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AUTISM:

“Integrative Behavioral and Neurophysiological Studies of Normal and Autistic Cognition Using Video Game Environments”

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Supported by Division of Behavior and Cognitive Sciences, National Science Foundation

GRANT DESCRIPTION

What makes some people in susceptible families autistic, while others escape autism? What is it about autism that runs in families; is it possible to be “just a little” autistic, or is autism an all-or-none condition? And might genes be associated not only with autism in general, but also with certain patterns of cognitive superiorities, such as excellent attention to detail? Answering these questions will help us find out how a familial susceptibility to autism translates into autism itself during the early months of brain development — and how we might interfere with this process so as to prevent the development of autistic social and communicative deficits whilst preserving autism’s special perceptual and cognitive skills. Our work with students of neuroscience and computer science combines the study of brain function — using scalp electrodes and MRI scanners — with the study of children’s behavior as they play a video game into which we’ve built several scientific experiments.

SCIENCE AND HEALTH IMPLICATIONS

Our work will help understand how autistic differences in brain function contribute to autistic differences in behavior across many different cognitive domains. For example, we know that some



The figure above shows that the brain of a 3-year-old child with autism is larger than that of a typical child. While the abnormal enlargement in brain size may not be this great in all autistic children, even slight abnormal brain overgrowth may reflect problems in the development of brain circuitry and brain function. Possibly newly discovered biological indicators of autism like brain overgrowth could be used together with behavioral signs to help confirm an autism diagnosis early. Currently, researchers are testing the use of measurements of brain size and other biomarkers to assist in diagnosing autism in the first year of life.

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people with autism are very good at noticing small details, and we know that some people with autism are poor at recognizing faces and emotional expressions, but might these two very different abnormalities — one abnormal skill and one abnormal deficit — stem from the same neurophysiology? Using these experiments, we hope to test the idea that these abnormalities relate to a decrease in the degree to which separate parts of the brain “talk to” or cooperate with each other when solving cognitive problems, and we hope to develop targets for new interventions — behavioral or even drug-based — that might help to increase this cooperation.

RESEARCH IMPACT: IN THEIR WORDS

“Ithaca is a rural environment and the only major employers are its academic institutions. A star student of mine graduated this past year and is very well qualified to have his pick of graduate programs in other regions, but is tied to Ithaca whilst his wife is still here. He would have been unemployed but for my NSF Career Award, funded by ARRA, which pays his salary as my research assistant and laboratory technician. Parents and therapists in Ithaca especially thirst for information because we are so far from the autism centers in major cities; this project helps connect these families with the most current, science-based information on autism theory and treatment.”

—Matthew Belmonte, Primary Investigator

The Society for Neuroscience (SfN) is the world’s largest organization of scientists and physicians devoted to advancing understanding of the brain and nervous system. Since its inception in 1969, the Society has grown from 500 members to more than 40,000.