Face-shape facilitates detection of facial expressions.

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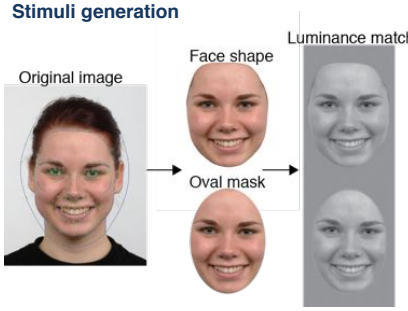
Introduction

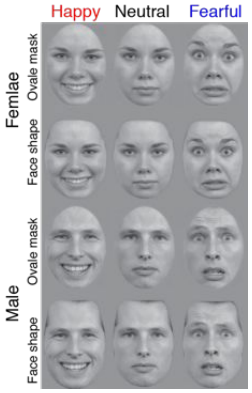
- When recognising different social signals conveyed by the faces, people rely on the features that are most informative[1].
- Several studies investigated the contribution of internal facial features to the recognition of basic facial expressions[1,2,3].
- The contribution of external facial features such as face shape to the recognition of facial expression is less known.
- Face shape information facilitates recognition of face identity[4], race[5], gender[6], or age[7] and influences the perceptions of complex social traits[8].
- Here, we investigated weather sensitivity to facial expressions of happiness and fear is affected by the information carried by the external features i.e. the face shape[9].

Stimuli

Stimuli generation



Example stimuli



- 6 Actors (3 male and 3 female) from Radboud Face Database[10].
- Morph continua for happy and fearful expressions (0-100%) created using Psychomorph[11].
- Faces masked to remove external features:
  - ***Face shape*** mask followed a natural outline of the face
  - ***Oval mask*** removed face shape information
- Converted to greyscale and matched for average mean luminance of images using Matlab SHINE toolbox[12].
- Presented on 22" monitor (HP P1230, refresh rate 120Hz) using Matlab with Psychtoolbox routines.
- Image size 9.5° x 13.3°

Methodology

Experimental Conditions

- **Happy**
  - Face shape
  - Oval mask
- **Fearful**
  - Face shape
  - Oval mask

- 6 actors x 7 morph intensities x 20 repeats.
- 120 repeats per experimental condition.

Task

- Temporal two-interval forced-choice paradigm.
- Method of constant stimuli
  - Neutral comparison stimulus (0%)
  - Signal of test stimulus varied (0-100%)
- "Which interval contained the image with the greatest expression?"
  - First or second (single click or double click of mouse respectively).

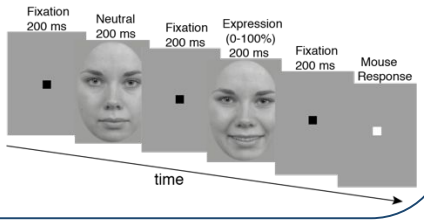
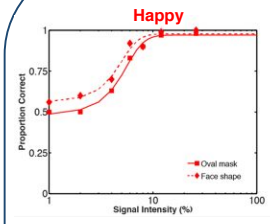


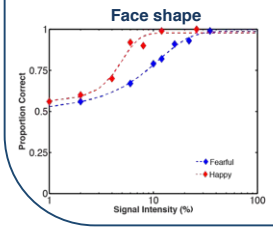
Figure 1: Effect of Mask type on Detection*



Results

- Increased sensitivity to *Face shape* over *Oval mask* for both *Happy* and *Fearful* expressions

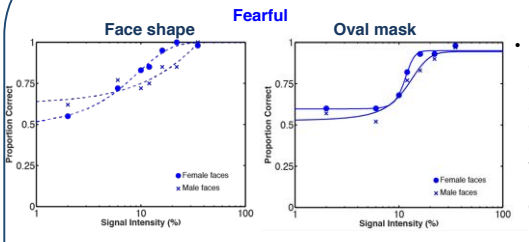
Figure 2: Happy vs. Fearful Expressions*



Results

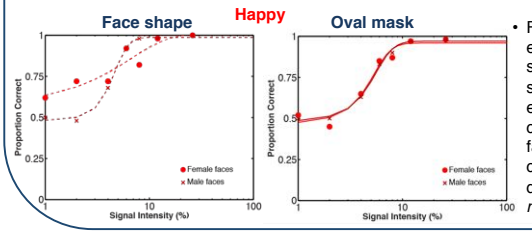
- Increased sensitivity to *Happy* over *Fearful* expressions in both *Face shape* and *Oval mask* conditions

Figure 3: Comparison of Male and Female Faces*



Results

- For *Fearful* expressions there is a small increase in the sensitivity to the expression in female as compared to male faces in both *Face shape* and *Oval mask* conditions



Results

- For *Happy* expressions there is a small increase in sensitivity to the expression in male as compared to female faces in *Face shape* condition. There is difference in the *Oval mask* condition.

Summary of Results

- As the signal intensity increases performance improves from chance (0.5) to accurate (1). This improvement occurs in both *Face shape* and *Oval mask* conditions and for both *Happy* and *Fearful* expressions.
- The curves representing *Face shape* are shifted to the left of the these representing *Oval mask* for both *Happy* and *Fearful* expressions. This suggests an increased sensitivity to happiness and fear when information about face shape is preserved.
- The curves representing *Happy* expressions are shifted to the left of the these representing *Fearful* expressions in both *Face shape* and *Oval mask* conditions. This suggests an increased sensitivity to happy compared with fearful expressions.
- The curves representing *Female* faces are shifted (slightly) to the left of the these representing *Male* faces for *Fearful* expressions. This suggest an increased sensitivity to fear conveyed by female compared to male faces.
- For *Happy* expressions the slope of the function representing *Male* faces is slightly steeper in the *Face shape* condition. This suggest an increase in sensitivity to happiness in male compared to female faces.

*The data is representative of one observer

Discussion

- We show that information carried by the face shape facilitates the detection of emotional expression of happiness and fear.
- The advantage of face shape information occurs for both male and female faces.
- Our results suggest that the information carried by the external features such as face shape can aid the recognition of facial expressions.
- Our results are consistent with reports suggesting that faces shape information is potentially important for judgment of complex facial characteristics and social traits[4,5,6,7].

Future Work

- Understand the relative contribution of individual external features (face shape) and internal features (e.g. eyes, mouth) as well as surface information (e.g. pigmentation, shading) in the recognition of all basic emotional expressions.
- Understand the role of sexually dimorphic facial features (e.g. female vs. male face shape) in the recognition of emotional expressions.
- Measure the sensitivity to different emotional expressions in clinical populations (SPIEs)

Acknowledgments
SPIEs
NHS National Institute for Health Research

Contact

References
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