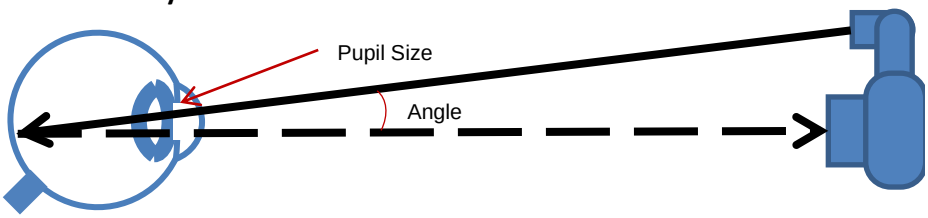
PhotoRED

Photographic Red Eye Diagnosis

The Early Detection of Childhood Blindness using Digital Photographs to Elicit a Red-Eye Reflex from Children.



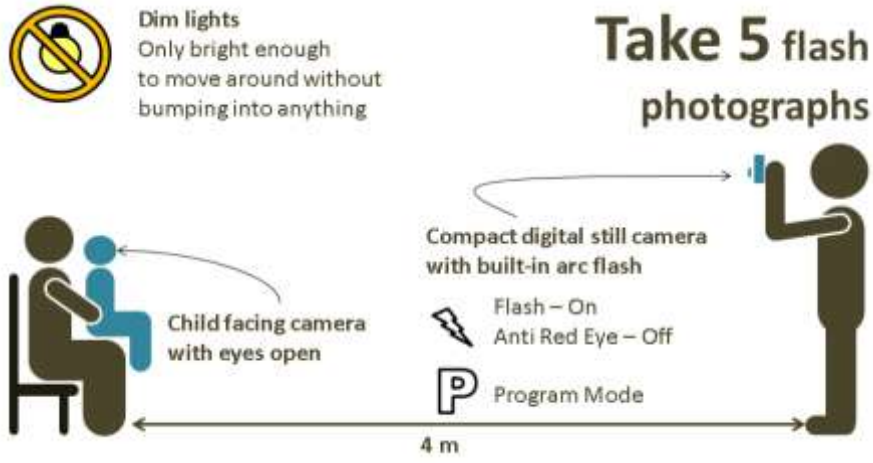
Links to more information about the project:

Humanitarian of the Year Award technology review

The Economist

The red eye reflex is a phenomenon with which we can predict the health of an eye. This is especially useful in detecting eye problems in children before they can read an eye chart. The red reflex test basically tells us that a light source can reach the retina of the eye, bounce back and be detected as a red glow. This indicates that there is nothing abnormal blocking the light from reaching inside the eye, and nothing abnormal in the retina which is reflecting the light back as red. This red glow is a common occurrence in photographs, and if the glow is symmetrically red from both eyes – it is normal. We can elicit this red reflex if the pupil is large enough to allow the incident ray and the reflecting ray to pass through it. Doctors might have found a way by which we can almost always capture this important red reflex from a child's eye.

Protocol for Taking Red Eye Reflex Photograph:



Examples of Normal and Abnormal Photographs:

Normal Red Reflex	Absent Red Reflex (Right Eye)	White Reflex (Right Eye)
Symmetrical red reflections from within both eyes indicate a normal reflex.	Loss of red reflex from the right eye indicates no light entry.	Presence of white reflex instead of a red reflex in the right eye can indicate a retinal problem.

Advantages of the Photo-RED Screening Test:

When tested in a pilot study, the PhotoRED photographs could pick up more than 88% of the important abnormalities that could be picked up by the standard screening test (called “direct ophthalmoscopy”). Compact digital cameras are affordable, ubiquitous, and simple to use by a layperson. An important advantage of cameras is that they create a digital record. This would allow remote assessment of the examination and efficient liaison between urban specialist centres and rural primary centres.

Limitations of the Photo-RED Screening Test:

1. The red-reflex method of screening detects significantly abnormal eyes only, and cannot detect subtle eye problems. This is true irrespective of us using a direct ophthalmoscope or a digital camera for the test.
2. The Photo-RED test will not be accurate if the method described above is not closely followed. This is especially relevant for children who are under the age of three months, who cannot fix their eyes to look at the photographer or camera.
3. An abnormal red-reflex photograph should be followed by a proper clinical examination by a pediatric ophthalmologist to confirm the abnormality. This is because the Photo-RED test can sometimes falsely show eye abnormalities. Some situations which cause falsely abnormal reflexes are as follows:
    a. Falsely Absent Red-Reflex:
    This can be because of the normal retina being less reflective in children who have a lot of pigment. If this is the case, it invariably results in the reflex being absent from both eyes. If one eye red reflex is absent, and the other eye red reflex is normal, the eye with the absent reflex is invariably abnormal.
    b. White Reflection from a Normal Eye:
    A normal eye can sometimes displays a white reflection from within the eye for the following reasons:
        i. Eye facing the wrong direction:
        As mentioned previously, the Photo-RED screening is successful only if the photographs have been taken in the exact way described above. A white reflection can be found from a normal eye facing the wrong direction, instead of facing the camera. The child should be facing and focussing on the camera or photographer to avoid this problem.
        ii. Poor quality of the compact digital camera sensor:
        Some very inexpensive digital cameras show an abnormal white reflection instead of a red-eye reflection because the camera sensor and software display a poor “signal to noise” ratio.

Conclusions:

The PhotoRED strategy shows potential in being able to screen for eye abnormalities in children under the age of five years, especially as a supplement for existing screening strategies. We do not intend to replace important screening strategies such as red-reflex screening using a direct ophthalmoscope, eye examinations in children who are at a high risk of having an eye problems (such as premature babies, or family members of children with eye cancer) or the use of vision screening in school children.

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