

How do the ventral and dorsal processing streams develop? A fMRI study on face and spatial processing in children, teenagers and adults.

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Our study examines dynamics of specialization [3] and interaction [2] in the development of the ventral and dorsal processing systems, which are involved in face and spatial processing, respectively [4,5]. Specifically, this study examines the degree to which the two systems may be less specialized and more interactive in the developing brain, as a consequence of behavioral and neurological immaturity. In addition, given some behavioral evidence that spatial processing develops earlier than object processing, this study examines whether development of the two systems may mature at different times.

Experimental Design: Six adults (age: 20-28), six teenagers (age: 14-15), and six children (age: 10-11) saw three black-and-white faces, presented sequentially in three of twelve possible locations. In a “face-matching” task participants pressed a yes or no key depending on whether the third face matched either of the previous faces or not. In a “location-matching” task they pressed a yes or no key depending on whether the third face appeared in the same location as either of the previous faces or not [1]. In 4 min runs we alternated six 40 sec-blocks of the task and control (in which participants pressed both keys after three scrambled faces were presented).

Imaging: BOLD images were acquired on a Siemens Vision 1.5T system with a mosaic pulse sequence using single-shot EPI (TR = 2.5 sec, TE = 40, FOV = 220 mm, flip angle = 90 degrees, 27 5mm axial

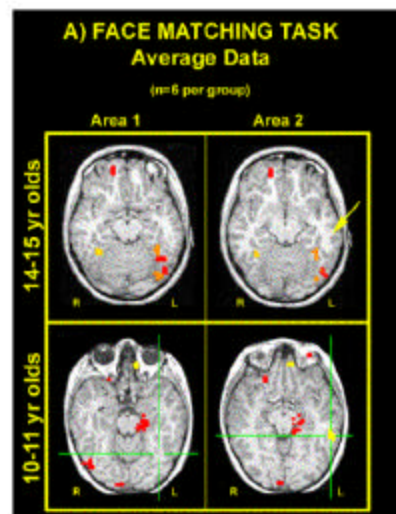


Figure 1

slices, 64X64 matrix, in-plane resolution, 3.43x3.43).

fMRI Analyses: AFNI (Cox, 1997) was used for motion correction, functional data processing and statistics. Cluster analyses were performed for each age group, to obtain regions of interest for ROI analyses.

Results and Discussion. Our data suggest that the ventral system may mature later than the dorsal one. In fact, whereas adults and teenagers show fusiform activation

(Area 1) for face processing, children show a more widespread and anterior activation (Area 2), with the presence of individual differences (Fig. 1). On the contrary, superior parietal activation for spatial processing is present across all ages (Fig.2).

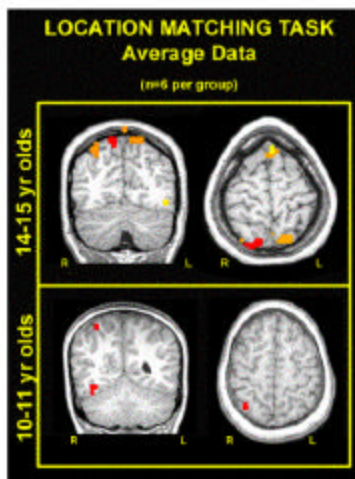


Figure 2

References:

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- 4) Haxby et al. (1994). *The Journal of Neuroscience*, 14 (11), 6336-6353.
- 5) Passarotti et al. (2000). *Neuroimage*, S38.