INFLUENCE OF SYMMETRY ON FACE DETECTION

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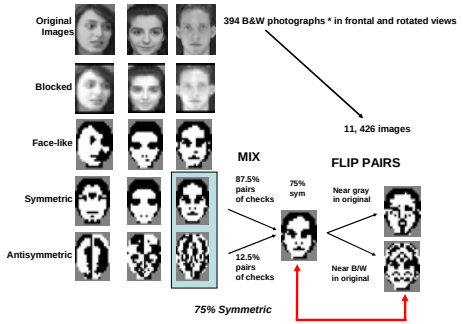
INTRODUCTION

- Symmetry and faces are highly salient in visual processing and ethologically significant (Chen et al., 2007; Kanwisher et al., 1997; Norcia et al., 2002; Saunders & Knill, 2001).
- Processing of symmetry and face perception interacts. Photographs of symmetric faces are preferred and perceived as more attractive compared to less symmetric faces (Perrett et al., 1999; Rhodes et al., 1998). Symmetry detection is enhanced for upright, normal faces compared to inverted, contrast- reversed faces (Rhodes et al., 2005)
- In previous studies, symmetry and face-likeness were not manipulated as independent variables. When stimuli were constructed in a manner that allowed symmetry and face-likeness to be varied independently, symmetry detection was enhanced for face-like images and there was no inversion effect (Conte, et al., SFN2006). So therefore we ask…

Does symmetry influence discrimination of face-like from non-face-like images?

STIMULI DESIGN



Symmetry was quantified by mixing different proportions of check pairs.

* Olivetti, Olivetti Research Laboratory Face Library, http://www.cam-orl.co.uk/facedatabase.html.2002.

Thanks to Logan Lowe for image generation

METHODS

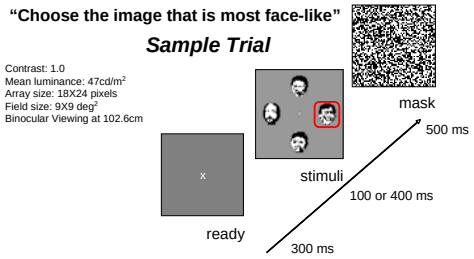
Participants:
- 6 R-handed females, avg. age 25 yrs, corrected to normal visual acuity; 2 were raters of face-likeness

Procedure:
- ~ 500 practice trials
- 2880 experimental trials/participant

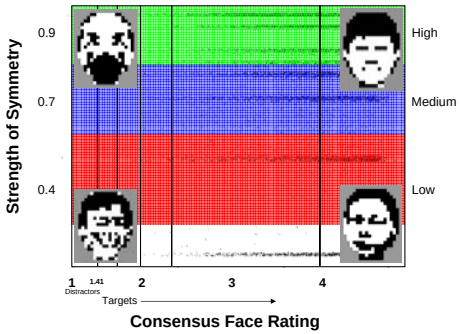
Variables:
- Symmetry (0.2 - 0.6, 0.6 - 0.8, 0.8 - 1.0)
- Face Ratings (1.41-1.67, 1.67-1.97, 1.97-2.36, 2.36-4.0)
- Presentation Time (100 or 400 ms)
- Orientation (upright or inverted)

"Choose the image that is most face-like"

Sample Trial



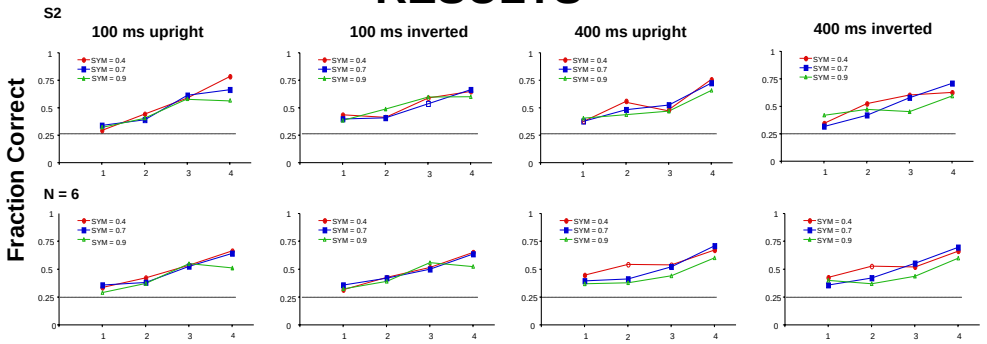
Rating the Images - 10 participants (5M, 5F) rated over 11,000 images as face-like on a 4-point scale (1 = least to 4 = most face-like). The overall ratings were derived from the 1st factor of missing-data principle component analysis. Each participant's ratings strongly correlated with the consensus rating.



Consensus Face Rating

To construct a trial, 4 images were chosen from the same symmetry range. 3 of the images were chosen from a face-rating of 1-1.41 (distractors) and 1 was chosen from one of 4 bands of face-likeness (target).

RESULTS



Face Ratings

Statistical analysis: ANOVA

Main Effects	F	p
Symmetry	28.941	< 0.001
Face Rating	236.29	< 0.001
Time	18.566	< 0.001
Orientation	0.058	> 0.05
Interactions		
Symmetry * Time	3.682	< 0.025
Symmetry * Face Rating	4.633	< 0.001
Face Rating * Time	8.047	< 0.001
Face Rating * Time * Symmetry	5.203	< 0.001

Identification of the most face-like target was:

- worse as symmetry increased
- better as face-likeness increased
- better with longer viewing time (400ms vs 100ms)
- not affected by inversion

- better at 400 ms and lower symmetry values
- worse as face-likeness and symmetry increased
- better as face-likeness increased and longer viewing time

No other interactions were significant
Logistic Regression analysis replicated the ANOVA results

Post-Hoc Analyses

- Errors were not systematic. They occurred equally in all locations, and were not correlated between participants.
- There were no differences in accuracy for participants who were raters (n=2) versus non-raters of the stimuli.

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CONCLUSION

When symmetry and face-likeness are manipulated as independent variables, symmetry ***interferes with*** discrimination of face-like from non-face-like images at the ***featural*** (parts-based) level, and has no effect at the ***configural*** (holistic) level.