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Face recognition ability inherited separately from IQ

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(PhysOrg.com) -- Recognizing faces is an important social skill, but not all of us are equally good at it. Some people are unable to recognize even their closest friends (a condition called prosopagnosia), while others have a near-photographic memory for large numbers of faces. Now a twin study by collaborators at MIT and in Beijing, China shows that face recognition is heritable, and that it is inherited separately from general intelligence or IQ.

This finding plays into a long-standing debate on the nature of mind and intelligence. The prevailing generalist theory, upon which the concept of IQ is based, holds that if people are smart in one area they tend to be smart in other areas, so if you are good in math you are also more likely to be good at literature and history. IQ is strongly influenced by heredity,

suggesting the existence of 'generalist genes' for cognition.

Yet some cognitive abilities seem distinct from overall IQ, as happens when a person who is brilliant with numbers or music is tone-deaf socially or linguistically. Also, many specialized cognitive skills, including recognizing faces, appear to be localized to specialized brain regions. Such evidence supports a modularity hypothesis, in which the mind is like a Swiss Army knife - a general-purpose tool with special-purpose devices.

"Our study provides the first evidence supporting the modularity hypothesis from a genetic perspective," said lead author Jia Liu, Professor of Cognitive Neuroscience at Beijing Normal University in China of the study published in the January 7 issue of *Current Biology*. "That is, some cognitive abilities, like face recognition, are shaped by specialist genes rather than generalist genes."

"Our finding may help explain why we see such disparities of cognitive abilities within the same person in certain heritable disorders," added co-author Nancy Kanwisher of the McGovern Institute for Brain Research at MIT, where Liu studied before moving to Beijing. In dyslexia, for example, a person with normal IQ has deficits in reading, while in Williams Syndrome, people have low IQ but excellent language skills.

For the study, Liu and his colleagues recruited 102 pairs of identical twins and 71 pairs of fraternal twins aged 7 to 19 from Beijing schools. Because identical twins have 100% of their genes in common while fraternal twins have just 50%, traits that are strongly hereditary are more similar between identical twins than between fraternal twins. (Identical twins still show variability because of the influence of environmental factors.)

Participants were shown black-and-white images of 20 different faces on

a computer screen for one second per image. They were then shown 10 of the original faces mixed with 20 new faces and asked which ones they had seen before. The scores were more closely matched between identical twins than fraternal twins, and Liu attributed 39% of the variance between individuals to genetic effects. Further tests confirmed that these differences were specific to face recognition, and did not reflect differences in sharpness of vision, general object recognition abilities, memory or other cognitive processes.

In an independent sample of 321 students, the researchers found that face recognition ability was not correlated with IQ, indicating that the genes that affect face recognition ability are distinct from those that affect IQ. Liu and Kanwisher are now investigating whether other cognitive abilities, such as language processing, understanding numbers, or navigation, are also heritable and independent from general intelligence and other cognitive abilities.

Researchers at the Beijing Normal University and Graduate University of the Chinese Academy of Sciences contributed to this research: Qi Zhu, Yiying Song, Siyuan Hu, Xiaobai Li, Moqian Tian, Zonglei Zhen and Qi Dong.

In addition to providing new insight into the structure of the mind, this work could shed light on the underlying causes of developmental disorders like autism and dyslexia. "The heritability of these cognitively specific diseases suggests that some genes have specific cognitive effects, but it's a big mystery how genes produce cognitively specific effects" said Kanwisher.

More information: Zhu Q, Song Y, Hu S, Li X, Tian M, Zhen Z, Dong Q, Kanwisher N, Liu J. Heritability of the specific cognitive ability of face perception. Current Biology (2009). doi: 10.1016/j.cub.2009.11.067

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