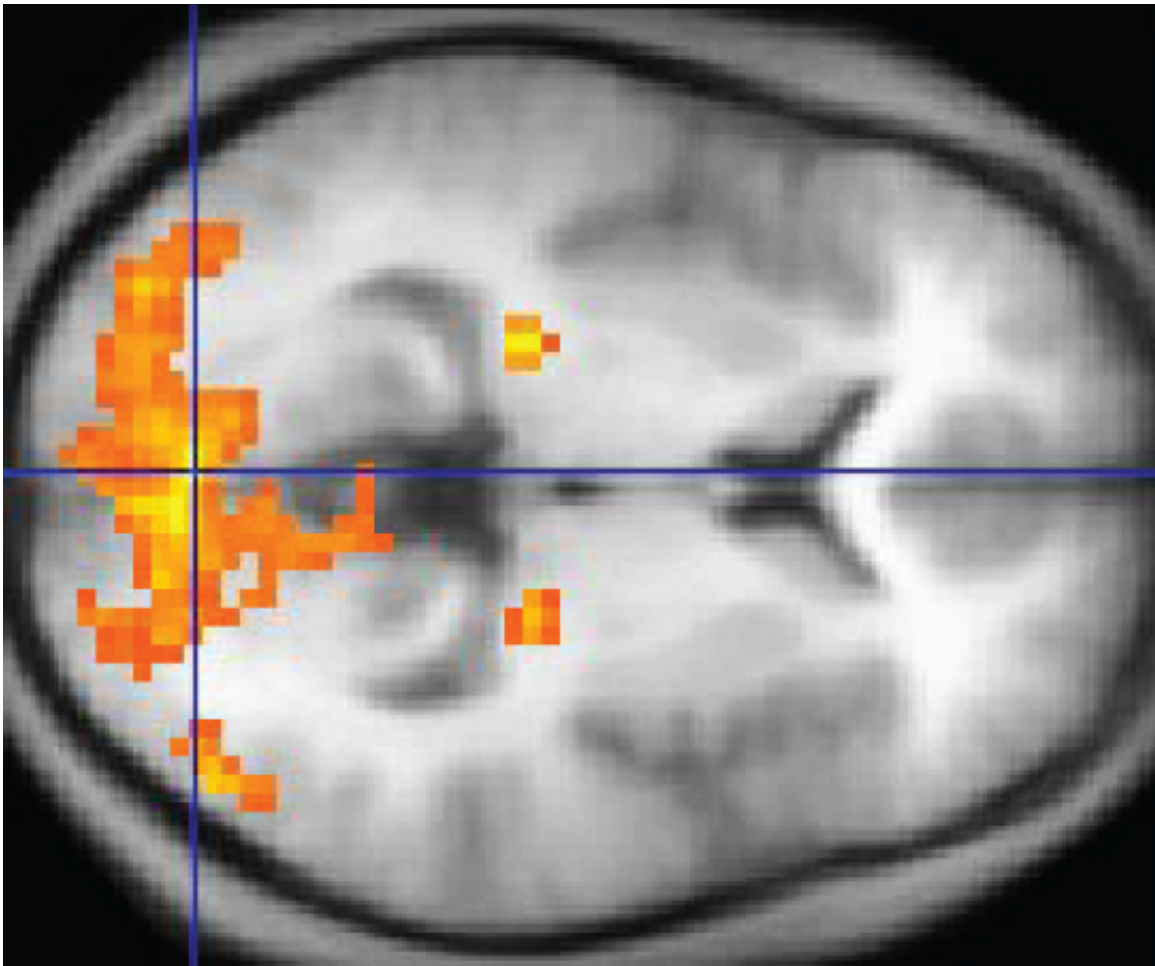# Medical Xpress

Resting-state fMRI might be an amazing predictor of autism outcomes

November 25 2015, by Christopher Packham

An fMRI image with yellow areas showing increased activity. Credit: Wikipedia/ CC BY 3.0

(Medical Xpress)—Autistic traits diagnosed in early childhood,

including communication problems and adaptive behavior deficits, tend to persist into adulthood. A very few autistic individuals demonstrate improvement in their symptoms over time and achieve good outcomes, which are characterized by a high level of independence and social adaptivity.

Thus, in order to adapt treatments and services to individuals, researchers have sought predictive tools to assess the probability that a person with autism might achieve a level of independence later. Previous studies have demonstrated that behavioral assessments offer some predictiveness, including intelligence quotient, early language ability and adaptive behavior scores. But these assessments leave a high level of variance that has been difficult to rectify.

Recently, a collaborative of researchers in the U.S. hypothesized that a measure of intrinsic functional brain connectivity might predict behavioral outcomes at least one year after the imaging data were acquired. They have published the results of their study in the *Proceedings of the National Academy of Sciences*.

The researchers recruited 31 male adolescents and young adults with autism spectrum disorder (ASD) without intellectual disability. They collected fMRI data of the participants while they maintained visual fixation on a central cross image. The researchers were interested primarily in three functional brain networks implicated in the development and progression of autism symptoms—the salience network, the default-mode network, and the frontoparietal task control network. The participants were scanned on two occasions up to several years apart.

The researchers found that fMRI was amazingly predictive in assessing outcomes for individuals with ASD. Connectivity between the studied functional brain networks predicted future autistic traits and the change

in autistic traits and adaptive behavior over time. In fact, functional connectivity in the salience network predicted reliable improvement in adaptive behaviors with 100 percent sensitivity and 70 percent precision.

The authors report, "Our strongest results were not from predicting future scores but rather from predicting the change in scores over time. We found that baseline social autistic traits, age, and follow-up latency explained almost 41 percent of the variance in the change of social autistic traits." They note that they are aware of only one other study that attempted to predict the magnitude of change in scores of social autistic traits, with less conclusive results.

The authors believe that their results could be predictive of other outcomes in ASD populations. For instance, the anterior cingulate peninsula of the salience network, as well as brain network nodes in other regions, correlate with future language ability. But they note that their results were poorly predictive of reliable declines of social autistic traits. Due to the limitations of the current study, including the the small sample size and the heterogeneity of the cohort, they believe further investigation could provide more definitive parameters for fMRI diagnostics for predictions of ASD outcomes.

They conclude, "These findings provide evidence for networks that underlie changes in social and adaptive behavior and suggest that including brain data may improve the prognostic power of clinical assessments."

Abstract

Although typically identified in early childhood, the social communication symptoms and adaptive behavior deficits that are characteristic of autism spectrum disorder (ASD) persist throughout the lifespan. Despite this persistence, even individuals without cooccurring intellectual disability show substantial heterogeneity in outcomes. Previous studies have found various behavioral assessments [such as intelligence quotient (IQ), early language ability, and baseline autistic traits and adaptive behavior scores] to be predictive of outcome, but most of the variance in functioning remains unexplained by such factors. In this study, we investigated to what extent functional brain connectivity measures obtained from resting-state functional connectivity MRI (rs-fcMRI) could predict the variance left unexplained by age and behavior (follow-up latency and baseline autistic traits and adaptive behavior scores) in two measures of outcome—adaptive behaviors and autistic traits at least 1 y postscan (mean follow-up latency = 2 y, 10 mo). We found that connectivity involving the so-called salience network (SN), default-mode network (DMN), and frontoparietal task control network (FPTCN) was highly predictive of future autistic traits and the change in autistic traits and adaptive behavior over the same time period. Furthermore, functional connectivity involving the SN, which is predominantly composed of the anterior insula and the dorsal anterior cingulate, predicted reliable improvement in adaptive behaviors with 100% sensitivity and 70.59% precision. From rs-fcMRI data, our study successfully predicted heterogeneity in outcomes for individuals with ASD that was unaccounted for by simple behavioral metrics and provides unique evidence for networks underlying long-term symptom abatement.

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