Neuropsychological investigations of social perception



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Developmental Prosopagnosia

Face identity impairments in absence of brain damage and broad neurodevelopmental problems

Affects 1-2% of population

Often has substantial effects on quality of life (Dalrymple et al. 2014; Yardley et al. 2008)

Behavioral studies indicate considerable heterogeneity

"I listened to an NPR episode recently and realized that other people didn't have to use shoes to recognize their friends."

"I once asked my younger brother where my younger brother was."

"When my son started school I dyed his hair so I'd know which kid was mine without having to be a detective every day."

"I have tried tell people about my problem but coming out as gay in the 1970s was easier. Recently one of my sisters (who is a psychologist) openly scoffed at the suggestion, hurting me deeply."

"A friend was showing me photos. I kept seeing this woman and I was jealous because she looked sexy and I liked this guy. I said, 'Who is that?' My friend said, 'It's you!'"

What regions are abnormal in DP?

Posterior regions: occipital and posterior temporal cortex, including Haxby model core areas (OFA, FFA)

Anterior regions: focus on anterior temporal lobe (ATL-FA)



What regions are abnormal in DP?

Disconnection syndrome? (Avidan & Behrmann 2014)

Normal posterior areas; white matter deficits in ILF and IFOF → deficits in anterior temporal cortex

More distributed account? Anterior areas + Posterior areas are abnormal in many DPs



Issues to keep in mind

DP is probably a family of disorders with different cognitive, neural, and etiological bases.

Therefore there is no one neural account of DP but many.

Number of studies with small samples (n < 7) in literature.

For most part, I won't discuss them because it's hard to make inferences about proportions from them.

Evidence for anterior dysfunction

MethodFindingnPaperfMRIReduced activation / connectivity7Avidan 2013

If posterior areas function normally, disconnection provides a nice neural account of DP.

Are posterior areas normal in DP? fMRI, MRI, ERP

A number of fMRI studies with small samples (n < 7) have reported normal findings in posterior face-selective areas.

What happens when sample size increases?

Furl et al. 2011 n = 15 DPs



Dinkelacker et al. 2011 n = 24 DPs

Reduced response: Faces v scrambled faces







performance on CFMT [%correct]

Garrido et al. 2009 n = 17 DPs

Reduced gray matter volume

Right posterior STS



17



*small volume corrections; p < 0.05, corrected

Dinkelacker et al. 2011 n = 24 DPs

Reduced gray matter volume

Bilateral lingual gyrus



Towler et al. 2012 n = 16 DPs

In normals, N170 to inverted faces is stronger and later than N170 to upright faces.



Towler et al. 2012 n = 16 DPs



Towler et al. 2016 n = 10 DPs





Towler et al. 2016 n = 10 DPs



Fisher et al. 2016 n = 11 DPs





Contrast-Normal

Positive-eyes Chimera



Negative-eyes Chimera

Contrast-Inverted

Fisher et al. 2016 n = 11 DPs



White matter deficits in ILF & IFOF?

Gomez et al. (2015) – Normal ILF in 8 DPs; WM deficits in tracts local to FFA.

Song et al. (2016) – Normal ILF/IFOF in 15 DPs; WM deficits in tracts local to FFA.

b. Mean fractional anisotropy in ILF and IFOF

. Metrics for FFA fibers (local WM)



Abnormalities in posterior and anterior regions, but anterior abnormalities often found with smaller Ns.



Problems originating in posterior areas are more likely to be propagated to anterior areas than vice versa. Functional responses? Probably Structural abnormalities? Maybe.

Accumulation of abnormalities



Cumulative account: Questions

Still need more evidence that abnormalities more common in anterior areas

DPs with posterior deficits will have anterior abnormalities – Need measures that can be interpreted at individual level

Accumulation of abnormal functional responses <u>and</u> structural abnormalities in anterior areas?

