

Sensory Perception and Psychosis

New Research Partnership

Launched by Meeting for Minds, the SYNERGIES programme integrates people with mental illness into brain research. Referred to as **PLEX-Research Partners** (People with Lived **EX**perience of mental illness), they participate in the development of the study, monitor its progress and examine its results. In this way, they provide researchers with the benefit of their experiential knowledge. The SYNERGIES programme enables members of the PLEX community, directly affected by psychological disorders, to participate in scientific studies as fully accredited collaborators and not subjects of research.

In Switzerland, PLEX groups drawn from the Graap-Fondation are involved in two neuroscience research projects, one in Zurich and another in Lausanne. Scientists and PLEX-RPs meet about eight times a year.

The link between sensory perception and psychosis

In collaboration with Professor Micah Murray and his team at the CHUV (Lausanne University Hospital), the PLEX-RPs analysed and discussed the results of a research project that is already revealing promising insights.



The SYNERGIES team at the Laboratory of Investigation in Neurophysiology (LINE) Lausanne - From left to right: Fabienne Furger, Fernando Garcia, Alexandre Mariéthoz, Micah Murray, Chrysa Retsa, Jacqueline Vorburger.

Under the guidance of Professor Micah Murray, recent research conducted at the CHUV seeks to explain how representations of objects in our minds are affected in cases of early psychosis, as well as in pre-teenagers born prematurely. The results highlight how all processes (from sensory processing of sound to the identification of the objects that emit them) can help to better understand psychiatric disorders. This is paving the way for new approaches to faster and more effective therapeutic interventions.

The overall aim of Prof. Murray and his team's research is to provide equal opportunities for all, children and adults, through pre-screening for sensory disorders and appropriate individualised care.

Professor Micah Murray arrived from the United States in 2001 and now works in the Department of Radiology at the CHUV in Lausanne. In 2003, he created the Laboratory of Investigation in Neurophysiology (LINE) whose mission is to improve diagnosis, therapeutic intervention and prognosis in the event of sensory dysfunction (visual, auditory, tactile and cognitive). Various non-invasive tests such as magnetic resonance imaging (MRI) or electro-encephalography (EEG) are used to examine brain activity, as it processes sensory information towards conscious perception.

The research, which involves collaborative contributions from PLEX-Research Partners drawn from the Graap-Foundation (see box), is being conducted by a collaborator of Professor Murray, Chrysa Retsa, a post-doctoral fellow in psychology. This study focuses on the reaction of the brain when subjected to an auditory stimulus in a population of early psychosis and in prematurely born pre-adolescents. The main objective is to demonstrate the importance of sensory processing, disrupted or not, in the brain; a difference that could be decisive in the development of psychiatric and neurodevelopment disorders.

Proactive Psychiatry

The scientists explain the following as an introduction: sensory perception disorders exist in many areas throughout life (learning, language, memory, for example) and do not occur only in cases of mental illness. "Today," adds Professor Murray, "it is common to detect vision or hearing problems in children. Wearing glasses is commonplace and well accepted. Early detection of sensory disorders provides access to other aspects of brain function and allows for different interventions, when there is evidence of dysfunction or deficit. We could identify the indicators of a disease earlier and develop better tools for its management." The research team acknowledges that, currently, psychiatry is still too reactive. It treats clinical symptoms, whereas the disease has sometimes already been present for many years.

The objective of the study conducted by Dr. Retsa is first to explore the functioning of the brain subjected to auditory stimuli. In a second step, the researcher compares traces of the brain's electrical waves in a control group with those of people who have had a first psychotic breakdown or of children born prematurely, aged 10 years at the time of the examination. The final idea of the study is to establish a link between the pre-cursor signs visible on the EEG and the symptoms of a psychiatric disorder. In this way, the persons concerned could, in the future, benefit from rapid care.

Study Results

Each person participating in the study is equipped with an electrode "cap" placed on the head. The EEG takes place in a dark room, isolated from noise and external stimuli. Dr. Retsa is in an adjoining room where a computer records brain electrical waves following a sound emitted by a living being or object. We will see later why this distinction is important. In addition, sound perception is automatic, without the participant having any influence on the reaction of their brain.

After analysis, comparing the EEG of a control group with people who had a first psychotic episode, Chrysa Retsa found a difference in auditory perception between the two groups studied, particularly in the way the sounds of objects are processed. There is a difference both in the strength with which the cerebrum reacts and in the specific network of brain areas used to recognise sounds. A generally similar trend was also observed in the experiment comparing pre-adolescents born prematurely with controls born at term.

Functional differences are not systematically pathological

The team is continuing its work. The results already indicate that psychic and developmental neurological disorders may have some common aspects, particularly with regard to sensory treatment. Other research has also shown that differences in sensory processing are observable not only in patients, but also in their genetic relatives. This implies that both genetic and experiential factors contribute to clinical disorders. The LINE team's work suggests that early life experiences (probably in combination with immaturity of the brain and other risk factors, including genetics) can contribute to the development of psychiatric and neurodevelopmental disorders.

Issues and Perspectives

The work of Professor Murray and his team shows how sensory processes can be a crucial element in understanding these disorders and even in intervening preventively and evaluating the effectiveness of medical treatment. By observing the significant differences in sensory process in people at risk, these scientists are asking how targeted interventions on sensory dysfunction could be innovative therapeutic tools. Their work would help to identify people "at risk", perhaps before clinical symptoms appear. This would allow for early intervention. Although much work remains to be done, it follows that sensory processes can be a particularly effective tool in psychiatry.

However, such a procedure could stigmatise an individual and contribute to the fact that the diagnosis, once made, strengthens the pathology and its evolution. "In addition," adds Professor Murray, "health policy makers and health insurance companies sometimes struggle to grasp the potential of new discoveries and decide quickly on their use. However, we are continuing our efforts to better understand the pathophysiology of psychiatric and neurodevelopmental disorders. Which, in the long run, will provide vital support for individuals and their families."

A PLEX Perspective

During the meetings with the researchers, the PLEX-RPs raised various questions. Early detection has the advantage of promoting rapid intervention in the event of perceptual dysfunction. But at what age should this screening begin? At school or only when identifying a difficulty? Would it be a matter of screening all subjects? We therefore see the ethical problems of such an approach. Is it useful to tell parents that their child is different from others, that he or she will "potentially" have problems later on or that he or she needs to be treated in order to continue his or her education and life? The main risk is to place children and future adults in "boxes" and to assign them a "diagnostic" likely to be frightening. We know, and this aspect is essential for the team of Professor Murray and Dr. Retsa, that functional difference is not systematically pathological and that human beings possess brain plasticity and proven coping skills.

In trying to understand the difference in sensory treatment presented by people suffering from psychosis, PLEX-RPs and researchers came to the hypothesis that patients would put in place a protective system to avoid being invaded by all external noise, such as aggressive noise. These people, hypersensitive to any stimulation, may create a more "waterproof" inner world by reducing the perception of the sounds around them. A hypothesis that may be demonstrated by further research.

Sensitive to the questions raised by PLEX-RPs, the scientists point out that the identification of a biological part in psychological disorders (the psyche - something in this study) leads to a reduction in the guilt of the persons concerned and to a destigmatisation concerning a different, rather than abnormal, brain processing. In the context of early detection, "it is less stigmatising to tell you that you have a sensory perception problem rather than a disease. It is also easier for relatives to accept," concludes Professor Murray.

By Jacqueline Vorburger, Fernando Garcia and Alexandre Mariéthoz in collaboration avec Fabienne Furger et Micah Murray