



## Yesterday

- Amblyopia, a common childhood eye disorder in which the brain favors vision in one eye, was only treatable by wearing an eye patch over the preferred eye to force the brain to use the other eye.
- Eye care professionals lacked clinical trial data to guide them in determining the optimal number of hours required to wear a patch each day. This led to widely varying patching regimens that lasted as little as 1-2 hours and as long as 24 hours per day.
- Children who wore eye patches at school and in public often experienced social stigmas causing them to remove their patch when away from home to avoid the stigma they felt. This lack of compliance jeopardized the effectiveness of treatment.
- The treatment window for amblyopia was thought to close after age 7 when the “critical period” for visual development ended and plasticity became very limited. This point of no return required that children be diagnosed early in life; however, children under 7 do not often receive regular eye examinations.
- Furthermore, there were no available data on the effectiveness of vision screening tools used to test vision in preschoolers entering kindergarten.

## Today

- NIH-sponsored clinical trials found that patching for 2 hours a day is an effective regimen to reverse moderate amblyopia. This new finding allows children to wear patches in the privacy of their home, thus promoting improved treatment compliance.
- NIH investigators found that daily eye drops of atropine, a drug which temporarily blurs vision in the preferred eye, offers a pharmacologic alternative to eye-patching.
- For severe amblyopia, researchers found that a 6 hour patching regimen plus an hour of near work was as effective as full-time patching.

- Additional NIH clinical trials have found that the treatment window for amblyopia extends to at least age 17, thus allowing children who were missed in early childhood a reprieve from a lifetime of monocular visual impairment.
- The key to treating amblyopia is early detection. A large NIH clinical trial called the Vision in Preschoolers Study (<http://www.nei.nih.gov/neitrials/static/study85.asp>) evaluated 11 vision screening tests for their ability to identify pre-school children who need a comprehensive eye exam. The best performing tests identified 90 percent of children with severe eye conditions. Results from this clinical trial will help improve early detection of amblyopia and other childhood eye diseases and offer solid, evidence-based criteria in choosing vision screening tools for childhood screening programs.

## Tomorrow

- Amblyopia is fundamentally a neurologic disorder. To preempt the disease, we must first understand the disturbances in the developing brain that affect plasticity. The recent development of sophisticated imaging technologies, such as functional MRI (fMRI), allows researchers to image neuronal activity in real time and will provide valuable insight into the causes of amblyopia.
- Using sophisticated fMRI, neuroscientists are uncovering how and when the brain develops the ability to resolve disparities in the visual field to create depth perception. Research suggests that amblyopia tends to begin with the onset of depth perception.
- More importantly, NIH supported research finds that in animal models of amblyopia, the neurons that process visual information from the amblyopic eye respond differently to visual information than the neurons from the unaffected eye.
- Amblyopia often results from a misalignment of the eyes, a condition known as strabismus, which creates two discordant images that the brain must reconcile.

NIH researchers recently discovered mutations in two genes that cause rare, inherited forms of strabismus. The discovery of these genes provides important clues in our understanding and perhaps the prevention of strabismus and amblyopia.

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