How and why are eye movements affected after a stroke?

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What is the problem?
- Every year 150,000 people have a stroke in the UK.
- Visual neglect (VN) is a severe and very common and debilitating condition found after a stroke.
- VN is a loss of awareness of the side of space opposite the side of brain damage.
- After a stroke affecting the right side of the brain, VN patients behave as if the left side of the world ceases to exist.
- Stroke patients often have eye movement deficits, but the cause of these is poorly understood.
- Our aim was to carry out a detailed investigation of the eye movement behaviour in patients who suffered a stroke to the right side of the brain.

What did we find?
Pro-saccade
- Patients with VN took significantly longer to initiate an eye movement to the left when compared both with stroke patients without VN and healthy controls. They had no deficits when looking at right targets.
- This slowness was associated with damage in posterior parts of the brain.

Anti-saccade
- VN patients presented a higher number of errors when compared both with stroke patients without VN and healthy controls. They always looked at the target rather than away from it.
- Surprisingly, these errors happened in response not only to left targets (neglected field), but also to right targets (non-neglected).
- These errors were associated with damage in anterior parts of the brain.

What does this mean?
After a stroke affecting the right side of the brain, patients with VN have specific deficits in eye-movement control tasks which are not present in other stroke patients. These deficits vary depending on the task:
- in reflexive eye movements (PRO task) a slowing to left targets is observed. This is caused by damage to posterior brain regions;
- in volitional eye movements (ANTI task) there is an inability to inhibit eye movements to all targets, irrespective of where they are in space. This is caused by damage to more anterior brain regions.

PRO and ANTI tasks are controlled by different parts of the oculomotor brain network.

This work can help understand the deficits present in VN patients and develop new techniques for VN diagnosis and treatment assessment.

Who am I?
I am now a 4th year Psychology student at Glasgow University and hope to develop a research career in neuropsychology.

Studying relationships between eye movement deficits and lesion locations in stroke patients;
Linn Olsen, supervised by Dr Stephanie Rossit, School of Health & Life Sciences, Glasgow Caledonian University.