Different visual processing strategy for non-face stimuli in Developmental Prosopagnoisa

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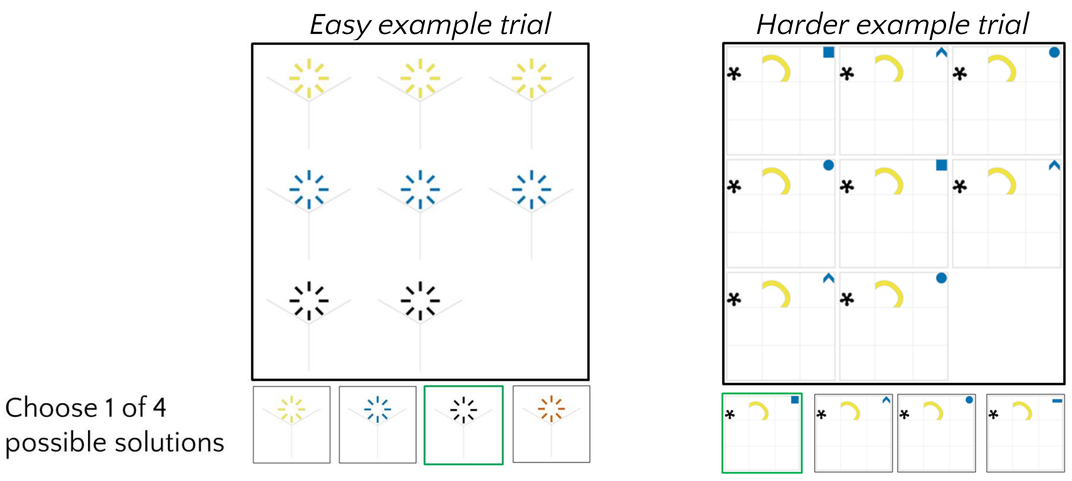
Introduction

- Developmental Prosopagnosia (DP) is a neurodevelopmental syndrome that results in severe face recognition difficulties despite normal IQ and vision and lack of obvious brain damage.
- **Study Aim: Investigate the underpinnings of DP**
- Many, **but not all**, individuals with DP have concurrent object recognition difficulties and/or deficits in holistic processing (a hallmark of neurotypical face processing). The specificity of DP as a **face-selective** disorder independent of other object processing impairments remains a key question.
- DPs typically show longer response times (RT) on face processing tasks vs controls. A common interpretation is that longer RTs are due to laborious, atypical featural face processing in DP.
- Because some DPs can achieve normal accuracy scores in face tasks with long presentation times, longer RT is often used as an additional indictor of impaired performance in DP.

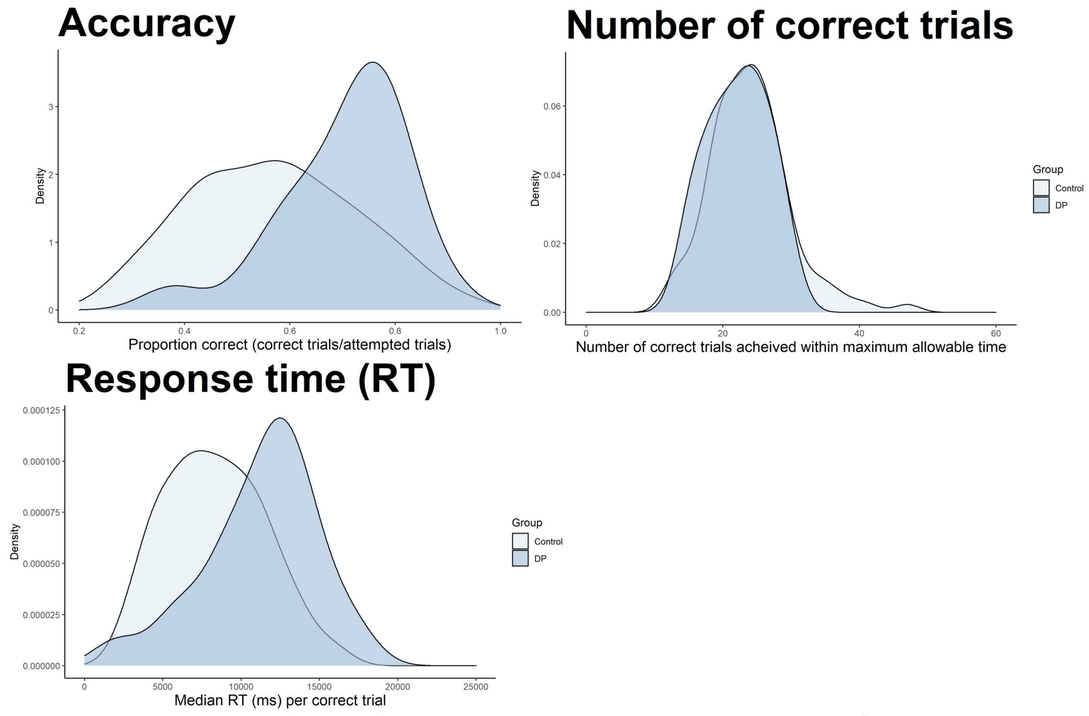
Methodology

- To screen for wider cognitive deficits that might explain poor face test performance, participants completed a computerized fluid reasoning task, the **Matrix Reasoning Item Bank** (Chierchia et al 2019[1]) as part of a large neuropsychological test battery.
- **Participants**: **21 DPs**, 91 age-matched controls aged 6 – 74 years. Remote testing. < 18yrs supervised by parents.
- **Task**: Decide which of 4 possible abstract shapes correctly completes 3 x 3 grid. 3 practice trials followed by max. 80 trials, presented in a fixed order (30 *s* per trial).
- Instructions stress neither speed nor accuracy
- Test ends after 8 *mins* *or* when all 80 trials are complete, whichever occurs first. Participants may therefore complete a **different** number of trials.



- **Analysis**: Welch's and Bayesian independent samples t tests
- **DV1**: **Accuracy** (correct trials/completed trials), **DV2**: **number of correct trials** completed in 8 *mins*, **DV3**: Median item **RT** (correct trials only)

Results



DPs were **significantly more accurate** than controls

t(29.3) = 2.88, *p* = .007**, Cohen's *d* = .705 (BF_{10} = **9.48**)

No group difference observed in the **number of correct trials**

t(38.1) = -1.52, *p* = .136 Cohen's *d* = -.336 (BF_{10} = .499)

DPs showed **significantly longer RT** than controls

t(27.5) = 3.34, *p* = .002** Cohen's *d* = .843 (BF_{10} = **62.2**)

Conclusion

- Poor face recognisers (developmental prosopagnosics) clearly adopted a **different general strategy** to neurotypical controls on a task not involving faces, objects containing clear semantic information (e.g. cars, bicycles) or memory
- They chose to proceed **more slowly and carefully** than controls and were therefore more accurate due to the speed-accuracy trade off on this task
- A similar slow approach by developmental prosopagnosics to face tasks should **not** automatically be interpreted as a **lack of face processing ability.** It may indicate a **strategic difference** in approach or, alternatively, a more generalised visual issue.
- Extended response time in developmental prosopagnosia may **facilitate** atypical feature-by-feature face processing but **may not be driven by it**
- Results strengthen the case for RTs to be routinely inspected in face and also non-face tasks

Next steps: Complete analysis of the full test battery

Acknowledgements

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References: [1]Chierchia, G., Fuhrmann, D., Knoll, L.J., Pi-Sunyer, B.P., Sakhardande, A.L., Blakemore, S.-J., 2019. The Matrix Reasoning Item Bank (MaRs-IB): novel, open-access abstract reasoning items for adolescents and adults. Royal Society Open Science 6, 190232. https://doi.org/10.1098/rsos.190232

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