

A strong bias to fixate the upper eye in tilted faces

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Background

The **left-gaze bias** is a tendency to attend to and make first fixations to the left side of the face, from the observer's perspective (e.g. Campbell, 1978; Guo et al., 2009).



This bias is observed across tasks and populations (even species) and may be related to the right-lateralization of the face processing network.

Although the *in-plane orientation of a face* affects many aspects of face perception and recognition, the left-gaze bias has been only studied in upright, inverted, or depth-rotated faces. It is unknown how the left-gaze bias manifests as faces tilt away from upright.

We hypothesized that tilted faces will elicit an upper eye bias that can compete with (or even override) the left gaze bias.

Methods

Study 1

- Participants (15 UC Santa Cruz undergraduates) viewed 42 faces from the FERET database, half mirror-reversed, at one of 3 orientations:



- After 1 s of exploration (during which eye movements were measured) they reported the face's expression: happy or neutral.

Study 2

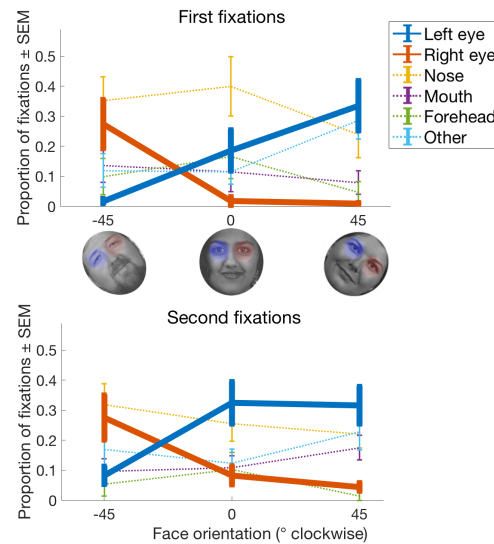
- Participants (13 UCSC undergraduates) completed the same task on 196 faces from the Chicago Face Database, half mirror-reversed, at one of 14 orientations:

180° ± 135° ± 90° ± 45° ± 33.75° ± 22.5° ± 11.25° 0°

Eye tracking details:

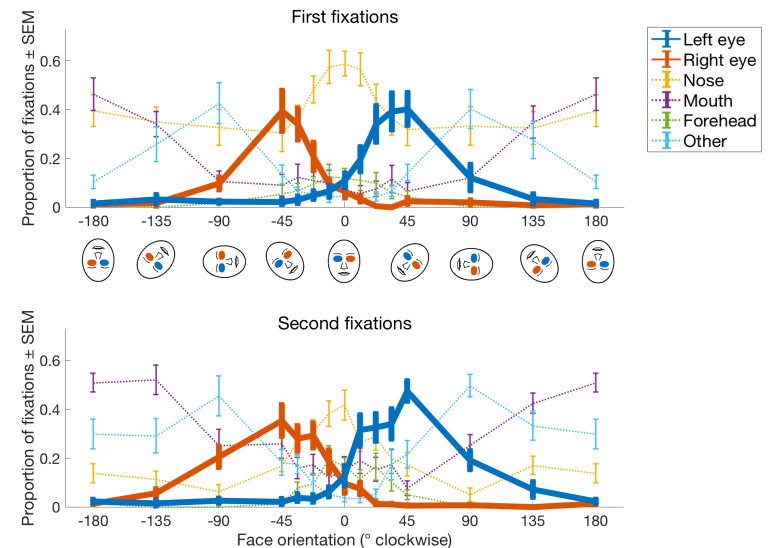
- GazePoint remote tracker, 60Hz, precision ~1.5°; faces subtended ~15°
- Locations of 1st and 2nd fixations were annotated by 3 independent coders
- We report results from trials in which at least 2 of the 3 coders agreed on the feature fixated (~78% of trials).

Study 1 results (n=15)



- Upright faces elicited a significant left-gaze bias in first and second fixations, replicating classic findings.
- Tilted faces elicited a strong upper eye bias that completely outweighed the left-gaze bias in -45° faces.

Study 2 results (n=13)



- Upright faces showed a non-significant trend toward a left-gaze bias.
- The upper eye bias was highly significant across a range of in-plane orientations, emerging with as little as a ±11.25° tilt, and peaking at ±45°.
- Tilted faces elicited more overall eye-fixations than upright faces.

Potential mechanisms and implications

General top bias?

- The upper eye bias may reflect a general tendency to fixate the "top" of visual stimuli, and may manifest in faces as well as objects.

Face-specific bias?

- The upper eye bias may reflect a neural preference for specific face features to fall in typical retinal locations (e.g. De Haas et al., 2016).

Face-to-face communication

- The upper eye bias may account for some gaze behavior during head tilt in face-to-face communication.

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