For the first time, prediction of schizophrenia is possible with the help of an imaging procedure

Despite worldwide efforts for improved early detection, schizophrenic psychoses are still diagnosed in affected persons only after 3-5 years. This causes valuable time to be lost in preventing or at least mitigating, through the earliest possible treatment in the early stage of the disease, the later onset of the clinical picture, which is characterized by delusions, hallucinations and thought disturbances. The delayed diagnosis and therapy for schizophrenic disorders is primarily due to the lack of biological markers which could reliably reduce the diagnostic uncertainty in the at-risk state of the disease. An international research team, composed of scientists from the Ludwig-Maximilians University (LMU) in Munich, the Friedrich-Schiller University in Jena, and the University of Pennsylvania in the United States, has for the first time been able to provide proof that by using computer-assisted artificial intelligence methods, patterns of neuroanatomical changes can be extracted from the cerebral magnetic resonance imaging data of at-risk subjects, significantly differentiating these persons from healthy control subjects. The researchers could show that these “learned” patterns both allow a reliable diagnostic classification of different at-risk states, as well as enable prediction of a later onset of schizophrenic disorders with great certainty.

Schizophrenia is a worldwide disease affecting approximately 1% of the population. It results in enormous personal suffering and economic costs. In Germany alone, 800,000 citizens are affected. Despite improved medicinal treatment options, in many cases the disease, with its onset primarily during adolescence and early adulthood, progresses unfavorably. The course of the disease is characterized by psychotic crises with delusions, hallucinations, and massive disruptions of the thought processes, and this generally lead to longer hospital stays. In addition, many of the affected persons suffer from emotional blunting and cognitive decline, which lead to social withdrawal and occupational disability.

In the scientific literature there are indications that this progression of disease can be mitigated, or at least delayed, by beginning therapeutic
treatment as early as possible. However, in practice this early therapeutic window is missed because the diagnosis of the disease is, on average, only made 3-5 years after the first onset of symptoms. The reasons for this are primarily due to the lack of biological markers which could support the clinical physician in the early recognition of the disease and thereby enable a reliable indication for medicinal and psychotherapeutic treatment.

An international team of researchers (Munich, Jena, Pennsylvania with Prof. Davatzikos), led by Assoc. Prof. Dr. Eva Meisenzahl, Director of the Image Processing Research Team and her colleague Dr. Nikolaos Koutsouleris, (Psychiatry and Psychotherapy Clinic of the Ludwig-Maximilians University) and Prof. Christian Gaser (Psychiatry Clinic of the Friedrich-Schiller University in Jena) has for the first time been able to provide proof that a reliable, biologically-supported early recognition of schizophrenic disorders is possible based on neuroanatomical differences in the cerebral magnetic resonance tomography between at-risk subjects with later disease onset as well as healthy control persons.

For this, the scientists used a multivariate pattern recognition procedure from the field of machine learning, with which neuroanatomical differences from the cerebral magnetic resonance imaging data of a training collective were extracted, and these represented the association between diagnostic assignment of the training individuals and their brain structure. These patterns were then applied to the cerebral magnetic resonance imaging data of test persons who were not part of the original training collective in order to assign them to a given diagnostic category. Through this, the researchers showed that the different at-risk states of the test persons as well as the later onset of disease could be correctly recognized with a probability of between 80% and 90%.

Prof. Hans-Jürgen Möller, Director of the LMU psychiatric clinic: “I am very happy that our long-held hope of using imaging of the central nervous system in the diagnosis of schizophrenia and of putting it into clinical practice has obtained an important scientific confirmation today. This is a great success for psychiatric brain research.”

These findings prove that it is possible in principle to diagnose or predict the early stage of psychiatric disorders as well as a later disease onset on the basis of neuroanatomical differences. If these results are confirmed in subsequent studies, clinicians could be provided with an important diagnostic tool for corroborating the suspicion of an incipient psychotic disease and thereby allow therapeutic measures to be initiated as early as possible.

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**University Clinic of Munich**

At the University Clinic of Munich (LMU), in the year 2008, about 500,000 patients were treated at the locations Großhadern and Innenstadt as outpatients, in polyclinics, partially hospitalized and fully hospitalized. The 44 specialist clinics, institutes and departments have more than 2,300 beds. Around 1,700 of the total 9,800 employees are medics. Research and teaching guarantees the highest medical standards of patient treatment. The University Clinic of Munich attracted external funding amounting to about 64 million Euros in 2008 and has been an institution of public law since June 2006.

You can find further information on the internet at [www.klinikum.uni-muenchen.de](http://www.klinikum.uni-muenchen.de)