

Decoding brainwaves lets scientists read minds

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(Medical Xpress) -- While currently in the realm of sci-fi fantasy, the ability to read people's minds has taken a step closer to reality thanks to neuroscientists at the University of Glasgow.

Researchers at the Institute of [Neuroscience](#) & Psychology have been able to identify the type of information contained within certain [brainwaves](#) related to vision.

Brainwaves – the patterns of electrical activity created in the brain when it is engaged in different activities – can easily be measured using [electroencephalography](#) (EEG).

However, knowing exactly what information is encoded within them, and how that encoding takes place, is a mystery.

Professor Philippe Schyns, Director of the Institute of Neurosciences & Psychology and the Centre for Cognitive Neuroimaging, who led the pioneering study, said: “It’s a bit like unlocking a scrambled television channel. Before, we could detect the signal but couldn’t watch the content; now we can.

“How the brain encodes the visual information that enables us to recognise faces and scenes has long been a mystery. While we are able to detect EEG activity in certain areas of the brain when particular tasks are performed, we’ve not known what information is being carried in those brainwaves.

“What we have done is to find a way of decoding brainwaves to identify the messages within.”

In order to decode some of these brainwaves, the scientists at Glasgow recruited six volunteers and presented them with images of people’s faces, displaying different emotions such as happiness, fear and surprise.

On different experimental trials, parts of the images were randomly covered so that for example, only the eyes or mouth were visible. The volunteers were then asked to identify the emotion being displayed.

While engaged in this exercise the participants’ brainwaves were measured using EEG which allowed the researchers to identify which parts of the brain were active when looking at different parts of the face.

Brainwaves vary widely in frequency, amplitude and phase. In this study, the researchers found that ‘beta’ waves which have a cycle of 12Hz carried information about the eyes, while ‘theta’ waves at 4Hz encoded information about the mouth.

The researchers also found information could be primarily encoded depending on the phase – or timing of the brainwave – and less so by its amplitude – or strength.

Prof Schyns added: “By using multiple frequencies to encode two different parts of the face – a process called multiplexing – the brain can code more signals at the same time. It is a bit like radiowaves coding different radio stations at different frequency bands. Likewise, the brain tunes in different waves to code different visual features. This work has huge potential in the development of brain-computer interfaces.”

The research ties in with an initiative unique to Glasgow, developed by Professor Philippe Schyns, Professor Joachim Gross and Dr Gregor Thut

at the Centre for Cognitive Neuroimaging (CCNi), combining Magnetoencephalography (MEG), Transcranial Magnetic Stimulation (TMS) and statistical information mapping, to understand how the oscillatory networks of the brain can be modelled and interacted with to enhance or suppress visual perception.

This will enable them to gain a greater understanding of brain processes – which part does what and when – creating a model of the [brain](#) as an [information](#) processing device or a computer.

The research is being published in [PLoS Biology](#).

Provided by University of Glasgow

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