

path of communication and behavioral development as adolescents.

The new work builds on a [previous MIND Institute study](#) of IQ trajectories in [autistic children](#) ages 2-8. It expands the findings to older youth.

The [study](#), published in *JCPP Advances*, has identified three distinct paths of intellectual development in autistic children: persistent intellectual disability, an increase in IQ, or an IQ that remained average or above.

"Once more, we have shown that we can use IQ to identify a subtype of autism," said lead author Marjorie Solomon. She is the MIND Institute's associate director and a professor in the Department of Psychiatry and Behavioral Sciences. "Given that IQ is perhaps the strongest predictor of later outcomes in autistic children, we believe that studying IQ trajectories in childhood is very important. It provides clues about their potential different future paths and how we can help individuals to flourish."

Study methods

The study's participants were from the MIND Institute's [Autism Phenome Project](#), one of the world's most comprehensive longitudinal studies of its kind. Researchers have been following a group of autistic children from about age 3 through adolescence

The study included 373 (115 females, 258 males) autistic participants ranging from age 2 to age 12. Importantly, individuals with all levels of intellectual ability were part of the sample.

Assessments of behavior and autistic characteristics were collected across childhood. IQ was evaluated at three timepoints: T1 (mean age of

3 years), T2 (mean age of 5.6 years) and T3 (mean age of 11.5 years).

Licensed clinical psychologists specializing in autism evaluated the participants using autism assessment tools. These included the ADOS (Autism Diagnostic Observation Schedule), ADOS-2, ADI-R (Autism Diagnostic Interview—Revised), and the Vineland Adaptive Behavior Scales (VABS).

Based on these assessments, the participants were divided into three subgroups:

- "Changers" described those who began with low IQs in [early childhood](#), followed by a substantial increase that slowed as they entered middle childhood. "Changers" made up 39% of the participants.
- "Persistent Intellectual Disability" described the individuals who began with a below average IQ that persisted across childhood. Around 45% of the participants were in this group.
- "Persistently High IQ" described the individuals who began with an average or above average IQ and remained relatively stable throughout childhood. Sixteen percent belonged to this group.

Results

The researchers analyzed changes in autism traits and communication adaptive functioning. This is the ability to understand language, engage in meaningful verbal expression, and read and write, over time.

They also looked at internalizing behaviors, such as anxiety or depression, and externalizing behaviors, such as impulsivity or aggressiveness.

Of the 191 participants with assessments at two timepoints or more, 10

lost their autism diagnosis. This included about 5% of the "Changers," 10% of the "Persistently High IQ" group and none of those in the "Persistent Intellectual Disability" group. Identifying what makes the "Changers" group different from those in the groups with more stable IQs is a major goal of the research.

Individuals with stronger early communication adaptive function and lower autism 'severity' scores were more likely to be in the "Persistently High IQ" group versus the "Persistent Intellectual Disability" group by adolescence.

Both the "Changers" and "Persistent Intellectual Disability" groups had lower IQ scores in early childhood. However, those that showed improved communication adaptive function and decreased externalizing behaviors into adolescence were more likely to be in the "Changers" group compared to the "Persistent Intellectual Disability" group.

"It is striking that we found so much overlap in individuals following different trajectories of intellectual development when assessed at the early childhood and adolescent time points," Solomon said. "Of course, many other factors are involved in determining outcomes, but intellectual ability level is a core feature and an important starting point."

Brain differences among the three autistic groups

Last year, a closely related MIND Institute [study](#) compared MRI scans of the three IQ subgroups at age 3. The researchers evaluated two [brain networks](#) associated with intellectual functioning: the frontoparietal network and the [default mode network](#).

The frontoparietal network is involved in sustained attention, problem-solving and [working memory](#). The default mode network contributes to remembering, thinking about the future and mind wandering.

The 2022 study was led by Joshua Lee, an assistant professional researcher in the Department of Psychiatry and Behavioral Sciences. The team found that the "Changers" and "Intellectual Disability" groups, which both had low IQs at age 3, differed from the group with average IQs in several regions of the frontoparietal network.

In contrast, the default mode network differed between the "Changers" group and the other two groups. This difference suggested that this network may be involved in mechanisms related to improving intellectual function.

"The findings of both studies provide clues about how brain differences between autistic individuals with and without intellectual disability during early childhood might predict future outcomes," said Christine Wu Nordahl, director of the Autism Phenome Project, a professor in the Department of Psychiatry and Behavioral Sciences and a coauthor on both studies. "Future studies will evaluate brain structure and function development across [childhood](#) and how they differ across various subgroups of intellectual development in [autism](#)."

Additional coauthors on the new study included Billy Cho, Ana-Maria Iosif, Brianna Heath, Apurv Srivastav, Emilio Ferrer and David G. Amaral, all of UC Davis.

More information: Marjorie Solomon et al, IQ trajectories in autistic children through preadolescence, *JCPP Advances* (2023). [DOI: 10.1002/jcv2.12127](#)

Provided by UC Davis

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