Differences in White Matter Fiber Tract Development Present from 6 to 24 Months in Infants with Autism

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Abstract

OBJECTIVE: Evidence from prospective high-risk infant studies suggests that early symptoms of autism usually emerge late in the first- or early in the second-year of life after a period of relatively typical development. The purpose of this study was to prospectively examine white matter fiber tract organization from 6 to 24 months in high-risk infants who develop autism spectrum disorders (ASDs) by 24 months.

METHOD: Participants included 92 high-risk infant siblings from an ongoing imaging study of autism. All participants had diffusion tensor imaging at 6 months and behavioral assessments at 24 months, with a majority contributing additional imaging data at either or both 12 and 24 months. At 24 months, 28 infants met criteria for ASDs; 64 infants did not. Microstructural properties of white-matter fiber tracts reported to be associated with ASDs or related behaviors were characterized by fractional anisotropy (FA) and radial and axial diffusivity.

RESULTS: FA trajectories differed significantly between infants who did versus did not develop ASDs for 12 of 15 fiber tracts. Development for most fiber tracts in infants with ASDs was characterized by elevated FA at 6 months followed by slower change over-time relative to infants without ASDs. Thus, by 24 months of age, lower FA values were evident for those with ASDs.

CONCLUSION: These results suggest that the aberrant development of white matter pathways may precede the manifestation of autistic symptoms in the first year of life. Longitudinal data are critical to characterizing the dynamic age-related brain and behavior changes underlying this neurodevelopmental disorder.