



Sex Matters If You Ask The Right Question – Eye Movements In Face Comparison



Regine Armann, Isabelle Bülthoff



Max-Planck Institute for Biological Cybernetics, Tübingen, Germany
regine.armann@tuebingen.mpg.de



MPI FOR BIOLOGICAL CYBERNETICS

1 - Introduction

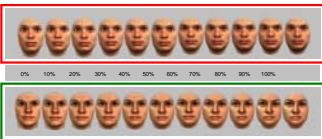
- Knowing where people look in a face reveals what information enters the visual system.
- Eye movements are functional during face learning (Falk et al., 2005).
- 'Diagnostic features': Task-dependent differences in the number and duration of fixations to different facial regions (e.g., Schyns et al., 2002; Pearson et al., 2003).
- Most eye-tracking studies use single face images. However, in everyday situations, one also happens to compare faces of people or to match a face to a photograph. When stimuli remain visually available, there is no necessity to build a detailed mental representation of them in memory (in contrast to long-term memory tasks, Galpin & Underwood, 2005).
- How do observers look at faces in a 'natural' comparison task, i.e. in the absence of memory constraints?

2 - Methods & Data Analysis



Stimuli: 2D images from computer-reconstructed laser scans of >200 real heads; without ears, facial hair etc.

"Morphable Model" by Blanz & Vetter: single face properties (sex, identity) modified



Sex and Identity morphed faces; "morph distance" between original face (left) and morphs used as a measure of similarity



Key feature points on reference face used to define 10 Areas Of Interest (AOIs) on each single face stimulus (see 4 – results)

Three tasks:

- Identity same-different task: identity morphs (all morph distances, 140 trials)
- Sex same-different task: sex morphs (no 20% and 30% distance, 144 trials)
- Feminine task: sex morphs, 'which one is more feminine?' (no 0%, 46 trials)

Within-tasks factor: 'difficulty'

defined by similarity (morph distance) between the two faces in a trial (taken from same morph continuum)

Between-subjects factor: Sex of participant

- 30 participants, 15 female
- Head and chin rest to avoid movements
- Button Box (eprime) to collect responses
- Eye movements recorded with iView X SMI® dark pupil remote eye-tracker, 50Hz
- Trials with tracking errors + participants not following instructions (interview) removed

Analysis

- Performance
- Response times
- Number and duration of fixations
- Spatial distribution of fixations
- Sequence of fixations (scan paths)

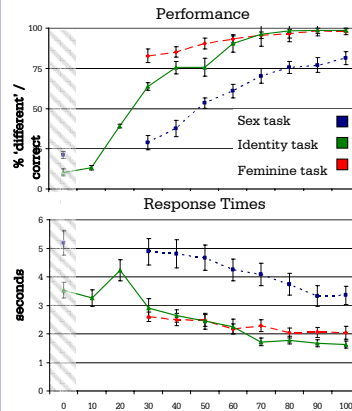
750 ms

until button press

600 ms

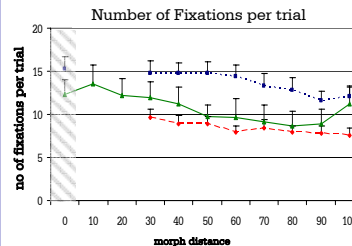
ms

3 - Results



Observers were faster and better the smaller the similarity between faces – no trade-off.

Task difficulty unequal – although same stimuli in Sex and Feminine tasks.

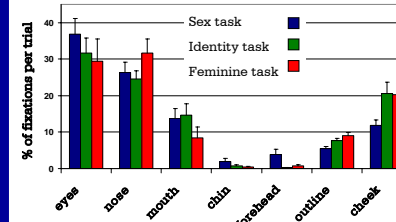


The more difficult a trial / the whole task, the more fixations were made.

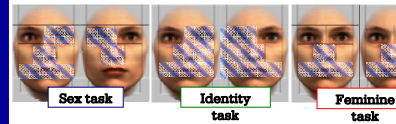
Number and duration of fixations correlated – no difference in single fixation duration.

4 - Results

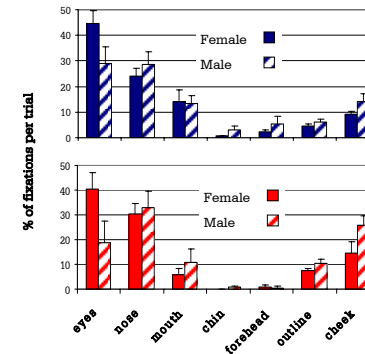
Task-dependency of fixations to facial features



Only some facial features receive more fixations with increasing difficulty



Female observers looked more at the eyes than male observers



6 - Conclusions

Performance got better and faster with decreasing similarity, and was dependent on task: Identity much easier than Sex task, but also Feminine much easier, although the same face stimuli were used. Maybe the perceptual system is just not tuned for discrimination between faces differing only in sex?

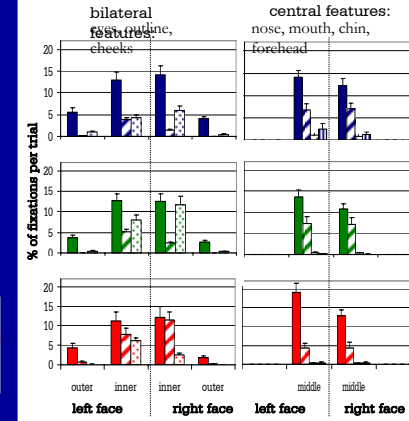
Diagnostic features were eyes, nose, mouth, cheeks in all tasks; with increasing similarity (increasing difficulty) only some regions were looked at more often, depending on task. Eyes were more important in Sex task, more fixations all over faces were made in Identity task, in accordance with literature. Feminine task: more fixations to nose → maybe due to more holistic comparison? Also: more fixations to left face (main effect); faster performance (Schwarzer et al., 2005) and report of 'intuitive decision'. Thus a more holistic strategy could be the reason for superior performance in the Feminine task.

Mainly the inner halves of the faces were compared → seems to be a useful heuristic although we actually know that faces are not always symmetric.

Female observers looked more at the eyes than male observers, but only when the sex of the face stimuli was task-relevant. Further studies are planned...

5 - Results

Asymmetric fixation pattern - 'inner features' more fixated

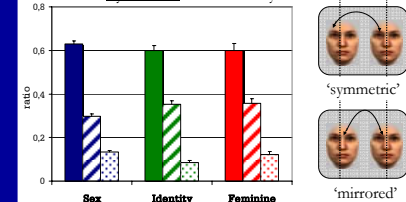


Scanpath analysis – 'mirrored' comparison

consecutive eye fixations / 0.5*fixations on eyes

'mirrored' consecutive eye fixations

'symmetric' consecutive eye fixations



Observers moved their gaze more often from the left eye of one face to the right eye of the other face and vice versa than from right to right and from left to left eye.