# Faster help for stroke victims

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Scientists have developed a quick, easy and cheap vision test to find out which part – and how much – of the brain of a stroke victim has been damaged, potentially enabling them to save more lives.

The test requires patients to look into a device for about ten minutes, enabling it to be used in the early stages of a stroke – even if the patient cannot move their limbs or speak.

This can help doctors diagnose and treat the stroke quickly and accurately, which is vital, as early treatment can greatly improve a person's chances of survival and recovery, say Dr Corinne Carle and Professor Ted Maddess from The Vision Centre and The Australian National University.

According to the World Health Organisation, stroke is currently the world's sixth commonest cause of death, accounting for 4.9% of all fatalities. In Australia it kills about 9000 people a year and hospitalises 35,000.

"Our new test automatically tracks the response of the patient's eye pupils to different colours, and can show doctors whether the injury is located in the evolutionarily 'new brain' or the 'old brain'," Dr Carle says.

"The distinction is important because the 'old brain', or midbrain, controls things like the heart rate and blood pressure of the body. So if you find that the midbrain has been damaged, you'll need to treat the patient much more aggressively, because there's a higher risk of death."

On the other hand, an injury in the 'new brain' – the cortex – may cause permanent blindness in a part of the person's visual field, or difficulty in their thoughts, speech and movement, but has a lower risk of death, she says.

Using the TrueField Analyzer, a device developed by Prof. Maddess' Vision Centre team and the Australian company Seeing Machines, the researchers tested how the pupils respond to images on LCD screens. A mixture of red, green and yellow coloured stimuli were provided to each eye, at 24 locations in the person's visual field.

Two video cameras using infrared lighting recorded the instant response of the pupils, which was then analysed by a computer.

The colours red, green and yellow were chosen because they are processed by different parts of the brain, Dr Carle explains. In mammals, the cortex, or 'new brain', is the most recently evolved area, and allows humans to differentiate between red and green.

The 'ancient' midbrain, on the other hand, is red-green colourblind, but can detect the colour yellow.

"If the pupils don't react when red changes to green, we know that the damage is in the cortex. The same concept applies to the yellow stimulus," says Dr Carle. "The test has been successful in checking the vision of people with glaucoma or type-1 diabetes, and we have now tweaked the stimuli for stroke patients as well."

Prof. Ted Maddess says that the test will complement various types of brain scans.

"A CT scan tells you where the bleed is, but it doesn't show you everything," he says. "For instance, the blood could have cleared up in a

particular part of the brain during the scan, or where swelling has reduced the function of a nearby part that looks fine on the scan. It may also miss injuries that are too small, or those that occur in the midbrain, where it doesn't scan well."

This is where the test can be useful, Prof. Maddess says. As every single vision cell is wired into a different part of the brain, by testing a particular area in the visual field, doctors can check if the corresponding part of the brain is functioning or not.

The test can be used to monitor stroke patients' recovery, Prof. Maddess says: "Currently, apart from brain scans, there is no cheap, routine test that can quantify the amount of improvement that results from a treatment. Stroke patients have a very high risk of recurrence, so it's important that doctors can accurately assess their recovery."

"The TrueField Analyzer is small, affordable and the test only takes ten minutes," he says. Working together with neurologists, the research team will start clinical tests with stroke patients in February this year.

The team's study "The pupillary response to color and luminance variant multifocal stimuli" by Corinne F. Carle, Andrew C. James and Ted Maddess is published in the latest issue of *Investigative Ophthalmology & Visual Science (IOVS)*. See: 1.usa.gov/T3PdRH

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