

AB058. A longitudinal study on the effects of the optic nerve crush on behavioural visual acuity measures in mice

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Background: Visual deficits, caused by ocular disease or trauma to the visual system, can cause lasting damage with insufficient treatment options available. However, recent research has focused on neural plasticity as a means to regain visual abilities. In order to better understand the involvement of neural plasticity and reorganization in partial vision restoration, we aim to evaluate the partial recovery of a visual deficit over time using three behavioural tests. In our study, a partial optic nerve crush (ONC) serves as an induced visual deficit, allowing for residual vision from surviving cells.

Methods: Three behavioural tests—optokinetic reflex, object recognition, and visual cliff—were conducted in 9 mice prior to a bilateral, partial ONC, then 1, 3, 7, 14, 21, and 28 days after the ONC. The optokinetic reflex test measured the tracking reflex in response to moving sinusoidal gratings. These gratings increase in spatial frequency until a reflex is no longer observed, i.e., a visual acuity threshold is reached. The object recognition test examines the animal's exploratory behaviour in its capacity to distinguish high versus low contrast objects. The visual cliff test also evaluates exploratory behaviour, by simulating a cliff to observe the animal's sense of depth perception. All three tests provide an estimate of the rodent's visual abilities at different levels of the visual pathway.

Results: The partial optic nerve crush resulted in a total loss of visual acuity as measured by the optokinetic reflex. The deficit did not show improvement during the 4 following weeks. Despite the visual cliff test showing a non-significant decrease in deep end preference 1-day post ONC, though this was not the case for subsequent test occasions. The object recognition test showed no significant trends.

Conclusions: In conclusion, the optokinetic reflex test showed a significant loss of function following the visual deficit, but no recovery. However, a complimentary pilot study shows visual recovery using lighter crush intensities. The spatial visual function does not seem to be affected by the ONC, suggesting that the object recognition and visual cliff tests, in their current design, may rely on somatosensory means of exploration.

Keywords: Visual deficit; behaviour

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