Vision restored with total darkness

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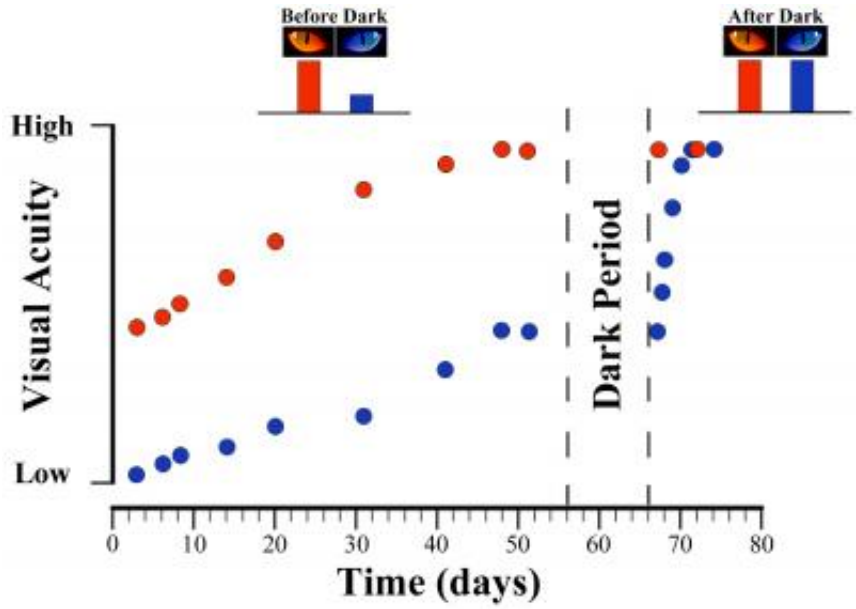

Depriving normal visual experience in one eye early in life produces a reduction in visual acuity (amblyopia) for that eye (blue circles) while the acuity of the other eye is normal (red). The visual acuity of the amblyopic eye remains low compared to the fellow eye, but after immersion in complete darkness the amblyopic eye very quickly recovers to match the visual acuity attained by the normal eye. Credit: *Current Biology*, Duffy et al.

Restoring vision might sometimes be as simple as turning out the lights. That's according to a study reported on February 14 in *Current Biology*, a Cell Press publication, in which researchers examined kittens with a visual impairment known as amblyopia before and after they spent 10 days in complete darkness.

Researchers Kevin Duffy and Donald Mitchell of Dalhousie University in Canada believe that exposure to darkness causes some parts of the visual system to revert to an early stage in development, when there is greater flexibility.

"There may be ways to increase brain plasticity and recover from disorders such as amblyopia without drug intervention," Duffy says. "Immersion in total darkness seems to reset the visual brain to enable remarkable recovery."

Amblyopia affects about four percent of the general population and is thought to develop when the two eyes do not see equally well in early life, as the connections from the eyes to visual areas in the brain are still being refined. Left untreated, that imbalance of vision can lead to permanent vision loss.

In the new study, the researchers examined kittens with amblyopia induced by experimentally depriving them of visual input to one eye. After those animals were plunged into darkness, their vision made a profound and rapid recovery. Further examination suggested that the restoration of vision depends on the loss of neurofilaments that hold the visual system in place. With those stabilizing elements gone, the visual system becomes free to correct itself.

Darkness therapy holds promise for the treatment of children with amblyopia, the researchers say, but don't try this at home. They think that the darkness must be absolute to work, with no stray light at any time. It is also important to address the original cause of the amblyopia first, and to ensure that a period of darkness will not harm an individual's good eye.

The researchers are still working out just how much darkness is required, and for how long. Regardless, they say it is unlikely that a drug

could ever adequately mimic the effects of darkness that they've seen.

"The advantage of a simple nonpharmacological sensory manipulation, such as a period of darkness, is that it may initiate changes in a constellation of molecules in a beneficial temporal order and in appropriate brain regions," they write.

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