Feedback on 'Need for Speed? The role of perceptual speed in generalised visual comparison'

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Overview

This study examines the relationship between perceptual speed and visual comparison ability, using a sample of 122 participants who completed a perceptual speed task and two visual comparison tasks. The research found a significant positive correlation between perceptual speed and visual comparison performance, which remained reliable after adjusting for age.

Here, I evaluate the study's strengths and offer a few suggestions.

Overall Mark: 84.5 ≈ A

Evaluation

Abstract and Title (4.5/5)

The title "Need for Speed? The role of perceptual speed in generalised visual comparison" is catchy and effectively conveys the study's focus. While I personally prefer more descriptive titles (e.g., "Perceptual Speed is Associated with Visual Comparison"), the chosen title is appropriate if that is your preference.

The abstract is well-structured and provides a concise overview of the study's purpose, methods, findings, and conclusion. However, it slightly oversells the design by claiming to explore the "role" of perceptual speed, which suggests causality. Given the correlational nature of the study, it would be more accurate to describe it as examining the "relationship" between perceptual speed and visual comparison ability.

Introduction (20/25)

Strengths

- Clear justification for the research topic
- Demonstrates a strong rationale based on relevant literature and theory
- Evidence of critical evaluation and synthesis of background information
- Effective examination of Varga and Hamburger's (2014) tri-dimensional model.

Areas for Improvement

- Could further emphasise the theoretical implications of finding (or not finding) similarities between perceptual speed and visual comparison tasks.
- More explicit discussion of how this study fits into the broader research context.

Method (17/20)

Strengths

- Design, data, and R scripts available on OSF.
- Inclusion of power analysis.
- Clear visual aids for describing the design.

Areas for Improvement

- Pre-register future studies on OSF
- Clarify the rationale for choosing r = .3 in the power analysis?
- Reconsider the timing of the intrinsic motivation scale because performance on the tasks might affect motivation.
- Likewise, be cautious about excluding participants after data collection (see (Bulbulia, 2024))
- Strengthen the rationale for using 30-second trials over 20-second trials. The motivation for the 20-second trial is unconvincing. The normality assumption applies to the *residuals* of a fitted model. Had you fit a non-linear model, you might have have satisfied this assumption. What would a 20-second trial have revealed? Generally, what would a non-linear model would imply for the relationship between perceptual speed and visual comparison?
- Correct the mis-characterisation of the study as a 'within-subject design' – there's no experiment here.

Results (17/20)

Strengths

- Appropriate analytic strategy
- Clear and accurate presentation of results
- Competent data analysis.

Areas for Improvement

- Include raw data and full data with all information for excluded participants
- Provide scripts used for data cleaning, with documentation for column names
- Include the 20-second and 30-second trial data from the pilot study
- Add confidence intervals to your analyses. I give some code below to show you how.

Discussion (17/20)

Strengths

- Effectively relates results to previous research
- Explores the meaning of findings
- Well-considered limitations
- Logical future research directions

Areas for Improvement

- Further clarify the correlational nature of the findings and its limitations in understanding causality
- Reconsider the speculative argument about hiring practices in forensic analysis. Specifically this argument on p.19 is unconvincing:

  Forensic experts rendering "match" or "onmatch" judgments in court can have significant implications. Therefore, selecting individuals who exhibit a natural aptitude in visual comparison and its related cognitive mechanisms (i.e., perceptual speed) could boost overall professional performance and reduce costly errors. If faster perceptual speed indeed enables individuals to extract additional information

> *from stimuli, subsequently enhancing visual comparison performance, then prioritising this trait during the hiring process could allow for more accurate and reliable outcomes in fields like forensic analysis.*

The argument assumes that faster perceptual speed directly leads to better performance in forensic analysis however this ignores other critical skills and traits necessary for accurate forensic analysis. To my ear, this speculation detracts a little from your work because it overreaches.

Formatting, Clarity & Referencing (9/10)

Strengths

- Adheres to APA 7th edition formatting
- Writing is clear
- Appropriate use of references and citations

Areas for Improvement

- None noted

Overall Assessment

This honours project demonstrates strong research skills, clear writing, and a solid understanding of the topic. You have effectively conducted and reported a meaningful study on visual comparison and perceptual speed. The main areas for improvement lie in:

1. More careful interpretation of correlational findings
2. Strengthening methodological decisions and their rationales
3. Providing more comprehensive data and analysis scripts.

These improvements would further enhance what is already a commendable piece of research. Your work contributes valuable insights to the understanding of perceptual speed and visual comparison ability suggests intriguing horizons for future research.

Some Code

Code for obtaining confidence intervals (and to simply your life). Again please provide clear definitions of your variables in your work.

```
# Load necessary libraries
library(ggplot2) # graphs
library(here) # for easy importing of data
library(ggeffects) # graphs
library(tidyverse) # wrangling
library(parameters) # nice tables
library(marginaleffects) # results
library(here) # for importing data
library(janitor) # better names
library(readxl) # better to use csv files, but what you did is fine.

# import data
data <- read_excel(here::here("students", "briana_murphy", "FinalCleanedData.xlsx"))

# inspect data
# head(data)

# z scores and composite scores made easier
data <- data |>
  rename(PS_total_score = PStotal_score) |>
  dplyr::mutate(
    ArtificialAcc_z = scale(ArtificialAcc),
    FingerprintAcc_z = scale(FingerprintAcc),
    VC_General = rowMeans(cbind(ArtificialAcc_z, FingerprintAcc_z))
  )

# better names
df <- data |>
  janitor::clean_names()

# check if you like
# head(df)

# linear regression of vc_general on ps total score, adjusting for age and gender
fit_0 <- lm(vc_general  ~ ps_total_score +  age + female, data = df)

# table: obtain standardised regression coefficients
parameters::model_parameters(fit_0, standardize = "refit")
```

Parameter	Coefficient	SE	95% CI	t(108)	p
(Intercept)	2.58e-17	0.09	[-0.18, 0.18]	2.79e-16	> .999
ps total score	0.23	0.09	[0.05, 0.42]	2.46	0.015
age	-0.08	0.09	[-0.27, 0.11]	-0.83	0.409
female	0.07	0.09	[-0.12, 0.25]	0.73	0.469

Next we make a graph:

```r
# graph
predicted_fit_0 <- predict_response(fit_0, terms = "ps_total_score")


# plots response
p <- plot(
  predicted_fit_0,
  dot_alpha = 0.35,
  show_data = TRUE,
  jitter = .05
  )  +  scale_y_continuous(limits = c(-2,2)) # set as desired
```

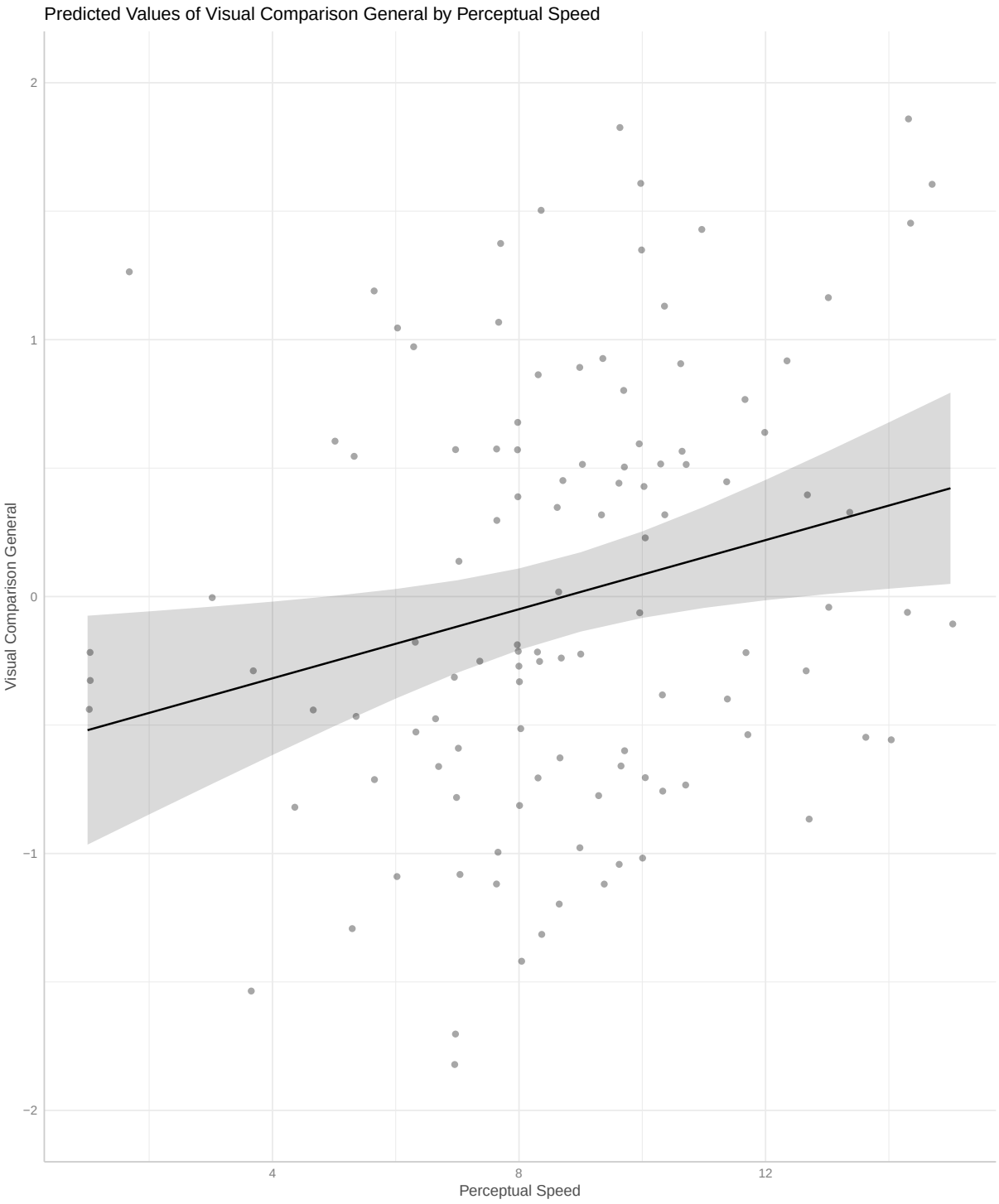

Figure 1: Graph of Results

References

Bulbulia, J. A. (2024). Methods in causal inference part 4: Confounding in experiments. *Evolutionary Human Sciences*, *6*. https://osf.io/preprints/psyarxiv/6rnj5