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Abstract Title: **Infrared Eyetracker Methods for Measuring Strabismus**

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Purpose: Accurate measurement of eye deviation is important for managing patients with strabismus. In this study we assessed the precision and accuracy of an infrared eye tracker (ViewPoint EyeTracker, Arrington Research, Scottsdale, AZ) to detect ocular misalignment.

Methods: Vertical strabismus was induced in the right eye of a non-strabismic subject by using base-down prisms of 4, 5, 6, 8, 10, 12, 15, and 20 prism diopters (pd) mounted in a trial frame, in random order. Each deviation was tested 6 times (48 total assessments) in a masked manner while the subject fixed on a 3 m target. Deviations were also measured in a masked manner by a certified Orthoptist using the simultaneous prism cover test (SPCT). For individual EyeTracker assessments, data from 7 cover tests were used (based on previous pilot work). Agreement between the EyeTracker, Orthoptist and prism was determined by intraclass correlation coefficients (ICC). In deviations under 4 pd, where it was not possible to induce a constant tropia due to normal fusion, sensitivity and accuracy of the EyeTracker was measured by 20 horizontal and 20 vertical sets of 7 voluntary saccades of 0 (no movement), 0.5, 1, 1.5, 2, 3, and 4 pd. Agreement was assessed by calculating the 99% confidence intervals (CI) of the mean difference between the EyeTracker and the intended saccade.

Results: Measurements of prism-induced deviations by both the EyeTracker and Orthoptist showed excellent agreement with prism strength (ICC = 0.98 and 0.97 respectively). The EyeTracker showed excellent agreement with SPCT measurements by the Orthoptist (ICC=0.96) and could reliably detect voluntary saccades as small as 0.5 pd. The 99% CI's of the differences for 0.5 pd saccades were 0.44 to 0.75 pd horizontally and 0.42 to 0.81 pd vertically, and therefore saccades of 0.5pd could be distinguished from 0 and 1pd. Overall (0-4 pd), the 99% CI's of the differences between the intended and measured saccades were 0.02 to 0.13 pd horizontally and -0.05 to 0.11 pd vertically.

Conclusions: The ViewPoint EyeTracker shows promise as an accurate and sensitive instrument for objectively measuring ocular misalignment of 0.5 pd and greater. Ocular alignment measured by the EyeTracker may serve as an objective outcome measure for clinical trials in strabismus.

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