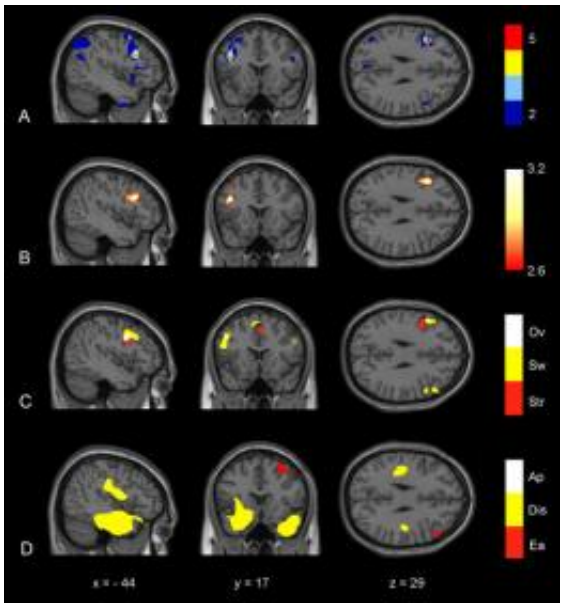
Brain region can signal early-stage Alzheimer's and other dementias

12 January 2012



A and B show the correlation of cognitive impairment in early dementia with sugar metabolism in the inferior frontal junction (IFJ; red). In healthy subjects, the control functions are located in the same region (C). Personality changes such as those that may occur in dementia are associated with other regions of the brain (D). Credit: MPI for Human Cognitive and Brain Sciences

(Medical Xpress) -- A key misplaced yet again? Unable to recall a name? Forgetfulness frequently leads to anxiety: is it just a sign of age, or are these the first symptoms of the onset of Alzheimer's disease? It has never been easy to answer this question in the early stages - however, that might be about to change. Using modern imaging techniques, scientists from Leipzig's Max Planck Institute for Human Cognitive and Brain Sciences and Leipzig University have identified a brain hub that is associated with thought functions often affected by dementias. This could facilitate improved predictions of the progress of dementia.

Dementia disorders are one of the major problems faced by societies with aging populations. The most common form of dementia is Alzheimer's disease, which generally makes its appearance after the age of 60. As a rule, it is preceded by a phase of mild cognitive impairment that does not diminish quality of life. Forgetting the keys or checking twice for the post - these slight impairments of memory are easy enough to live with. Experience shows that only about half of those affected by such forgetfulness go on to develop Alzheimer's or other forms of dementia in the following years.

"In dementias, other thought processes are often affected as well as memory, such as those known as the executive or control functions", explains Matthias Schroeter of the Max Planck Institute for Human Cognitive and Brain Sciences. Using brain scans and modern imaging techniques, his team in Leipzig are working to make early diagnosis possible. "These control functions come into play when we face new and unexpected situations, for example, enabling us to react in flexible and appropriate ways. If they are affected in addition to memory, patients can no longer compensate for their handicap by, say, writing reminders for themselves." Deficiencies in these control functions actually indicate that dementia is imminent.

In a current study, the researchers use measurements of brain metabolism to show that impairments to the control functions are reflected in a specific part of the frontal lobe of the brain, the inferior frontal junction. The data suggests that this junction, where two depressions or sulci meet, is of major importance in the development of dementia and its symptoms.

For the purposes of this study, the scientists examined 54 patients with different early-stage dementias, including Alzheimer's disease. The patients completed typical dementia tests used to evaluate cognitive impairment. One example is the classic Stroop test, in which the subject must read words that represent specific colours (yellow, red,

blue, etc.) but that are printed in different colours. The idea is to name the colour in which the word is printed as fast as possible: a task that requires quick rethinking in the brain. Another test, this time used to assess language competence, is the supermarket test. Within a given time, patients have to name as many items as possible that can be bought in a supermarket. A third test is used to test problem-solving ability. Together, these and other tests give a good overall picture of the cognitive deficiencies that may occur in dementia and that affect the functions most likely to impinge on daily activities. Over and above the dementia tests, all patients were subjected to a PET scan (positron emission tomography) to assess their cerebral metabolism. The resulting images showed that problems detected by the dementia tests were associated with reduced sugar metabolism in the neurons of the inferior frontal junction.

If this correlation is confirmed in further studies, it could be that scans of the frontal lobe of the brain will provide the answer to that pressing, fearful question: just forgetfulness or the onset of dementia?

More information: Matthias L. Schroeter, et al. Executive deficits are related to the inferior frontal junction - An FDG-PET study in early dementia. *Brain* (2011) doi: 10.1093/brain/awr311 First published online: December 19, 2011