

Spatial frequency and facial expressions of emotion

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Abstract

Face recognition has been shown to depend on a "critical band" of spatial frequencies [Harmon and Julesz 1973], thought to lie between 8 and 16 cycles/face [Costen et al 1996]. However, evidence suggests that emotional expressions are processed separately from identity [cf Adolphs 2002]. These experiments aim to determine whether processing emotional expressions shows dependence on the same "critical band" as does recognition, and whether this spatial frequency dependence is best expressed in object-centered or retinal coordinates (cycles/face or cycles/degree). In experiment 1, subjects viewed bandpassed images of emotional and neutral faces [Gur et al 2002] and performed a yes/no emotion detection task. Images were displayed at two sizes (5 and 10 degrees visual angle in width), to isolate scale-dependent effects. Four emotions (anger, fear, happiness and sadness) and three octave-wide spatial frequency bands were used. Main effects of emotion and spatial frequency band were significant, but the image size manipulation had no effect, suggesting that recognition of emotion is largely scale independent, in agreement with previous work on face identification [Hayes et al 1986]. In experiment 2, subjects first viewed a series of unfiltered faces. Subsequently they viewed bandpassed neutral faces, including both previously seen and novel individuals, and judged each person displayed as previously seen or unseen. Performance deteriorated at spatial frequencies below 8 cycles/face, in agreement with previous work on identification and with the results of experiment 1 on emotion processing. Ongoing work is aimed at directly comparing the dependence of emotion processing and identification on higher spatial frequencies.

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History

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