

Examining Autism: The Role of MRI

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Introduction

Autism spectrum disorder (ASD) is a neurological condition characterized by deficits in social cognition, social interaction, and verbal and non-verbal communication. Other features of ASD include a narrow range of interests and repetitive and ritualized behaviors.^{1,2} Challenges of ASD include symptoms, and the severity of symptoms are heterogeneous in nature which can sometimes make diagnosis difficult. Additionally, the cause or causes of autism are unknown and often highly speculated. With ASD affecting 1 in every 88 children, it is essential to seek out a better understanding of this condition.³ Magnetic resonance imaging (MRI) has been proven to be a valuable tool to examine ASD further. With the capabilities of MRI, researchers can investigate both structural and functional components associated with ASD to understand the underlying etiology better.

Discussion

An MRI of the brain is typically not part of a diagnostic evaluation of ASD, however, much research has been performed using both structural and functional MRI which has led to further understanding of ASD.⁴ Numerous studies utilizing MRI have observed structural changes in the brains of individuals with ASD. Changes include increased total brain volume, increased cortical thickening in the parietal lobes, and increased amygdala volume.⁴ One particular study imaged infants 6 to 12 months old with high familial risk for ASD to examine if early increased brain volume could be predictive of an ASD diagnosis.⁵ Researchers did note early increased brain volume in several regions of the brain which resulted in ASD diagnosis later in life at an 88 percent sensitivity rate (see Figure 1).⁵

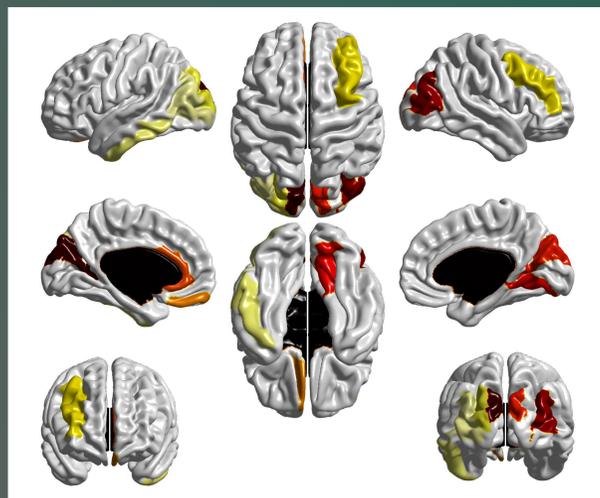


Figure 1. Areas of significant volume differences in children with ADS compared to the control.⁵

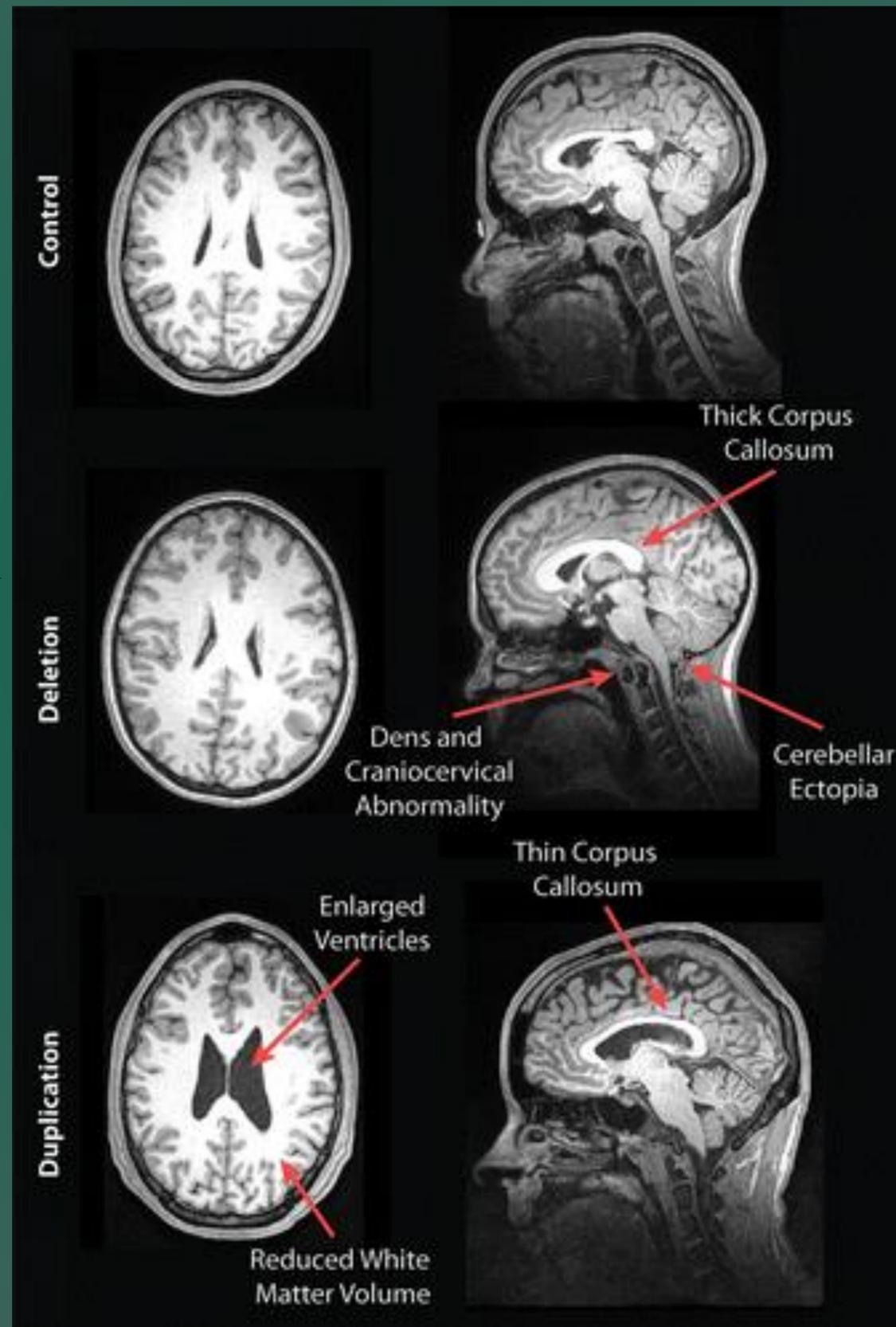


Figure 2. Example images demonstrating a thickened corpus callosum, dens and craniocervical abnormality, and cerebellar ectopia in deletion carriers and enlarged ventricles and reduced white matter in duplication carriers.⁶

Discussion Continued

Another study focusing on brain structure, imaged participants who had either a deletion or duplication of the 16p11.2 chromosome which has been previously linked to ASD.⁶ Using T1, T2, and T2 FLAIR pulse sequences, researchers noted several changes structural changes unique to ASD individuals who are a carrier for either the chromosomal addition or deletion (see Figure 2).⁶

Functional MRI (fMRI) is another valuable asset being utilized to learn more about ASD. Multiple studies using fMRI have discovered children with ASD have hyper-connectivity between several regions of the brain, which may be related to social deficits.^{3,7} One particular study, using resting-state fMRI, found that children with ASD had hyper-connectivity in six of the ten neural networks examined compared to typically developing children including the salience and motor networks (see Figure 3).³

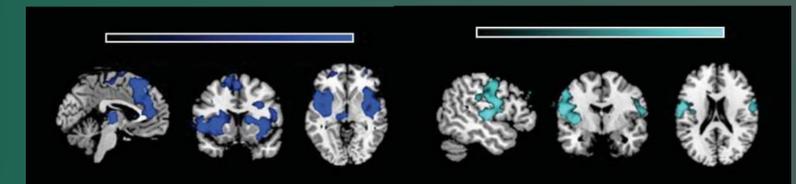


Figure 3. Hyper-connectivity observed in the salience and motor networks.³

Conclusion

Autism spectrum disorder is a complex neurological condition that affects a significant portion of the world's population. Despite its prevalence, ASD is still not fully understood by the medical community. With the help of MRI, researchers have been able to uncover valuable information regarding both structural and functional changes that occur in individuals with ASD. With these findings and continued research ASD may be understood further and recognized earlier in those with high familial risk, allowing for improved support and resources for those affected.

References

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