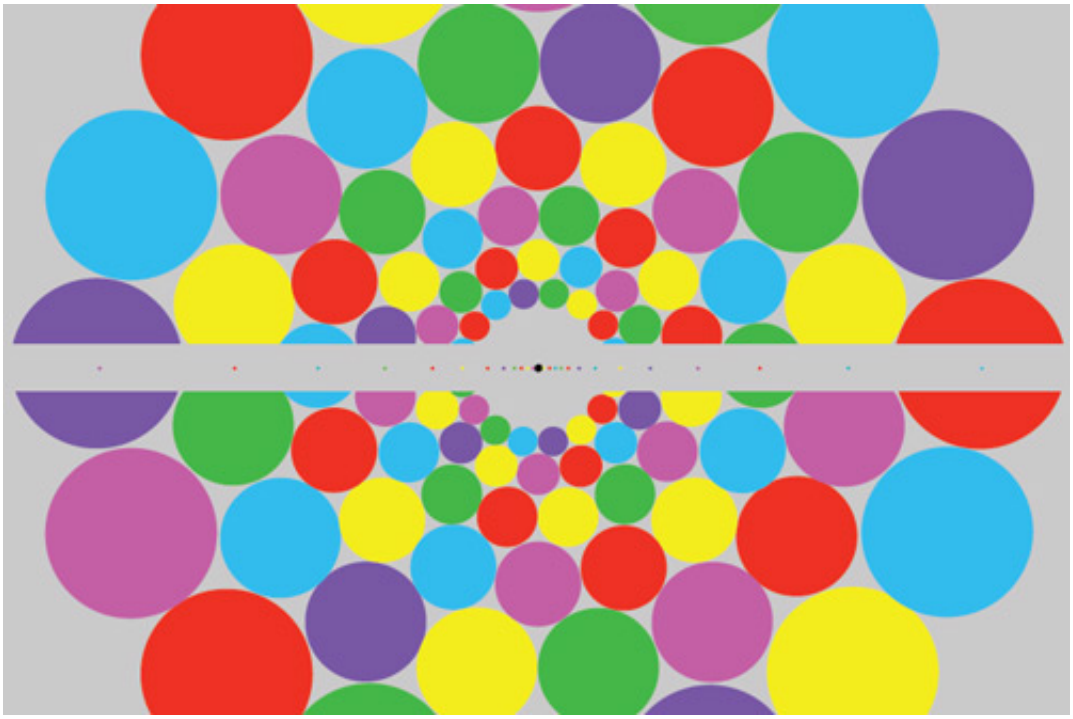
Researcher dispels common 'misconception' about weak peripheral colour vision

November 9 2015, by George Wigmore



A new paper from an academic at City University London has challenged the widespread 'misconception' among vision scientists and the general population that peripheral colour vision is weak or non-existent.

The study, which is published in the journal *i-Perception*, used a novel

demonstration using an array of multi-coloured disks to shows that cones – the photoreceptors responsible for colour vision – are in fact present in a high enough density in all areas of the eye to enable vivid peripheral colour perception. As a result, the research shows that colour vision is not just restricted to the fovea in the centre of the eye as is widely believed.

The research could have important implications for everyday use of colour in products and devices in the world, including in the design of traffic lights, signage and visual displays. The paper is also the first to provide a readily accessible demo to participants enabling direct experience of the effect.

Within the eye, vision is mediated by two kinds of photoreceptors – rods and cones. Rod photoreceptors are very sensitive but of only one type, meaning that they facilitate vision at night in low light but cannot convey colours, as seen by our colourless night vision.

In contrast, cone photoreceptors support daytime colour vision, are less sensitive and operate only in brighter lights, but are of three types that allow us to see the whole spectrum of visible light. But while there is a sharp drop-off in cone density outside of the centre of vision - known as the fovea - there are still enough cones in the periphery to enable good colour vision.

Speaking about the study, author Professor Christopher Tyler from the Division of Optometry and Visual Science said:

"This misconception about weak peripheral colour vision is completely incorrect, akin to the oft-quoted statement that we only use 10 per cent of our brains.

"Although the number of cone photoreceptors is lower in the periphery

than in the fovea, with about 4 thousand cones per mm2 throughout the peripheral retina compared to 200 thousand in the central fovea, this is still plenty enough to give vivid colour vision. In fact, 99 per cent of all the cones are in the periphery! My hope is that no-one who sees this demo can persist in the belief that there are no cones in the periphery, and that we only have colour vision in the fovea."

Using a set of structured images of arrays of multi-coloured disks that varied according to distance from the fovea, Professor Tyler was able to provide a direct demonstration for the readers showing the vividness of peripheral colour vision.

"The key factor in the demo is that, unlike traditional studies of peripheral colour processing, the coloured disks, or patches, are scaled with distance from the fovea. This is a critical factor, because peripheral regions of the visual field project to progressively smaller regions of the visual cortex in the brain. Therefore to give the periphery an equal chance and to level the playing field for the assessment of peripheral visual function, stimuli must be scaled up in proportion to distance from the fovea to in order to stimulate equal regions everywhere in the visual cortex," said Professor Tyler.

Provided by City University London

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