THE LATEST RESEARCH ON AMYGDALA GROWTH IN AUTISM

This article is a review of the following research: Shen, M. D., Swanson, M. R., Wolff, J. J., Elison, J. T., Girault, J. B., Kim, S. H., Smith, R. G., Graves, M. M., Weisenfeld, L., Flake, L., MacIntyre, L., Gross, J. L., Burrows, C. A., Fonov, V. S., Collins, D. L., Evans, A. C., Gerig, G., McKinstry, R. C., Pandey, J., St John, T., ... IBIS Network (2022). Subcortical Brain Development in Autism and Fragile X Syndrome: Evidence for Dynamic, Age- and Disorder-Specific Trajectories in Infancy. *The American Journal of Psychiatry*, 179(8), 562–572.

The amygdala is a region of the brain that is typically associated with fear and stress, or the fight-or-flight response, as well as memory, anxiety, decision-making and emotional responses. The amygdala is also a major recipient of sensory input, including visual, auditory and tactile stimuli.

While previous research has shown that many autistic children have an enlarged amygdala, these studies have not addressed when this overgrowth occurs.[1,2] Are children who develop autism born with an enlarged amygdala, or is it something that develops during infancy? It is also important to determine **why** autistic children have an enlarged amygdala and what behaviors this could affect.

A recent study led by Dr. Mark Shen from the Carolina Institute for Developmental Disabilities and Department of Psychiatry at the University of North Carolina at Chapel Hill investigated the timing of amygdala enlargement in babies, prior to being diagnosed with autism, and measured cognitive ability, later autism diagnoses and repetitive behaviors to determine if there were any relationships.

Study

A total of 408 individuals enrolled in the study. The participants included the following:

- 58 infants with a high likelihood (HL) of developing autism as they had an older autistic sibling, and who later went on to develop autism themselves;
- 212 infants with a high likelihood of developing autism but who did not go on to develop autism;
- 109 control infants who did not have an autistic sibling and who did not go on to develop autism;
- 29 infants with Fragile X Syndrome, a single gene condition that is associated with autism.

The researchers used magnetic resonance imaging (MRI) to image selected brain structures, including the amygdala, caudate, putamen, globus pallidus, and thalamus. The images were taken at different timepoints when participants were between 6 and 24 months of age, during natural sleep without sedation.

At 24 months of age, each participant was assessed for cognitive ability (Mullen Scales of Early Learning) and for repetitive behavior (Repetitive Behavior Scale-Revised). It was also determined at this time if each participant qualified for an autism diagnosis or not.

Results

- At six months of age, babies who would later develop autism had typically-sized amygdala volumes.
- These babies had significantly faster amygdala growth between the ages of six and 24 months.
- By age 12 months, the size difference in babies who later developed autism was much greater than in all other groups; this difference continued until the last measurement at age 24 months, the age when the children were diagnosed with autism.
- The faster the amygdala grew between 6 and 12 months, the more social deficits the children had at 24 months when they were diagnosed. But this growth was not associated with restricted and repetitive behaviors.
- No difference was seen in the thalamus volume between the groups.
- The researchers found that the individuals with Fragile X Syndrome had enlargement of a different brain structure at 6 months, the caudate, which was associated with a different symptom, restricted and repetitive behaviors.

Conclusion

Current research continues to reveal more and more information about the complexities of autism. As mentioned earlier, previous research showed that amygdala volume was increased in some autistic older children.[1,2] This study shows that the increased growth begins as early as at six months of age, prior to the onset of diagnostic behavioral syptoms of autism, and well before diagnosis. The results of this study also show that the amygdala volume was specifically associated with social deficits in autistic individuals.

The authors indicate that that there is "an age- and disorder-specific pattern of cascading brain changes leading to autism." Given these findings, it is now important to address what could be causing the amygdala to increase in volume in autistic individuals at the age of six months. The researchers suggest some possibilities, including increased stress from sensory overstimulation, visual attention deficits and neuroinflammation.

POSSIBLE DEVELOPMENTAL CASCADE IN INFANCY

Sensory Dysregulation → Enlarged Amygdala → Social Deficits/Anxiety

Research continues to seek more information about the development of autism and the brain changes that occur in autistic individuals. At the same time, it is important for parents and caregivers to be aware of the timing of these changes and to seek intervention as early as possible in order to arrive at the best possible outcomes for their children.

Written by Autism Advocate Parenting Magazine

References

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