Simulation of Tunnel Acuity in Infantile Nystagmus Syndrome

L.F. Dell'Osso, Ph.D.

From the Daroff-Dell'Osso Ocular Motility Laboratory, Louis Stokes Cleveland DVA Medical Center and CASE Medical Center; and the Depts. of Neurology and Biomedical Engineering, Case Western Reserve University, Cleveland OH, USA

OMLAB Report #072020
Written: 07/20/20; **Placed on Web Page:** 07/20/20; **Last Modified:** 07/20/20
Downloaded from: OMLAB.ORG
Send questions, comments, and suggestions to: lfd@case.edu

This work was supported in part by the Office of Research and Development, Medical Research Service, Department of Veterans Affairs.

The main detriment to good visual function in infantile nystagmus syndrome (INS) is what I refer to as "tunnel acuity." That is, the limitation of high visual acuity to a small range of gaze angles (the INS "null") and the sharp deterioration of acuity as gaze is directed laterally to either side of that region of peak acuity. The reduction of peak acuity due solely to the INS waveform and its poor foveation-period quality is usually not severe, so those patients with a very low peak acuity usually have a significant afferent visual deficit in addition to their INS.

Figure 1. Photographic simulation of the pre-therapy effects of a narrow field of high acuity that rapidly falls off as gaze is directed laterally from it. Post-therapy, targets in lateral gaze are also seen clearly. T&R, tenotomy and reattachment.

Figure 1 shows the result of foveal tunnel acuity on targets in the visual field. As it illustrates, lateral targets cannot be seen pre-therapy with the same clarity as those in the region of peak acuity (here shown in primary position). Post-therapy the broadened high-acuity range of gaze angles makes face recognition far easier and faster.

Tunnel Acuity Simulation

The following exercise is recommended for *all* ophthalmologists, optometrists, residents, fellows, and to visual and ocular motor scientists, students, and post-docs. That is, anyone who sees INS patients or studies INS; it is also recommended for the parents of a child with INS who often want to understand "how their child sees." Experiencing this simulation will provide insights into the actual visual function deficits experienced by those with INS. Perform as many of the exercises as you can.
NOTE: This is a simulation of the loss of *foveal* acuity in lateral gaze; it does not simulate the perceived visual world of an INS patient. The latter is the same as for non-INS individuals, i.e., a stable image that appears equally clear across the visual field. In both non-INS and INS individuals, the brain compensates for the loss of acuity as an image appears farther lateral to the fovea

1. Place two vertical strips of translucent tape over each lens of your eye glasses leaving a ¼" gap through which you can view the world with your normal acuity (this simulates an approximately 10° high-acuity tunnel similar to the "null" region in INS. If you wear contacts or do not require refractive correction, use a pair of full-lens, low-diopter reading glasses.

2. While seated, read something or use your computer.

3. Walk about in familiar or unfamiliar surroundings.

4. Try to identify familiar faces in a crowded room.

5. Play catch using a *soft* rubber ball.

6. Track a bird or car traveling across your visual field.

7. While seated in the driver's seat, simulate the following actions required during driving:

a) Quickly look at the instrument panel
b) Quickly look through the windshield at the left and right side of the road
c) Quickly look through the upper right windshield at am imaginary street sign
d) Quickly look through your rear, left-side, and right-side mirrors

WARNING: Do not turn on the engine or attempt to drive.

The difficulties you experience doing these simple, required real-life tasks should provide you with a better understanding of the visual function deficits caused by INS, even if BCVA is normal. More realistic simulations can be accomplished by placing the gap between the two tapes at 15° to the left or right of center (this will give you a right or left head turn for primary position fixation) and by using small plus lenses to reduce your peak BCVA.

Citation

Although the information contained in this paper and its downloading are free, please acknowledge its source by citing the paper as follows:

Dell'Osso, L.F.: Simulation of Tunnel Acuity in Infantile Nystagmus Syndrome in Infantile Nystagmus Syndrome. OMLAB Report #072020, 1-3, 2020. http://www.omlab.org/Teaching/teaching.html