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Twins Study Looks at Genetic Influences on Thinking

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(PhysOrg.com) -- A groundbreaking study by UT Dallas' Center for Vital Longevity is focusing on twins in an effort to answer some long-debated questions about the rival influences of nature vs. nurture.

Researchers are seeking participants for the Texas Twins Study, which tests the genetic component of neurocognitive development among young adults. The study uses functional MRI technology to investigate brain activity among pairs of identical and fraternal twins.

Dr. Denise Park, director of the Center for Vital Longevity, is conducting this work in collaboration with Dr. Thad Polk, the Arthur F. Thurnau Professor of Psychology at The University of Michigan.

The study examines the pattern of neural activation in the human brain in response to various stimuli and tasks, as well as the differing roles played by nature - or genetics - and by nurture, which reflects how a person was raised and educated. The UT Dallas researchers use leading-edge technology to investigate a range of cognitive functions and their corresponding neuronal activity patterns.

By comparing twins, the researchers are able to learn more about the influence of genetics on our thinking and behavior by identifying differences in cognitive functions and neuronal activity. Identical twins share the same genetic pattern, while fraternal twins are no more alike than other siblings. To get a comparison between non-related individuals, scientists scramble the pairings and look at unrelated individuals from

among the tested groups.

Neuroscientists have established that different categories of visual stimuli elicit distinct patterns of neural activity in the brain's ventral visual cortex, which is associated with object recognition and form representation. Different parts of the brain are activated when people look at faces as opposed to when they view buildings and other outdoor scenes. Meanwhile, certain parts of the brain are engaged by words and letters, while other sections play a central role in processing symbolic or non-symbolic numerical information.

In a previous study with twins, the research team discovered the role of genetics in cortical response to various visual stimuli. Scientists determined that neural activity in the brains of identical twins is more similar than that of fraternal twins while performing the same simple task, indicating genes' influence on recognizing faces and outdoor scenes.

"The activity was more similar in identical twins when they were looking at pictures of faces and places than when they looked at pictures of chairs, for example," Park said. "Recognizing faces and locations is vitally important to survival, whereas identifying chairs is not, so we may be more genetically wired for tasks that are closely connected to survival."

Researchers know less about the role that heredity might play in neural function as individuals engage in more complex tasks. The current study seeks to expand on the findings from the previous work.

Participants will perform two tasks as part of the project. The arithmetic section involves adding and subtracting sets of dots and judging whether the dots are similar geometric shapes. In the word task, participants will decide whether certain letter arrangements match or differ.

Park said she hopes the study reveals clues about how much our genes determine our math and reading abilities. Based on the previous findings, the answer may be connected to how essential these abilities are to our survival.

After the completion of this round of research, Park may embark on another twins study. She said she is interested in testing sets of elderly twins to find out how their neural activity is modified by aging. Park would like to know if genes play a smaller or larger role as we grow older.

Provided by University of Texas at Dallas