



Neurofunctional Indices of Executive Functioning in Autism Spectrum Disorder

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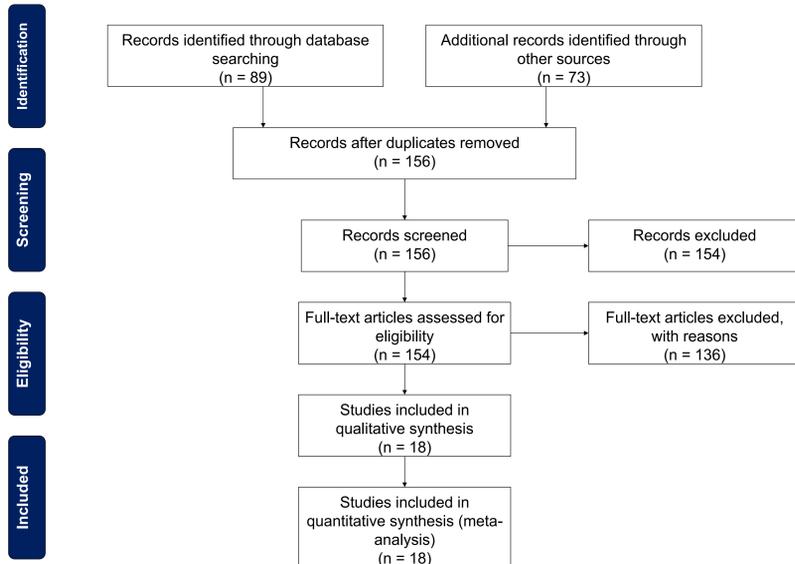


BACKGROUND

- Impairments in executive functions (EF) are widely reported in autism spectrum disorder (ASD) and may underlie the core behavioral difficulties in ASD (Hill, 2004).
- While some research attributes this to an overreliance of the prefrontal cortex (PFC), others demonstrate poor recruitment of the PFC (Gilbert et al., 2008) or its connectivity to other brain areas (Just et al., 2007) in individuals with ASD.
- Empirical studies suggest a broad impairment in EF, although there is significant inter-individual variability in EF performance.
- Identification of a cognitive profile of EF dysfunction could provide a better understanding of the neural circuitry underpinning ASD and may be useful with clinical utility, diagnosis, treatment, and biomarkers.
- **To assess the emerging consensus across imaging studies of EF in ASD, the current study used coordinate-based activation likelihood estimation (ALE) analysis of 18 functional magnetic resonance imaging (MRI) studies.**

METHODS

- The methods detailed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed as shown in the flow chart below. Exclusions were made for reasons including: lack of whole brain coordinates, no official ASD diagnosis, and comorbid ASD sample.
- A total of 18 papers were included for this meta-analysis representing a total of 846 participants (ASD = 406; TD = 440). They were matched on age (range = 7-52 years), gender, and IQ.
- Peak activation coordinates (x,y,z) were extracted into text files. Any Talairach coordinates were converted to Montreal Neurological Institute (MNI) coordinates.
- The text files were used to run separate Activation Likelihood Estimation (ALE) Analysis for TD and ASD groups using **GingerALE** software.



METHODS, cont.

	PubMed	Google Scholar	PsychInfo
Search Yield	24,835	33,200	73,593
Retrieved	38	36	15

Search 1

1. Neuroimaging/fMRI
2. autism spectrum disorder/ASD/autism
3. executive functions/executive function

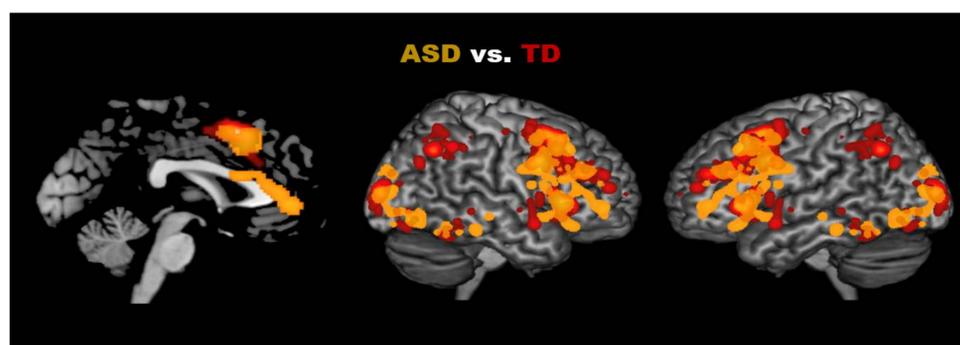
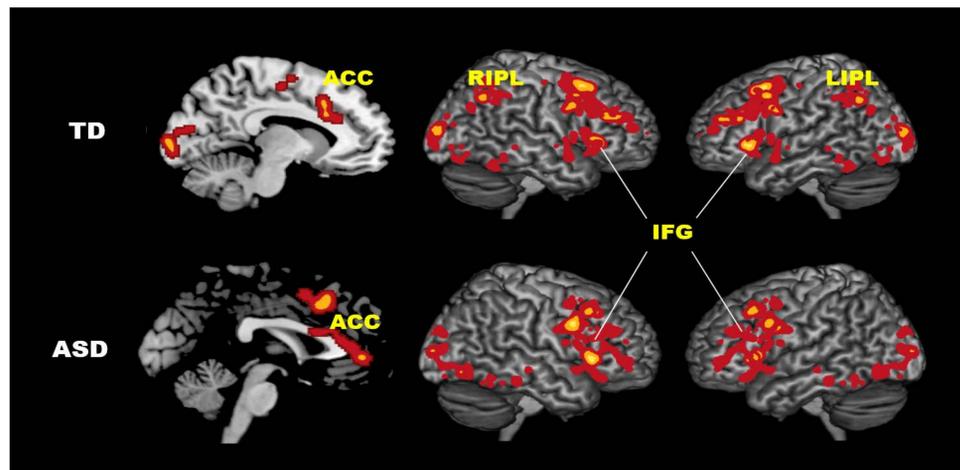
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Search Yield	104,928	20,600	138,978
Retrieved	20	29	24

Search 2

1. Neuroimaging/fMRI
2. autism spectrum disorder/ASD/autism
3. cognitive control/cognitive controls

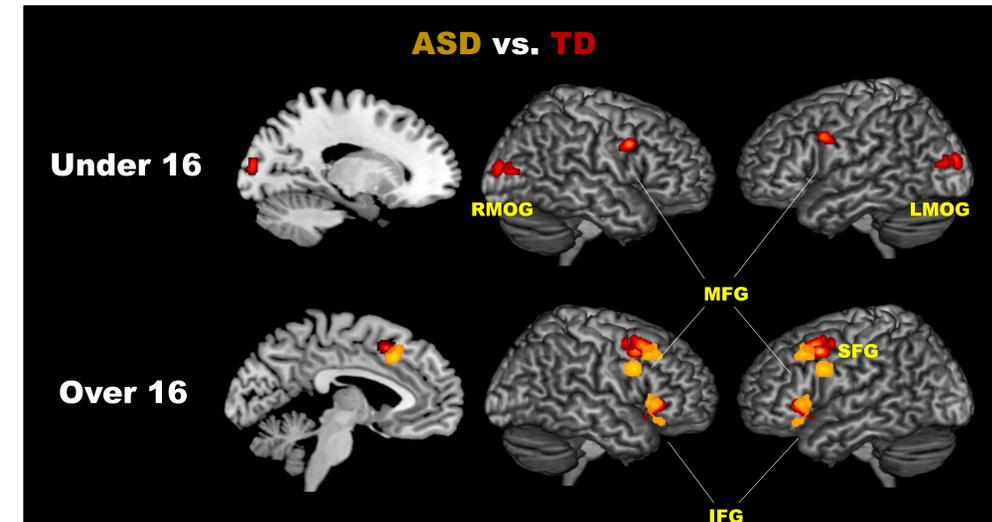
RESULTS

The ASD group's activation pattern seems to differ from the TD participants primarily in left and right IPL, where the ASD participants did not recruit IPL during EF tasks.

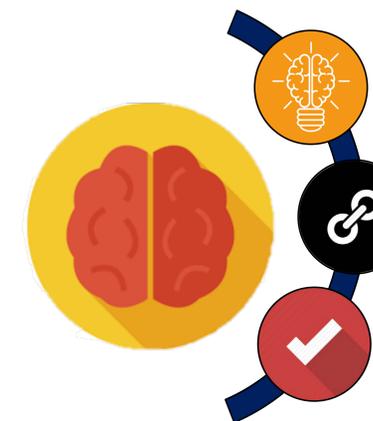


RESULTS, cont.

The ASD group's activation pattern seems to follow a different developmental trajectory than the TD participants. Further, the TD group's activation is primarily in the occipital lobe, spreading to the frontal lobe after the age of 16.



DISCUSSION



Lack of activity within frontoparietal circuits may be related to some of the EF difficulties individuals with ASD experience.

Absence of parietal activation may be due to a lack of connectivity between frontoparietal networks with other regions during EF tasks.

Support the executive dysfunction hypothesis of ASD.

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