**ADHD Hyperaktiv - Data Visualization**

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**Intro**

This is a self-guided project for learning purposes only. The dataset analyzed can be found here: <https://www.kaggle.com/datasets/arashnic/adhd-diagnosis-data>

And I prepped the data here: <https://github.com/burn-all-the-files/get-out-your-map/blob/main/adhd-testing>

Now, we are going to visualize the data to determine whether the Conners Continuous Performance Test (CPT-II) can accurately detect or rule out attention-deficit/hyperactivity disorder (ADHD). We will be comparing the CPT-II to self-rated scales of ADHD and with the results of the Mini International Neuropsychiatric Interview (MINI), conducted by two trained clinicians.

**Load packages**

**library**(tidyverse)

## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──  
## ✔ dplyr 1.1.4 ✔ readr 2.1.5  
## ✔ forcats 1.0.0 ✔ stringr 1.5.1  
## ✔ ggplot2 3.5.0 ✔ tibble 3.2.1  
## ✔ lubridate 1.9.3 ✔ tidyr 1.3.1  
## ✔ purrr 1.0.2   
## ── Conflicts ────────────────────────────────────────── tidyverse\_conflicts() ──  
## ✖ dplyr::filter() masks stats::filter()  
## ✖ dplyr::lag() masks stats::lag()  
## ℹ Use the conflicted package (<<http://conflicted.r-lib.org/>>) to force all conflicts to become errors

**library**(ggplot2)

**Import data**

joined\_cptmini <- **read\_csv**("joined\_cptmini.csv")

## Rows: 99 Columns: 22  
## ── Column specification ────────────────────────────────────────────────────────  
## Delimiter: ","  
## chr (2): self\_rated\_adhd\_wurs, self\_rated\_adhd\_asrs  
## dbl (20): id, detectability, missed\_targets, incorrect\_nontarget, hit\_rxn\_sp...  
##   
## 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.

**Visualize the data**

Let’s try plotting the two self-rated ADHD scales, the Wender Utah Rating Scale (WURS) and the Adult ADHD Self-Report Scale (ASRS):

## Warning: NAs introduced by coercion  
  
## Warning: NAs introduced by coercion

## Warning: Removed 9 rows containing missing values or values outside the scale range  
## (`geom\_point()`).



It looks like the two self-reported scales are slightly correlated. This makes sense; because the answers are self-reported, and because the tests both try to detect ADHD, the results are consistent with one another.

What if we want to calculate the correlation coefficient between these two variables? Don’t forget the “use” argument because there are some missing values in our data.

## [1] 0.6734995

What’s the relation between a self-rated scale and the CPT-II? We will use the ADHD Confidence Index from the CPT-II results as a measure for the CPT-II.

## Warning: Removed 5 rows containing missing values or values outside the scale range  
## (`geom\_point()`).



It doesn’t look like there is much of a correlation. What’s the correlation coefficient between these two measures?

## [1] 0.3546369

So, either the CPT-II test isn’t very reliable, or a self-rated ADHD test isn’t very reliable, or both.

The other self-rated scale ASRS has similar results:

## Warning: Removed 5 rows containing missing values or values outside the scale range  
## (`geom\_point()`).



## [1] 0.3546369

**Compare with clinicians’ MINI Interview**

Now, let’s add the clinicians’ MINI Interview to the previous visualization.

Here’s a helpful website for ggplot that I used for this part: <http://www.sthda.com/english/wiki/ggplot2-colors-how-to-change-colors-automatically-and-manually>

First, we need to convert the interview\_adhd column to a factor variable. Then, we’ll use the same self-rated vs adhd confidence index plot as previously used, but color the dots based on the clinician’s assessment.

## Warning: Removed 5 rows containing missing values or values outside the scale range  
## (`geom\_point()`).



In general, it looks like clinicians’ assessments were pretty consistent with detecting ADHD and in ruling out ADHD. The bottom left corner (low CPT-II confidence index, low self-rated ADHD) is mostly red, while the top right corner (high CPT-II confidence index, high self-rated ADHD) is mostly green.

The MINI interview can also determine whether the subject’s ADHD symptoms are of the predominantly inattentive subtype. If we use the same plot as last time, but color the dots based on inattentive ADHD vs no ADHD, we get:

## Warning: Removed 5 rows containing missing values or values outside the scale range  
## (`geom\_point()`).



It doesn’t look like there’s much of a pattern.

Finally, let’s try looking more closely at certain parts of the test. The authors of the CPT-II test suggested that certain measures in the test were most related to the inattentiveness subdomain of ADHD. They are: detectability, omissions (missed\_targets), commissions (incorrect\_nontarget), hit reaction time (hit\_rxn\_speed), hit reaction time standard deviation (hit\_rxn\_speed\_consistency), and variability (variability\_consistency). These are expressed in the data as T-scores.

[T-Scores] (<https://assess-1c314.kxcdn.com/wp-content/webp-express/webp-images/uploads/2021/11/T-scores-e1696930130676.png.webp>)



The plot that doesn’t quite look right is the omissions/missed targets plot. IDs 15, 94, 100, 101 had some T-values that were extremely high. To take those out, we’ll make a new dataframe first, and then plot the same variables.



**Conclusion**

The Conners’ Continuous Performance Test and the trained clinicians’ MINI interview are two different ways of assessing someone’s ADHD status. The MINI interview more closely aligns with the subjects’ self-reported ADHD rating than the CPT-II assessment aligns with the self-reported ADHD rating.