Individual differences in gaze behavior: Comparing high-level and perceptual contributions

Dyllan Simpson, Benjamin Wolfe, & Anna Kosovicheva
Department of Psychology, University of Toronto

UNIVERSITY OF TORONTO

APPLY LAB

Background

Previous work has shown large individual differences in gaze behaviour in naturalistic tasks, including visual search[1,2]

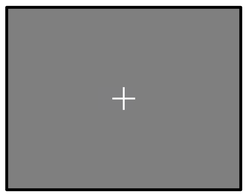
How much do differences in high-level strategies vs perceptual factors contribute to these differences?

Q: Can we determine the source of these differences by varying the task and keeping the stimulus constant?

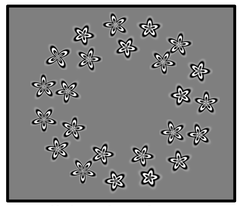
Method

Participants completed two tasks with the same stimuli:

Ensemble Task	Search Task	n=8
Search Task	Ensemble Task	n=8



Fixation
700-1400 ms



Stimulus Array
2000 ms

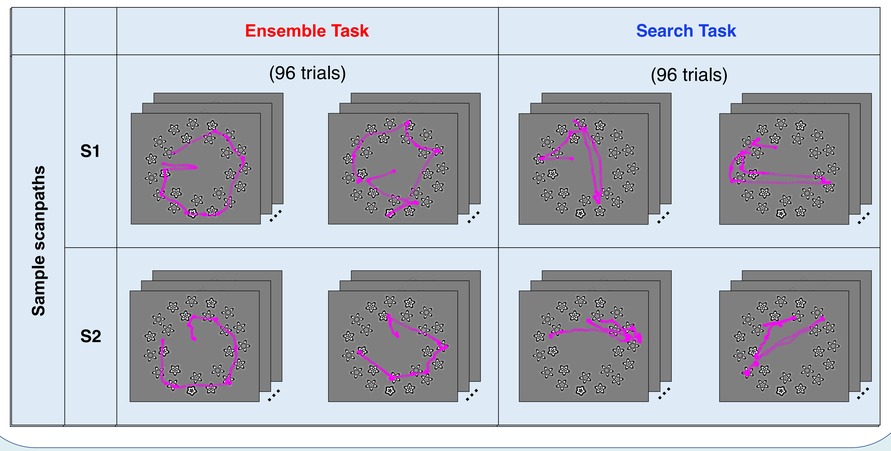
Ensemble Task

Match pointedness to the average of the set

Search Task

Was there a four-spoked stimulus?

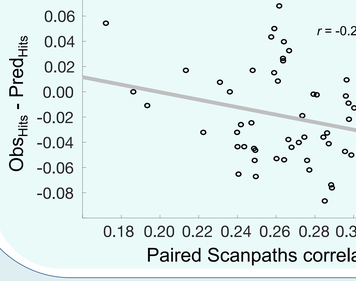
← No Yes →

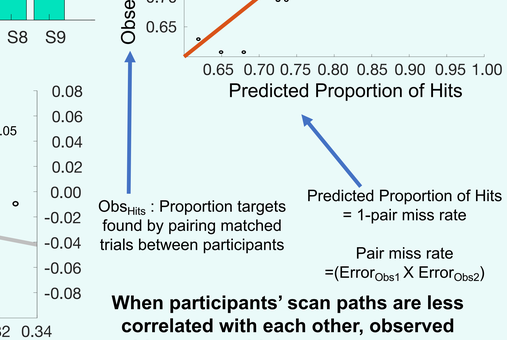


Results

Do Participants Look In The Same Place?

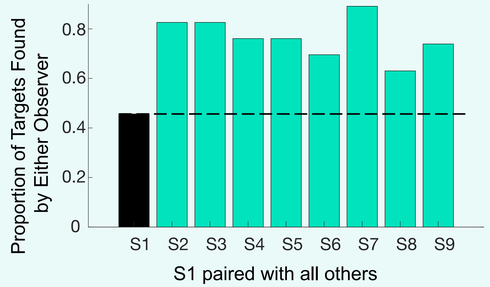
Analysis: Correlate eye movements across all possible trial pairs

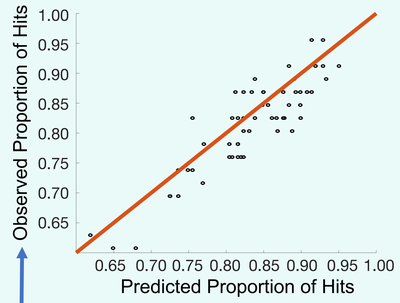




Search strategies are less consistent both within *and* between participants

Are Two Heads Better Than One?





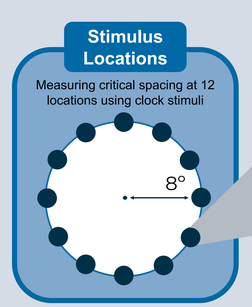
Obs_{Hits} : Proportion targets found by pairing matched trials between participants

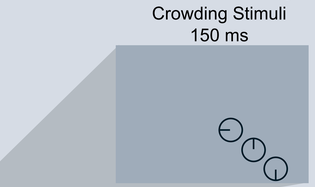
Predicted Proportion of Hits = 1-pair miss rate

Pair miss rate =($Error_{Obs1}$ X $Error_{Obs2}$)

When participants' scan paths are less correlated with each other, observed hit rates are higher than predicted

Do Individual Differences In Crowding Explain Where People Look First?

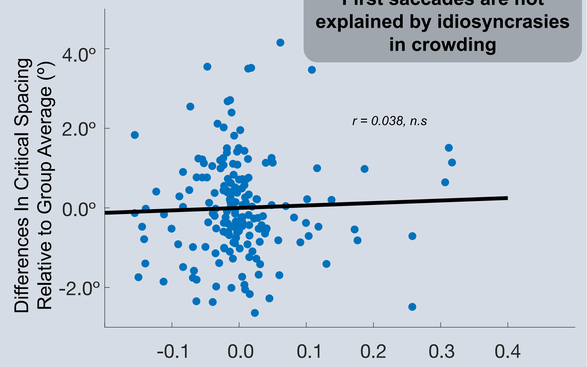




4AFC: Clock Orientation

Keyboard Response

First saccades are not explained by idiosyncrasies in crowding



Conclusions

- Individual differences in gaze behavior vary with task
- These differences can be harnessed to maximize search performance: the more different participants' scanpaths are, the more likely they'll succeed at the search together
- Initial gaze direction is not explained by variation in the strength of crowding

References: [1] Andrews, T. J., & Coppola, D. M. *Vision Research, 39:17* (1999)., [2] Henderson, J. M., & Luke, S. G. *JEP:HPP 40:4* (2014).