Neural Mechanism Underlying Developmental Prosopagnosia

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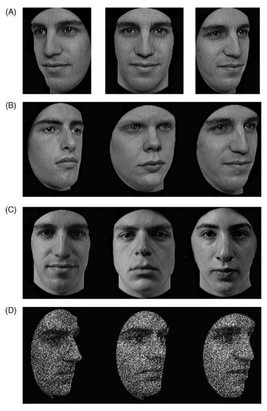
Introduction

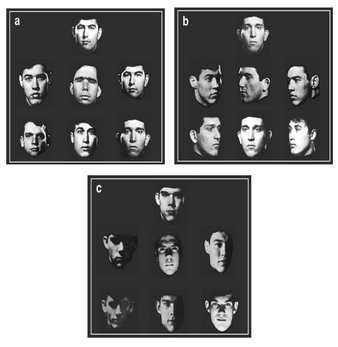
- Developmental prosopagnosia (DP) is characterized by severe facial recognition deficits, though it is currently debated whether only face-specific neural mechanisms are disrupted.
- A recent theory proposed that DP could be the result from widespread disturbance in neural migration that affects not just the face-sensitive, but also other category-responsive areas.
- To further evaluate neural deficits in DP, we conducted a joint behavioral and task-based fMRI (faces/scenes/objects/bodies dynamic localizer) study in 30 DPs and 24 controls (TD).

Methods

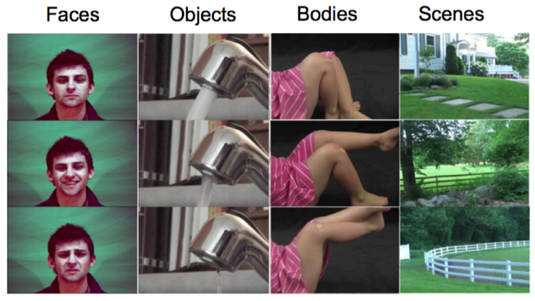
Cambridge Face Memory Test (CFMT)



Benton Face Recognition Test (BFRT)



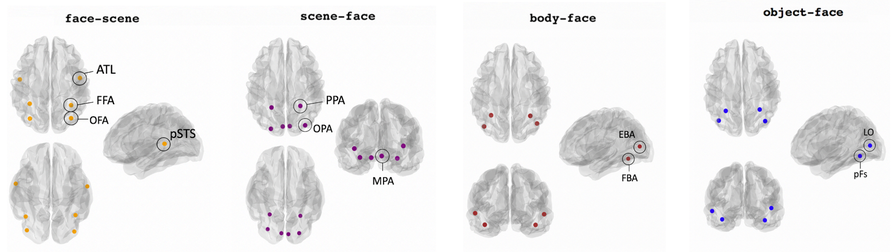
Example stimuli from dynamic localizer in fMRI



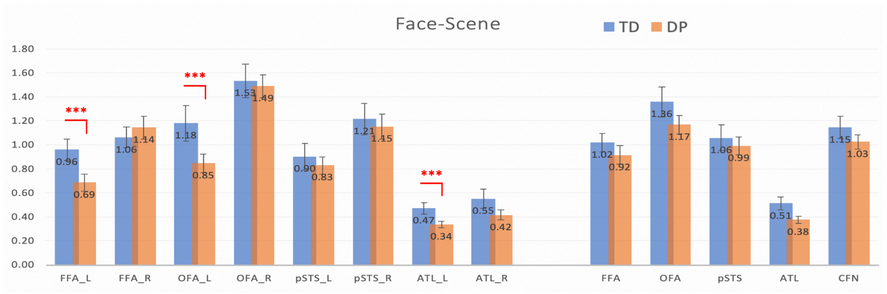
Participants

	Age	F/M	CFMT	BFRT	PI-20
Controls (n=24)	34.2 (15.4)	13/11	57.0 (8.4)	44.4 (3.1)	35.0 (8.7)
DPs (n=30)	37.9 (15.1)	25/5	40.7 (5.2)	40.2 (3.0)	80.5 (9.3)

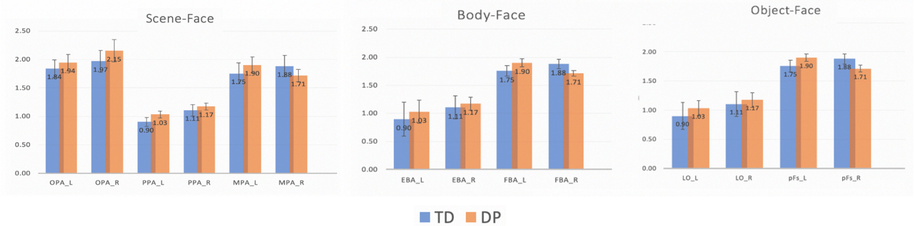
Demonstration of Functionally Localized ROIs Across Groups



Results: Reduced Face-Selectivity in DPs (Left Hemisphere more prominent)



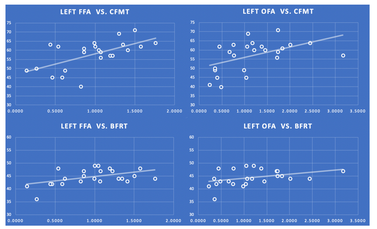
Results: Other Categories Unimpaired in DPs



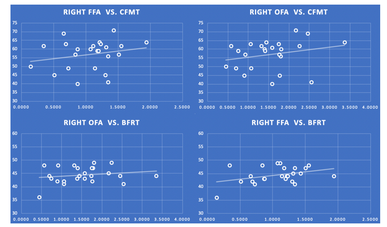
Results: Left Hemisphere Face Areas Predict CFMT/BFRT

Pearson Correlation		Face - Scene					
TD (n=24)		left FFA	right FFA	left OFA	right OFA	left pSTS	right pSTS
	CFMT	0.61	0.21	0.49	0.24	0.21	-0.08
	Benton	0.48	0.37	0.38	0.18	0.20	0.02
ALL (n=54)		left FFA	right FFA	left OFA	right OFA	left pSTS	right pSTS
	CFMT	0.47	0.01	0.44	0.12	0.07	0.01
	Benton	0.28	0.21	0.42	0.27	0.07	0.06

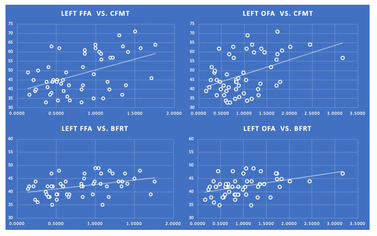
Left FFA/OFA predicting for CFMT/BFRT within TD



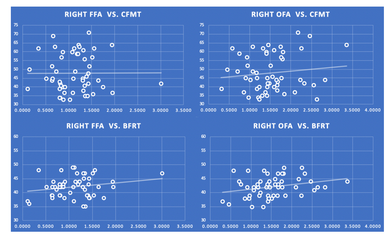
Right FFA/OFA predicting for CFMT/BFRT within TD



Left FFA/OFA predicting for CFMT/BFRT across groups



Right FFA/OFA predicting for CFMT/BFRT across groups



Discussions

- The current study showed reduced face-selectivity in DPs across ventral face areas (FFA, OFA, pSTS, ATL), but not for any of the other categories.
- Further, such reduction for faces in DPs was more prominent on the left hemisphere, which was also where we found the face areas predicted for the CFMT and BFRT within controls as well as across groups.
- These results suggested that neural deficits in DPs were specific to the faces, therefore disapproved the 'widespread disturbance in neural migration' theory on DP formation.
- Moreover, our results suggest that the left (but not the right) hemisphere face regions may be the key to facial processing deficits in DPs.