Retina holds the key to better vision in deaf people

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People who are deaf benefit from better vision due to the fact their retinas develop differently, experts at the University of Sheffield have shown.

The research, which was funded by RNID - Action on Hearing Loss and published today (1 June 2010) in the journal *PLoS ONE* suggests that the retina of adults who are either born deaf or have an onset of deafness within the very first years of life actually develops differently to hearing adults in order for it to be able to capture more peripheral visual information.

Using retinal imaging data and correlating this with measures of peripheral vision sensitivity, a team led by Dr Charlotte Codina and Dr David Buckley from the University's Academic Unit of Ophthalmology and Orthoptics, have shown that the retinal neurones in deaf people appear to be distributed differently around the retina to enable them to capture more peripheral visual information. This means that in deaf people, the retinal neurones prioritise the temporal peripheral visual field, which is what a person can see in their furthest peripheral vision, i.e. towards your ears.

Previous research has shown that deaf people are able to see further into the visual periphery than hearing adults, although it was thought the area responsible for this change was the visual cortex, which is the area of the brain that is particularly dedicated to processing visual information. This research shows for the first time that additional changes appear to be

occurring much earlier on in visual processing than the visual cortex - even beginning at the retina.

The team also found an enlarged neuroretinal rim area in the optic nerve which shows that deaf people have more neurones transmitting visual information than hearing.

The findings were collected after the experts used a non-invasive technique called ocular coherence tomography (or OCT) to scan the retina. OCT works in a similar manner to ultrasound however uses light interference as opposed to sound interference.

Using this technique, it was possible to map the depth of retinal architecture including the depth of the neurone layer (retinal nerve fibre layer depth) and dimensions of the components of the optic nerve. All adults involved in the research were either severe/profoundly deaf or hearing and had their pupils dilated just before the retinal scans were taken. On a separate visit the participants had their visual fields measured in either eye to compare the retinal scan information with visual behaviour. The changes in retinal distribution were significantly correlated with the level of advantage individuals were showing in their peripheral vision.

Dr Charlotte Codina said: "The retina has been highly doubted previously as being able to change to this degree, so these results which show an adaptation to the retina in the deaf really challenge previous thinking.

"This is the first time the retina has been considered as a possibility for the visual advantage in deaf people, so the findings have implications for the way in which we understand the retina to work. Our hope is that as we understand the retina and vision of deaf people better, we can improve visual care for deaf people, the sense which is so profoundly

important to them."

Dr Ralph Holme, Head of Biomedical Research at RNID - Action on Hearing loss, says: "The better peripheral vision experienced by people who are deaf, in comparison to those who hear, has significant benefits for their everyday lives - including the ability to quickly spot hazards at the boundaries of their view. This research substantially improves our understanding of how changes in the retina create this advantage, and could help researchers identify ways to further enhance this essential sense for people who are born deaf."

Provided by University of Sheffield