

Quantifying nystagmus in infants and young children: relation between foveation and visual acuity deficit.

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Abstract

PURPOSE:

Nystagmus eye movement data from infants and young children are often not suitable for advanced quantitative analysis. A method was developed to capture useful information from noisy data and validate the technique by showing meaningful relationships with visual functioning.

METHODS:

Horizontal eye movements from patients (age 5 months-8 years) with idiopathic infantile nystagmus syndrome (INS) were used to develop a quantitative outcome measure that allowed for head and body movement during the recording. The validity of this outcome was assessed by evaluating its relation to visual acuity deficit in 130 subjects, its relation to actual fixation as assessed under simultaneous fundus imaging, its correlation with the established expanded nystagmus acuity function (NAFX), and its test-retest variability.

RESULTS:

The nystagmus optimal fixation function (NOFF) was defined as the logit transform of the fraction of data points meeting position and velocity criteria within a moving window. A decreasing exponential relationship was found between visual acuity deficit and the NOFF, yielding a 0.75 logMAR deficit for the poorest NOFF and diminishing deficits with improving foveation. As much as 96% of the points identified as foveation events fell within 0.25° of the actual target. Good correlation ($r = 0.96$) was found between NOFF and NAFX. Test-retest variability was 0.49 logit units.

CONCLUSIONS:

The NOFF is a feasible method to quantify noisy nystagmus eye movement data. Its validation makes it a promising outcome measure for the progression and treatment of nystagmus during early childhood.