New findings question past studies of brain differences between people with ASD and general population

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Quinn, an autistic boy, and the line of toys he made before falling asleep. Repeatedly stacking or lining up objects is a behavior commonly associated with autism. Credit: Wikipedia.

(Medical Xpress)—To better understand the underlying causes of autism spectrum disorders (ASD), psychologists have been using brain scanning to compare brain structures in people with ASD and the general

population. Keen to understand how differences in brain structure may be related to differences in cognition and perception in those with ASD, one line of research is looking at the connectivity between different regions of the brain. One way to measure the connectivity between brain areas at a distance from each other is to look at the structure of connective tissues in the brain: the "white-matter" fibre tracts, using diffusion-weighted magnetic resonance imaging (DW-MRI).

Previous work has suggested that white-matter connections are affected in people with ASD. Long-distance connections in particular, have been thought to be less robust. But a paper in the *Proceedings of the National Academy of Science* casts doubt on existing DWI-MRI results in those with ASD and suggests the need to review the current research conclusions drawn from diffusion-weighted imaging.

The historical findings, which showed differences in the long range white-matter fibre tracts had been taken as evidence that autism is fundamentally a 'disconnection' syndrome, in which the core deficits result from reduced 'integration' of information at the neural and cognitive level.

The latest research, led by Dr Kami Koldewyn, has now revealed how head movement during the scanning process can affect the results.

Dr Kami Koldewyn of Bangor University's School of Psychology explains:

"Movement during scanning causes a drop in contrast in the area being imaged - in a way similar to how movement or camera shake while taking a photo will cause the image to blur. Because the signal we use in DW-MRI is related to image intensity, movement causes a direct change in what we are trying to measure. Even relatively small differences between groups in how much they move during a scan can make big

differences in DW-MRI measures. Differences in these measures between groups may have been incorrectly interpreted as less robust connections in white-matter tracts when they may have simply been differences in head movement during scanning."

For the latest research, a large cohort of children was included in the study and all scans with any visual evidence of movement in the images were removed from the data set. When no allowance was made for head movement, there were clear group differences in several white-matter tracts. Indeed, analyses showed what might have been interpreted as differences in the long-distance white matter between two scan sets of the same group of children - caused by movement. When groups were carefully matched not only on IQ, age and gender but also on how much they moved during the scan, however, no discernible difference was found between groups - other than in one discrete area of the brain: the right inferior longitudinal fasciculus. This white matter tract connects early visual areas with higher-level visual areas of the brain important for face and object recognition. This result had been hypothesized - this white-matter tract is affected in people with congenital face recognition deficits and people with ASD often have difficulties with face recognition.

Dr Koldewyn says: "As a community of academics researching ASD, we need to acknowledge and address data qualities issues that we all struggle with. To achieve the high quality results needed to understand a complex disorder like ASD, we need to think carefully about how to improve scanning techniques and agree on what analysis methods are sufficiently robust."

"I am certainly interested in continuing this line of research here at Bangor University," she added.

More information: Kami Koldewyn, Anastasia Yendiki, Sarah

Weigelt, Hyowon Gweon, Joshua Julian, Hilary Richardson, Caitlin Malloy, Rebecca Saxe, Bruce Fischl, and Nancy Kanwisher. "Differences in the right inferior longitudinal fasciculus but no general disruption of white matter tracts in children with autism spectrum disorder." *PNAS* 2014 ; published ahead of print January 21, 2014, DOI: 10.1073/pnas.1324037111