

## Early Brain Development in Autism

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A pivotal period in human brain and behavioral development occurs in the first years of life, and it is also during these early years that autistic behaviors first begin. For more than half a century, scientists have hoped to discover what is going wrong with early brain development in autism.

New studies show that at birth, the brain is normal in size in infants who later become autistic. Surprisingly, this soon changes, so that within the first 6 months following birth, the autistic brain begins to grow too fast and too large. This abnormally rapid pace of growth results in a child having an abnormally large brain by 1 year of age. By 2 to 4 years of age, 90% of autistic patients have brain volumes that are larger than normal average. Moreover, 37% of 2-4 year old autistic toddlers have brain volumes that exceed 2 standard deviations above the normal mean, falling into the definitional zone of early developmental macrocephaly. After this period, the brain shifts to abnormally slow growth.

These studies provide for the first time, knowledge of a specific type and age of onset of a biological abnormality — early postnatal macrocephaly — that precedes the clinical manifestation of autism. The observation of such early brain overgrowth, followed by abnormally slow growth later in childhood, raises the "brain growth dysregulation hypothesis" of autism in which there is a pathologic dysregulation in the timing and amount of brain growth as well as in the cessation of growth.

If the causes of abnormal regulation of brain growth in early life are discovered, then in vivo anatomical MRI studies of infants and toddlers might be able to detect the onset and trajectory of the growth pathology, and biomedical interventions prior to the full expression of these abnormalities may be a possibility.

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