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Mirror, mirror: Scientists find cause of involuntary movements

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Researchers have identified the genetic cause of mirror movements, where affected people are unable to move one side of the body without moving the other. For example, when trying to open and close their right hand, their left hand will unintentionally copy the movement. While mirror movements can be observed in fingers, hands, forearms, toes and feet of young children, persistence beyond the age of 10 is unusual.

The gene mutation found to cause mirror movements is called DCC (Deleted in Colorectal Carcinoma). This important discovery provides new understanding on how mirror movements happen and improve scientific knowledge concerning how the brain functions. Published in the latest edition of *Science*, the discovery is the collaboration of scientists from the Université de Montréal, Sainte-Justine University Hospital Research Center, Centre Hospitalier de l'Université de Montréal, Institut de Recherches Cliniques de Montreal, Montreal Heart Institute and Jundishapour University of Medical Sciences.

"We found that all people affected with mirror movements in one large family have the same DCC mutation," says senior author Guy Rouleau, a Université de Montréal professor, director of the Sainte-Justine University Hospital Research Center and a scientist at the CHUM Research Centre.

"Our study suggests that individuals with mirror movements have a reduction in the DCC gene product, which normally tells the brain cell processes to cross from one side of the brain to the other. Simply put,

DCC mutations have an impact on how the brain communicates with limbs."

Discovery of the DCC mutation is significant, says Dr. Rouleau: "Our study provides important clues as to how the human brain is made. One of the mysteries in neurology is how and why the nervous system crosses - now we have helped reveal the 'how.'"

"This work is of broad interest because, despite the large number of studies on DCC in models such as fruit flies, worms and mice, this is the first study which indicates a role for DCC in the formation of brain cell connections in humans," says Dr. Frédéric Charron, study co-author and research unit director at the Institut de Recherches Cliniques de Montréal.

Sample groups from Canada and Iran

As part of the study, the research team analyzed the genes of four-generations of a French Canadian family affected by mirror movements. Another sample group included an Iranian family affected by the same condition. The genes of both families were compared to those of 538 people unaffected by mirror movements.

"Results of general and neurological examinations, as well as magnetic resonance imaging of the brain, were otherwise normal in people affected with mirror movements," explains first author Dr. Myriam Srour, a pediatric neurologist and a doctoral student at the Université de Montréal Faculty of Medicine. "Except that people affected by mirror movements had a DCC mutation, whereas people unaffected by the condition did not."

Among study participants with mirror movements, the condition appeared during infancy or childhood and remained unchanged over

time. Approximately half of participants with mirror movements were able to at least partially suppress their condition and function normally.

More information: Science: www.sciencemag.org

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