Abstract

The horizontal structure of the human face activates face-specialized visual mechanisms and conveys the most optimal cues to face identity and emotion. Face images also contain most energy in the horizontal range. Access to horizontal face structure might therefore facilitate performance in any face-related task. Alternatively, orientation tuning might differ across tasks, reflecting a flexible sampling of face information in the orientation domain. Our recent finding that, in a crowd of faces, observers detect the one that stares straight at them best while relying on vertical information supports the latter alternative. Here we measured the fine-grained sensitivity to direct gaze (DG) at the cardinal ranges (horizontal and vertical) of face information in twenty-five adults. They reported the gaze direction of centrally presented face stimuli as right, left, or direct. Gaze direction ranged from -8° to +8° with respect to DG (0°), in steps of 1.6°. The eyes were filtered to contain horizontal (H), vertical (V), or both (HV) orientations and embedded in a full-spectrum head-model. Proportions of DG responses were fitted with a Gaussian, whose peak and bandwidth respectively estimated the accuracy and selectivity of DG perception. In H and V conditions, DG responses peaked at the veridical DG angle; in HV condition it was slightly biased to the right (from observer's perspective). The bandwidth of the DG response function was narrower for HV and V compared to H range, reflecting a finer selectivity to DG in the vertical orientation-range. In an identification task, performance of the same participants was, as expected, tuned to horizontal orientation. The present findings speak against a generic horizontal advantage for face processing. Rather orientations seem to be sampled in parallel and serve distinct perceptual goals. Thus, orientation-encoding is not exclusively driven by image statistics but modulated by high-level perceptual goals.

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