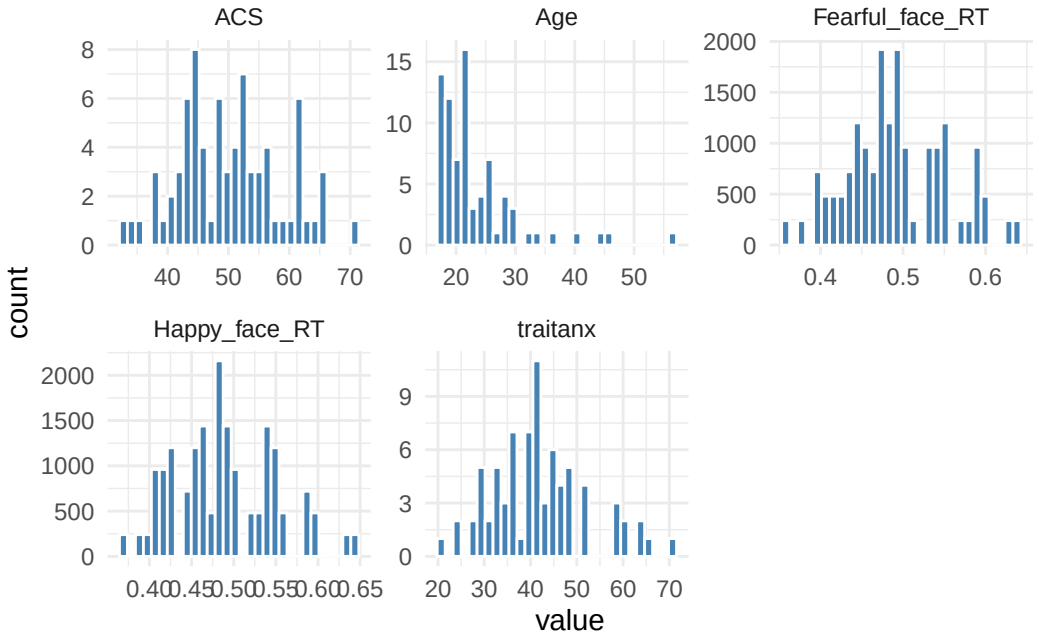
```
fearful_data %>%
  summarise(across(c(Fearful_face_RT, Happy_face_RT, traitanx, ACS, Age), list(mean = mean, s
```

```
Warning: There was 1 warning in `summarise()`.
i In argument: `across(...)`.
Caused by warning:
! The `...` argument of `across()` is deprecated as of dplyr 1.1.0.
Supply arguments directly to `.fns` through an anonymous function instead.

  # Previously
  across(a:b, mean, na.rm = TRUE)

  # Now
  across(a:b, \(x) mean(x, na.rm = TRUE))
```

```
# A tibble: 1 x 10
  Fearful_face_RT_mean Fearful_face_RT_sd Happy_face_RT_mean Happy_face_RT_sd
                 <dbl>              <dbl>              <dbl>            <dbl>
1                0.491             0.0604              0.489           0.0600
# i 6 more variables: traitanx_mean <dbl>, traitanx_sd <dbl>, ACS_mean <dbl>,
#   ACS_sd <dbl>, Age_mean <dbl>, Age_sd <dbl>
```

```r
fearful_data %>%
  pivot_longer(cols = c(Fearful_face_RT, Happy_face_RT, traitanx, ACS, Age), names_to = "vari
  ggplot(aes(x = value)) +
  geom_histogram(bins = 30, fill = "steelblue", color = "white") +
  facet_wrap(~ variable, scales = "free") +
  theme_minimal()
```

```
Warning: Removed 53784 rows containing non-finite outside the scale range
(`stat_bin()`).
```



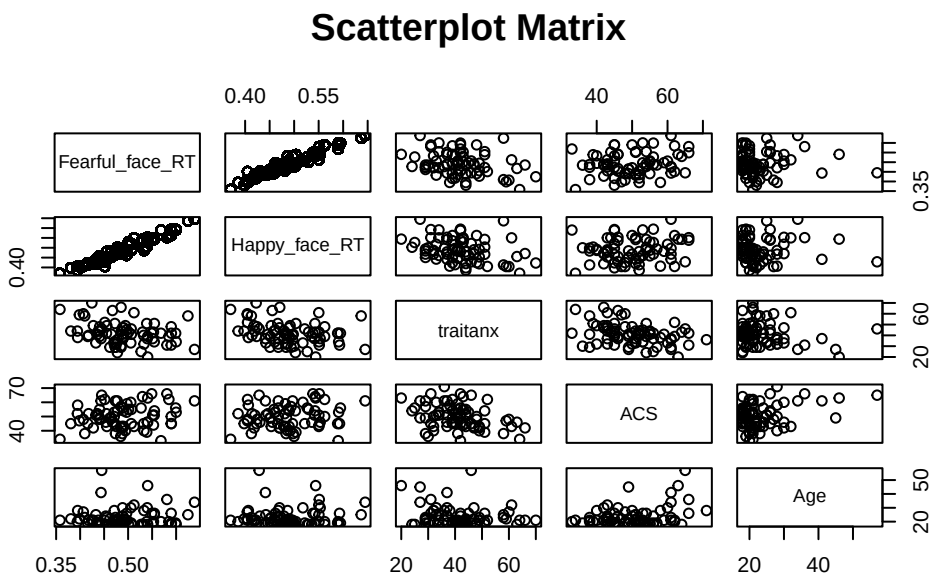
8.5 Task 2: Correlation Analysis

- Compute a correlation matrix
- Visualize relationships using scatterplots

```
fearful_data %>%
  select(Fearful_face_RT, Happy_face_RT, traitanx, ACS, Age) %>%
  cor(use = "complete.obs") %>%
  round(2)
```

```
                Fearful_face_RT Happy_face_RT traitanx   ACS   Age
Fearful_face_RT            1.00          0.96    -0.33  0.18  0.04
Happy_face_RT              0.96          1.00    -0.37  0.14  0.02
traitanx                  -0.33         -0.37     1.00 -0.36 -0.14
ACS                        0.18          0.14    -0.36  1.00  0.36
Age                        0.04          0.02    -0.14  0.36  1.00
```

```
pairs(fearful_data %>% select(Fearful_face_RT, Happy_face_RT, traitanx, ACS, Age), main = "Sc
```



8.6 Task 3: Multiple Regression

- Conduct a multiple regression predicting Fearful_face_RT from traitanx, ACS, and Age.

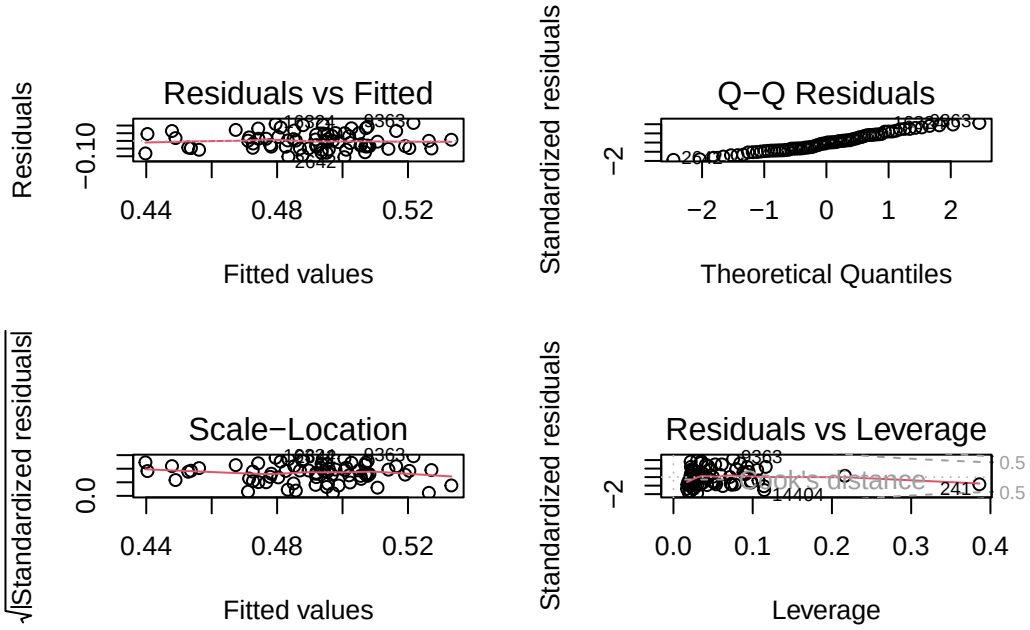
```
model <- lm(Fearful_face_RT ~ traitanx + ACS + Age, data = fearful_data)
summary(model)
```

```
Call:
lm(formula = Fearful_face_RT ~ traitanx + ACS + Age, data = fearful_data)

Residuals:
      Min        1Q    Median        3Q       Max
-0.105742 -0.043660 -0.002261  0.044587  0.116670

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.5470081  0.0637205   8.584  1.9e-12 ***
traitanx    -0.0018929  0.0007492  -2.527   0.0138 *
ACS          0.0005506  0.0009446   0.583   0.5619
Age         -0.0002299  0.0010605  -0.217   0.8290
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.05698 on 68 degrees of freedom
  (17931 observations deleted due to missingness)
Multiple R-squared:  0.1149,    Adjusted R-squared:  0.07587
F-statistic: 2.943 on 3 and 68 DF,  p-value: 0.0391
```

8.7 Task 4: Model Diagnostics

- Check linear regression assumptions.

```
par(mfrow = c(2, 2))
plot(model)
```



8.8 Task 5: Partial and Semipartial Correlations

```
# Load required libraries
library(tidyverse)
library(ppcor)


# Calculate partial correlations
partial_data <- fearful_data %>%
  dplyr::select(Fearful_face_RT, traitanx, ACS, Age) %>%
  drop_na()
pcor_result <- pcor(partial_data, method = "pearson")
pcor_result
```

```
$estimate
               Fearful_face_RT    traitanx         ACS         Age
Fearful_face_RT      1.00000000 -0.29295465  0.07051172 -0.02627832
traitanx            -0.29295465  1.00000000 -0.29776049 -0.02300362
```

```
ACS                  0.07051172 -0.29776049  1.00000000  0.33458467
Age                 -0.02627832 -0.02300362  0.33458467  1.00000000

$p.value
                Fearful_face_RT   traitanx         ACS         Age
Fearful_face_RT      0.00000000 0.01384887 0.561885102 0.829035513
traitanx             0.01384887 0.00000000 0.012298804 0.850075844
ACS                  0.56188510 0.01229880 0.000000000 0.004640019
Age                  0.82903551 0.85007584 0.004640019 0.000000000

$statistic
                Fearful_face_RT   traitanx        ACS        Age
Fearful_face_RT       0.0000000 -2.5266180  0.5829054 -0.2167714
traitanx             -2.5266180  0.0000000 -2.5720632 -0.1897429
ACS                   0.5829054 -2.5720632  0.0000000  2.9277975
Age                  -0.2167714 -0.1897429  2.9277975  0.0000000

$n
[1] 72

$gp
[1] 2

$method
[1] "pearson"
```

8.9 Task 6: Semipartial (Part) Correlation

This task explores how to isolate the unique contribution of one predictor (e.g., trait anxiety) to a dependent variable (reaction time), controlling for other variables only in the predictor.

8.9.1 Objective

- Calculate a semipartial correlation between `Fearful_face_RT` and `traitanx`, controlling for `ACS` and `Age` **only in the predictor**.

```r
# Load tidyverse if not already
library(tidyverse)

# Ensure your data is clean
semipartial_data <- fearful_data %>%
  dplyr::select(Fearful_face_RT, traitanx, ACS, Age) %>%
  drop_na()

# Step 1: Residualize the predictor (traitanx ~ ACS + Age)
resid_traitanx <- lm(traitanx ~ ACS + Age, data = semipartial_data)$residuals

# Step 2: Compute correlation between raw DV and residualized predictor
semipartial_corr <- cor(semipartial_data$Fearful_face_RT, resid_traitanx)
semipartial_corr
```

```
[1] -0.2882545
```

> **Tip**
>
> **Interpretation:** This semipartial correlation represents the unique association between trait anxiety and fearful face reaction time, controlling for ACS and Age **only in trait anxiety**. Unlike partial correlation, it leaves the DV unadjusted.

8.10 Reflection

- How does anxiety influence reaction time to fearful faces?
- Does attentional control modify this relationship?
- Are the findings specific to fearful stimuli, or would they generalize to other emotional expressions?

  Review your code and interpretations. Cross-reference with theoretical models on anxiety and attentional control.

Dataskillsintro

9 WhatIsScience (Week Link)

Please read WhatIsScience

10 WhyStatistics (Week Link)

Please read WhyStatistics