Do Individuals with Developmental Prosopagnosia Benefit from Motion During Face Recognition?

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BACKGROUND

- Facial motion can facilitate the recognition of familiar faces (O'Toole et al., 2002).
- The social signals hypothesis (SSH) proposes that social cues carried in movement enhance face recognition by attracting attention to the identity-specific internal facial features (Roark et al., 2003).
- We previously found support for the SSH as a theory of the motion advantage in three studies featuring 'typical' recognisers (Sexton, Butcher & Reay, 2020).
- In contrast, research has drawn inconsistent conclusions as to whether individuals with Developmental Prosopagnosia (DP), benefit from motion during face recognition (e.g. Bennetts et al., 2016; Longmore & Tree, 2013).
- When viewing static images, individuals with DP direct less attention to the internal facial features (Bobak et al., 2017). However, we do not know if the same is true when viewing moving faces.

AIMS

- To determine whether individuals with DP benefit from motion during familiar face recognition.
- To examine the validity of the SSH as an explanation for any observed motion advantage effect.

METHOD

Design:

- **IV_1:** Presentation style of the stimuli (moving or static)
- **IV_2:** Interest area (internal features or external features) (Fig 1)
- **IV_3:** Group (DP or control)
- **DVs:** Recognition accuracy and proportion of dwell time within each interest area (IA)

Participants

- 14 individuals with DP (performance > 2 SD below published norms on two of the CFMT, CFPT, and a Famous Faces Task).
- 16 age-matched controls (typical performance on all three tasks)

Stimuli:

- 60 x 2 second videos of famous faces. Blurred and B&W
- Half presented in motion, half static (counterbalanced)
- Presented individually in two blocks (one static, one moving)

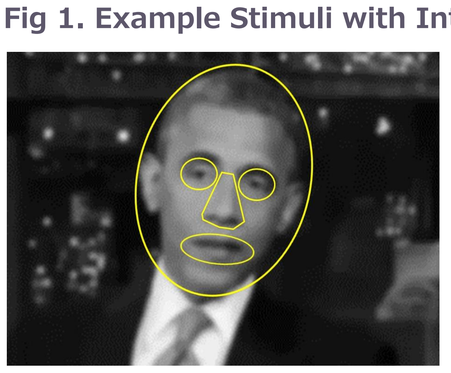
Procedure:

- Participants asked to verbally identify each face by name or non-ambiguous semantic information, while their eye movements were tracked with an Eyelink II eye-tracker.
- After task completion, participants were presented with a list of the celebrity names and were asked to rate their familiarity with each name on a binary scale (familiar or non-familiar).

Analysis:

- Faces deemed unfamiliar were excluded from the analysis.
- Eye movement analysis performed on correct trials only.

Fig 1. Example Stimuli with Interest Areas.

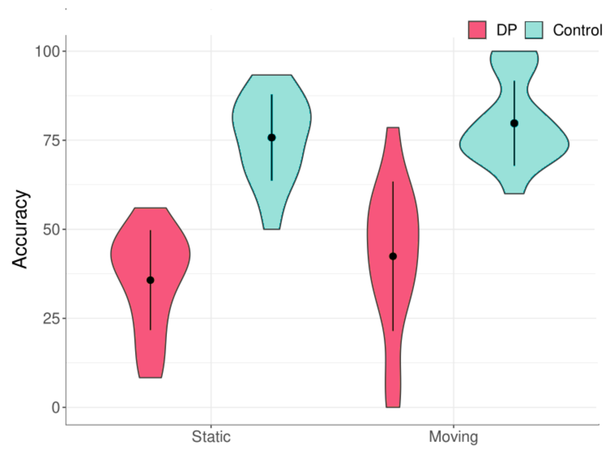


Internal IA:
Eyes + Nose + Mouth

External IA:
Whole Face - Internal

BEHAVIOURAL RESULTS

Fig 2. Accuracy Rates in DP and Control Groups



A 2 x 2 repeated measures ANOVA revealed:

- A significant effect of presentation style, $F(1,28) = 5.04$, $p < .05$, partial $\eta^2 = .15$. Participants were more accurate when recognising moving faces
- A significant effect of group, $F(1,28) = 48.58$, $p < .001$, partial $\eta^2 = .63$. The DP group performed less accurately than controls.
- No significant two-way interaction, $F(1,28) = .04$, $p = .84$, partial $\eta^2 < .01$. The beneficial effect of motion was consistent across both participant groups

EYE-TRACKING RESULTS

In both participant groups, motion increased the proportion of dwell time directed towards the internal facial features, and decreased the proportion of time directed to the external.

Fig 3. Dwell Time on Internal and External IAs in the DP Group

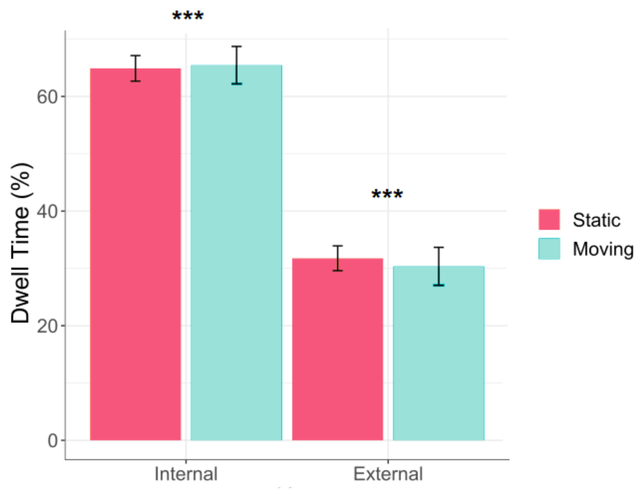
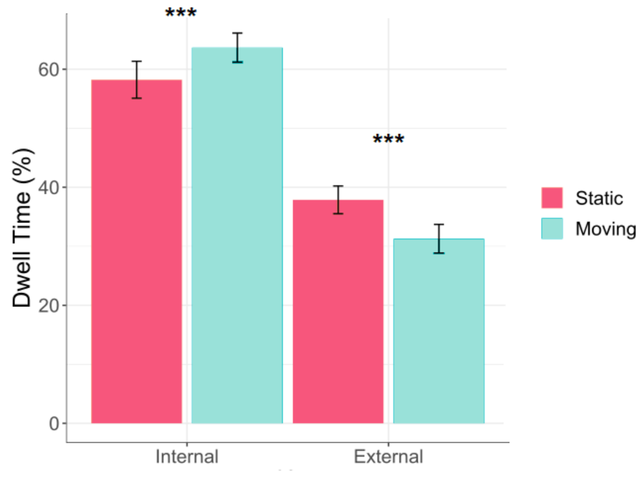


Fig 4. Dwell Time on Internal and External IAs in the Control Group



Motion increased the proportion of time directed towards the three internal features equally

Irrespective of presentation style, the DP group directed more time to the mouth, and less time and to the eyes than the control group.

Fig 5. Dwell Time on the Eyes, Nose and Mouth during Static Presentations

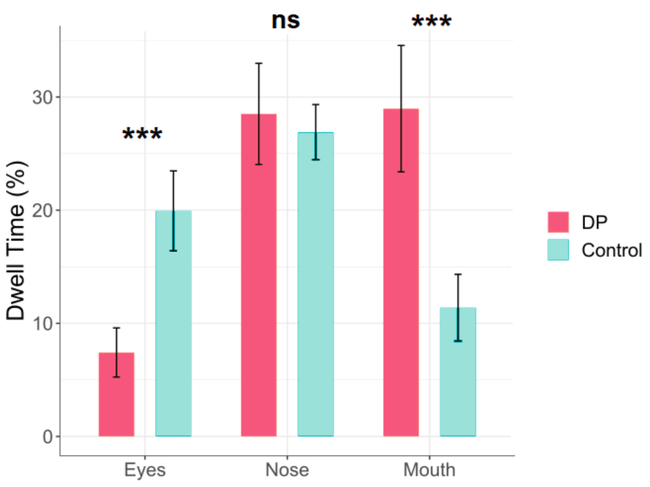
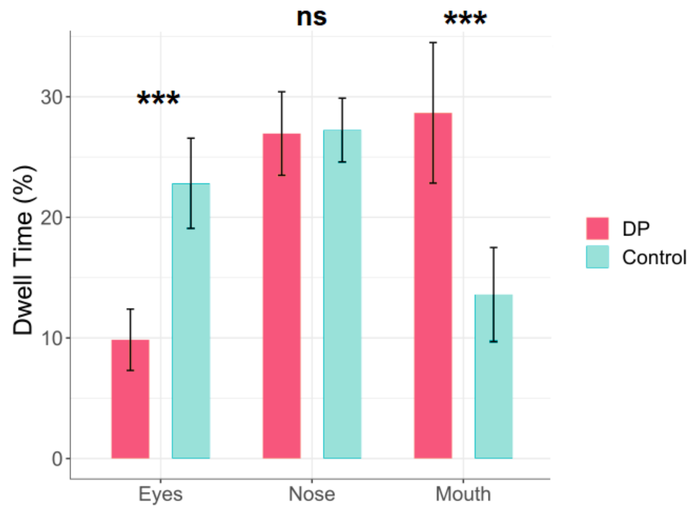


Fig 6. Dwell Time on the Eyes, Nose and Mouth during Moving Presentations



CONCLUSIONS

Both participant groups benefitted from motion during familiar face recognition.

Movement changed the way that participants (DP and control) viewed faces by increasing attention to the identity-specific internal features and decreasing attention to the external features.

Irrespective of presentation style, DP participants directed less attention to the eye region, and more attention to the mouth than control participants.

These findings provide support for the SSH by demonstrating that facial motion attracts attention to the internal facial features, facilitating identity processing.

However, we cannot be certain that the internal features of dynamic faces attract attention because they move in a social way (as theorised by the SSH), rather than simply because they display a greater amount of movement than the external features. This is a question for future research.