Finding our color center

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Strictly Ballroom's color and movement made it perfect for this study.

The colorful Australian film *Strictly Ballroom* has been used in a breakthrough scientific experiment to locate the colour processing center in the human brain.

The unconventional method helped researchers at The Vision Centre to find regions of the brain that respond particularly strongly to color.

Their work could in future help in the treatment of patients who have become color blind due to brain injuries or a stroke.

"In non-human primates there's a proposed 'color processing centre' called V4. But those who've asked 'where is V4 in the human brain?'

have come up with different results," says Erin Goddard, a researcher in the ARC Centre of Excellence for Vision Science and the University of Sydney.

"We decided to pick visual cues that are more natural, with lots of colours, movement and different types of objects, in preference to the usual equipment of colored dots and squares. That's why we chose Strictly Ballroom - because, as a movie, there's a lot going on visually that will engage the brain, and, in light of the subject matter, it has a lot of vivid colors."

The research method involved putting people in a functional MRI scanner and taking images of blood flow in their brains. During the scanning process, a short sequence of Strictly Ballroom was played, with the display switching back and forth between multi-color and black and white.

"The first sequence was arranged to have a multi-colour display for the first 15 seconds, followed by 15 seconds of black and white, switching a total of 17 times in the four and a half minute scan. We then replayed the same clip in a second scan, instead starting in black and white."

Erin says that this allowed the researchers to observe the brain's complex response to movement, edges, sizes, facial expressions, colors and angles in the movie, using the MRI scanner. With the same clip played in different color sequences, they were able to 'subtract' the responses to the two different types of scan and so isolate those regions that responded particularly to color.

The location of the centralised colour processing region advances understanding to how the visual cortex is organised in our brain and opens the way for researchers to work on understanding cortical colour blindness.

Their discovery challenges the scientific theory that the V4 region is split across different parts of the human brain, as it is in monkeys.

Erin says that cortical color blindness differs from hereditary, or retinal, color blindness, the most common type of color blindness. Known as 'cerebral achromatopsia', it occurs when patients are unable to see colors following a brain injury or a stroke. The loss of color vision ranges from partial to complete color blindness, where the patient lives in a world of grey.

"People who are born color-blind do not have the normal three visual pigments in their cones - the vision cells that that provide us color vision - and that limits the information about color input to their brains," Erin explains.

"Patients with cortical color blindness can have a complete set of visual pigments in their cones, but the damage to their brain in the vicinity of V4 prevents their brains processing color. The colors are seen but not recognized."

Provided by University of Sydney