Environmental factors as important as genes in understanding autism

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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.

Environmental factors are more important than previously thought in understanding the causes of autism, and equally as important as genes, according to the largest study to date to look at how autism runs in families.

The study also shows that children with a brother or sister with autism are 10 times more likely to develop autism; 3 times if they have a half-brother or sister; and 2 if they have a cousin with autism, providing much needed information for parents and clinicians for assessing individual risk.

The study, which looked at over 2 million people, was led by researchers at King's College London, Karolinska Institutet in Sweden and Mount Sinai in the US, and is published in *JAMA* today.

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder defined by impairments in social interaction and communication and the presence of restrictive and repetitive behaviours. The exact causes are unknown but evidence has shown it is likely to include a range of genetic and environmental risk factors.

Using Swedish national health registers, the researchers analysed anonymous data from all 2 million children born in Sweden in between 1982 and 2006, 14,516 of which had a diagnosis of ASD. The researchers analysed pairs of family members: identical and non-identical twins, siblings, maternal and paternal half-siblings and cousins.

The study involved two separate measures of autism risk – heritability, which is the proportion of risk in the population that can be attributed to genetic factors; and Relative Recurrent Risk which measures individual risk for people who have a relative with autism.

Most previous studies have suggested that heritability of autism may be as high as 80-90%, but one study has hinted at a lower estimate. The new study is the largest and most comprehensive to date and estimates heritability of autism to be 50%, with the other 50% explained by non-heritable or environmental factors.

Environmental factors are split into 'shared environments' which are shared between family members (such as family socio-economic status), and 'non-shared environments' which are unique to the individual (such as birth complications or maternal infections or medication during the pre and perinatal period). In this study, factors which are unique to the individual, or 'non-shared environments' were the major source of environmental risk.

Professor Avi Reichenberg, author of the study from Mount Sinai Seaver Center for Autism Research, who led the study whilst at King's College London, says: "Heritability is a population measure, so whilst it does not tell us much about risk at an individual level, it does tell us where to look for causes. We were surprised by our findings as we did not expect the importance of environmental factors in autism to be so strong. Recent research efforts have tended to focus on genes, but it's now clear that we need much more research to focus on identifying what these environmental factors are. In the same way that there are multiple genetic factors to consider, there will likely be many different environmental factors contributing to the development of autism."

In the other part of the study, the researchers looked at individual risk. In the general population, autism affects approximately 1 in 100 children. The researchers found that children with a brother or sister with autism were 10.3 times more likely to develop autism; 3.3-2.9 times if they had a half-brother or sister with autism; and 2.0 times if they had a cousin with autism. There were no differences in relative risk between genders. This is the first study to provide such a comprehensive and far reaching analysis of individual risk extended as far as cousins.

Dr Sven Sandin, author of the study from King's College London and Karolinska, says: "Our study was prompted by a very basic question which parents often ask: 'if I have a child with autism, what is the risk my next child will too?' Our study shows that at an individual level, the

risk of autism increases according to how close you are genetically to other relatives with autism. We can now provide accurate information about autism risk which can comfort and guide parents and clinicians in their decisions."

More information: Paper: Sandin, S. et al. 'The familial risk of autism' is published in *JAMA* doi:10.1001/jama.2014.4144

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