

Data Science Project Proposal

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Introduction

Research question Does meditation influence an individual's selective attention?

Source The dataset I will be using corresponds to this journal article: Heino, M. T. (2022). Cognitive Dynamics of a single subject: 1428 Stroop tests and other measures in a mindfulness meditation context over 2.5 years. Journal of Open Psychology Data, 10. <https://doi.org/10.5334/jopd.51> I found this dataset on Open Science Framework.

Description The data was collected independently by a 33-year old male doctoral student. Each row represents one day of data collection over the course of 900 days. I am particularly interested in the following measured variables:

- Stroop_mistake_post_meditation: Stroop test consisted of 5 congruent (e.g. the word “blue” in blue letters) and 15 incongruent trials. This is the average response time (in units of 1/100 seconds) to the congruent trials before doing the meditation.
- Stroop_mistake_pre_meditation: Was there one or more errors in answering the Stroop task pre-meditation? “none” for no errors, “almost” for almost making an error, “at least one” for one or more errors.
- Meditation_randomised_walking: Meditation was randomised to be performed as walking meditation. 1 for yes, 0 for no.
- Meditation_randomised_sitting: Meditation was randomised to be performed as sitting meditation. 1 for yes, 0 for no.
- Meditation_randomised_standing: Meditation was randomised to be performed as standing meditation. 1 for yes, 0 for no.

Data

```
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
```

```

library(readr)

cognitive_dynamics_heino <- read_csv("data/cognitive_dynamics_heino.csv")

## Rows: 971 Columns: 34
## -- Column specification -----
## Delimiter: ","
## chr   (3): date, stroop_mistake_pre_meditation, stroop_mistake_post_meditation
## dbl   (30): rowNumber, headspace_package, day_within_headspace_package, clari...
## time  (1): time_of_day
##
## 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.

glimpse(cognitive_dynamics_heino)

## Rows: 971
## Columns: 34
## $ rowNumber          <dbl> 1, 2, 3, 4, 5, 6, 7, 8~
## $ date               <chr> "1.7.2014", "2.7.2014"~
## $ time_of_day         <time> NA, NA, NA, NA, NA, N~
## $ headspace_package  <dbl> 1, 1, 1, 1, 1, 1, 1, 1~
## $ day_within_headspace_package <dbl> 1, 2, 3, 4, 5, 6, 7, 8~
## $ clarity_pre_meditation <dbl> NA, 7.00, NA, NA, NA, ~
## $ calm_pre_meditation <dbl> NA, 5.00, NA, NA, NA, ~
## $ tiredness_pre_meditation <dbl> NA, NA, NA, NA, NA, 7.~
## $ hours_away_today    <dbl> NA, 14.00, NA, NA, NA, ~
## $ hours_slept_last_night <dbl> NA, NA, NA, NA, NA, NA~
## $ hours_since_meal    <dbl> NA, NA, NA, NA, NA, 16~
## $ meditation_minutes_earlier_today <dbl> NA, NA, NA, NA, NA, NA~
## $ mood_bad_proportion_since_last_entry <dbl> NA, NA, NA, NA, NA, NA~
## $ mood_low_proportion_since_last_entry <dbl> NA, NA, NA, NA, NA, NA~
## $ mood_mildlypleasant_proportion_since_last_entry <dbl> NA, NA, NA, NA, NA, NA~
## $ mood_verygood_proportion_since_last_entry <dbl> NA, NA, NA, NA, NA, NA~
## $ stroop_congruent_pre_meditation <dbl> NA, NA, 16.508, 11.096~
## $ stroop_incongruent_pre_meditation <dbl> NA, NA, 21.9810, 19.56~
## $ stroop_mistake_pre_meditation <chr> NA, NA, NA, NA, NA, NA~
## $ meditation_randomised_walking <dbl> NA, 0, NA, NA, NA, 0, ~
## $ meditation_randomised_sitting <dbl> NA, 1, NA, NA, NA, 0, ~
## $ meditation_randomised_standing <dbl> NA, 0, NA, NA, NA, 1, ~
## $ stroop_congruent_post_meditation <dbl> NA, NA, 13.398, 16.160~
## $ stroop_incongruent_post_meditation <dbl> 20.3115, NA, 21.7065, ~
## $ stroop_mistake_post_meditation <chr> NA, NA, NA, NA, NA, NA~
## $ clarity_post_meditation <dbl> NA, 4.00, NA, NA, NA, ~
## $ calm_post_meditation <dbl> NA, 6.00, NA, NA, NA, ~
## $ tiredness_post_meditation <dbl> NA, NA, NA, NA, NA, NA~
## $ self_regulation_failure_severity <dbl> NA, NA, NA, NA, NA, NA~
## $ hrs_since_coffee    <dbl> NA, NA, NA, NA, NA, NA~
## $ out_of_home         <dbl> NA, NA, NA, NA, NA, NA~
## $ hangover            <dbl> 0, 0, 0, 0, 0, 0, 0, 0~
## $ re_anchor           <dbl> NA, NA, NA, NA, NA, NA~
## $ data_point_quality_compromised <dbl> NA, NA, NA, NA, NA, NA~

```

Research questions

Research Question 1 Does meditation moderate an individual's selective attention over time?

Research Question 2 How do different types of meditation moderate an individual's selective attention over time?

Analysis plan

Research Question 1

- a) We will look at the `stroop_mistake_post_meditation`, `stroop_mistake_pre_meditation` variables and create a measure for time (beginning, middle, or end of the study).
- b) I plan to create a bar graph. This visualization will illustrate the potential relationship between meditation and cognitive performance over time. With this visualization, any differences between `stroop_mistake_post_meditation` and `stroop_mistake_pre_meditation` will be distinguishable based on the height of bars. I expect that we will see differences when comparing pre and post meditation stroop test mistake trends.
- c) Different hypotheses may be crafted from these results. One possibility may describe the factors as to why meditation may improve cognitive performance, such as how it may be calming.

Research Question 2

- a) I will use of `stroop_mistake_post_meditation`, `meditation_randomised_walking`, `meditation_randomised_sitting`, and `meditation_randomised_standing`.
- b) I plan to create a multiple regression. This visualization will illustrate the relationship between different types of meditations (walking, sitting, or standing) and the individual's selective attention post-meditation over time.
- c) One future hypothesis that may be derived from these results is the reasoning behind why one type of meditation may be more or less effective in aiding in one's selective attention.