



Xiaoming Zhou Neurobiologist

Xiaoming Zhou is a neurobiologist at East China Normal University in Shanghai. Here he speaks to *Nature* about his research into age-related hearing loss, and explains why he hopes that brain training could help to lessen declines in sensory perception generally, and so ward off neurodegenerative diseases.

What is your current research focus?

We want to better understand the neural basis for why a person's hearing function declines as they grow older. For example, we have performed research to see whether we can reverse age-related changes to the auditory systems of rodents.

We gave the animals a set of tasks, such as learning to discriminate between sounds of different frequencies or intensities. These exercises caused the rodents' hearing to improve, and also promoted changes to the hippocampus, a part of the brain structure closely associated with learning and memory.

The relationship with the hippocampus suggests that new kinds of brain training might help to attenuate our declines in perception and other brain functions, such as learning and memory, as we grow older — and so have the potential to stave off neurodegenerative diseases.

How is ageing-related science developing in China?

As has happened in the rest of the world, a rapidly ageing population has brought significant concern to policymakers. However, as far as I know, only a few neuroscience laboratories in China are specifically focused on learning more about the underlying mechanisms that cause changes in brain function as we age. This is despite the fact that such research could have a considerable impact on the welfare of older people in the future.

Nevertheless, the volume of research carried out in China in this area has increased dramatically — probably because of the huge growth of the country's

scientific community as a whole in recent years, but also because funding for neuroscience research has risen.

In what areas of ageing-related research is Chinese science making most progress?

I think we could make the most progress in our research on Alzheimer's disease, a neurodegenerative disorder that causes difficulties with memory, cognition and behaviour in many older people. It is one of three brain-related diseases that will be the focus of a forthcoming national neuroscience initiative called the China Brain Project.

So it is foreseeable that a considerable number of Chinese scientists in related fields, such as neuroscience, medicine and artificial intelligence, will work together as part of this plan to study the mechanisms of Alzheimer's. Of course, it's hoped that these studies will receive huge financial support from the central government, and this should help to propel our research.

What needs to happen for China to make greater leaps in scientific research?

The environment for scientific research, including the management of staff, academic evaluation and financial support, needs to be further improved. For example, researchers spend a lot of valuable time doing administrative work, such as making applications for new instruments and organizing their expenses — time that would be better spent on scientific research, I think.

Fortunately, the management team at my university has noticed this problem and has made a big effort to solve it, and the situation is now gradually improving. In the field of brain science, many Chinese scientists also need more opportunities to collaborate with our international peers to help advance our research. Patience and persistence are very important, too, of course.

Interview by Sarah O'Meara.

This interview has been edited for length and clarity.

The nation has already prioritized the use of big data and artificial intelligence in medicine. Its Healthy China plan, for example, will involve building more data centres to collect and combine medical records that are currently spread across separate departments.

National investment

In 2018, MOST awarded 15 million yuan to Piu Chan, director of the Chinese National Clinical Research Center for Geriatric Disorders at Xuanwu Hospital, Capital Medical University, in Beijing. The grant was so that Chan, a neurologist who researches Parkinson's disease, could use patients' electronic medical records to build a national database of information about neurodegenerative conditions. Given that nearly 60% of people with Parkinson's live in China, that could become a valuable resource for researchers around the world.

Chan is now working with biologist Gang Pei, who is at Tongji University in Shanghai and researches drugs that could reduce the effects of Alzheimer's disease on cognitive decline, to get the database off the ground. It can be tough to convince different government offices to share information, Pei says, because there is little precedent for this kind of national collaboration. "We need to all agree on the rules of how data are shared, how they will be used, what form they come in and who will receive the benefit of any scientific achievement," he says.

Pei would also like to see China develop a repository for tissue samples that can be used by neuroscientists and clinical researchers throughout the nation, as well as worldwide, but says that's likely to be stymied by the stigma attached to organ donation in the country.

"We don't have this tradition. We think the body is sacred. So we need to teach people why they should agree to donate their body to medical science for the greater good."

Guanghui Liu, a stem-cell researcher at the CAS Institute of Stem Cell and Regeneration in Beijing and president of the Chinese Society of Aging Cell Research, says that as well as overcoming cultural challenges, research areas will need to be integrated better if the field is to make progress. "In China, we need cross-disciplinary integration of areas such as biomedicine, physics, chemistry, engineering, bioinformatics and artificial intelligence," he says. "That's probably our greatest challenge to promote the development of the field."

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