Dissecting the Reaction Times of Global and Local Processing

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INTRODUCTION

- **Reaction time (RT)** hierarchical vision studies demonstrate global processing is faster than local processing, **Global precedence** effect.
- **Global interference** has a greater affect on Local stimuli than vice versa.
- Prior research on individual differences (ex. ASD) has been inconclusive.
- Inconsistencies are due to RT as a blunt measure of processing speed.
- RT is the sum of task and non-task processes. (ex. Signal transmission and processing)
- RT is prone to speed-accuracy trade-off distortions.
- Compelled response extracts task relevant information from RT.

RESEARCH QUESTIONS

- Does the Compelled Response method capture the global precedence effect?
- Does Non-Decision time and Decision time vary with mean reaction time?
- Does Non-Decision time and Decision time predict individual differences?

METHODS

Experimental Procedure:

- Hierarchical C's (large C's made of small c's, open either right or left).
- Responses based on direction of opening at either global or local level.
- Correct responses = +2 points, incorrect = 0 points.
- Speed and accuracy emphasized.

Compelled Response Task:

- 700 ms window requiring response, Time indicated by 4 audio clicks.
- Stimulus appears variably throughout window.
- Post-700 ms answers = "faster!" prompt, -2 points, and alert sound.

Reaction time:

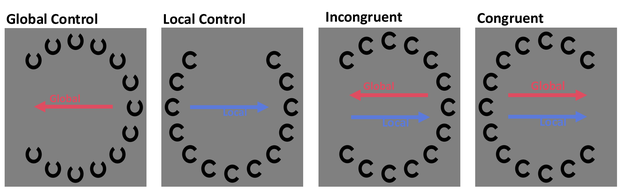
- Same stimulus appeared at go signal, paired with audio beep.

Processing time: PT = RT – stimulus gap – non-decision time

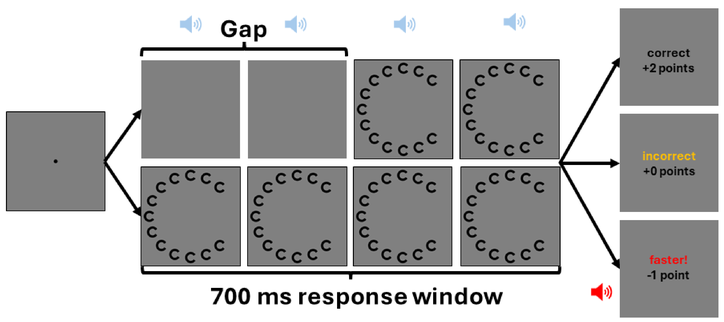
Parameter estimation: Optimized curve using exponential function

Software and Package Versions: Coding done in R (version 4.4.0) using lme4, optim, stats, and Tidyverse.

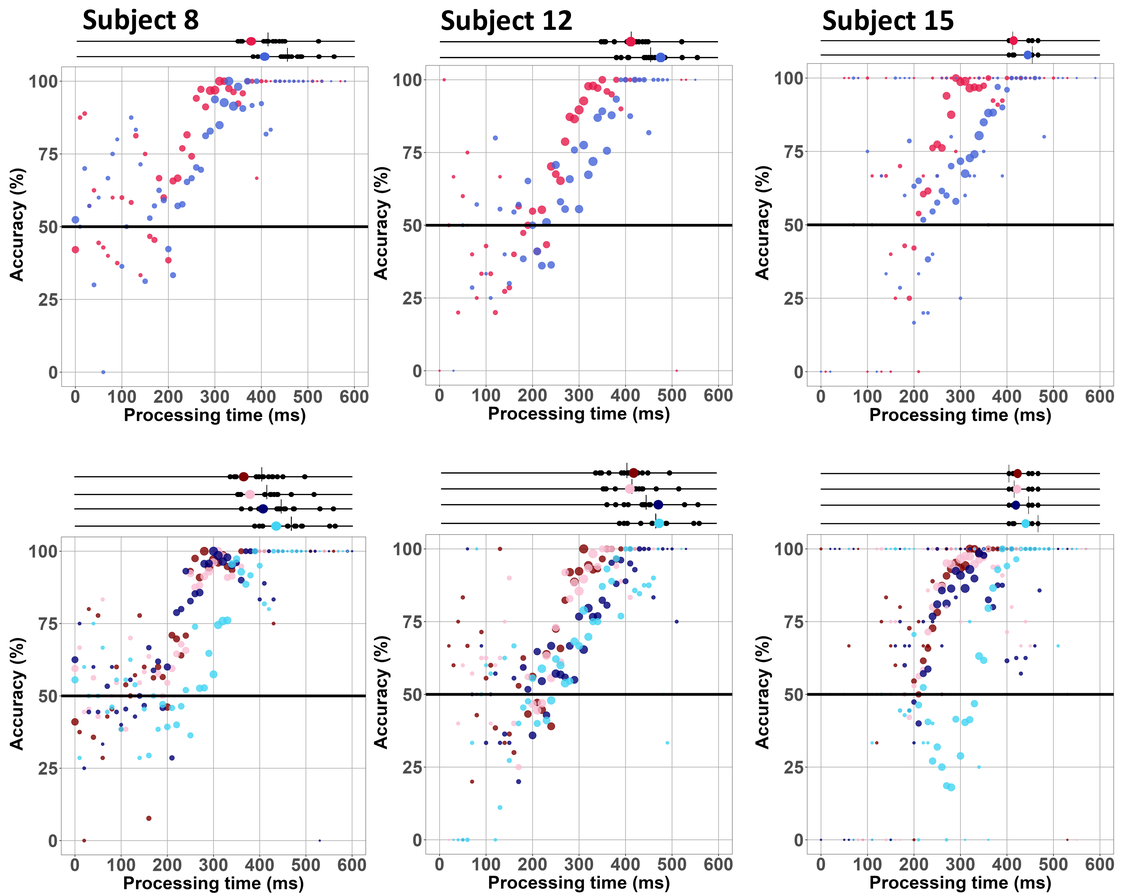
Experimental Stimulus

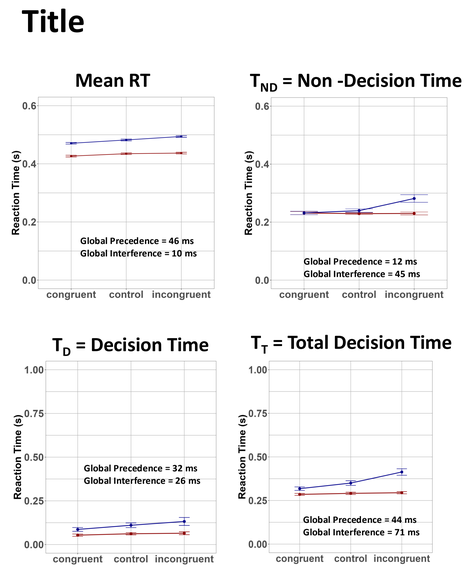


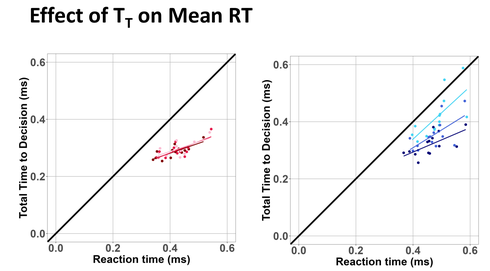
Compelled Response Task

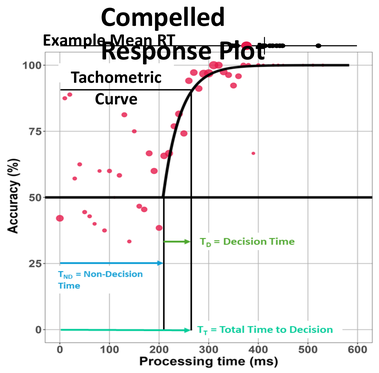


RESULTS









DISCUSSION

- Global interference effect was reflected in both non-decision and decision time.
- Total time to decision was predictive of RT.
- Global interference effect was reflected in non-decision and decision time.
- Total time to decision effect on mean RT global precedence effect comprised of increased durations for local decisions.
- Little difference in the durations of non-decision processes.
- Individual curves provide opportunity to characterize variability.
- Compelled response task measures provide more precise measure of processing durations underlying

REFERENCES

Navon, D. (1977). *Cognitive Psychology*, *9*(3), 353–383.

Stanford, T. R., Shankar, S., Massoglia, D. P., Costello, M. G., & Salinas, E. (2010). *Nature Neuroscience*, *13*(3)